Understanding the capability of Indonesian shrimp producers to participate in lucrative export markets; using the integrated sustainable livelihoods approach (SLA) and global value chain (GVC) analyses

Irna Sari

A thesis submitted for the degree of

Doctor of Philosophy

Faculty of Arts and Social Sciences

University of Technology, Sydney

September 2015

Acknowledgements

Firstly I would like to thank the Australian Leadership Awards program; without the scholarship I could never undertake my PhD program in Australia. I am also grateful for the research grant given under ACIAR project FIS/2007/124, which partly supported my fieldwork in the Netherlands. Dr Mike Rimmer is thanked for supporting my application for the scholarship and involving me in the ACIAR project in Indonesia.

I am grateful to A/Prof. Kate Barclay for accepting me as her student and for her supervision throughout the program.

I owe my deepest gratitude to A/Prof. Jesmond Sammut who played multiple roles: as a person close to me, a colleague and a mentor throughout my PhD journey. He has always been there whenever I needed him. I really appreciate his wise counsel and judgement when I was in doubt, his overall support, his review of the thesis, and his insightful comments. I do not have enough words to fully express my gratitude.

I am particularly grateful to all my PhD friends on Level 8, Building 10, UTS. A special thanks to Amina Singh for all the stimulating discussions - my PhD journey would be different without you. Thanks to Sandris Zeivots, Shashi Sharma, Benjamin Hanckel, Nipa Saha, Shaonee Rahman, Vassiliki Veros, George Catsi, Ivor King with whom I have shared the PhD experience. All the drinks and dinners helped to 'normalize' my life as a PhD student.

Thanks also to my colleagues at the UNSW Aquaculture Research Group. I am grateful to Dr Tarunamulia and his family who provided shelter when I landed in Sydney to start my studies. Thanks to Bayu Priyambodo, Laila Wijaya, Hatim Albasri and Irja Tobawan Simbiak for all the stimulating conversations.

I extend particular thanks to respondents who generously gave of their time and shared their insights, and those who assisted me during the fieldwork periods: ACIAR project officers in Makassar, Nazar Rusli, Irma Arsyanti, Wahyudin Putra Sasmita and Andi Armynsyah Pangera. Thanks to Elite Editing for the final editing of the thesis.

Finally, thanks to my parents, my sister and brothers who are always there for me. I deeply appreciate their continual support, prayer, and encouragement.

Certificate of original authorship

I certify that the work in this thesis has not previously been submitted for a degree nor has it been submitted as part of requirements for a degree except as fully acknowledged within the text.

I also certify that the thesis has been written by me. Any help that I have received in my research work and the preparation of the thesis itself has been acknowledged. In addition, I certify that all information sources and literature used are indicated in the thesis.

Signed: Production Note: Signature removed prior to publication. On: 08/09/2015

Table of contents

List of figures

List of tables

List of plates

List of appendices

Glossary and abbreviations

ACIAR—Australian Centre for International Agricultural Research

Acidic sulphate soils—soil or sediment containing iron sulfate or products resulting from oxidation of sulfide, with an actual or potential low pH (<4)

ADB—Asian Development Bank

AQD—Aquaculture Department under the South–East Asian Development Center (SEAFDEC)

Aquaculture—refers to the farming of aquatic organisms, including fish, molluscs, crustaceans and aquatic plants

Artemia—brine shrimp used in hatcheries as feed for early stage of shrimp post-larvae in hatchery

ASC—Aquaculture Stewardship Council, an organisation promoting an eco-label certification scheme (ASC certification)

AwF—Aquaculture without Frontiers

Backyard hatchery—a type of hatchery operated at the household scale and usually located in the backyard of the households

BADP—Brackishwater Aquaculture Development Programs; a program established in 1983 by the Indonesian government to enhance shrimp farming production

BAP—Best Aquaculture Practices; an eco-label certification scheme

BBAP—Balai Budidaya Air Payau; Brackishwater Aquaculture Centre

BBPBAP—Balai Besar Pengembangan Budidaya Air Payau, Indonesian Brackishwater Aquaculture Research Centre

BKIPM—Fish Quarantine and Quality Control Agency

BMP—Better Management Practices

BNI—Bank Negara Indonesia

Brackishwater aquaculture—aquaculture system located in estuary areas usually with salinity level ranging from 0.5 grams to 30 grams of salt per litre

Broodstock—matured shrimp used to produce seed in hatchery

BSN—Badan Standarisasi Nasional, an Indonesian standardisation agency

BRR—Badan Rehabilitasi dan Rekonstruksi, Agency of the Rehabilitation and Reconstruction for the Region and Community of Aceh and Nias

Buyer-driven value chains—those industries in which large retailers, brand-named merchandisers and trading companies play a pivotal role in setting up decentralized production networks in a variety of exporting countries, typically located in the Third World' (Gereffi 1994, p. 97)

BPBAP—Balai Pengembangan Budidaya Air Payau, Brackhiswater Aquaculture Development Agency

BVI—British Virgin Islands

CA—Capability approach, normative framework used to evaluate and assess wellbeing, social phenomena and policy that it can be applied to a wide range of social phenomena

Capability—an individual's or group's ability to undertake a function which requires assets to enable them to pursue their economic or social interests (Sen 1981, 1987)

CBB—Central Bali Bahari

Competent Authority—a legal authority body that is responsible to ensure compliance of an importing counting country's regulation; in Indonesia, the compliance relates to the European Union's regulation on food safety measures

Consumers—an end buyer who purchases a commodity for consumption or possession

Coordinator—broker for processing companies; often defined as an agent of processing companies supplying shrimp to processors

CP—Charoen Pokphand

CP Group—Charoen Pokphand Group; a company originating from Thailand, established in 1921, starting as an agriculture inputs supplier and later becoming a globally integrated shrimp producer

CPB—Central Pertiwi Bahari

CPP— Central Proteinaprima Tbk

CSR—Corporate Social Responsibility

DFID—Department for International Development

DGA—Directorate-General of Aquaculture under Ministry of Marine Affairs and Fisheries (MMAF) of Indonesia

DKP—Dinas Kelautan dan Perikanan, Marine Affairs and Fisheries Office Indonesian; a government institution responsible for marine and fisheries affairs at the provincial and district levels

Downstream—refers to nodes that are closer to end consumers

EC—European Commission

Eco-label certification—labelling systems for food and consumer products as a form of measurement for sustainability

Engineered broodstock—genetically engineered broodstock

EU—European Union

Export market requirements—precondition imposed on exporters by shrimp buyers and governments from importing countries

Extensification—a way for improving fisheries production through expanding production areas

FAO—Food and Agriculture Organization of the United Nations

FCR—food conversion ratio

FDA—Food and Drug Administration for the United States

FDI—foreign direct investment

FGD—focus group discussion

Financial capital—financial resources including income, savings, credit and remittances

Fixed cost—expenses that are not required in each production cycle and are not dependent on the level of production; this may include production infrastructure and facilities such as water canals, water gates, water pumps, paddlewheel and rents

Food safety—describes the handling, preparation and storage of food in ways that prevent foodborne illness

Formulated feed—artificial shrimp feed produced manually or mechanically with a feed formulation composing protein, carbohydrates, lipids and other essential nutrients for shrimp growth; used to replace or enhance natural food in the pond system

FSSP—Fisheries Support Services Project

GAA—Global Aquaculture Alliance; an international, non-profit trade association dedicated to advancing environmentally and socially responsible aquaculture

GAM—Free Aceh Movement; Acehnese separatist group

GAP—Good Agricultural Practice

GCC—global commodity chain; an earlier concept of the flow of production, which later became synonymous with the notion of global value chain (GVC)

Global value chain (GVC)—'sets of interorganisational networks clustered around one commodity or product, linking households, enterprises, and state to one another within the world economy' (Gereffi, Korzeniewicz & Korzeniewicz 1994, p. 2)

GlobalGAP—an eco-label certification scheme that focuses on the implementation of good agricultural practice (GAP) in production

GOI—Government of Indonesia

Governance—'Co-ordination of economic activities through a non-market relationship … Allows inclusion and not just network but also hierarchical form, such as corporate governance … Used for both private and public spares and at the local and global level' (Humphrey & Schmitz 2000, p. 4)

GM—genetically modified

GRIM—Gondol Research Institute for Mariculture

HACCP—hazard analysis critical control point

HACCP certification—a systematic preventive approach to food safety from biological, chemical and physical hazards in production processes that can cause the finished product to be unsafe and the design of measurements to reduce these risks to a safe level based on HACCP

Hatchery—a facility where eggs are hatched under artificial conditions, in shrimp farming hatcheries usually produce post-larva

Household-scale shrimp producer (**HSSP**)—a unit of shrimp farm-owned and managed by a household, the primary labour inputs are sourced from household members; in Indonesia, this type of shrimp farm is not required to have a legal permit from the Indonesian government

Household-scale shrimp producers global value chain (HSSP_GVC)—an abbreviation to describe the value chains of household-scale shrimp producers within the Indonesian shrimp global value chain

Household—the social group which resides in the same place, shares the same meals and coordinates resources allocation and income pooling

Human capital—skills, knowledge and capabilities of the workforce or the population of a country to be more innovative and productive (Blain 2011, p. 49)

IDH—Dutch Sustainable Trade Initiative

IFC—International Finance Corporation of the World Bank Group

IMNV—infectious myonecrosis virus; a type of virus that infects shrimp causing mortality

Importer—a shrimp buyer who is usually located in consuming countries

Indonesian shrimp global value chain (ISGVC)—value chain that describes the product flows of Indonesian shrimp

Indoor hatcheries—a type of hatchery operated within a controlled and enclosed environment; usually uses higher technology compared to a backyard hatchery

Industrial-scale shrimp producers' global value chain (ISSP_GVC)—an abbreviation to describe the value chains of industrial-scale shrimp producers within the ISGVC

Industrial-scale shrimp producer (ISSP)—shrimp farm which is required to have a legal business permit from the Indonesian government issued by the relevant government authority at the district or provincial level; this type of farming system is financed by domestic entrepreneurs

Inland fisheries.—freshwater fisheries including farmed and capture-based inland fisheries

INTAM—*Intesifikasi tambak*; a program developed by the Indonesian government to enhance farmed shrimp production under REPELITA IV and V

Integrated shrimp farming—refers to a company growing shrimp which produces production inputs or directly sells its shrimp to an importing country (acts as an exporter)

Intensification—a way to improve fisheries production through adopting modernised and intensive technology

Intensive shrimp farming system—a system of brackishwater aquaculture using intensive production inputs and practices

Intensive capital—a business process or an industry that requires large amounts of money and other financial resources to produce a good or service

IRES—Institut de Recherches Economiques et Sociales

ISGVC—Indonesian shrimp global value chain

IUCN—International Union for the Conservation of Nature

JICA—Japanese International Cooperation Agency

Juvenile—a stage in the shrimp life cycle after post-larva, which is usually 30 days after hatching

KEPRES—Presidential Decree of Indonesia

KUR—*Kredit Usaha Rakyat*; Credit for Communities' Business; a credit scheme targeting small and medium businesses

Livelihood capitals—assets defined within the sustainable livelihood approach which include human, financial, social, physical and natural capitals

Lucrative export markets—refers to export markets in developed countries that impose stringent import requirements (e.g. the European and the US markets)

Marine capture fishery—a form of harvesting of naturally occurring living resources in the marine environment using fishing gear

Marketing actors—refers to actors involved in marketing chains, including the wholesaler, coordinator, processing companies and importers and retailers

MDG—Millenium Development Goals

Milkfish—*Chanos chanos* (Latin); a type of fish usually farmed in brackishwater ponds either as polyculture together with shrimp or monoculture

Mixed methods—a research approach that applies qualitative and quantitative methods

MMAF—Ministry of Marine Affairs and Fisheries of Indonesia

Monoculture—aquaculture in the context of the practice of producing or growing a single commodity

Monodon—*Penaeus monodon* (Latin); is also known as tiger shrimp and giant tiger shrimp

NACA—Network of Aquaculture Centres in the Asia-Pacific

Natural capital—assets that relate to land, water and biological resources.

Natural feed—shrimp feed grown in the ponds; mainly refers to algae and plankton

Nauplius—the immature stage between hatching from eggs and reaching adult form

NGOs—Non-government organisations

Non-production facilities—physical assets which are not directly needed in shrimp production such as mobile phones and cars

Non-value chain actors—people who are indirectly involved in the shrimp supply chain including government officials, NGOs and experts

Nursery farmer—refers to the seed intermediary who adds value by growing post-larvae for two weeks before selling it to shrimp producers

OTCA—Overseas Technical Cooperation Agency

Pangasius—*Pangasius* (Latin); also known as the bahsa catfish; a farmed fish species

Permanent house—refers to a house in which the main structure and walls are built using concrete or cement and brick

Permanent labour—workers who are hired on a permanent basis receiving either fixed regular payments or a profit share

Physical capital—goods or facilities directly and indirectly required in production, including irrigation, canals, machines, roads, houses and vehicles

Polyculture—aquaculture system of producing or growing more than one commodity such as growing shrimp and fish together in a pond

Post-larva—the life stage for shrimp which is used as the seed in shrimp farming and produced by hatcheries

Primary canals—water supply infrastructure that access water directly from main water source

Processor—also called a processing company that processes shrimp prior to export and who usually acts as exporter

Producer-driven value chains—'value chain where producers control the supplies; the producers have competency to decide product specification and process of production' (Kaplinsky & Morris 2001)

Production cost—a total cost associated with production, including fixed and variable costs

Production cycle—the period of shrimp farming at the beginning with the pond preparation stage and ending with the harvesting stage, involving labour and production inputs

Production facilities—physical assets directly needed in shrimp production such as paddlewheels, water pumps, generators and auto feeders

Pro-poor credit—a formal credit system which enables the poor to access loans by accommodating for their limitations through using mechanisms such as flexible collateral requirements

Random sampling—a sampling method which provides equal probability for each individual in a population to be a respondent

RASFF—Rapid Alert System for Food and Feed

RCU—Research Centre for Shrimp, developed by the Indonesian government in 1971

REPELITA—a five-year development plan in Indonesia, developed and applied during the Suharto regime; REPELITA I was a development plan during the period 1969/1970–1973/1974; REPELITA II was developed in 1974/1975–1978/1979; REPELITA III was developed in 1979/1980–1983/1984; REPELITA IV was developed in 1984/1985–1988/1989 and REPELITA V was developed in 1989/1990–1994/1995

Routes—a specific supply chain within ISGVC which describes a specific flow for accessing inputs and markets differently

SANCO—European Commission's Directorate-General for Health and Consumer Protection

SCI—Shrimp club Indonesia; an association for Indonesian industrial-scale shrimp producers

SEAFDEC—South–East Asian Development Center

Secondary canal—water supply infrastructure which accesses water from a primary canal

Semi-extensive shrimp farming system—a system of brackishwater aquaculture using a higher quantity of inputs; a farming system between traditional and intensive shrimp farming system

Semi-permanent house—refers to a house that has walls made with a combination of concrete and wood

Shrimp wholesaler—marketing actor who purchases and sells shrimp

SIS— Shrimp improvement system

Snowball sampling—a chain-referral method, in which respondents are selected from friendship networks and through already engaged respondents (Salganik & Heckathorn 2004)

Social capital—refers to networks and relationships between individuals which may be vertical between stakeholders or horizontal (as in voluntary organisations)

Specific Pathogen Free (SPF)—a seed which is guaranteed to be free of a particular pathogen

SPR—Specific pathogen resistant

SSPIFF—safe and sanitary processing and importing of fish and fishery products

Standards—technical specifications or criteria used as guidelines and measurements to ensure the products meet the objectives

Sustainable livelihood approach (SLA)—an approach to enhance the understanding of poor people through including factors that affect the livelihood of the poor and the interaction between these factors; the factors include their livelihood capitals and the role of external interventions such as policy and institutions

SNI—Standar Nasional Indonesia, Indonesian national standard

Tambak—Indonesian word referring to ponds which are predominantly associated with brackishwater shrimp ponds

Tilapia—*Oreochromis* sp (Latin); a type of fish that can be farmed in brackishwater or freshwater ponds

TIR (nucleus-plasma systems)—*Tambak Inti Rakyats*; a program developed by the Indonesian government under REPELITA IV and V to increase shrimp farming production through the collaboration between private businesses and communities

TNC—transnational corporation

Traceability—the ability to trace 'one step backward, one step forwards', endorsed with specified documentations; the key facets of traceability are that all products should have a unique batch code and should be identifiable

Traditional extensive shrimp farming system—a system of brackishwater aquaculture using the least inputs

Transaction cost—a cost incurred in making an economic exchange

Transnational-scale shrimp producer (TSSP)—a transnational corporate or multinational shrimp producer that operates in more than one nation state

Transnational-scale shrimp producers global value chain (TSSP_GVC)—an abbreviation for the value chains of transnational-scale shrimp producers within the ISGVC

TSV—Taura Syndrome Virus; a virus that can infect shrimp and cause mortality

UK—United Kingdom

UNCED—United Nations Conference on the Environment and Development

UNDP— United Nations Development Programme

Upgrading—various strategies that firms may develop to strengthen their penetration in global markets (Gereffi 1994; Humphrey & Schmitz 2000)

Upstream—refers to nodes that are closer to production, including production inputs provision

UTS HREC—University of Technology Sydney Human Research Ethics Committee

Value chain (GVC) actors—people who are directly involved in the shrimp supply chain including suppliers, farmers and buyers

V**annamei**—*Litopenaeus vannamei* (Latin); a type of farmed shrimp introduced in Indonesia since the early 2000s; it is also called whiteleg shrimp

Variable cost—costs which depend on the volumes traded; for example costs related to transferring the product to its destination; these costs may prevent or reduce market exchange; market failure is further exacerbated by information asymmetries, imperfectly specified property rights and risk

Vertical integration—the supply chain of a company where nodes are integrated through ownership of that company

Water canal—physical infrastructure which functions in water supply

WB—World Bank

WFC—WorldFish Center

WNF—Wereld Natuur Fonds, the Dutch branch of the World Wildlife Fund

WSSV—White Spot Syndrome Virus

WWF—World Wide Fund for Nature

Abstract

Aquaculture is the fastest growing animal-based, food-producing sector. Over the past 20 years it has experienced an average annual growth of almost 10 per cent per year. Furthuremore, brackishwater aquaculture for shrimp has been rapidly expanding over the last few decades, particularly in Asia. Advances in aquaculture technology have enabled developing countries to substantially increase production; this has stimulated growth in the seafood trade globally, especially in the flow of commodities from developing to developed regions and countries such as Europe, the US and Japan. Moreover, there has been a rise in standards to control food safety such as eco-label certifications required by governments and buyers from the importing countries. Compliance with these requirements is imposed on developing country shrimp producers by the importing countries. In Indonesia, the shrimp aquaculture sector has also attracted transnational companies who have invested heavily in shrimp farming. This has resulted in the formation of three groups of shrimp producers based on their business scale. The three types of producers are: (1) household-scale, which are small, family-run businesses and dominate the sector; (2) industrial-scale, which are characterised by a business organisational structure; there are approximately 400 of these in Indonesia; and (3) transnational-scale, of which there is only one in Indonesia; it is foreign owned and operates across a number of countries. The scale of the production can potentially affect the ability to participate in lucrative export markets because of the different abilities to comply with the importing requirements. This might lead to the exclusion of Indonesian household-scale producers from the export markets.

To understand the ability of household-scale producers to comply with the food safety and eco-labelling certification requirements, this study determined the capabilities of household-scale producers and then compared them with the capabilities of industrial- and transnational-scale shrimp producers. This study is important for the development of appropriate industry support programs and to address any potential inequalities that might lead to market exclusion. The study combined the sustainable livelihood approach (SLA) and the global value chain (GVC) to evaluate the capabilities of the three scales of shrimp producers; past studies have usually used one method or the other. The SLA approach enabled this study to evaluate the capabilities from the perspective of human, financial, social, natural and physical capitals in relation to the abilities to comply with export market requirements. The GVC approach allowed this study to evaluate capabilities from the perspective of how shrimp producers access their production inputs and markets. The combined method more effectively determined the effect of livelihood capitals on Indonesian shrimp global value chains.

This study showed that capabilities between different scales of Indonesian shrimp producers were stratified based on the level of endowment of the livelihood capitals and the types of global value chain shrimp that they could access. Household-scale shrimp producers do not have sufficient capabilities, both from the perspective of livelihood capitals and the type of global value chain which can be accessed, to enable them to comply with the export market requirements. They have low competency of necessary human capital, a lack of social networks, limited access to formal banking and lack the uptake of technology that could support their ability to comply with food safety, eco-label certification and traceability. Household-scale shrimp producers also have very fragmented and lengthy value chains which increase the complexities around complying with the requirements. In contrast, the transnational-scale shrimp producer was the most capable to comply with the export market requirements. It had a high accumulation of the livelihood capitals and was able to establish very efficient vertically integrated supply chains which favoured its capability. The industrial-scale shrimp producers have levels of capability in between household- and transnational-scale shrimp producers. This shows that the business scale of shrimp producers determines capability to comply with the export market requirements. This leads to the ability to participate in lucrative markets. Accordingly, household-scale shrimp producers are at risk of being excluded from the lucrative markets.

External interventions from government and non–government organisations are necessary to enhance the capabilities of household-scale shrimp producers. The interventions would need to have greater emphasis on developing human and social capitals. Parallel to such development interventions, it is also critical to develop governance related to seafood global trades which can protect and enhance household-scale shrimp producers' participation in the most lucrative markets for a fairer globalised world.

Chapter 1: Introduction

1.1 Introduction to the research problem

The research problem for this thesis emerges from the history of aquaculture production in developing countries, which led to the new entry of transnational shrimp producers and the vast majority of household-scale aquaculture farmers. While seafood exports have contributed to the development of the producing countries' farmed seafood, participation within international markets, particularly in the markets of the European Union and the United States (US), have become more difficult due to increasingly stringent requirements (detailed in Chapter 4). The capabilities of the shrimp producers are the critical enabling factors which will allow them to meet those requirements.

This chapter discusses the background related to the research problem as the genesis of this study (Section 1.1); the objectives, central argument and the research question (Section 1.2) are provided. This chapter also presents the conceptual framework of the capability approach (CA) and approaches to evaluate capabilities to participate in lucrative export markets (Section 1.3). There are several key concepts that are discussed and developed in this thesis that relate to the capability of farmers to participate in markets. In brief, capability is defined as the ability of the shrimp producers to perform functions which enable them to comply with the requirements of the export markets. The capability to comply with the requirements is determined by livelihood capitals and the type of global value chains (GVCs) that shrimp producers are enmeshed within. The compliance capability is the means by which they can participate in the export market. Details of these concepts are presented in Section 1.3.

The limitations and contributions of this study are also presented, highlighting the position of this study among previous studies (Section 1.4 and 1.5). Finally, this chapter provides an overview of the thesis plan; this should be seen as the thesis' roadmap, presenting the relationship between chapters to achieve the objective of this study (Section 1.6).

1.1.1 Global growth of seafood and aquaculture production

Global fisheries production has grown in the last few decades. It grew by 30.6 per cent within the period 2001 to 2011 (Figure 1.1). This growth has been driven by the aquaculture sector, which has been increasing production over the last few decades due to technological advances and increasing demand for seafood products. Aquaculture production grew by 13,011.86 per cent from 1950 to 2011 and production increased by 83,090,736.40 tonnes from only 638,577 tonnes in 1950 (Figure 1.1). In contrast, capture fisheries production has declined by almost three per cent from 2001 to 2011. The Food and Agriculture Organization of the United Nations (FAO) suggests that the decline in capture fish production has been associated with the depletion of wild fish stocks due to unsustainable and overfishing practices (FAO 2010). In relation to the growing aquaculture sector and the decline in capture fisheries production, this trend may suggest that aquaculture production can substitute capture fisheries production to supply current and future world seafood demand.

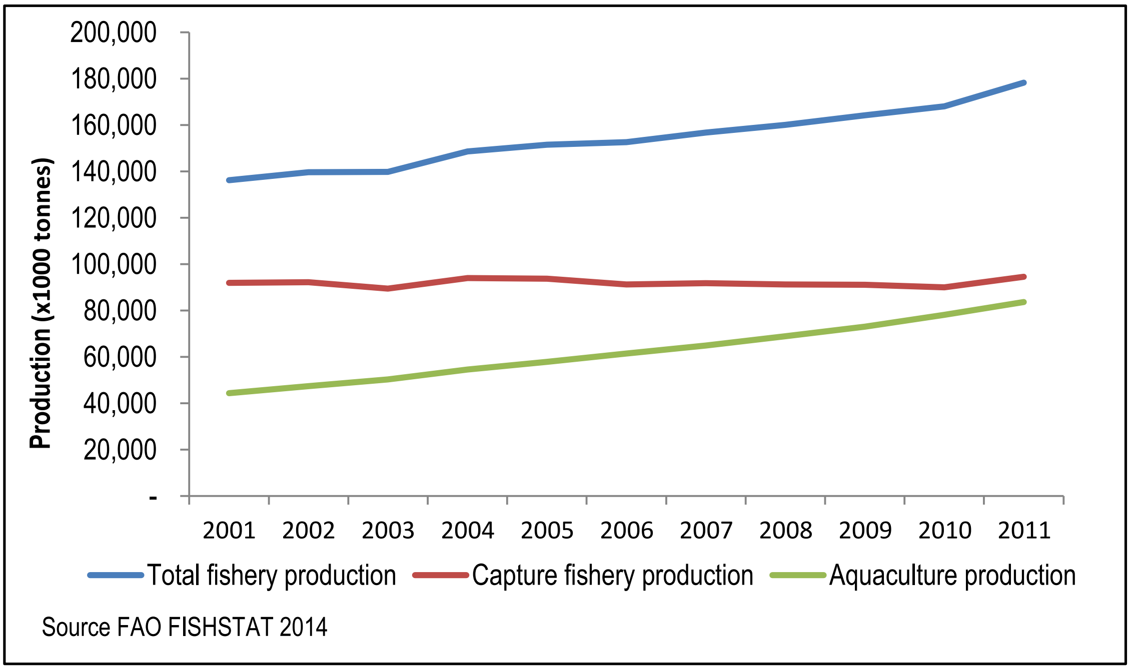


Figure 1.1 Global productions of fishery products

The growth in aquaculture production relates to significant growth experienced by Asian developing countries, particularly China (Table 1.1; Hishamunda & Subasinghe 2003), and growth in demand for shrimp in Western nations and wealthy countries in Asia (FAO 2012). The huge share of China's aquaculture production volume has positioned Asia as the leading continent in the world aquaculture sector. India has also been strengthening its position; Indian aquaculture production grew by 63 per cent between 1999 and 2008. This positions India as the second biggest producer globally. South–East Asian countries such as Viet Nam, Indonesia, Thailand and the Philippines are among the main producers (Table 1.1). The rapid growth of aquaculture development in South–East Asia is driven by the rapid growth of aquaculture in Viet

Nam. Viet Nam's aquaculture has grown by 641 per cent for the period 1999–2011 (FAO FISHSTAT 2014).

Brackishwater aquaculture for shrimp is part of the aquaculture sector; it has been continuously expanding over the last few decades. The global production of shrimp under brackishwater practices, largely in earthen ponds, has increased by 216,588 per cent from 1,289 tonnes to 2,793,113.10 tonnes for the period 1950–2011 (FAO FISHSTAT 2014). Growth in brackishwater shrimp culture production in Asian countries has contributed to the bulk of global production—around 84 per cent of total brackishwater production for shrimp. The biggest four shrimp-producing countries are China, Thailand, Viet Nam and Indonesia, with their share of total global production being 28.91 per cent; 21.02 per cent; 20.27 per cent and 6.26 per cent, respectively (FAO FISHSTAT 2014).

Table 1.1 The biggest ten aquaculture producing countries

Country	Aquaculture production of fish, crustaceans and molluscs (tonnes)										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
China	29,874,867	31,866,489	33,668,450	35,946,139	37,619,441	39,363,399	41,177,565	42,673,599	45,283,992	47,833,948	50,176,578
India	2,120,634	2,189,445	2,316,947	2,804,362	2,973,126	3,182,817	3,114,762	3,855,763	3,798,842	3,790,021	4,577,965
Viet Nam	608,098	728,041	967,502	1,228,617	1,467,300	1,693,727	2,123,400	2,498,150	2,589,680	2,706,800	3,052,500
Indonesia	1,076,749	1,137,151	1,228,559	1,468,612	2,124,093	2,479,247	3,137,376	3,854,944	4,712,847	6,277,925	7,937,072
Thailand	814,121	954,608	1,064,407	1,259,981	1,304,231	1,354,297	1,370,456	1,330,861	1,416,668	1,286,122	1,008,049
Bangladesh	712,640	786,604	856,956	914,752	882,091	892,049	945,812	1,005,542	1,064,285	1,308,515	1,523,759
Norway	510,748	551,297	584,423	636,802	661,877	712,373	841,560	848,359	961,840	1,008,010	1,138,797
Chile	631,634	617,303	607,338	696,157	739,368	832,329	806,166	870,845	881,084	713,241	969,539
The Philippines	1,220,456	1,338,394	1,448,504	1,717,028	1,895,848	2,092,274	2,214,785	2,407,698	2,477,392	2,545,967	2,608,120
Japan	1,311,828.5	1,385,099	1,301,794	1,261,003	1,254,143	1,224,189	1,284,425	1,186,722	1,243,358	1,151,101	906,518
World total production	44,329,277	47,384,363	50,318,957	54,587,777	57,835,144	61,401,866	64,956,463	68,851,543	73,093,355	78,091,908	83,729,313

Source: (FAO FISHSTAT 2014)

1.1.2 Global seafood consumption, global trade and social and economic benefits

1.1.2.1 Seafood consumption

Alongside the growth in seafood production, global seafood consumption has increased. The FAO (2008, 2010) reported that global seafood consumption doubled between 1973 and 1997. A recent FAO publication (2012) reported a consistent increase in seafood consumption; it stated that global seafood consumption grew from 114.3 million tonnes to 130.8 million tonnes (14.4 % of growth) between 2006 and 2011. Growth has not only had a linear relationship with population growth, but also in parallel with increases in per capita seafood consumption. World per capita seafood consumption increased from an average of 9.9 kilograms (kg) (live weight equivalent) in the 1960s to 18.4 kg in 2009 (FAO 2012).

Comparing per capita seafood consumption rates between countries, the per capita seafood consumption rates of developed counties are higher than developing counties. For example, annual per capita seafood consumption for Japan, North America and Europe were reported to be 58.6 kg, 24.1 kg and 22 kg, respectively, which are 3.4, 1.4 and 1.3 times higher than the quantities consumed in developing countries. Although seafood consumption has increased in developing countries from 5.2 kg in 1961 to 17 kg in 2009, the total share of consumed seafood in North America and Europe is still significantly higher when compared to developing countries (FAO 2012).

1.1.2.2 Seafood trade

Corresponding to the increase in global seafood consumption, trade in seafood products has grown. Although the seafood trade is connected to the global economic situation, which drives fluctuations in demand and prices, in general, the global seafood trade has shown a steady increase. The seafood trade has been expanding since 1976 at an average annual rate of 8.3 per cent in value. The value generated from seafood exports grew from US$ 8 billion in 1976 to US $102 billion in 2008 (FAO 2012). High value commodities such as shrimp, groundfish, tuna and salmon have occupied the top traded seafood commodities with a value share of 16.5 per cent, 10.2 per cent, 8.7 per cent and 8.5 per cent of the total international fisheries trade, respectively (FAO 2010). According to an FAO report, the share of shrimp exports by value still remains the largest among other seafood commodities traded globally despite the fluctuating global market price (FAO 2012).

1.1.2.3 Shrimp trade from developing to developed countries

Many developing countries play an important role as seafood suppliers in global seafood trade. Developing countries accounted for 56 per cent of the quantity of seafood products traded in 2010 for human consumption. China, Thailand and Viet Nam are the major Asian exporters of seafood. In addition to these prominent seafood producers, other developing countries, Indonesia, the Philippines, and Bangladesh also contribute as significant seafood suppliers in global markets (FAO FISHSTAT 2014).

Developed countries continue to be the major markets of the global seafood trade despite the emerging markets in developing countries (FAO 2010). According to an FAO report, the share of seafood market held by developed countries was 76 per cent in value and 58 per cent in volume of the total seafood trades globally. Among the developed countries, the European Union (EU) is the world’s largest seafood market, followed by the United States (US) and Japan. The EU seafood import share was 26 per cent of the global trade; this figure excludes intra-European union trade (FAO 2012). Shrimp imports by the EU grew by 59.8 per cent from 1990 to 2009 (FAO FISHSTAT 2014). The US’ seafood import share was 25.3 per cent globally, and it grew by 48.2 per cent from 1990 to 2009 (FAO FISHSTAT 2014).

The increasing demand for seafood from developed countries is very important for the development of shrimp producers in China, Thailand, Viet Nam and Indonesia. The large markets in developed countries significantly contribute to the export revenue of seafood producers in developing countries. The FAO reported that developed countries contributed around 67 per cent in value of the total revenue of seafood exports from developing countries (FAO 2012).

In the face of increasing seafood demand in developed countries, seafood production in developed countries cannot supply the growing its domestic seafood demand. Seafood production has declined with the FAO reporting that production in developed countries declined by 10 per cent for the period 2000–2010 (FAO 2012). This means that developed countries are becoming more dependent on imported seafood. Thus, the seafood trade from developing countries to supply seafood demand in developed countries may increase in the future.

1.1.2.4 Economic and social benefits

The rise in commercial seafood production has created social and economic benefits. It plays a role as an employment generator in rural areas in developing countries. The FAO estimated that capture and aquaculture fisheries provided a direct livelihood for 58.6 million people in 2010. Eighty-seven per cent of these people rely on this sector as their primary form of livelihood and are concentrated in Asia. The employment benefit is not only limited to primary production; it also generates employment in supporting activities such as marketing, processing and research. According to the FAO, the supporting activities of the sector provide employment for 680–820 million people (FAO 2012).

Referring to direct employment within the fisheries sector, the aquaculture sector itself contributes 30 per cent of total employment in primary production. Thus, aquaculture provides incomes for 16.6 million people and 97 per cent of these people live in Asia. This number may increase in the future because the growth of employment in aquaculture is high and is significantly higher than employment levels in the traditional agriculture sector. The annual growth of employment in the aquaculture sector is 5.5 per cent, while for traditional agriculture it is only 0.5 per cent (FAO 2012).

Within the growing aquaculture sector, small-scale producers comprise the majority of producers. According to the FAO (2012), 90 per cent of producers in aquaculture are classed as small-scale and are located in Asia. FAO compared data on the share of aquaculture production between Asia and Europe and showed that producers in Asian countries are generally small-scale producers with low productivity rates. The FAO also calculated per capita aquaculture production for Norway and several countries in Asia. The 2010 data analysis showed that annual production for an aquaculture producer in Norway was 187 tonnes, Chile was 35 tones, China was about 7 tonnes, India was around 4 tonnes and Indonesia was only 1 tonne (FAO 2012).

The FAO (2012) also reported that the aquaculture sector has provided employment for young people to stay in their communities, which can contribute to strengthening economic viability in rural areas and in turn, can reduce urban drift. It also stated that several countries have been promoting aquaculture through fiscal and monetary incentives which have improved the accessibility of food for many households. The FAO also suggests that aquaculture has contributed towards the Millennium Development Goals (MDGs). In a more country-focused study, Munasinghe et al. (2010) stated that the aquaculture sector has become an important component of rural development in Sri Lanka. In the case of Indonesia, Sunaryanto and Pahlevi (2008) suggest that the aquaculture sector also creates employment at the production, processing and marketing levels (Employment in Indonesian aquaculture is discussed in Chapter 2).

Further, the global seafood trade, through connecting producers in developing countries to the export market, can provide higher incomes to producers (Arthur & Sheriff 2008). For example, studies by Kurien (2004) and Arthur and Sheriff (2008) have shown that in the majority of countries studied, fishers who were directly connected to export markets had higher incomes. Arthur and Sheriff (2008) found that fishers in Sri Lanka who sell their produce to a domestic market earn a monthly income of US$ 25–30 per month. Those who target the export markets could generate an income of around US$ 230 for tuna fishing, US$ 80 for coastal lobster and US$ 70 for shrimp farming per month (Kurien 2004). Although the economic benefit may vary from one country to another, Kurien (2004) confirmed that revenue generated from export-oriented products is higher compared to products sold within the domestic market.

1.1.3 Transnational-scale producers, global trade requirements and compliance capability

Aspects of globalisation such as the fluid movement of capital and technology have contributed to the global growth of the aquaculture sector. The dynamic global business of acquiring fishery products by developed countries from developing countries has contributed to growth in the global fisheries trade (FAO 2010). The economic benefits generated by global trade have also driven transnational entrepreneurs with intensive capital to invest in aquaculture farming in developing countries (discussed further in Chapter 2). One example of this is the case of Charoen Pokphand (CP Group) which has invested in shrimp production. The company was established in 1921, originating from Thailand as an agriculture inputs supplier. In the late 1960s, the company expanded into animal feed production and then into poultry production. The increase in global seafood demand, especially in wealthy countries such as Japan, North America and Western Europe, motivated CP to diversify their production into brackish shrimp farming with CP Aquaculture in the 1980s. CP collaborated with Mitsubishi[1] at the beginning of 1986. The

[1] Mitsubishi is a Japanese company with many business interests including producing shrimp production; it employs Taiwanese technicians. Japanese shrimp production collapsed in the late 1980s. This stimulated the expansion of production to other countries with cheaper production costs (Goss, Burch & Rickson 2000).

collaboration aimed to enhance access to the initial technology required for shrimp production. The development of CP Aquaculture was supported by international financial bodies. In 1986, the Asian Development Bank provided a loan of US$ 11.1 million for brackishwater shrimp culture development in Thailand. This investment triggered the global growth of shrimp production because CP Aquaculture expanded its production to other neighbouring countries such as Indonesia. The expansion in shrimp production has enabled the company to establish itself as a leader in aquaculture. By the mid-1990s, CP became Thailand's largest transnational company and Asia's largest agro-industrial conglomerate (Goss, Burch & Rickson 2000).

While the global trade in seafood has grown, standards to control food safety have also increased. These standards have been predominately required by governments from importing (developed) countries and buyers (Trienekens & Zuurbier 2008). For example, the EU has developed regulations to measure food safety for all seafood (European Commission 2004a, 2004b; Tran et al. 2013). Food safety measures are also required by the US government (United States Environmental Protection Agency [USEPA] 2012). In parallel to requirements by governments from importing countries, some major retail chains have also imposed their own food safety requirements including private eco-label certifications (Gardiner & Viswanathan 2004; May et al., 2003; Potts & Haward, 2007; Roheim 2003; Tran et al. 2013; Trienekens & Zuurbier 2008). Chapter 4 discusses the detailed export requirements for Indonesian shrimp producers and suppliers.

Aquaculture producers aiming to export to lucrative markets such as those in the EU and US are subject to these requirements. The ability of aquaculture producers to comply with requirements depends on their capabilities (Hatanaka 2010; Okello & Swinton 2007; Hatanaka 2010). For example, agricultural producers need to make significant investments to upgrade their practices, management and production facilities. Such investments require financial and human capabilities (Okello & Swinton 2007).

The requirements limit the abilities of small-scale agricultural producers' to participate in the international markets. Thus, they are at risk of being excluded from such markets (Barret 2008; De Schutter 2010; Farina & Reardon 2000; Okello, Narrod & Roy 2011; Okello & Swinton 2007; Reardon & Farina 2001). This is because small-scale producers do not have the capabilities needed to comply with export market requirements and cannot make the necessary investments (Farina & Reardon 2000; Okello, Narrod & Roy 2011). The challenges include limitations on tangible and intangible assets (Farina & Reardon 2000). For example, financial limitations to making a necessary investment in new or modified facilities may prevent small-scale producers from being able to adopt farming practices required by the food safety standards. The asset also includes skills and the acquirement of new information to support the adoption of new practices (Farina & Reardon 2000). A study by Okello, Narrod and Roy (2011) found that small-scale green bean producers in African countries are excluded from European markets because of limitations finance and knowledge. Financial limitations constrained the ability to invest in facilities needed to meet the food safety standards, such as special crates and cooling facilities, storage for pesticides and a grading shed with a cement floor. Inadequate knowledge and skills hinder their abilities to keep production records to demonstrate traceability. Thus, they are at a high risk of being excluded from lucrative markets. Previous studies have suggested that the market share of small-scale producers is reduced due to the inability to comply with the stringent food safety requirements. For instance, Kimenye and Jaffee in Okello, Narrod and Roy (2011) found the market share of small-scale green bean farmers from the total exports from Kenya to Europe was 60 per cent in 1980s, but this figure reduced to 30 per cent in 2003.

As stated above, the existing studies demonstrate that the export market requirements can exclude smallholder agricultural producers from developing countries from markets. To address this problem, it is necessary to analyse the level of capabilities of the smallholders by exploring the factors that may inhibit or enable them to participate in lucrative markets. There is also a need to understand the complexity associated with the process of endowment of the competencies. This will inform theoretical and practical considerations regarding the development of smallholders' capabilities in which were not evaluated in the previous studies.

1.2 Objectives, argument and research question

1.2.1 Objectives of study

Following the above discussion, this study assesses the capabilities of Indonesian smallholder shrimp producers (hereafter referred to as household-scale shrimp producers) to participate in lucrative export markets. The export markets this study focuses on are the European and US markets because these countries are the largest importers of Indonesian shrimp. The governments, buyers and expert groups such as non-government organisations (NGOs) have established requirements for seafood products marketed to the EU and US.

As stated earlier, in this study, the concept of participation in export markets relates to the ability of shrimp producers to comply with export market requirements. This also includes the ability to upgrade towards the capability to comply with the requirements.

Shrimp is a significant commodity because it is one of the highest traded seafood products globally. Household-scale shrimp producers are the largest group of shrimp producers in developing countries, including Indonesia. This group of producers may have limited ability to fulfil the stringent requirements from developed country markets. Thus, the objective of this research is to enhance the understanding of household-scale shrimp producers' capabilities to participate in lucrative export markets. This understanding is necessary to improve development interventions to enhance the participation of this group of shrimp producers, and is also important for supporting better global seafood trade governance.

1.2.2. Argument and research questions

The main argument of this thesis is that the extent to which shrimp farmers can participate in lucrative export markets is determined by the level and accumulation of their capabilities. Accordingly, the lack of capabilities for household-scale producers limits their participation.

To develop this argument, this study proposes one central research question: What are the capabilities of household-scale shrimp producers and those that are needed to better participate in lucrative export markets? To answer this question, a subset of research questions is needed to identify clear and targeted answers. The set of questions are presented below and are structured sequentially to show linkages and logical flow emanating from the umbrella question:

1. What are the livelihood capitals of different kinds of Indonesian shrimp producers?
2. How do shrimp producers' livelihood capitals affect their capability to participate in lucrative export markets?
3. What kinds of GVCs are available to Indonesian shrimp producers?
4. How do shrimp producers' livelihood capitals affect their access to different channels within the Indonesian shrimp global value chains (ISGVCs)?
5. How do the different channels within the Indonesian shrimp value chains affect shrimp producers' capability to participate in lucrative export markets?

1.3 Conceptual framework

The conceptual framework of this study is the capability approach (CA) by Amartya Sen (1981, 1987, 1999). This framework is useful for understanding the complexity affecting producers' ability to participate in the lucrative export markets (Section 1.3.2). Before the CA is introduced in Section 1.3.2, this section first explains the concept of development as it is applied in this thesis.

1.3.1. Development as the ability to participate in global lucrative markets

Various perspectives on development have been proposed since development as a concept first emerged in the second half of the twentieth century (Hopper 2012). The idea of pro-poor globalised production markets underlines the development perspective in this study. Sen (1999) conceptualised that development, overall, should not be limited to the narrow definition of development as the growth of gross national product, individual earning, industrialisation or modernisation. Development is fundamentally about the enhancement of people's capabilities.

In Sen's book, *Development as Freedom* (1999), he also illustrated that freedom, whether in political or social arrangements, involves the opportunity to access education and health services. Development in this context is seen as the substantive freedom to have an option and equal opportunity to access the means to development. Development is seen as opportunity or ability to choose whether or not to participate in certain functions based on a person's rational justification. As written by Sen (1999, p. 4):

> Development requires the removal of major sources of unfreedom: poverty as well as tyranny; poor economic opportunities as well as systematic social deprivation, neglect of public facilities as well as intolerance of overactivity of repressive states …. The violation of freedom results directly from a denial of political and civil liberties by authoritarian regimes and from imposed restrictions on the freedom to participate in the social, political and economic life.

Besides the social and political arrangement presented above, freedom also applies to economic institutions, which is described as the freedom to participate in market transactions:

> The freedom to exchange words, or goods, or gifts does not need defensive justification in terms of their favourable but distant effects; they are part of the way human beings in society live…. The freedom to enter markets can itself be a significant contribution to development (Sen 1999, p. 6).
>
> We have good reason to buy and sell, to exchange, and to seek lives that can flourish on the basis of transactions. To deny that freedom in general would be in itself a major failing of a society (Sen 1999, p. 112).

The concept of development in this study relates to the household-scale shrimp producers' capability to participate in lucrative export markets, measured through the capability to comply with market requirements such as traceability, food safety and eco-label certifications. Development for household-scale shrimp producers is also viewed as their ability to strategise their own decisions to choose their economic transactions based on their business rationality and their endowment of capabilities. In relation to global market access, there is scrutiny around who and how individuals or groups of individuals participate in the market. It should be considered to what extent social and political arrangements, such as regulations for food safety requirement and eco-label certification, may restrict or enhance those individuals or groups of individual's market participation. In cases where such social and political arrangements inhibit or eliminate their ability, 'individual freedom' may be taken away, which can be viewed as a societal failure. Extending this preposition implies that society as a wider unit of individuals is also responsible for providing space for disadvantaged, less capable individuals or groups to participate in markets. Society is also responsible for providing space for the less fortunate individuals or groups to define their own development options surrounding whether they want or do not want to participate in certain markets.

1.3.2. The concept of the capability approach (CA)

The capability approach (CA) is a general, normative framework used to evaluate and assess wellbeing, social phenomena and policy. In empirical research, it can be applied to a wide range of social phenomena. The CA can assess wellbeing at the individual or group level in relation to poverty, inequality and discrimination such as the disadvantages faced by a particular group. It can be used as a framework to develop and evaluate policies, ranging from government to non-government or as a basis for social and political criticism (Sen 1987).

Amartya Sen and Martha Nussbaum are prominent scholars and originally developed the concept of the CA. The difference between Sen and Nussbaum is that Sen's CA has been applied in general development paradigms focused on poverty and social justice (Sen 1981, 1990) and Nussbaum's works on the CA is more rooted within the gender paradigm (Nussbaum 1993, 1995). The capability perspective in this study adopts the perspective suggested by Sen due to its relevance to the development of shrimp producers.

Sen defines capability as an individual's or group's ability to undertake a function which requires assets to enable them to pursue their economic or social interests (Sen 1981, 1987), such as participating in the lucrative export markets. The notion of capability as 'functioning' underpins the analysis of what a person can achieve based on their endowment of assets. In Sen's book *Commodities and Capabilities* (1987), the term 'commodity' denotes the assets of a person. Thus, 'functioning' is someone's ability to undertake an activity based on their assets.

The concept of capability originates from the notion of human wellbeing which encompasses more than income earned by an individual. Sen argued that evaluating the wellbeing of a person must move to the functioning of the individual. Functioning reflects the ability of a person to live a life based upon what that person values or desires. This means that the person has an ability to choose based on their values (Sen 1987).

Functioning covers a wide range of aspects relating to people's lives such as working, resting, literacy, being part of community and being able to access resources. Functioning also includes 'potential or achieved of the intended functions'.

> In getting the idea of wellbeing of a person, we clearly have to move to functioning, to wit, what a person succeeds in *doing* with the commodities and characteristics of his or

her command …. A functioning is an achievement of a person: what he or she manages to do or to be (Sen 1987, p. 6–7).

Means and ends are the key analytical points of the CA. The end is seen to have intrinsic significance while the means is the instruments needed to reach a development target. However, the distinction may also be blurred because some means can also be an end in itself. For example, being in good health is an end, but it also a means for the capability to work. Another example is that we are interested in a bicycle not for its physical structure, but because it enables the function of mobility more effectively than walking (Robeyns 2005). Nevertheless, as suggested by Sen (1987) an ability to act or perform a function is determined by assets. Robeyns (2005) added that function requires a combination of capabilities. Therefore, regarding the capability to participate in export markets, the capability of a person or group can be defined by the person's or group's attainment of a set of assets or capabilities. In this study, the assets include human, financial, social, physical and natural capitals and the types of value chains which a person or group can access that are dicussed furthure below.

The CA has been applied in previous studies (Iversen 2003; Kuklys 2005; Murphy & Gardoni 2012; Robeyns 2003, Robeyns 2006; Schokkaert & Van Ootegem 1990) across a wide range of disciplines such as feminist studies (Iversen 2003) and welfare studies using an econometric approach (Kuklys 2005). In this study, the capability to participate in export markets is measured by livelihood capitals from the sustainable livelihood approach (SLA) framework suggested by Ellis (2000) and the types of GVCs that shrimp producers can access, such as lengthy or short chains (Gereffi, Korzeniewicz & Korzeniewicz 1994; Kaplinsky & Morris 2001; Porter 1985) (details presented in Section 1.3.2 and 1.4). The integration of the SLA framework with GVC is to capture the complexities associated with gaining the capabilities required to participate in lucrative export markets (discussed further in Section 1.3.2.2).

1.3.2.1 Livelihood capitals in the sustainable livelihood appproach (SLA)

Capability is an abstract concept; it contributes to a normative framework on how development should be pursued (Robeyns 2005). However, it lacks a structured framework to measure capability. Chamber and Convey (1991) formulated the sustainable livelihoods approach (SLA) to measure capabilities, which defines livelihood assets. In Ellis (2000), the assets were constituted by human, social, financial, natural and physical capitals. These capitals are also the components of the community capitals framework (CCF) suggested by Emery and Flora (2006) which includes natural, cultural, human, social, political, financial and built capitals. Emery and Flora focus on the interaction between capitals in capital accumulation through a process called ‘spiraling-up’. The ‘spiraling-up’ process underlines the process of transformation of one capital to another capital or the gaining of capitals; acquiring a capital requires initial capital. The SLA included mediating factors such as social relations or institutions that can inhibit or facilitate access to livelihood assets in the pursuance of livelihood activities (Ellis 2000). However, these two frameworks convey similar understandings about the endowment of those capitals outlined and their roles in community development, which is an important aspect of this research.

It should be noted that this study does not adopt the whole SLA per se, rather it will apply the well-defined livelihood capitals in the SLA to simplify Sen’s abstract notion of capability. This study adopted the capitals suggested by Ellis (2000) without denying other types of capitals suggested by different authors mentioned above. Thus, this study considers human, social, financial, natural and physical capitals to evaluate the capability to participate in international markets despite the overlapping content between livelihood capitals (Ellis 2000) and community capitals (Emery & Flora 2006). The SLA framework provides a structured approach and methodology to analyse the level of capital endowment of shrimp producers and to evaluate the competencies needed for participation in lucrative export markets. The SLA also has been applied widely in rural studies (Cherni et al. 2007; Ferrol-Schulte et al. 2013; Hussein 2002; Reddy et al. 2015; Tang et al. 2013), including fisheries (Allison & Ellis 2001; Alison & Horemans 2006) and aquaculture (Ahmed et al. 2008). Therefore, the concept has been further developed to understand the complexities of the social mechanisms involved in the development of fisheries communities.

1.3.2.1.1 Human capital

Human capital is a tangible asset that has been recognised as having a significant influence on economic growth (Becker 1962; Becker, Murphy & Tamura 1990). Blair (2011) notes that the ‘human capital’ concept emerged from economics and social sciences to refer to the ‘skills, knowledge, and capabilities’ of the worker of a firm, or the population of a country to be more ‘innovative’ and ‘productive’ (p. 49). Focusing on livelihoods analysis, the Department for International Development (DFID) UK considers human capital an intrinsic value which is essential for gaining access and utilising the other four livelihoods assets. Skills, knowledge, ability to labour and good health are together a representation of human capital and enable people to advance their livelihoods and develop strategies for their livelihoods (DFID 1999). Regarding compliance capability to meet the export market requirements, a study by Okello, Narrod and Roy (2011) has shown a relation between the human capital (skills and knowledge) of farmers and food safety standards. In their study, it was found that sufficient skills and knowledge are necessary to upgrade the farming practices of the vegetable farmers in Kenya to meet the food safety standards.

1.3.2.1.2 Financial capital

Financial capital refers to financial resources including income, savings, credit and remittances. A lack of financial capital and restricted access to credit has always been a problem for the poor, often limiting their ability to improve their livelihoods. A lack of access to financial capital from formal banking forced poor shrimp farmers in Bangladesh to borrow money from informal money lenders at high interest rates (Ahmed et al. 2008). This resulted in social conflicts and forced poor shrimp farmers to sell their yield to the money lenders. Limited financial access also prevents upgrading capability towards export market requirements. For example, Farina and Reardon (2000) suggest that financial capital is necessary to support the investment necessary to enhance the tangible and non-tangible assets of small-scale farmers to upgrade their practice.

1.3.2.1.3 Social capital

Social capital consists of some aspects of social structure and is developed through interaction between actors (Coleman 1988). The scope of social capital has been extended beyond the individual level to encompass communities and even the nation level (Portes 1998). In the context of livelihoods, it has been used to denote those social resources that assist people to pursue their livelihood objectives (Ellis 2000a). Networks, cultural norms and community organisations that contribute to knowledge exchange among people are the embodiment of social capital (Woolcock & Narayan 2000). The social capital of producers is a factor necessary to obtain information related to global markets for commodities or certain types of GVCs (Kelling 2012). This is because most of the information is coordinated between actors (Gereffi, Humphrey & Sturgeon 2005; Gibbon, Bair & Ponte 2008; Gibbon & Ponte 2008; Hess 2008; Islam 2008; Ponte & Gibbon 2005).

1.3.2.4 Physical capital

Physical capital describes infrastructure that improves the physical environment needed by people to be more productive. Physical capital includes the equipment required in shrimp farming such as paddlewheels, generators and water pumps. Physical capital also includes public goods that support people to be more productive such as water supply, energy production and roads. Inadequate physical capital in rural areas has often constrained the poor's ability to gain better livelihoods (DFID 1999). Thus, physical capital plays a role in farmers' ability to pursue their livelihoods. For instance, the supply of clean water is a critical measure of hygiene standards required by export markets for agricultural products (Farina & Reardon 2000; Okello, Narrod & Roy 2011; Okello & Swinton 2007). Thus, a lack of clean water supply can hinder farmers' ability to sell their yield in high value markets.

1.3.2.5 Natural capital

Natural capital refers to natural resource stocks, land and ecosystems (Azqueta & Sotelsek 2007). Natural capital also includes a broader set of natural resources, such as the intangible public goods of the atmosphere and biodiversity, used directly for production (DFID 1999). Collados and Duane (1999) concluded that natural capital influences the quality of life of an area in two ways: (1) through the direct benefits of environmental services and; (2) by supplying natural resources through human-controlled activities. Natural capital is closely linked to vulnerability contexts such as risk, natural disaster and quality (carrying capacity) of natural resources needed for farming productivity. Many of the environmental shocks that destroy livelihoods are derived from these vulnerability contexts. The quality of natural capital is also influenced by seasonality because of the natural changes that occur over the year, such as the climate, which affects the service ability, value and productivity of the natural capital (DFID 1999).

Although the five livelihood capitals may affect people's livelihoods and their development in a linear and separate way, people can also require a combination of livelihood capitals to achieve their livelihoods or development objectives (Emery & Flora 2006; Scoones 1998). For example, successful agricultural intensification requires a combination of natural capital assets (land and water), financial capital (credit), human capital (technology skills) and social capital, such as networking for labour sharing systems among farmers (Scoones 1998).

The above livelihood capitals are not an exhaustive list of all forms of capitals. There are other forms of capitals that affect people's capabilities (Emery & Flora 2006; Scoones 1998) such as cultural and political capitals (Emery & Flora 2006). It is a limitation of the current study that it does not cover these other forms of capital, however, in the interests of manageability of an already-complex study the scope was restricted to the five well-established capitals most commonly used in SLA

1.3.2.2 Global value chain

As briefly mentioned earlier, this study uses the global value chain (GVC) approach to measure capability to participate in lucrative export markets. The approach enables the evaluation of capability from the perspective of how shrimp producers access input suppliers and buyers in the shrimp supply chains (Kaplinsky & Morris 2001). First, this approach maps the GVC of shrimp producers. The ability to access types of GVCs, such as complex or simple supply chains, is the means for the capability to comply with export market requirements (discussed in Chapter 4). This relates to the product flow and coordination between actors within a GVC, which can affect capability (Kelling 2012). Second, the GVC approach enables an understanding of the governance within the Indonesian shrimp global value chain (ISGVC), which influence decision making by value chain actors. For the purpose of this study, the market requirements for traceability, food safety and eco-label certifications are the salient forms of governance. In this study, shrimp producers' capability or incapability and advantage or disadvantage are examined in relation to the governance of market access. The GVC approach also enables this study to integrate the notion of 'upgrading' of capability for Indonesian shrimp producers to enhance their export market participation (upgrading within GVC concept is presented below).

Further, the inclusion of GVCs in this study relates to the ongoing debate about how, in a globalising world, politics, power and governance can be integrated within a livelihood analysis (Kanji et.al. 2005; Scoones 2009). Previous studies have criticised livelihood approaches for neglecting macro process and structural interactions among actors relating to power, politics and governance (Kanji et.al. 2005; Scoones 2009). In addition, Scoones's (2009) study highlighted that the livelihood approach focuses only on local actors and most agricultural studies focus only on a farm segment (Ahmed et al. 2009). Given aquaculture's place in the global market, an understanding of commodity market dynamics is necessary to understand the competitiveness of aquaculture commodities, particularly those produced by poor household-scale farmers. Therefore, value chain analysis addresses this gap.

The justification to integrate the SLA and GVC approaches in this thesis is also to address critiques of GVC analysis in development studies. GVC analysis emphasises only a particular commodity or business and is unable to provide a framework for analysing the complexities of farmers' capitals which critically influence farmers' ability to engage in a particular market (Kanji et al. 2005). Thus, these two methods are believed to complement each other to create a more holistic analysis of shrimp producers' capabilities from a horizontal perspective (livelihood capitals of shrimp producers) and a vertical perspective (shrimp producers in the GVC).

1.3.2.2.1 Definition of the global value chain

The GVC approach has evolved over time across a range of terms such as supply chain analysis (Porter 1985), lean thinking (Womack & Jones 1996), *filiere* (Raikes, Jensen & Ponte 2000), value chain analysis (Kaplinsky & Morris 2001) and global commodity chain (GCC) analysis (Gereffi, Korzeniewicz & Korzeniewicz 1994).

Porter (1985) used supply chain analysis as a strategy to identify the advantages and competitiveness of a firm. He described the overall structure of a business required to develop its competitive strategy. Competitiveness can be identified through fragmenting the firm's activities into product design, market, delivery and support activities. The associated cost of each activity can then be identified. The connections between the fragmented activities, as well as general strengths and weaknesses (p. 36) are also highlighted. The overall cost analysis conducted in each activity provides a starting point for prescribing the competitive strategy of a firm through sourcing information on cost efficiency.

Womack and Jones' (1996) theory of 'lean thinking' emerged from an assessment of the automotive production system of Toyota. Lean thinking was applied to reduce waste generated from manufacturing processes.

The term *filiere* was originally developed in French agriculture during the 1960s to assess contract farming systems and vertical integration. This method was then deployed in developing France's policy for accommodating French interests during the (post) colonial era for the development of agricultural countries that were 'commodity centred'. The evolution of *filiere* research has been used to further map out the flow of commodities and the agents and activities involved (Raikes, Jensen & Ponte 2000).

The concept of global commodity chains was the origin of the GVC approach. The global commodity chain (GCC) was initially introduced by Gereffi, Korzeniewicz and Korzeniewicz (1994). They expanded the use of Porters' supply chain concept into an analytical and normative concept, covering power between stakeholders along a supply chain and the development consequences of these relations. The concept has broader global relevance; it includes coordination and linkages from the production system to global marketing systems and linkages between the micro-scale to macro-scale of an industry. It also maps the flow of a product or a commodity from the upstream node (production) and the downstream node (retail consumption):

> A GCC consists of sets of interorganisational networks clustered around one commodity or product, linking households, enterprises, and states to one another within the world economy (Gereffi, Korzeniewicz & Korzeniewicz 1994, p. 2).

All the concepts relate to the notion of a network of activities and actors in the process of production and trade of a good (Bair 2009). However, the earlier concepts of *filiere*, supply chain analysis and lean thinking focused on a production process limited to the manufacturing company level. These concepts do not consider how a company is connected to globalised production and markets. The GVC concept developed the focus process from the value added activities to include 'governance.' This meant that the relationship between companies with globalised production and markets could be explained (Gereffi, Korzeniewicz & Korzeniewicz 1994; Gereffi, Humphrey & Sturgeon 2005; Kaplinsky & Morris 2001). The latest GVC concept is relevant to this study.

Gereffi, Humphrey and Sturgeon (2005) then reviewed the GCC approach. They stated that the GCC uncovered 'the variety of network forms' as types of governance within supply chains, which a company might link themselves to the global economy. Their article recommended using the terminology of 'global value chain' instead of 'global commodity chain'. Humphrey and Schmitz (2000) had already argued that the GCC suggested by Gereffi, Korzeniewicz and Korzeniewicz (1994), as a term, was ambiguous because 'commodity' has come to refer to 'standardized products made in large volumes' that does not reflect those products with different specifications requested by lead companies or buyers. Such analysis is one of the main principles of GCC analysis (Humphrey & Schmitz 2000). They also added that the commodity chain cannot reflect the actor who adds value along the chain. However, most scholars have viewed the GCC, as first suggested by Gereffi, Korzeniewicz & Korzeniewicz (1994), as the departing point for GVC analysis (Bair 2009; Kelling 2012; Humphrey & Schmitz 2000).

There are elements within the GVC analysis that include mapping the flow of products and resources, mapping the governance structures that determine the flow and allocation of products and resources (Gereffi & Korzeniewicz 1994; Humphrey & Schmitz 2000; Kelling 2012), and the opportunity for upgrading through participation in a certain value chain (Humphrey & Schmitz 2000, 2002).

1.3.2.2.2 Mapping product flow

Mapping product flows and the activities of a product across various geographies is a central aspect of GVC analysis (Gibbon, Bair & Ponte 2008). The flow presents the sequential stages of inputs acquisition manufacturing, distribution, marketing and consumption and the stages are presented in nodes or boxes that are linked together through networks (Gereffi, Korzeniewicz & Korzeniewicz 1994). Each node of a value chain describes the process of access and organisation of input, labour and distribution of finished or semi-finished a product. For the purpose of this study, this concept enables the identification of shrimp producers' access to inputs and markets and identification of the organisation involved in each node. As a result, this concept enables the identification of the types of Indonesian shrimp GVCs based on different groups of shrimp producers. It highlights how each shrimp producer group are linked to the end buyers and how the group of shrimp producers is positioned in relation to other groups.

The concept of the value chain was criticised by Henderson et al. (2002). Henderson et al. argued that the notion of a chain only reflects vertical and linear relationships. Henderson et al. suggested that production processes in the global economy is better presented as a network which includes intricate links that are horizontal, diagonal and vertical, forming multi-dimensional, multi-layered economic activities. However, the concept of GVC that highlights the linkages between actors of the value chain, coordination processes between the actors, the role of lead firms in determining what kind of products need to be produced, and how and when products are produced, the GVC approach is still essential for understanding development processes in the global economy (Humphrey 2005). For this study, while the reality of Indonesian shrimp global value chain (ISGVC) may be more like a network, the concept of a 'chain' is still beneficial for mapping production flows across various actors and geographical areas and is useful as a representation of the complexities within the ISGVC.

1.3.2.2.3 Global value chain governance

GVC governance is relevant to capturing the coordination of product flows between value chain actors and to understanding the export requirements of lucrative markets (Gereffi, Humphrey & Sturgeon 2005). This affects the ability of products to penetrate markets (Humphrey 2005). It is a conditioning factor which can result in opportunity or exclusion for shrimp producers. Meeting market requirements can be an opportunity to strengthen product acceptance for those who have the capability to meet the standards and therefore, can enhance market penetration. Those who do not have capability to meet the requirements are at risk of becoming marginalised from the markets (Humphrey 2005; Yusuf & Trondsen 2014).

Governance refers to the coordination of economic activities or 'steering activities' in networks or hierarchy relationships; it is used at private and public and local and global levels (Humphrey & Schmitz 2000). Within GVCs, there are 'dominant stakeholders' who 'determine the overall character of the chain' (Gereffi, Korzeniewicz & Korzeniewicz 1994; Humphrey & Schmitz 2000). Adopting the definition used by Humphrey and Schmitz (2000), powerful actors can steer the GVCs of certain products.

There are two types of supply chain governance—buyer-driven chains and producer-driven chains (Gereffi 1994).The buyer-driven chain is described as a chain in which the buyers explicitly control the specified supply system without direct ownership (Gereffi, Humphrey & Sturgeon 2005). Such a form of governance has developed because of the high capabilities of firms from more developed countries to control and guide industrial resources in developing countries, even when they do not own them. The buyer-driven chain is defined as:

> Those industries in which large retailers, brand-named merchandisers and trading companies play a pivotal role in setting up decentralized production networks in a variety of exporting countries, typically located in the Third World (Gereffi 1994; p. 97).

In contrast, producer-driven value chains occur when producers control the supplies; the producers have the competency to decide product specification and the process of production

(Kaplinsky & Morris 2001). At the global industrial level, the producer-driven chain is often characterised by the vertical integration of multinational companies who have direct ownership of the companies (Gereffi 2001). Gereffi (1994, p. 97) described the producer-driven chain as borne out of manufacturing:

> Producer-driven commodity chains are those industries in which transnational corporations (TNCs) or other larger integrated industrial enterprises play the central role in controlling the production system (including its backward and forwards linkages). This is characteristic of capital and technology-intensive industries such as automobiles, aircraft, computers, semiconductors and heavy machinery.

The global supply of agriculture products fall under the buyer-driven commodity chain category (Dolan & Humphrey 2000; Gereffi & Lee 2009). This means that buyers possess control over product specifications, processes of production, the quantity of the product and the schedule of product shipment (Humphrey 2005). The requirements are transferred from downstream to the upstream actors reaching the producers of value chains. The requirements also involve institutions for monitoring and enforcing compliance through processes of supplier selection, auditing and regular inspections. Inability to comply with the requirements can result in sanctions such as the risk of exclusion (Humphrey 2005). Therefore, competency to meet the buyer's requirements is a precondition for market participation.

1.3.2.2.4 Upgrading in global value chains

The buyer-driven value chain for agricultural products results in a supplier necessity (producers) to upgrade to meet the buyers' expectations (Humphrey & Schmitz 2000; Humphrey 2005). Producer upgrading enhances the compliance ability of producers to meet the buyers' requirements. This is crucial for the producers' participation in markets. According to Humphrey and Schmitz (2000) and Gereffi (1994), upgrading relates to various strategies that firms may develop to strengthen their penetration in global markets. However, according to Humphrey and Schmitz (2000), upgrading requires substantial investment. In this study, the ability to undertake investment is determined by the capability of shrimp producers. In other words, those who do not have the capability to upgrade may not be able to enhance their participation in the global market.

According to Gereffi et al. (2001), there are four types of upgrading which relate to a business unit's ability to enhance its global market penetration:

1. Process upgrading; a process whereby a firm may develop an efficiency strategy in its production system. For instance, a firm may adopt new technology to improve the production system.
2. Product upgrading; a strategy based on adopting a new production line; this can involve shifting into a new product.
3. Intra-chain upgrading (also called 'functional upgrading') (Humphrey & Schmitz 2000). This involves several possibilities for upgrading within a commodity chain. A firm can adopt a new function in a chain such as input production, designing or marketing. This includes backward and forwards integration in the chain. Diversification is also viewed as this form of upgrading, which can include market diversification. Functional upgrading is adopted when firms can or cannot sustain their competitiveness in a chain. Thus, functional upgrading can also mean downgrading as a business strategy.
4. Inter-chain upgrading. This upgrading takes place when firms use their competence in performing a specific function in a new sector, within a different value chain. For instance, firms that specialise in graphite components move from making golf clubs and tennis rackets to racing bikes and fishing rods.

In the context of global trade, firm upgrading relates to the role of lead firms in controlling the supply chain through product specification (Humphrey 2005). Market participation via interaction with buyers along the commodity chain can generate technology and knowledge transfers (Rodrik 2001). Several studies on garments, electronics and agricultural commodities have proven the role of lead firms in driving the upgrading process of firms in these value chains (Gereffi, Humphrey & Kaplinsky 2001). In these examples, leading companies based in developed countries triggered the upgrading of suppliers from developing countries. Product requirements imposed by leading companies (buyers) based in developed countries are the driving force behind the upgrading process (Gereffi, Humphrey & Kaplinsky 2001).

In the case of primary commodity production, participation in global markets can be a catalyst for the development of agricultural producers. The developmental effect is related to how the nature of production is governed (Gereffi 1994). A buyer-driven value chain may imply that there is an unbalanced power relationship between the value chain's actors (Gereffi 1994). However, the interaction between suppliers and producers and the domino effects throughout the value chain actors can stimulate adjustment strategies to meet buyers' demands, which then lead to upgrading. Humphrey and Schmitz (2000) suggested that upgrading possibilities are achieved through the interaction between GVC actors, particularly buyers from developed countries. However, as stated above, the capability of the suppliers plays a role in whether or not they can upgrade (Humphrey 2005; Hatanaka 2010; Okello &Swinton 2007).

1.3.3 Stylised conceptual framework for the capability to participate in lucrative export markets

Figure 1.2 presents the conceptual framework for this thesis regarding the capability to participate in lucrative markets. Livelihood capitals and the GVC of Indonesian shrimp producers contribute to their capability to comply with the market requirements. In this study, livelihood capitals are the crucial means by which shrimp producers can comply with the export market requirements. It has direct and indirect connections to the capability to comply with export market requirements.

The framework departs from livelihood capitals (Box A in Figure 1.2), comprising human, financial, physical, social and natural capitals. Box A in Figure 1.2 depicts the endowment process of livelihood capitals. The circular line between livelihood capitals indicates a reciprocal relationship between one capital and other capital(s). This means that the endowment of a certain type of capital such as capital A can be determined by the endowment of another type of capital, capital B (Bebbington 1999; Emery & Flora 2006).

The combination of livelihood capitals can affect the endowment of:

1. The capability to comply with export market requirements (functioning), which can involve a set of complex livelihood capitals (see B in Figure 1.2). For example, a capital or a set of capitals may be required to comply with traceability, food safety standards or eco-label certification. In this relationship, the livelihood capitals directly affect the capability to participate in lucrative markets. In another example, the capability of a student to understand a theory is determined by the student's human capability to perform reading skills, English skills, computer literacy and critical analysis skills.
2. The capability to participate in a certain GVC through access to input suppliers and buyers (see C in Figure 1.2). Access to certain types of GVCs is also a means to comply with export market requirements; in which relates to the buyer driven value chains (diagram is presented in Figure 4.2). In this context, the livelihood capitals indirectly affect the capability to comply with export market requirements.

The complex causal relationship detailed above underpins the capability of producers to participate in lucrative export markets. As stated, the CA concept includes the 'freedom' or 'ability to choose'. Thus, if a farmer or group of farmers can reach this capability, the person or group has the ability to choose to participate in the lucrative export markets. If they do not have the capability to meet the market requirements, they are denied this choice.

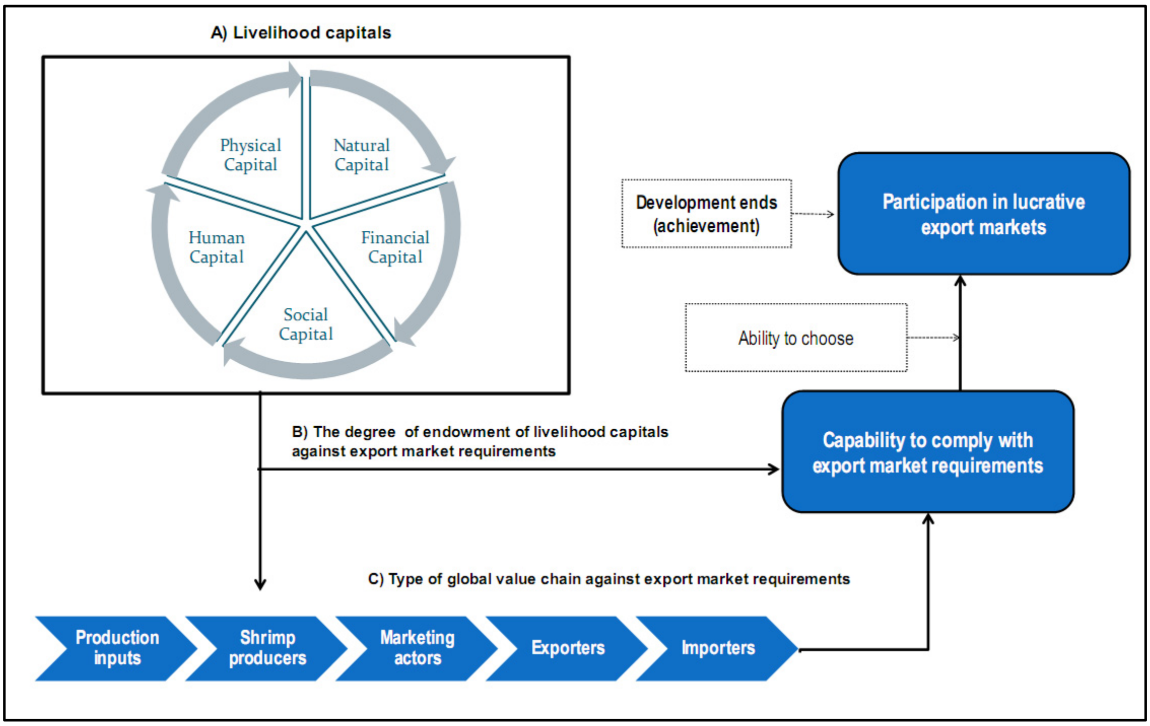


Figure 1.2 A stylised framework of capability for participation in lucrative export markets

1.4 Scope of the study

The scope of this study is limited by a number of factors. The focus of the thesis is to understand the capabilities of household-scale shrimp producers to participate in lucrative export markets. As mentioned above, this is because small-scale agricultural producers are at risk of being excluded or marginalised from lucrative export markets due to a lack of the capabilities required to comply with export market standards (Farina & Reardon 2000; Okello & Swinton 2007; Okello, Narrod & Roy 2011). Participating in these markets can provide significant economic benefits (FAO 2012; Kurien 2004) as well as other benefits relating to upgrading and development (Humphrey 2005; Kaplinsky 2006). Therefore, enhancing the capabilities of the less capable agricultural producers is important for eliminating potential risk of market exclution. Understanding the capability or incapability of these groups also provides a pathway towards developing the groups' capabilities regarding better access to export markets. To do so, it is important to further unpack the level of competency of smallholders through a more complex understanding by integrating the analytical components of the livelihood capitals and GVCs.

This study considers household-, industrial- and transnational-scale shrimp producers. This expands the scope of previous studies, which have focused only on household-scale shrimp producers. This classification of Indonesian shrimp producers differs with those of previous studies which mainly focused on shrimp farming technology (discussed in Chapter 2). The inclusion of industrial- and transnational-scale shrimp producers reflects the business scale of Indonesian shrimp producers which relates to their capabilities. This approach to shrimp producer classification is more relevant for evaluating market penetration in a globalised world where shrimp producers may compete in the same markets. In this study, the different tiers of shrimp producers are defined below:

- Household-scale shrimp producers are shrimp farmers who manage their farming system at the household level. The definition of households is 'the social group which resides in the same place, shares the same meals and make joint decisions over resources allocation and income pooling' (Meillassoux in Ellis 2000, p. 18). Thus, household-scale shrimp producers are a business unit for which the primary labour inputs are sourced from household members. In Indonesia, this type of shrimp farm is not required to have a legal permit to operate, neither at the village level nor from higher levels of the Indonesian government.
- Industrial-scale shrimp producers are defined as shrimp farms that are required to have a legal business permit from the Indonesian government (Statistics Indonesia 2011). The permit *(Ijin usaha*) is issued by the relevant government authority at the district or provincial level. This type of farming system is financed by domestic entrepreneurs. It usually hires external, technical experts which may include aquaculture experts and aquaculture engineers, as well as other qualified tradespeople.
- Transnational-scale shrimp producers are transnational corporate or multinational companies that have productive operations in more than one nation state (Cohen & Hymerl 1979; Jones 2003). Based on this definition, this study selected CP Prima as an example of a transnational shrimp producer. CP Prima and its subsidiaries are part of the Charoen Pokphand group of companies (CPP 2011), a leading agro-industrial and food company with a global production network for shrimp (Charoen Pokphand Foods 2014).

This study applies a comparative analysis to identify the level of capability of household-scale shrimp producers. This approach is necessary because the study assumes that all shrimp producers are participating in the export market with a different degree of capability. This enables a consideration of the level of competition among shrimp producers at different levels and with different types of capability.

The application of the SLA is limited to the adoption of the livelihood capitals. Some variables integrated in the approach have been excluded such as cultural capital, the vulnerability aspects of livelihood, shocks and livelihood survival strategies (Divakarannair 2007; Ellis 1998, 2000). Nevertheless, these aspects are covered in the discussion relating to the limited livelihood capitals and the complicated value chain of household-scale shrimp producers.

As discussed, the GVC analysis in this study involves mapping the product flow from the upstream nodes (shrimp growing) to downstream nodes (retail node in export markets). In the production node, the study includes shrimp broodstock production. This has not been integrated within previous studies of the shrimp GVC. The inclusion of shrimp broodstock production and supply is relevant for traceability, which is a central export market requirement. The focus is on evaluating the capability of shrimp producers to access inputs and markets. However, due to the limitations of this study's scope, a detailed economic analysis of value added at each node due has been excluded. Instead, this study emphasises the relationships between types of value chains (simple or complicated chains) and capability to access lucrative export markets. This study excludes quantifying the level of existing participation within export markets by household-scale shrimp producers.

The GVCs studied in this thesis do not include domestic markets and less stringent and less lucrative export markets such as those in other developing countries. Although domestic markets absorb around 60 per cent of the total production of shrimp in Indonesia, the price per kg of shrimp is cheaper compared to the price in the export market (MMAF 2013). Indonesian statistics reported that the retail price for shrimp in Jakarta was around US$ 4.9 per kg (Statistics Indonesia 2010a). In comparison, based on the total revenue from shrimp exports reported by MMAF (2013), the value of one kg of shrimp was around US$ 8.3. The FAO reported that seafood markets in developing countries have also been growing (FAO 2010). However, the markets for shrimp export from Indonesia to these countries are smaller compared to the markets in wealthy countries (detailed in Chapter 2).

This study does not include the gender aspect due to the time limitation as this study has covered very complex aspects. Furthermore, this study also uses the household unit for the unit of analysis for household-scale shrimp producers, which is analogical with one business unit (company) for industrial- and transnational-scale shrimp producers (Session 3.7). Thus the endowment level of livelihood capitals refers to the accumulative endowment of the livelihood capitals of the household.

1.5 Contributions of the research

This research contributes to knowledge, methodology and development practices. The study provides an understanding of the complexities associated with the capabilities required to access lucrative export markets through considering the role of livelihood capitals and the GVC. This study integrates the two methods, presenting the compatibility of each. This helps to develop a holistic understanding of the capabilities of farmers. Such an understanding contributes to the development of methodological approaches in future studies and is useful for designating future development interventions by the Indonesian government such as policy and shrimp farmer development and by other non-government organization.

This study contributes to empirical knowledge about the competency of household-scale shrimp producers' capabilities to comply with the requirements of lucrative export markets. Many studies have looked at food safety standards and small-scale agricultural producers (Asfaw, Mithöfer & Waibel 2010; Bush, Khiem & Sinh 2009; Farina & Reardon 2000; Okello, Narrod & Roy 2011; Okello & Swinton 2007; Tran 2013; Tran, Wilson & Phillips 2013). As explained in Section 1.1, there is still limited knowledge about the capability of shrimp producers to comply with export market requirements. Studies by Tran, Wilson and Phillips (2013) and Tran (2013) emphasise the role of governance through the Hazard Analysis Critical Control Point (HACCP) certification and eco-label certification schemes for shrimp produced in Viet Nam (see Chapter 4 and Glossary). Although their study implies that such requirements can place small-scale shrimp producers at a risk of market exclusion due to their limitations, the study did not explain attributes of small-scale shrimp producers in relation to their compliance capabilities. A similar study approach for other types of aquaculture commodities was also conducted by Bush, Khiem and Sinh (2009), which focused on the governance of pangasius (also known as the bahsa catfish) commodity (*Pangasius* sp). The study suggested possible development intervention to enhance the compliance of farmers with food safety measures. However, again, the study did not demonstrate the complex capabilities requiring enhancement. By using a more holistic and detailed approach, this study contributes relevant knowledge to those development strategies that are able to enhance household-scale shrimp producers' participation in lucrative export markets.

This study extends the application of the CA to the complexities associated in the capitals endowment process. To the best of the author's knowledge, there are limited studies on aquaculture development which apply the CA, particularly in relation to globalised markets and production. The CA has predominately been applied in the studies of empowerment, poverty, welfare and agency (Cockerill 2014; Frediani 2010; Iversen 2003; Kuklys 2005; Murphy & Gardoni 2012; Robeyns 2003, 2006; Simon et al. 2013; Schokkaert & Van Ootegem 1990; Trommlerová, Klasen & Leßmann 2015). For example, a recent study by Trommlerová, Klasen and Leßmann (2015) looked at the effect of age, gender, marital status, nationality, economic activity and health on the empowerment of communities and individuals in Gambia towards poverty alleviation. Simon et al. (2013) applied the CA to evaluate mental health service for the service users treated using the Community Treatment Orders in England. Thus, this study further extends the ongoing application of the CA in research.

This study contributes to the integration of the SLA with the GVC approaches. This integration is believed to overcome the shortcomings of each method, discussed above. To the best knowledge of the author, this study presents the first attempt to integrate the two methods (Challies & Murray 2011). A study by Challies and Murray (2011) focused on a different commodity (raspberry) and did not demonstrate the complex relationship between the livelihood capitals and GVCs, which this study aims to show. For instance, Challies and Murray (2011) did not demonstrate the effect of endowment on livelihood capitals and consequently, the effect on the ability of famers to participate in certain types of value chains.

1.6 Thesis plan

This thesis is divided into eight chapters; the flow of the thesis and the relationship between each chapter are presented in Figure 1.3.

Chapter 1: Introduction

This chapter describes the underlying issues justifying the need for this study. This chapter also outlines the conceptual framework of the thesis which will provide the lens for analysing the findings (Chapter 5 and Chapter 6) generated in this study and for summarising the central argument of this study.

Chapter 2: Indonesian shrimp aquaculture

This chapter presents a history of shrimp farming development in Indonesia, explaining how industrial and transnational-scale shrimp producers have emerged in recent decades in Indonesia, alongside household-scale producers which have existed for several centuries. This history provides a necessary context for understanding stratification among Indonesian shrimp producers and the development intervention implications. The Indonesian shrimp producers are stratified by their business scale: transnational-, industrial- and household-scale shrimp producers. This chapter also presents the classification of shrimp farming practices in relation to shrimp farming technology and production. The last section of this chapter presents the socio-economic functions of shrimp aquaculture for Indonesia, which covers export revenue and employment.

Chapter 3: Methodology

This chapter presents the approaches applied in this study including justifications for the selected approaches. Topics discussed include the design of study, methods for data collection, village and respondent selection and data analysis.

Chapter 4: Requirements for participating in lucrative export markets

This chapter describes the export requirements for food safety required by governments from importing countries and by private eco-label certification. This chapter establishes the requirements and forces of compliance for participation in lucrative export markets.

Chapter 5: Livelihood capitals of household-scale shrimp producers and complexity in endowment

The main focus of this chapter is to evaluate the endowment of livelihood capitals and the factors affecting the endowment process for household-scale shrimp producers in the villages studied. This chapter argues that, generally, household-scale shrimp producers have a low endowment of livelihood capitals. The endowment of livelihood capitals is a complex process involving reciprocal and even loop relationships between the different livelihood capitals.

Chapter 6: Livelihood capitals, scale of shrimp producers and capability to participate in lucrative export markets

This chapter extends the discussion of livelihood capitals from Chapter 5, by comparing the competency of livelihood capitals of household–scale shrimp farmers to access export market with industrial–and transnational–scale shrimp producers. This chapter reinforces the complex relationship among livelihood capitals, and demonstrates the effects of the livelihood capitals on shrimp producers' capabilities to comply with export market requirements. The discussion highlights the relationship between scale of farm, livelihood capitals and capability to access the lucrative markets and conceptualises a theoretical relationship among these aspects.

Chapter 7: Indonesian shrimp global value chain and capability to participate in export markets

This chapter discusses the relationship between livelihood capitals, participation in the ISGVC and the capability to meet export market requirements. First, the chapter presents an overview of the ISGVC, which is stratified into the ISGVC for transnational producers (TSSP_GVC), the ISGVC for industrial-scale shrimp producers (ISSP_GVC) and the ISGVC for household-scale shrimp producers (HSSP_GVC). This is followed by a discussion on the effect of the livelihood capitals endowed by each group of Indonesian shrimp producers upon the types of GVC in which they participate. This section is based on a causal relationship between the type of GVC in which shrimp producers participate and the capability to access export markets. This chapter shows that the lengthy and complicated value chains in which household farmers can participate limit their capability to access lucrative export markets.

Chapter 8: Conclusion and recommendations

This chapter concludes with a conceptual understanding of the complexities affecting the capability to participate in lucrative export markets. The chapter also summarises the arguments related to and recommendations for enhancing the capability of household-scale shrimp producers and identifies areas for further research.

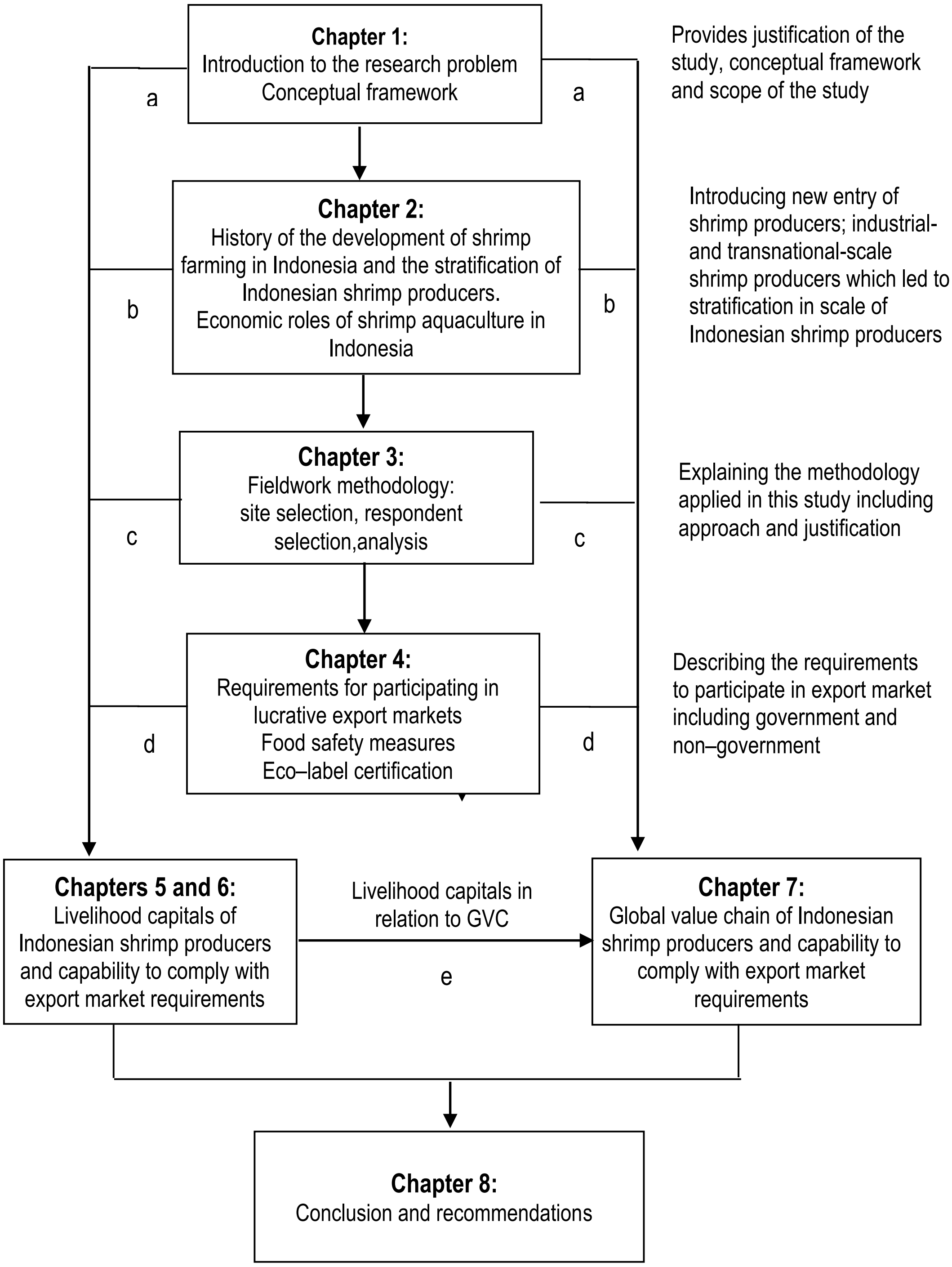


Figure 1.3 Flow chart presenting thesis structure used to achieve the research objective

Chapter 2: Indonesian shrimp aquaculture

2.1 Introduction

This chapter reviews Indonesian brackishwater shrimp aquaculture and provides an historical overview of the development, current practices and the economic roles of the sector.

The history of Indonesian brackishwater shrimp farming contributes to an understanding of how stratification of the Indonesian shrimp producers and shrimp farming practices has emerged. It also provides an insight into the history of household-scale shrimp producers, and how shrimp producers accessed natural resources, technology and funds during the industrialisation of Indonesian shrimp farming in the 1970s, through to the 1990s. This helps us to understand their capabilities, which will be discussed further in Chapters 5, 6 and 7.

Section 2.3 outlines current practices in Indonesian brackishwater shrimp aquaculture, highlighting the difference between extensive (traditional), semi-intensive and intensive shrimp farming systems. This review is important because the differences in shrimp farming systems are strongly related to the financial capability to support production costs. The type of shrimp farming system also determines productivity. This influences shrimp producers' capability to access inputs and markets, which is discussed further in Chapter 7.

Section 2.4 reviews the economic roles of brackishwater aquaculture with an emphasis on shrimp culture. The review considers the role of the sector in providing employment for rural coastal villages. This demonstrates the significance of the sector. It covers the economic revenue generated from the shrimp trade and the sector's function as an employment generator. The employment review includes the number of employment generated at the production, marketing and processing nodes of the supply chain.

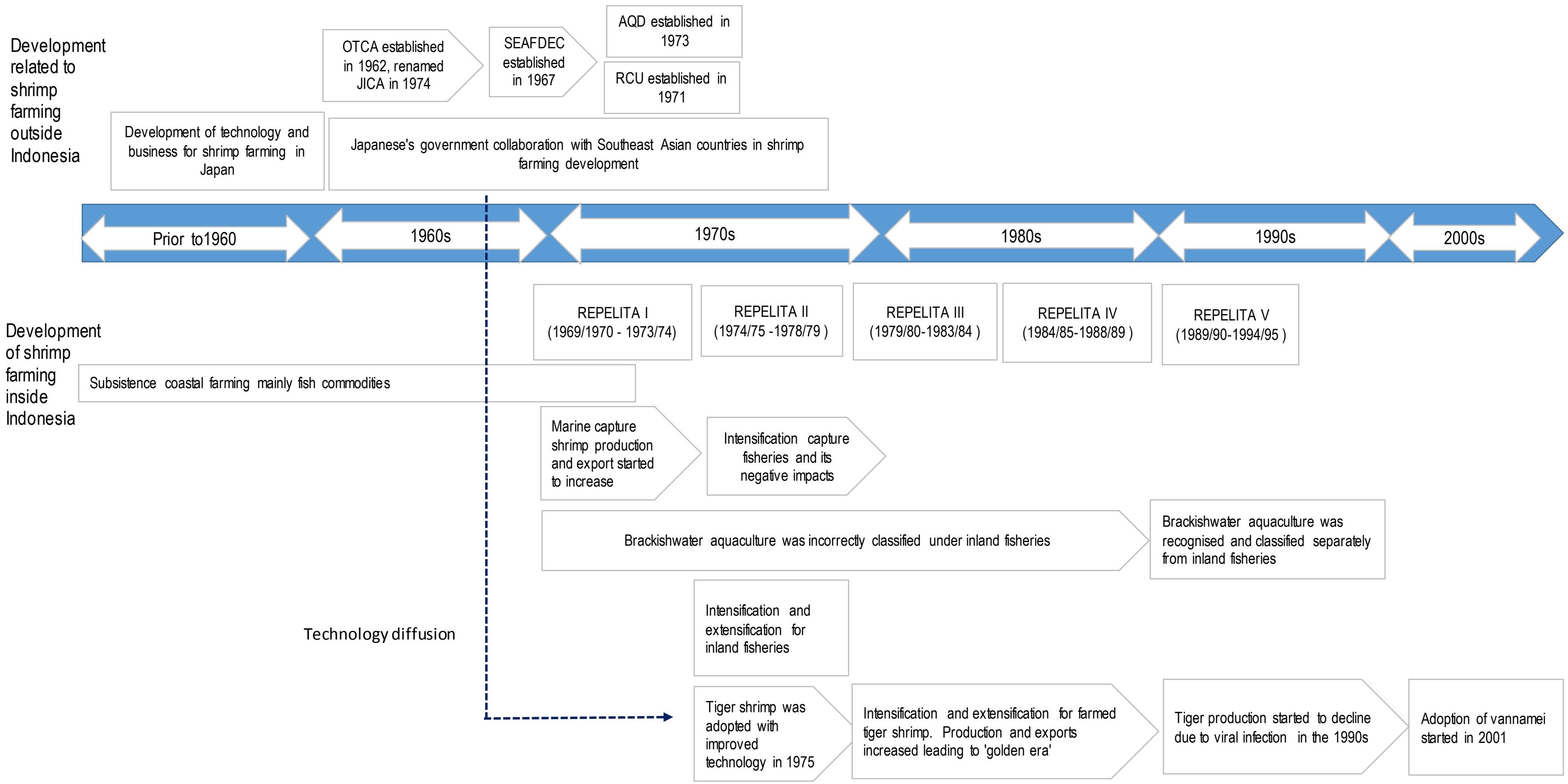


Figure 2.1 Timeline of the development of Indonesian brackishwater aquaculture

2.2 History of Indonesian shrimp farming

The historical development of brackishwater shrimp farming in Indonesia is summarised in Figure 2.1. Indonesian shrimp farming originated from subsistence-based brackishwater aquaculture, which was initiated by coastal inhabitants more than 400 years ago (Cremer & Duncan 1979; Nash 2011). Other shrimp-producing countries such as China, India and Thailand have similar shrimp farming industry origins (Cha, Young & Wong 1997). Indonesia's geographical position was beneficial for brackishwater aquaculture because there was an opportunity to utilise a range of coastal resources to support settlement and farming. As an archipelago country, Indonesia has 104,000 kilometres of coastal line and has around 2,963,717 hectares (ha) of shrimp farms across Indonesia (MMAF 2013).

2.2.1 Pre-modernised shrimp farming (prior to 1964)

Prior to the modern era of brackishwater aquaculture development in Indonesia, shrimp was largely caught from the wild to provide protein to rural households in coastal areas. Households used trap devices to catch fish and shrimp. The culture of shrimp was developed by impounding water and trapping shrimp for growout. Mangroves were gradually removed and dykes were progressively constructed (Cremer & Duncan 1979). This physical development allowed households to control water and to trap wild shrimp and fish larvae entering the areas during high tides. The reared shrimp and fish larva were kept in the ponds and grew on natural feed (algae) available in the pond (Muluk & Bailey 1996). However, ponds were used mainly to grow fish, especially milkfish (*Chanos chanos*). Wild caught fish fry began to be stocked in traditional ponds to increase fish production and shrimp larvae were still trapped during high tide when water flowed into the ponds. However, shrimp was considered a secondary crop (Poernomo 2001).

During the mid-1970s the traditional form of shrimp farming in Indonesia was revolutionised by new shrimp hatchery technologies (Yusuf 1995). Research and development activities for the domestication of shrimp outside Indonesia, particularly in Japan, resulted in the capacity to mass produce shrimp larvae for stocking in ponds (Sianipar & Genisa 1987). Motosaku Fujinaga, a Japanese biologist, first published his breakthrough study on the biological attributes of *Paneaeus japonica* in the mid-1960s (Fujinaga 1969). The study suggested that *Paneaeus japonicas* could spawn in a laboratory environment, which led to the possibility that post-larvae production could be undertaken in a hatchery environment (Fujinaga 1969; Nash 2011; Sianipar & Genisa 1987;

Treece 2000).The development of shrimp hatchery technology in shrimp farming positioned Japan as the leader of the shrimp aquaculture industry by the mid-1960s.

The Japanese government supported the emerging shrimp farming business in Japan and initiated regional collaboration. The government established the Overseas Technical Cooperation Agency (OTCA) in 1962, which was later renamed the Japanese International Cooperation Agency (JICA) in 1974 (JICA 2014). Though this organisation, Japanese aquaculture experts collaborated with several South–East Asian countries, which led to the establishment of an international research centre called the South–East Asian Development Center (SEAFDEC) in 1967 (SEAFDEC 2014). The aim was to develop a major site for research and development in South–East Asian countries (Nash 2011).The original members were Japan, Singapore and Thailand. Other South–East Asian countries joined SEAFDEC in the following years including Indonesia, Malaysia, the Philippines and the Republic of Viet Nam (Nash 2011).

In 1973**,** the Aquaculture Department (AQD) was established as part of SEAFDEC, based in the Philippines. A large training centre, research and production facilities was established at Leganes on Panay Island in the Philippines (Nash 2011; SEAFDEC 2014). This intergovernmental research collaboration essentially distributed Fujinaga's technology throughout the region. Member countries of SEAFDEC adopted and disseminated the technology widely throughout government institutions and among private entrepreneurs (Nash 2011).

Following the dissemination of shrimp farming technology, shrimp farming in South–East Asian countries developed rapidly. Within a decade, Indonesia, the Philippines and Thailand had overtaken Japan in shrimp production. The rapid development of aquaculture was associated with the natural assets of these countries which favoured shrimp farming industries. Nash (2011) suggested that the advantages included other types of indigenous Asian species of shrimp that were more suitable for farming compared to *P. japonicas.* The tropical climate enabled faster growth of the indigenous shrimp species and farmers were able to produce several crops each year. These countries have large coastal areas and brackishwater ponds already established which are easily modified for shrimp farming technology. In addition, the coastal ecosystems of these countries are rich in organic material, which is utilised by shrimp in their early life stages *(*Nash 2011).

2.2.2 Shrimp farming industrialisation: intensification and extensification

In parallel to the adoption of shrimp culture technology by farmers, interventions by the Indonesian government played a major role in the expansion of shrimp farming in Indonesia. During the Suharto regime, the government implemented a five-year strategic development plan known as '*Rencana Pembangunan Lima Tahun'* (REPELITA). The Indonesian government had implemented five REPELITA prior to the Indonesian reformation in 1997–1998. The first REPELITA was a development plan for the period 1969/1970–1973/1974; REPELITA II was for the period 1974/1975–1978/1979; REPELITA III was for 1979/1980–1983/1984; REPELITA IV covered 1984/1985–1988/1989 and REPELITA V was for the period 1989/1990–1994/1995 (Figure 2.1).

In REPELITA I, agricultural development was the main target, particularly an increase in paddy production. The aim was to meet Indonesian demand for rice supply. The government invested to establish extension services, deliver training programs and implement research and development activities. Priorities also included the development of horticultural and forest commodities such as rubber, palm oil, sugar cane, tea and spices. Although the fisheries sector was included in the development plan, the emphasis was lesser on the sector compared to the other agricultural and plantation commodities. The government approach to the fisheries sector only considered marine capture and inland fisheries (see Glossary for definitions). The inland fisheries sector included paddy-integrated fish culture, freshwater ponds and *tambak*. This structure was incorrect because *tambak,* which is a brackishwater aquaculture, was being classified as an inland fishery. This refers to freshwater farming. However, the terminology of brackishwater ponds still did not exist in the first REPELITA. Under the general fisheries sector, the development plan for the sector focused on marine capture fisheries. Brackishwater aquaculture was not clearly targeted and it was not strategised for supporting the early period of Indonesian development (Government of Indonesia [GOI] 1969).

During this era, the resources available for Indonesian fisheries were not fully exploited. The Indonesian government estimated that total fish production from marine capture and inland fisheries was only around 15 per cent of the potential production. In 1968, the potential fisheries production capture rate was estimated at 7.6 million tonnes compared to actual production which was only 650,000 tonnes (GOI 1969). Fish production prior to REPELITA I is presented in Table 2.1.

Table 2.1 Annual fish production prior to REPELITA I, 1953–1967

	1953–1957	1958–1962	1963–1968
Marine capture fisheries (tonnes)	400,000	450,000	650,000
Inland fisheries (tonnes)	220,000	300,000	440,000

Source: GOI 1969 (REPELITA I)

The Indonesian government invested funds for several programs in the fisheries sector. This initiated the development of Indonesian fisheries, in particular, the capture fisheries. They allocated 10 billion rupiah in the budget outlined by REPELITA I. The programs focused on intensification of the marine capture fisheries, development and rehabilitation of fisheries landing sites and fisheries infrastructure facilities. The intervention resulted in an annual increase of four per cent in Indonesian capture fisheries production (GOI 1974). This led to a significant increase in Indonesian exports for capture fishery commodities. Indonesian fisheries exports grew by 369 per cent for the period of 1968–1973 (Table 2.2).

Table 2.2 Indonesian fisheries commodities exports, 1968–1973

Capture fishery commodities	Unit	1968	1969	1970	1971	1972	1973
Fresh shrimp	tonnes	2,900	5,600	5,900	14,100	21,600	25,300
Fresh fish	tonnes	3,400	2,300	1,200	3,500	3,700	4,300
Total		6,300	7,900	7,100	17,600	25,300	29,600

Source: REPELITA II (GOI 1974)

The tremendous increase in Indonesian exports from marine capture fishery during REPELITA I encouraged the Indonesian government to enhance their intervention into the fishery sector. In REPELITA II (enacted in 1974), the Indonesian government included the fisheries sector as one development focus, together with the agriculture, horticulture and plantation sectors. The development target for the fisheries sector was to further increase Indonesian exports in fishery commodities. Although capture fishery was still the main focus within the fisheries sector, the Indonesian government began to increase the support for inland fisheries development, which also included brackishwater aquaculture (still classified as part of the inland fishery). The Indonesian government adopted agricultural development approaches for inland fishery development; intensification and extensification strategies were duplicated in the development programs for inland fisheries.

An intensification program was targeted at existing freshwater pond culture, paddy-integrated fish culture as well as brackishwater pond-based culture for fish and shrimp. Improved technology and production infrastructures enabled an increase in productivity under the intensification program. In comparison, the extensification program for inland fisheries was implemented by establishing new production areas for freshwater and brackishwater ponds in rural villages. Support was given to existing fish farmers and the government also encouraged those villagers who were not initially fish farmers to participate in the extensification program by opening new aquaculture ponds. Incentives were provided to attract newcomers to targeted villages. Brackishwater pond extensification was combined with a transmigration program such as that established in Sumatra Island. Thus, extensification not only worked to improve fisheries production, but it also supported the migration of Indonesians from highly populated areas (e.g. Java Island) to less populated areas (e.g. Sumatra Island).

The implementation of intensification and extensification of inland fisheries was designed with consideration for the geographical and demographic characteristics of areas across Indonesia. The Indonesian government mapped several locations for the development of *tambak* farming including coastal areas in the Aceh, Lampung, Central Java, East Java, South Sulawesi, Bali and Nusa Tenggara Barat Provinces. Developments for freshwater fish farming were targeted in the inland areas of the Sumatra Utara, Sumatra Barat, Jawa and North Sulawesi Provinces.

To support the development plans, the Indonesian government also included several other programs such as development for fisheries infrastructure, capacity development for farmers and fishery officials, and the improvement of financial access for small-scale inland fisheries holders. These investments significantly increased production for inland fisheries (Table 2.3). However, the Indonesian government stated that the production from brackishwater ponds, which was still called *tambak* and misclassified under inland fishery, contributed significantly to the overall increases in inland fisheries production (GOI 1979).

Table 2.3 Marine captured and inland fisheries productions, 1973–1977

	1973	1974	1975	1976	1977	Average annual growth (%)
Marine capture fisheries (X 1000 tonnes)	889	949	997	1.043	1.099	5,4
Inland fisheries (X 1000 tonnes	389	388	393	405	427	2,4

Source: GOI 1979

Parallel to the intensification and extensification programs implemented by the Indonesian government, SEAFDEC continued to disseminate tiger shrimp farming technology in Indonesia through training programs for its member countries (Nash 2011). The Indonesian government built the Research Centre for Shrimp (RCU) in Jepara, Central Java in 1971, which is now known as the Jepara Brackishwater Aquaculture Research Centre (BBPBAP). This BBPBAP was established to provide technical support for *tambak* development (BBPBAP 2014; Muranto 1989; Figure 2.1). The institution became the centre for the adoption of shrimp farming technology outside Indonesia, such as from SEAFDEC, and the hub for technology diffusion and dissemination across Indonesia via the extension programs (Muranto 1989). The Indonesian government encouraged the adoption of tiger shrimp (P *monodon*) in the mid-1970s due to its high market value compared to other shrimp species. Since 1975, tiger shrimp has become the main species farmed in brackishwater ponds, either as polyculture with milkfish or as a monoculture. Technology improvements were disseminated through the government agencies. Pond design and engineering approaches were improved and better water control systems were created, largely through the construction of canal networks. Stocking from hatchery-produced post-larvae became commonplace and formulated feeds were used (Yusuf 1995).

Parallel to the increase in shrimp production, both from farmed and wild caught shrimp, export markets for shrimp were also growing, particularly the Japanese and US markets. In Japan, farmed shrimp from South Asian countries including from Indonesia replaced shrimp imported from the US (Ferdouse 1989). These demands and the revenue generated from shrimp exports motivated the Indonesian government to further intensify their support for an increase in shrimp production, both for farming and capture practices. In 1987, shrimp export revenue reached US$ 352,435 million compared to US$ 475,523 million for total fishery products exports. The shrimp export share was 74.1 per cent of the total fishery products exported (Martosubroto & Wibisono 1989). This positioned shrimp farming as one of the major priorities for export commodities.

In parallel with the development of fishery production mentioned above, the Indonesian government began to reduce oil and gas exports during REPELITA II to meet the increasing demand for domestic energy consumption brought about by Indonesian industrialisation. To balance out the potential loss of revenue due to the reduction of oil and gas exports, the Indonesian government replaced the exports from non-oil and gas commodities including shrimp from capture fisheries. By the late 1970s, the annual export growth for non-oil and gas commodities overtook the total exports of oil and gas. At the conclusion of REPELITA II (1978), the Indonesian government reported that annual export growth for oil and gas was 6.4 per cent, while it was 16.5 per cent for non-oil and gas (GOI 1979). This included shrimp exports.

Although Indonesia achieved significant growth in marine capture fisheries, the intensification and modernisation approaches, using improved fishing technologies and vessels, involving large businesses in the capture fisheries sector, had generated some negative effects. The excessive use of intensive fishing technology, such as using trawl nets to catch wild shrimp, resulted in overfishing. The risk of stock depletion became a serious issue. Social conflicts were also emerging between traditional fishers and large-scale fishing companies. The social tensions included those associated with unfair competition because of disparities in available fishing technology and facilities, and with advanced fishing technology, which marginalised the traditional technology fishers. The large-scale fishers also over-exploited the fishing grounds (GOI 1979). In 1980, Presidential Decree No. 39 (KEPRES) banned trawlers in the capture fisheries sector within Indonesian fishing grounds. This resulted in a significant drop in capture fisheries production including captured shrimp. This further motivated the Indonesian government to increase shrimp production through aquaculture. Shrimp production using brackishwater, pond-based aquaculture was seen as an alternative to maintain Indonesian shrimp production and exports (Wahyono 1989). Although brackishwater shrimp farming was still classified under inland fishery, brackishwater shrimp farming was one of the development priorities articulated in REPELITA III (1979/80–1983/84). This era marked the start of large-scale brackishwater shrimp farming development in Indonesia.

Under REPELITA III (1974/75–1978/79) and REPELITA IV (1984/85–1988/89), intensification and extensification programs were continued and expanded to support the brackishwater aquaculture development agenda. In 1984/1985, the government officially launched a *tambak* intensification program, which was termed '*Intesifikasi tambak'* (INTAM). INTAM was also supported by foreign investment. The Asian Development Bank (ADB) provided a loan to the Indonesian government to support Brackishwater Aquaculture Development Programs (BADP) for the period 1983–1990 (GOI 1984). The program focused on small-scale shrimp farmers (Yusuf 1995). The INTAM program further encouraged the adoption of modernised technologies such as semi-intensive and intensive shrimp farming systems. The programs targeted shrimp farmers who practiced traditional shrimp farming systems in the Aceh, South Sulawesi, West Java, Central Java and East Java Provinces. The primary investments of BADP were to support development and rehabilitation of *tambak* water canals with an ability to supply water for 12,140 ha of *tambak* in the West Java, Central Java and East Java Provinces and to develop five shrimp hatcheries in West Java (1 unit), East Java (2 units), Aceh (1 unit) and South Sulawesi (1 unit). Extension services and the provision of credit were also supported under the BADP (Wahyono 1989).

In addition, new shrimp farming areas were further expanded in Java, South Sulawesi, Sumatra, Bali, West Nusa Tenggara and Kalimantan. The extension service was improved; officers disseminated technology through demonstration ponds, provided technical assistance to farmers and facilitated access to inputs and to faming equipment. Business management development was also integrated into an extension service program. The Indonesian government provided financial support to villagers to establish new ponds and to adopt the new technologies (Cremer & Duncan 1978; GOI 1979, 1984).

As an integral part of the development strategies, the government continued investment in research on shrimp farming technology such as shrimp hatching. In the mid-1980s, the RCU successfully produced shrimp post-larvae using ablation technology.[2] This enabled hatcheries in Indonesia to widely supply post-larvae to farmers (BBPBAP 2014) and triggered the development of shrimp hatcheries by the Indonesian government and private business. The government built 11 shrimp hatchery centres (*Balai Benih Udang*), 46 fish hatchery centres and five brackishwater development centres (*Pembinaan Budidaya Air Payau*) near to targeted production areas to supply good quality seed. This was also supported by information dissemination agencies. At the end of REPELITA IV, the government established 28 agricultural information centres (*Balai*

[2] Ablation is a broodstock maturation method (FAO Fisheries 2007)

Informasi Pertanian), 506 extension services centres (*Balai Penyuluh Pertanian*) involving 29,254 extension service officers (*Penyuluh Pertanian Lapangan*) and 1,600 extension service specialists (*Penyuluh Pertanian Spesialis*).

In addition to the development of household-scale shrimp farmers, in REPELITA IV the government fostered cooperation between private businesses to expand brackishwater farming. The scheme was called '*Tambak Inti Rakyat'* (TIR) (GOI 1984) and began in 1985/1986 (Poernomo 1989). The main aim of the TIR schemes was to foster development employment opportunities and income growth distribution. Some TIR programs were integrated with transmigration programs to redistribute part of the Indonesian population outside Java into Sumatra and Kalimantan (Poernomo 1989). The TIR was based on community-based brackishwater shrimp farms—a contract farming system between a private corporation farm (a 'nucleus'), with small-scale farms established in the adjacent areas ('plasma'). The private businesses provided financial credit to the community to establish plasma ponds close to the nucleus ponds. The design and layout of the ponds were developed by the private business. It included considerations of infrastructure such as water and electricity supply systems. At every production cycle, private business provided credit for production inputs as well as technical assistance. In return, the communities were required to comply with private business management including the farming practices and also to sell their yield to the private business. The revenue gained from the shrimp harvest was subtracted from credit. This scheme promulgated *tambak* farming all over Indonesia. The TIR scheme provided an opportunity for private businesses to expand large-scale shrimp farming areas by up to 30 ha for Java and up to 50 ha for outside Java. The Indonesian government granted larger areas if there was community involvement, which was up to 100 ha with a ratio of 40 per cent for nucleus and 60 per cent for plasma (GOI 1984; Kusumastanto1994). To escalate the development of the TIR, the Indonesian government sought foreign funds. For example, the World Bank injected funds through its Fisheries Support Services Project (FSSP) which started in 1987. The Indonesian government continued to support private business to access financial capital including financial support from the ADB. Ten units of TIRs (nucleus–plasma systems) were established in the North Sumatra, Riau, South Kalimantan and West Nusa Tenggara Provinces by the end of REPELITA IV (Soeprapto 1989).

The rapid development of shrimp *tambak* farming was occurring during REPELITA IV (1984/85–1988/89) and strengthened the position of this sector as an export income generator. At the end of REPELITA IV (1989), brackishwater shrimp farming became the ‘primadonna’ of Indonesian non-gas and oil export commodities (Wahyono 1989, para. 2). The Indonesian *tambak* area grew by 25,000 ha within four years. Hardjolukito (1989) noted that in 1984, Indonesia had 225,187 ha of *tambak*s; this figure increased to 250,000 ha in 1988. The productivity of small-scale shrimp farmers increased by 21.3 per cent from 608 kg/ha per year to 730 kg/ha per year for the period of 1983–1987 (Soeprapto 1989). Consequently, the total production of brackishwater shrimp farming increased by 24.5 per cent per year for the period 1983–1988 (from 27,600 to 82,573 tonnes). This increased the volume of shrimp exports by 16.9 per cent (from 26. 160 to 56.522 tonnes) and value by 22.1 per cent (from US$ 194.4 million to US$ 499.8 million) in the same period (Soeprapto 1989). In 1987, farmed shrimp contributed to around 7.3 per cent of total Indonesian GDP (GOI 1989).

Finally, in REPELITA V (1989/90–1994/95) brackishwater aquaculture stopped being incorrectly classified as inland aquaculture. The government used the terminology of brackishwater aquaculture in the planning document for REPELITA V and classified it as a separate group from inland fishery. The growing sector attracted a number of international private investors. By the beginning of REPELITA V, 350 companies were registered to invest in shrimp farming production. The Indonesian government also allocated 250,000 ha of land for shrimp farming, in addition to the existing allocated land in previous REPELITAs, and also granted international shrimp producers, such as the CP Group from Thailand, the ability to open shrimp farms in Indonesia. Private business also invested in the supporting sectors. In the same period, 92 private hatcheries were operating with a total production capacity of 2.6 billion shrimp fry per year at the beginning of REPELITA V (1989/80); nineteen private sector feed factories were established including some by Taiwanese companies (Wahyono 1989) and around 71 cold storages and processing plants were registered by the end of 1988 (Cholik 1989).

The golden era of Indonesian brackishwater shrimp culture peaked at the beginning of the 1990s. The development interventions for brackishwater shrimp culture resulted in rapid expansion of brackishwater shrimp farms across Indonesia. However, the shrimp farming technology intensification degraded the quality of the environmental in coastal areas, which led to production failures (Kusumastanto 1994).

2.2.3 Downfall of tiger shrimp and adoption of vannamei

The booming growth of Indonesian tiger shrimp did not continue linearly over time. According to statistical data base on Food and Agricultural Organization (FAO FISHSTAT 2014), Indonesian tiger shrimp production started to decline in 1992. Production declined from 98,358 tonnes (1992) to 87,285 (1993) and dropped to 83,193 in 1994, representing a 15.5 per cent reduction in productivity within two years (FAO FISHSTAT 2014). The significant decline in brackishwater shrimp productivity was associated with viral infection. According to Kusumastanto, Jolly and Bailey (1998), Indonesian brackishwater shrimp farming was severely affected by the spread of the White Spot Syndrome Virus (WSSV), which caused high production failures. The viral infection started in 1991 and affected intensive and traditional shrimp farms throughout Indonesia. Poernomo (1989) blamed unsuitable farm locations, bad pond design quality, inadequate production preparation and over-stocking density as the factors that triggered the widespread viral infection. A few years later after the early viral infection, around 4,749 ha of tiger shrimp farms were affected. Consequently, many farms stopped operating. It was reported that only 10 per cent of the total shrimp farming area was operating during the early disease outbreak (Cholik 1989).

Problems with farming tiger shrimp motivated the Indonesian government to import vannamei (*Litopenaeus vannamei)* as an alternative commodity because this species was considered disease resistant. It also grows faster than tiger shrimp and can tolerate poorer water quality and higher stocking densities. In 2001, the Indonesian government issued a ministerial decree (number: KEP. 41/MEN/2001) to include vannamei as a priority species for Indonesian brackishwater aquaculture. Several private sectors were given licenses to import vannamei broodstock. For instance, PT Central Pertiwi Bahari and PT Surya Adikumala Abadi imported 2000 broodstock and 5.1 million post-larvae from Hawaii and Taiwan. The adoption of vannamei was also supported by the Indonesian research agency—Gondol Research Institute for Mariculture (GRIM). GRIM, which is located in Bali, conducted an experiment for *P. vannamei* adoption in the Banyuwang District, East Java Province. The success of the vannamei culture trial in Banyuwangi motivated other shrimp farmers to adopt vannamei. The technology of vannamei culture was disseminated across Indonesia with a focus on the Bali, Lampung, West Java, Central Java, South Sumatra, North Sumatra, Bangka Belitung, Riau, West Kalimantan, East Kalimantan, West Nusa Tenggara and Bengkulu Provinces (Budhiman, Paryanti & Sunaryanto 2005).

2.3 Current practices and production

According to MMAF (2013), Indonesian brackishwater aquaculture is distributed across several major islands. Sumatra, Java, Bali-Nusa Tenggara, Kalimantan, Sulawesi and Maluku-Papua are the major islands practicing brackishwater aquaculture. Kalimantan has the largest shrimp production area with a total pond area of around 211,323 ha, followed by Java (173,216 ha), Sulawesi (152,843 ha) Sumatra (128,044 ha), Maluku-Papua (8,916 ha) and Bali-Nusa Tenggara Islands (8,515 ha).

Indonesian brackishwater shrimp farming practices are classified into three types: (1) traditional and extensive; (2) semi-intensive; and (3) intensive (MMAF 2006; Poernomo 1989; Sianipar & Genisa 1987; Suyanto & Mujiman 1995; Zainun et al. 2007). For Indonesia, this classification system emerged following the development of Indonesian shrimp farming. The intensification programs upgraded traditional shrimp farming practices into intensive and semi-intensive shrimp farming systems. Other Asian countries have similar classification systems for shrimp farming. The extensive, semi-intensive and intensive shrimp farming systems are differentiated by the level of technology applied (Apud 1985; Kungvankij 1985; Shang, Leung & Ling 1998).

There are various definitions of the extensive system; it has been defined as a natural system where artificial feed is not used, while others have suggested that it is a traditional system with low production inputs (Apud 1985; Cha, Young & Wong 1997; Tarunamulia 2014). Tarunamulia (2014) defined the latter definition as an 'improved extensive shrimp farming system. However, this difference is not significant for this study because the business scale of shrimp farming is being focused upon, rather than the type of technology practiced.

On the other hand, intensive farming uses modern technology, high-level inputs and advanced facilities. Semi-intensive farming uses a combination of technologies in extensive and intensive methods (Apud 1985). Some studies differentiate between levels of technology based on pond facilities, stocking density, artificial feed usage, water management and production (Apud 1985; Kungvankij 1985; Shang, Leung & Ling 1998). The summary of the differences between shrimp farming classifications is presented in Table 2.4.

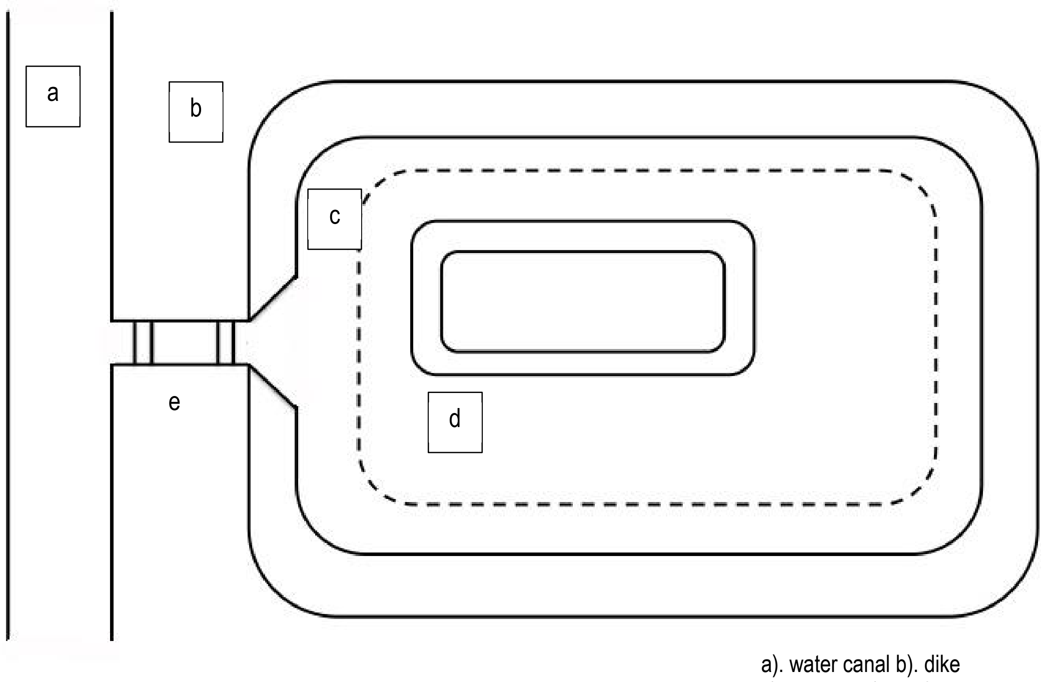
Table 2.4 Characteristics of Indonesian shrimp farming for extensive, semi-intensive and intensive systems

	Extensive /traditional	Semi-intensive	Intensive
Average farm size [a]	0.5 ha–5 ha	0.5 ha–10 ha	5 ha–50 ha
Pond layout [a]	Irregular; area per plot varies from 0.25 to 5 ha	Tetra square regular	Tetra square regular
Water supply [b]	Tidal	Tidal + pump	Pump + aeration
Water gate [a & b]	One—used for both intake and drainage. Irrigation relies on tidal water exchange	Two—separated sluice in the middle and in the dyke. Irrigation use tidal water exchange and also water pump	Two—separated sluice gate in middle and in the dyke. Irrigation relies completely on water pump to manage water quality
Production			
Shrimp farming system [a]	Poly/mono culture	Mono culture	Mono culture
Cycle, number of crops per year [a]	4–8 months per cycle (1–2 crop a year)	4–5 months per cycle (2–3 crops a year)	3–5 months per cycle (2–3 crops a year)
Type of hatched shrimp [c]	Tiger prawn	Vannamei shrimp	Vannamie shrimp
Inputs			
Feed [a]	Natural	Natural + supplementary feed	Formulated feeds
Shrimp fry	Wild + hatched	Hatched	Hatched

Source: (a) Zainun et al. 2007; (b) Tarunamulia 2008; Tarunamulia 2014; (c) Yi et al. 2009; (d) Noryadi et al. 2006

2.3.1 Physical structure

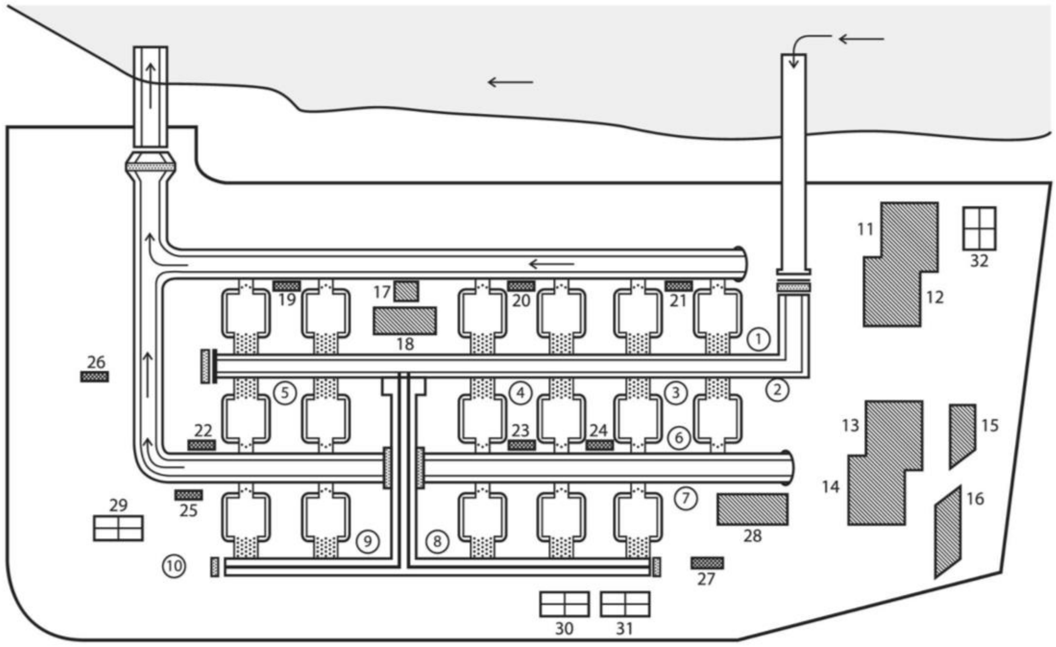
The average size of the extensive shrimp farms generally ranges from 0.5 to 5 ha (MMAF 2006; Zainun et al. 2007). Wealthier extensive shrimp farmers can have shrimp ponds above 10 ha per owner (Suyanto & Mujiman 1995). The physical structure of an extensive shrimp pond is the simplest and varies from one farm to another. A few extents of the ponds are built geometrically, but the majority of ponds originated from pre-modern fish ponds. Thus, the ponds were traditionally constructed following the natural shape of the landscape, without any modifications other than the construction of dykes to regulate water and trap shrimp. Therefore, the extensive shrimp farms have an inappropriate layout, shape and size. Figure 2.3 illustrates the typical structure of a traditional extensive shrimp pond, which is not a perfect tetra squared pond.



Source: Buwono 1993

Figure 2.2 Layout of an extensive shrimp pond in West Java; Indonesia

By comparison, semi-intensive and intensive shrimp farms have geometrical structures suited to modern aquaculture technology. For example, intensive shrimp farms are always built according to designed layout (see Figure 2.4). They include a separate inlet and outlet canal and access to electricity. The ponds of intensive shrimp farms are generally homogeneous in size, usually between 0.2–0.5 ha/pond. A small pond is easier to manage. Ponds can be totally or partly constructed using concrete but most are still earthen (Buwono 1993; Suyanto & Mujiman 1995). Figure 2.4 presents an example of the layout of an intensive shrimp farm.



Notes:

1, 2, 3, 4, 5, 6, 7, 8,9,10 artesian wells
11 office
12, 13 worker houses
14 storage
15 worker kitchen
16 toilet
17, 28 generator rooms
19 water pump room
19, 20, 21, 22, 23, 24, 25, 26, 27 feeder posts
29, 30, 31, 32 security posts

Source: Buwono 1993

Figure 2.3 Layout of a farm using an intensive shrimp culture system

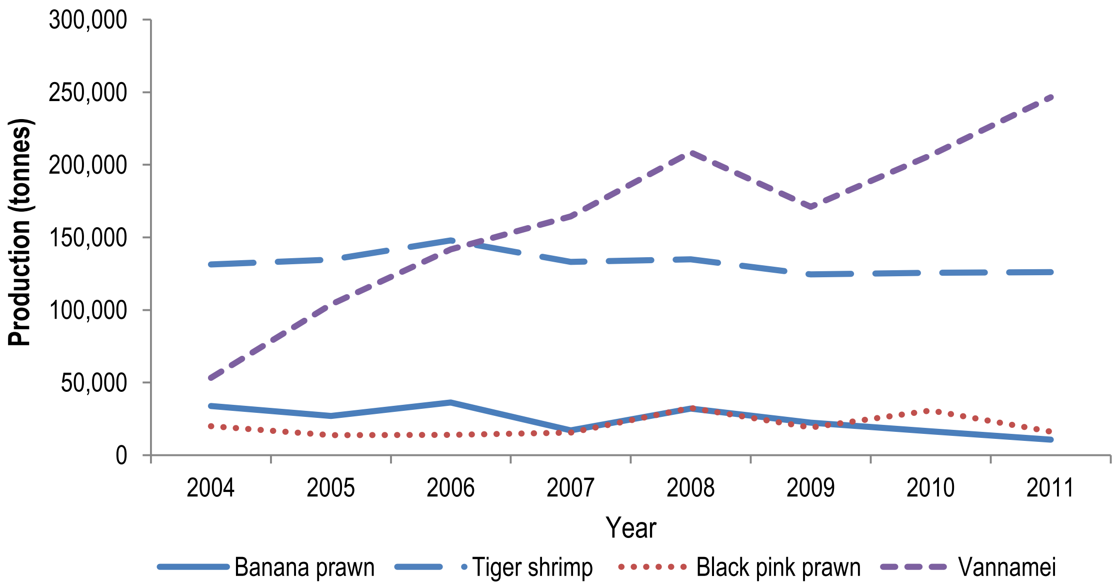
2.3.2 Water exchange

The different types of shrimp farms have different water supply systems. Traditional extensive shrimp farms are constructed without a water supply system. That is, there is no separate system between the water supply canal or inlet and the drain canal or outlet (Poernomo 1989; Zainun et al. 2007). Tarunamulia (2008) and Zainun et al. (2007) added that extensive ponds usually have one water gate, as illustrated in Figure 2.3. Thus, the extensive shrimp farming system depends on tidal flow from a creek. Those farms located next to a tidal river or creek within the estuary area obtain water from primary canals, while ponds further away from the river or creek acquire water access through secondary canals connected to primary canals (Poernomo 1989).

Although semi-intensive and intensive shrimp farming also have different water supply systems, these types of shrimp farming require more intensive water supply. The need for water supply systems in shrimp farming increases with the intensity of farming because waste needs to be flushed away (Phillips 1995). Therefore, intensive shrimp farming has the highest frequency of water exchange compared to other shrimp farming systems. According to Poernomo (1989), an intensive shrimp farming system can require 22 hours per day of water exchange in and out of the system. This requires sufficient production facilities such as water pumps and generators.

2.3.3 Current farmed species

Since the adoption of vannamie, Indonesian brackishwater shrimp farming currently produces four species: banana prawn (*Fenneropenaeus merguiensis*), giant tiger prawn (*Penaeus monodon*), black pink prawn (*Metapenaeus monoceros*) and vannamei shrimp (*Litopenaeus vannamei*) (FAO FISHSTAT 2014). The production shares of these species are presented in Figure 2.2. Giant tiger prawn and vannamei shrimp are the dominant commodities while banana and black pink prawns make up a smaller share of production. To date, the majority of extensive shrimp farms stock tiger shrimp (Bosma et al. 2012). Although vannamei production was initially adopted by intensive and semi-intensive shrimp farms (see Section 2.2; Yi et al. 2009), in recent years some studies have found that extensive shrimp farmers have also started to grow vannamei in the East Java Province (Florina & Hartoyo 2012; Lestariadi, Anindita & Thongrak 2012).



Source FAO FISHSTAT 2014

Figure 2.4: Brackishwater farmed shrimp production

The extensive shrimp farming practice may use the mixed seeds of wild fry and hatched shrimp fry (MMAF 2006; Poernomo 1989; Sianipar & Genisa 1987; Suyanto & Mujiman 1995; Zainun et al. 2007). Tiger and vannamei are farmed using hatched fry, while banana and black pink prawns are cultured using wild fry trapped during high tide. The difference in the production systems of the different species can explain the higher production levels for tiger and vannamei compared to the other two species, as presented in Figure 2.2. Shrimp farmers consider the wild shrimp yield as subsidiary to yields from their main production (Zainun et al. 2007).

Extensive shrimp farmers may also grow other commodities such as fish and crab. This is known as polyculture. There are various commodities stocked together with shrimp such as tilapia, milkfish, crab and seaweed (MMAF 2006). The commodity is selected based on suitability to an area and market availability. Milkfish is a common species found in South Sulawesi (Yusuf 1995).

2.3.4 Stocking density

Several studies have reported a different stocking density for each type of shrimp farming system (Table 2.5). In the case of extensive shrimp farming for tiger shrimp, earlier studies (Shang et al. 1998; Suyanto & Mujimin 1995) have suggested a higher extensive stocking density compared to a later study by Astuti (2007).

The stocking density in semi-intensive shrimp farming is slightly higher compared to that of the extensive shrimp farming system. However, there is also variation in stocking density among semi-intensive shrimp farms, which is presented in Table 2.5. The variations in stocking densities may relate to the type of species farmed. Primavera (1998), Shang et al. (1998) and MMAF (2006) do not state which shrimp species were stocked under the semi-intensive practice. Different stocking densities between species were reported by Apud (1985). For instance, it was found that the stocking density for tiger shrimp was 2–5 post-larvae per square metre, while *Fenneropenaeus indicus* (Indian banana prawn) was 5–10 post-larvae per square metre. As Indonesian shrimp farming practices have evolved, so differences in stocking densities and species farmed over the times may be possible.

Table 2.5 Stocking density for different types of shrimp in the farming system in Indonesia

Traditional extensive (post-larvae per square metre)	Semi-intensive (post-larvae per square metre)	Intensive (post-larvae per square metre)
2–5 (Suyanto & Mujimin 1995) and Shang et al. (1998)	3–6 (MMAF 2006)	10–15 (MMAF 2006)
1 (Astuti 2007)	3–10 (Primavera 1998)	67.7 (Shang et al. 1998)
	20.7 (Shang et al. 1998)	5–60 (Suyanto & Mujiman 1995)
		200 (Yi et al. 2009)

In contrast, intensive shrimp farming requires significantly higher inputs to achieve a greater yield. There is also a disparity in the stocking density for intensive shrimp farming systems across the existing literature (see Table 2.5). To reiterate the assumption made above, the different stocking density estimations may relate to the types of species being farmed earlier and the recent adoption of vannamie shrimp. It may also reflect variations in farm practices within each farming system or location.

2.3.5 Feeding

As shown in Table 2.4, there is a disparity in the feed uses different types of shrimp farming systems. Traditional extensive shrimp farmers use the least artificial shrimp feed. Kungvankij (1985) has found that extensive shrimp farming does not use supplementary feed at all. A later study by Shang, Leung and Ling (1998) indicated that there is supplementary feed usage in Indonesian extensive shrimp farming. However, shrimp farmers' practices also tend to be inconsistent within types of systems. For example, data presented in studies by Astuti (2007) and Asniati (2009) show that shrimp farmers using the extensive system may also have to add artificial feed when there is not enough natural feed grown in their ponds; consequently, there can be a temporary change in practices depending on the farmers' circumstances.

In contrast, semi-intensive and intensive shrimp farming require a higher quantity of shrimp feed. Intensive shrimp farming is completely dependent on formulated feed (Poernomo 1989; Zainun et al. 2007). Shang, Leung and Ling (1998) noted that the food conversion ratio (FCR) for intensive farming is 1.7. This means that this farming system require a minimum formulated feed of 1.7 times their harvest. Following the production calculations provided by Yi et al. (2009), 51 tonnes of formulated feed is necessary to produce 30 tonnes of shrimp through intensive farming. Consequently, there is a need for a consistent feed supply and the financial capability to secure the supply. These are considered critical factors in intensive shrimp farming (production costs are presented in Table 2.7 below).

2.3.6 Production cost and productivity

Various studies suggest that there is a linear relationship between the shrimp farming system, productivity and production costs. Semi-intensive and intensive shrimp farming systems require higher inputs. This creates higher production costs, but higher productivity rates to offset the costs (Astuti 2007; Suyanto & Mujiman 1995). Unsurprisingly, the extensive shrimp culture system has the lowest yield. Table 2.6 presents the productivity rates for each type of shrimp farming system. Although the figures vary between studies (Astuti 2007; Kungvankij 1985; Noryadi et al. 2006; Shang 1992; Suyanto & Mujiman1995; Tarunamulia 2014), all show that the productivity of extensive shrimp farming is lowest compared to other types of shrimp farming.

Table 2.6 presents the disparity in shrimp productivity rates between the types of shrimp farming systems. Again, this may be associated with the adoption of vannamei farming over tiger shrimp farming. For example, the study by Yi et al. (2009) referred to vannamei while Shang, Leung and Ling (1998) and MMAF (2006) did not provide any information about the species farmed. However, through considering the times in which the studies took place, it can be reasonably assumed that the data represents production rates for tiger shrimp. The study by Yi et al. (2009) is the most relevant for estimating the productivity of Indonesian shrimp farms following the adoption of vannamei by semi-intensive and intensive shrimp farmers.

Table 2.6 Annual productivity rates for each type of shrimp farming system in Indonesia

Extensive / traditional (kg/ha/year)		**Semi-intensive**		**Intensive (tonnes/ha/year)**
460 Astuti (2007)		1 tonne/ha/year (Astuti 2007)		2–3 (MMAF 2006)
100–300 for tiger shrimp (Kungvankij 1985 and Noryadi et al. 2006)		600 kg–1.2 tonnes/ha/year (MMAF 2006)		4.4 (Shang, Leung & Ling 1998)
Up to 500 (Tarunamulia (2014)		1.48 tonnes/ha/year (Shang, Leung & Ling 1998)		30 (Yi et al. 2009)
300–500 (Suyanto & Mujiman 1995)		4–8 tonnes/ha/year (Yi et al. 2009)		
162 for tiger shrimp (Shang, Leung & Ling 1998)				

Table 2.7 presents the production costs for extensive, semi-intensive and intensive shrimp farming systems extracted from studies by Astuti (2007) and Shang, Leung and Ling (1998). It is important to note that these studies only evaluated tiger shrimp farming. Astuti (2007) focused on extensive and semi-intensive tiger culture systems. The study by Shang, Leung and Ling (1998) was conducted before the introduction of vannamei in Indonesia. So, there may be a difference in current production cost for semi-intensive and intensive shrimp farming systems due to the adoption vannamei.

Furthuremore, the current comparison of the production costs between shrimp farming systems might be higher than what are presented in this review. It is assumed that there have been some inflationary effects on prices between the studies by Astuti (2007) and Shang, Leung and Ling (1998) conducted and at the time the production cost calculated in this study. Nevertheless, the data comparison from these studies still demonstrates the difference in production costs and productivity rates between extensive, semi-intensive and intensive shrimp farming systems, which is the main objective of this review.

Table 2.7 Production costs per cycle for extensive, semi-intensive and intensive shrimp farming systems

Cost[3]	Traditional (ha/production cycle)		Semi-intensive (ha/production cycle)		Intensive (ha/production cycle)
	Monoculture (Rp/US$)	Polyculture (Rp/US$)	Monoculture (Rp/US$)	Polyculture (Rp/US$)	Monoculture (Rp/US$)
Fixed cost	2,292,226.6[a] (199.88)	2,615,272.7[a] (228.05)	3,464,407[a] (302.09)	3,632,436[a] (316.75)	31,545,932.97 (2,750.78)[b]
Variable cost	450,522.2[a] (39.29)	692,882,8[a] (60.42)	1,225,632.4[a] (106.87)	1,348,283[a] (117.57)	90,131,237.05 (7,859.37)[b]
Total cost	2,741,638.8[a] (239.07)	3,308,155.5[a] (288.47)	4,690,039.7[a] (408.97)	4,980,720[a] (434.31)	121,677,170.02 (10,619.15)[b]
Production (kg/ha/cycle)	230[a]	710[a]	1,045[a]	2,314.7	2,311.58[b]
Revenue	12,920,000 (1,126.61)[a]	13,775,000 (1,201.17)[a]	62,600,000 (5,458.67)[a]	81,279,900 (7,087.54)[a]	171,779,534.15 (14,979.03)[b]

Source: (a): adopted from Astuti (2007); (b): recalculated from Shang et al. (1998) with 1.9 cycles per year. The study by Astuti (2007) presented the costs in Rupiah and Shan Shang, Leung and Ling (1998) presented costs in US$. The Rupiah and US$ values were based on the present currency exchange at the time of calculating the costs (US$ 1 = Rp. 11, 468). In Astuti (2007), production of polyculture included milkfish production with two cycles per year. The study did not differentiate production rates for tiger shrimp and milkfish.

2.4 Economic roles

Edwards (2000) found that there were direct and indirect economic benefits generated from shrimp farming. The direct benefits included employment and income to the farmers, while the indirect benefits related to the spillover effects on other businesses along the supply chain, such as inputs supply, marketing, manufacturing and processing. The review of this study focuses on revenue generated from export markets. However, this study could not disaggregate the export revenue from each group of shrimp producers (household-, industrial- and transnational-scale shrimp producers) due to limitations in data availability. Regarding employment, the the whole shrimp producing sector accommodates for both skilled and unskilled labour. Therefore, the sector provides employment for labourers with low levels of education (Kusumastanto, Jolly & Bailey 1998).

As explained above, Indonesian shrimp exports have greatly increased since the Indonesian government invested in the development of aquaculture. Thus, participation in export markets has

[3] Fixed costs cover physical assets, depreciation, maintenance and rent. For intensive shrimp farming, this includes insurance. Variable costs include feed, seed, power, probiotics, vitamins and labour.

provided economic benefits to Indonesians at the national level. Figure 2.5 and Figure 2.6 present the volume and value of Indonesian shrimp exports, which rose by 259 per cent from 1985 to 2009. The 2009 shrimp export value contributed 0.13 per cent of the total Indonesian GDP and 8.53 per cent of the total Indonesian revenue gained from non-oil and gas exports (FAO FISHSTAT 2014, Ministry of Trade 2014; World Bank 2014).[4] These figures confirm the significant contribution of the shrimp exports to the Indonesian economy.

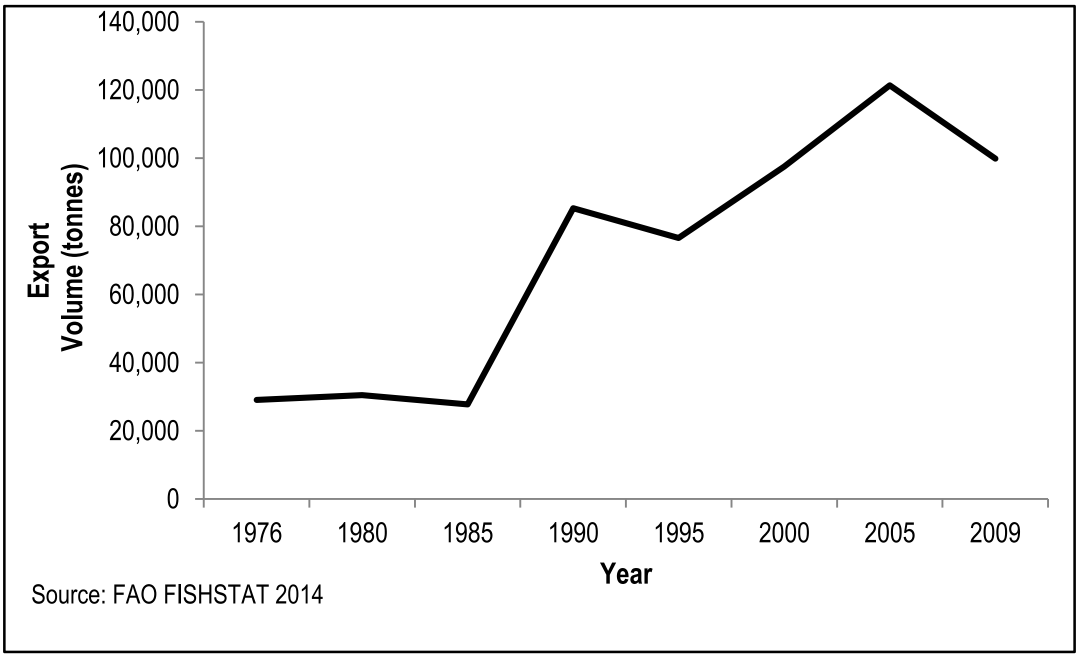


Figure 2.5 Indonesian shrimp export volume, 1976–2009

[4] The values are calculated based on FAO FISHSTAT data on Indonesian shrimp export value, World Bank data on Indonesian GDP in 2009 and Indonesian Ministry of Trade data.

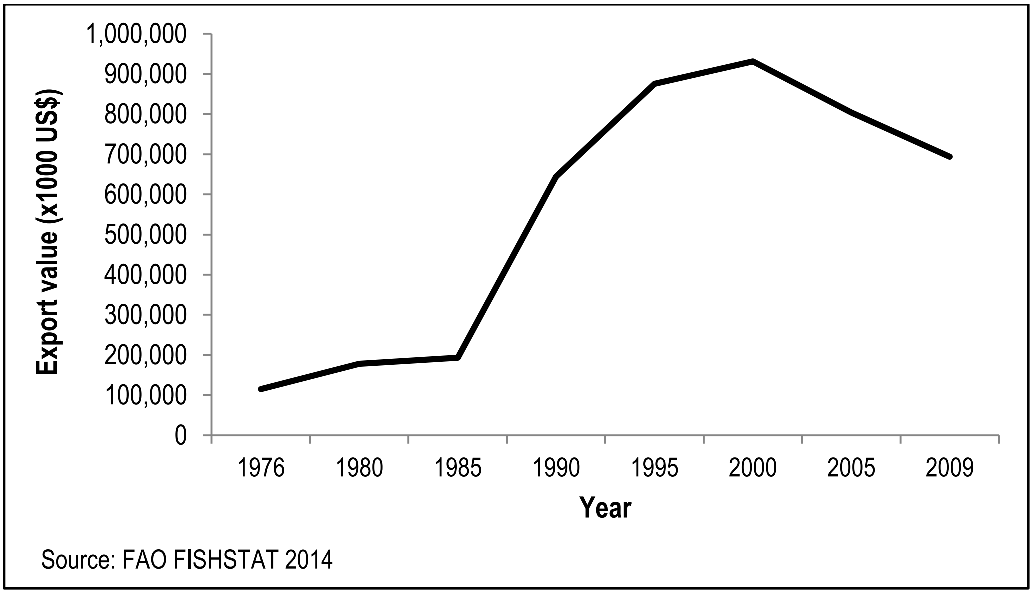


Figure 2.6 Indonesian shrimp export value 1976–2009

The export share of Indonesian shrimp to wealthy country markets have higher shares compared to the markets in developing countries. For example, the US, Japan and EU imported 44 per cent, 24 per cent and 10 per cent respectively of the total Indonesian shrimp exports. These lucrative markets in the wealthy countries contribute around 89.9 per cent of the total revenue from the Indonesian shrimp exports. In comparison, imports from other developing countries such as China, Singapore and Hong Kong comprised only 3.7 per cent, 1.2 and 1.8 per cent of the total shrimp exports from Indonesia respectively (MMAF 2013). This data strongly indicates that markets in developed countries are significant for Indonesian shrimp exports.

Brackishwater shrimp aquaculture generates employment for Indonesian families and individuals (see Table 2.8 and Table 2.9). The Indonesian 2010 statistical data showed that around 256,579 households were involved in brackish pond farming (MMAF 2011). The data is not disaggregated by the number of households related to the production of specific commodities. Thus, this figure includes households who farm shrimp and all other species produced in brackishwater aquaculture ponds. However, the data may still be relevant since the majority of brackishwater shrimp farmers practice polyculture (as described in Section 2.3). Based on the data, shrimp farming directly affects around 1,073,431.8 individuals in Indonesia. This figure is estimated based on calculations made by the Indonesian Statistics Department which found that the average family member per household is around 4.2 people (Statistics Indonesia 2010b).

The role of shrimp farming in developing employment in Indonesia has become more significant over time (Table 2.8). MMAF (2011) reported that the annual growth of household participation in brackishwater pond culture is around 4.22 per cent. This growth is greater than Indonesia's annual population growth, which is 1.49 per cent (Statistics Indonesia 2010b). Thus, if the growth of Indonesian households involved in shrimp farming is linear in the future, the role of shrimp farming as a source of Indonesian employment will continue to be significant to the future of Indonesian economic development.

Table 2.8 Number of households involved in Indonesian brackishwater culture

	2007	**2008**	**2009**	**2010**	**Average growth (%)**
Households	227,783	219,291	232,543	256,579	4,22

Source: MMAF 2011

In addition, the sector also creates spillover effects in generating employment and income to a number of intermediaries along the supply chain (Edwards 2000). For example, it generates employment in the processing and marketing sectors in Indonesia (Table 2.9). Thus, shrimp production's role as an employment creator is not only limited to those households directly working in shrimp farming. At the processing node, average employment rates grew by 4.75 per cent every year. Rising employment rates are revealed at the marketing node level too, which reported an average annual growth rate of 18.3 per cent. The MMAF (2011) data only states the number of labourers. If we assume that each labourer is responsible for a household and the number of household members published by Indonesian statistics stated above is considered (Statistics Indonesia 2010b), the processing node affects 5,362,576 individuals and marketing activities benefit around 19,496,332 individuals. It should be notes that these may be overestimations because the Indonesian statistics do not differentiate between shrimp products and other fishery products. However, the data demonstrates an increase in generating employment in Indonesia.

Table 2.9 Number of people working in fisheries processing and marketing 2007–2011

	2007	2008	2009	2010	2011	Average growth (%)
Processing	1,115,202	1,198,842	1,278,640	1,283,457	1,340,644	4,75
Marketing	2,676,480	2,997, 216	4,760,239	4,810,952	4,874,083	18,30

Source: MMAF 2011

In summary, referring to direct employment rates for famers and indirect employment rates within the related processing and marketing nodes discussed above, in total, the sector benefits 25,885,224 individuals. As there are also indirect activities related to the sector such as feed production, seed production and other service provision, the brackishwater aquaculture sector may benefit more than 25,885,224 individuals, or approximately 10 per cent of the Indonesian population.

2.5 Conclusion

This chapter has presented the history of the development of Indonesian shrimp aquaculture. It has provided an insight into the industrialisation of shrimp farming practices. Participation within the shrimp global markets was one of the key factors driving the industrialisation of Indonesian shrimp farming. This has resulted in the stratification of Indonesian shrimp producers into household-, industrial- and transnational-scale shrimp producers. It has also resulted in the adoption of different practices in Indonesian shrimp farming, which relate to the capabilities of shrimp producers. This chapter has also highlighted the economic roles of shrimp farming, which need to be sustained and enhanced to support continued Indonesian development. It also shows the necessity of capability upgrading to participate in export markets to ensure the sustainable development of Indonesian households.

Chapter 3: Methodology

3.1 Introduction

This chapter outlines and justifies the methodological approaches applied in this study. It covers study design, selection processes for study sites and for respondents, data analysis and ethical aspects of the study. These methods were developed through phases to ensure robustness of applied methods. The data analysis approach describes the analytical stages followed to reach the objective of the study.

3.2 Study design

This study adopted a mixed methods research design—a combination of qualitative and quantitative methods. However, the qualitative approach was predominantly applied because the study required a more explorative approach. For example, the complexities involved in the endowment of livelihood capitals were explored. The mixed method approach was suitable for this study because the data from the qualitative and quantitative approaches complemented each other. The quantitative research provides the possibility to generalise findings beyond the context of a study (Bergman 2008). For instance, the level of endowment of livelihood capitals by household-scale shrimp producers can be generalised. However, the quantitative approach does not enable a deeper understanding of social phenomena including the complexities involved in a social change. In contrast, the qualitative approach can explore how social and cultural phenomena are constructed and the complex factors affecting this process of construction (Creswell 2012; Silverman 2011).

The application of SLA and GVC approaches requires the combination of quantitative and qualitative methods. According to Ellis (2000), mixed methods research is the best approach for studies applying the SLA. Investigating livelihoods is not only limited to quantifying the level of individuals' or groups' access to livelihood capitals. It must also incorporate a description of process and consider the complex interrelationship between assets, access and activities affecting individuals' livelihoods (Ellis 2000). Previous SLA studies that have applied mixed methods include those by Ellis (1998, 2000a, 2000b), Allison and Ellis (2001), Allison and Horemans (2006), Hussein (2002), Divakarannair (2007), Ahmed, Allison and Muir (2008) and Ahmed et al. (2010). In this study, as mentioned previously, the quantitative approach allowed for the generalisation of endowment of livelihood capitals for household-scale shrimp producers, while the qualitative approach enabled a detailed exploration into how livelihood capitals are attained. For instance, the relationship between local culture, geographical position and other external factors with people's access to certain types of livelihood capitals, such as access to credit, and schooling were explored.

Mapping GVCs also requires qualitative approaches (Islam 2008; Kaplinsky & Morris 2001; Kelling 2012) to explore how actors function in supply and market chains function. This includes the complexities embedded within the relationships between nodes in a chain (Kaplinsky & Morris 2001).

Finally, there was limited access to respondents to represent industrial-scale shrimp producers and other actors engaged in ISGVCs. Respondents from these categories could not be contacted in a random approach. Thus, selecting respondents for this study did not meet the requirements of a statistical, quantitative analysis approach (Creswell, Plano Clark & Garrett 2008; Punch 2013; Rianse & Abdi 2008).

3.3 Approach to respondent selection

This study required various groups of respondents and a different approach for selecting each group. Respondents in this study included value chain actors and non-value chain actors. Value chain actors were input suppliers, shrimp farmers and marketers, while non-value chain actors were village authorities, shrimp farmer groups, government officials and experts. A total of 234 respondents were interviewed in this study. Respondents interviewed have been summarised in Table 3.1 and Table 3.2 and interview details are presented in Appendix 1.

Table 3.1 Number of respondents: value chain actors and actors at input node, including feed and seed suppliers

<table>
<tr><th colspan="7">Household-scale shrimp producer (total respondent = 138)</th></tr>
<tr><td>Tg. Ibus</td><td>Babah Krueng</td><td>Sangso</td><td>Manyampa</td><td>Mattiro Tasi</td><td>Madello</td><td>Pajukukang</td></tr>
<tr><td>18</td><td>24</td><td>17</td><td>23</td><td>23</td><td>18</td><td>15</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Input node</td><td>Industrial-scale shrimp producer</td><td>Transnational-scale shrimp producer</td><td>Small wholesalers</td><td>Big wholesalers</td><td>Coordinator of processing companies</td><td>Exporters</td></tr>
<tr><td>16</td><td>13</td><td>1</td><td>5</td><td>8</td><td>4</td><td>2</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td colspan="3">Importers</td><td colspan="4">Domestic retailers</td></tr>
<tr><td colspan="3">1</td><td colspan="4">6</td></tr>
</table>

Table 3.2 Number of respondents: stakeholders (non-value chain actors)

Village authorities	**Government officials (fishery department)**	**Shrimp groups**	**Village facilitators**	**Experts and NGOs**
8	12	10	4	9

Respondents were selected using the random and snowball sampling methods. Random sampling (probability sampling) is a sampling method that provides equal probability for each individual in a population to be a respondent. This sampling method is free of bias, which provides a representation and generalisation of a group's characteristics (Dattallo 2010).

The snowball method is also known as the chain-referral method, in which respondents were selected from friendship networks and through respondents who were already engaged in a study (Salganik & Heckathorn 2004). This method was utilised because some respondents were only contactable through recommendations from initial contact persons. Although there is bias associated with the respondent selection and the data is unrepresentative of a general population (Atkinson & Flint 2001, Illenberger & Flötteröd 2012; Salganik & Heckathorn 2004), the snowball sampling method provides a means to access 'impenetrable social groups' (Atkinson & Flint 2001). Previous GVC studies have also applied snowball sampling methods (Dolan & Humphrey 2000; Kaplinsky & Morris 2001; Rieple & Singh 2010).

3.3.1 Shrimp producers and selection approach

Respondents from shrimp producers in this study were household-, industrial- and transnational-scale shrimp producers. Representatives of shrimp farmer groups were also interviewed. These included the heads of groups of household-scale shrimp producers at the village level and heads of Indonesian Shrimp Club (SCI), which is a club of the industrial-scale shrimp producers distributed across Indonesia. As stated in Chapter 1, industrial- and transnational-scale shrimp producers were included to understand how the capabilities of household-scale shrimp producers compared to the larger-scale shrimp producers.

This study applied a random sampling method to select respondents from household-scale shrimp producers to meet the requirements of a quantitative approach (Bergman 2008; Dattallo 2010). This part of the research was focused on evaluating the attainment of livelihood capitals for this group (Ellis 2000a). The random sampling method for household-scale shrimp producers was also subject to the selection of respondents from the total population of household-scale shrimp producers in the studied villages. First, a list of household shrimp producers was obtained for each selected village through the village authorities. Second, each household was numbered. The numbers were placed into a container and were drawn randomly until 30 per cent of the total household-scale shrimp producers who lived in the studied villages had been drawn (Idrus 2009). The number of respondents in the studied villages is presented in Table 3.1. Gender was not considered in the respondent selection as the unit of analysis was household, thus the data covered household information including wife, husband and children.

Industrial-scale shrimp producers were also subject to the analysis of livelihood capitals, but the respondents for this group were selected via the snowball method. As stated above, selection was limited due to the difficulty of accessing representatives of this group; industrial-scale shrimp producers are geographically scattered across Indonesia and are not concentrated at a village level, which is the case for household-scale shrimp producers. The respondents were selected based on recommendation from my contacts such as from government officers. The industrial-scale shrimp producer respondents were selected among the members of Indonesian shrimp club (SCI). A similar approach was also applied to transnational-scale producers. CP Prima is the only transnational-scale shrimp producer in Indonesia. Thus, this study selected only CP Prima as the case for the transnational-scale shrimp category.

3.3.2 Respondents from inputs and marketing nodes, government and non-government actors

The respondents from the inputs and marketing nodes and government and NGOs were chosen based on their roles in the shrimp aquaculture sector. Therefore, the selection of respondents from these groups were highly purposive using the snowball sampling method.

Respondents at the inputs node included broodstock and post-larvae producers (hatcheries), suppliers and feed producers. The marketing actors were wholesalers, coordinators, processing companies; importers and retailers. Hatchery producers included sub-classes of respondents from backyard and indoor hatcheries. Wholesalers were classified into small and big wholesalers.

The classification enabled this study to capture a wide range of capabilities and business behaviours for these actors within the Indonesian shrimp value chain. A detailed description of each type of GVC actor is presented in Chapter 6. The respondents were codified based on group of respondent, their administrative locations and year of interview conducted. For example, an industrial-scale shrimp producer listed as the first respondent from South Sulawesi and was interviewed in 2013 was codified as ISSP_SS1 2013. Details about respondents, category, number of for each group, geographical areas and codes are presented in Appendix 1.

Respondents from the government were targeted based on the area of their responsibilities and their roles in shrimp aquaculture. Government officials from the national level of the Ministry of Marine Affairs and Fisheries (MMAF) were interviewed, as well as officials from the provincial level of the fishery department. These officials were from Marine Affais and Fishery Office (DKP) of North Sumatra*,* Aceh Province and South Sulawesi Province. District level government officials from DKP and the extension service were interviewed. This included the DKP in the East Aceh, Bireuen, Langkat, Bullukumba, Pinrang, Barru and Marros Districts. Village authorities from the seven villages selected for the study were also interviewed.

Respondents from the NGOs represented the Indonesia World Wide Fund for Nature (WWF), WorldFish Center (WFC), Oxfam Novib in the Netherlands and International Union for the Conservation of Nature (IUCN) National Committee of the Netherlands organisations. Respondents from WWF, WFC, Oxfam Novib and IUCN were selected due to their role in shrimp farming development and trade. WFC conducts development projects for household-scale shrimp producers in Aceh Province. WWF, Oxfam Novib and IUCN are involved in the development of eco-label certification. Freelance experts in shrimp aquaculture and the seafood trade were also interviewed.

3.4 Study location

This study was conducted predominantly in Indonesia and a short period was spent doing fieldwork in the Netherlands. Indonesia represented the beginning of the value chain and the Netherlands was where the value chain ended and the product was eventually sold to consumers. Fieldwork in Indonesia covered both the analysis of livelihood capitals of Indonesian shrimp producers and of GVCs. The fieldwork conducted in the Netherlands focused only on importing actors and retailers within the ISGVC.

Fieldwork in Indonesia was conducted across several provinces, with a focus on Aceh and South Sulawesi Provinces because household-scale farmers make up the largest group of shrimp producers in these provinces. Around 45,000 households in Aceh and 64,000 households in South Sulawesi are employed directly in brackishwater aquaculture production, covering a production area of 34,000 ha and 10,000 ha respectively (MMAF 2013). Tanjung Ibus village, located in North Sumatra Province, was also included because farmers in this village have demonstrated a greater access to formal credit compared to farmers from the villages in Aceh and South Sulawesi Provinces. This was discovered during the reconnaissance stage of the study (detailed descriptions of villages and the selection criteria are presented below in Section 3.5.2).

This study also interviewed government stakeholders, experts and value chain actors from other provinces such as East Java, Bali and Lampung Provinces. This was carried out because, as mentioned above, the industrial-scale shrimp producers are geographically scattered across Indonesia and the number of potential respondents from this category in Aceh, North Sumatra and South Sulawesi Provinces was small. Thus, respondents from other provinces including from Bali and Lampung Province were included to capture a wider range of data for this category of shrimp producers.

In addition, some value chain actors do not exist in Aceh, North Sumatra and South Sulawesi Provinces. For instance, this study did not find an employee from a feed company or an

Indonesian expert in shrimp exports from Aceh, South Sulawesi or North Sumatra Provinces. Only two actors from East Java could be accessed through a contact person. A list of respondents and geographical information for these respondents is presented in Appendix 1.

3.5 Fieldwork implementation and data gathering approaches in Indonesia

3.5.1 Phases

Fieldwork in Indonesia was conducted in two phases. This allowed for time to review and revise methods and approaches between the first and the second visits. The first phase was conducted from November 2011 to March 2012. This phase focused on study sites in Aceh and North Sumatra Provinces and on interviewing experts and value chain actors from Lampung Province. The second phase of fieldwork was conducted from February 2013 to May 2013, focusing on sites in South Sulawesi Province and GVC actors from East Java Province.

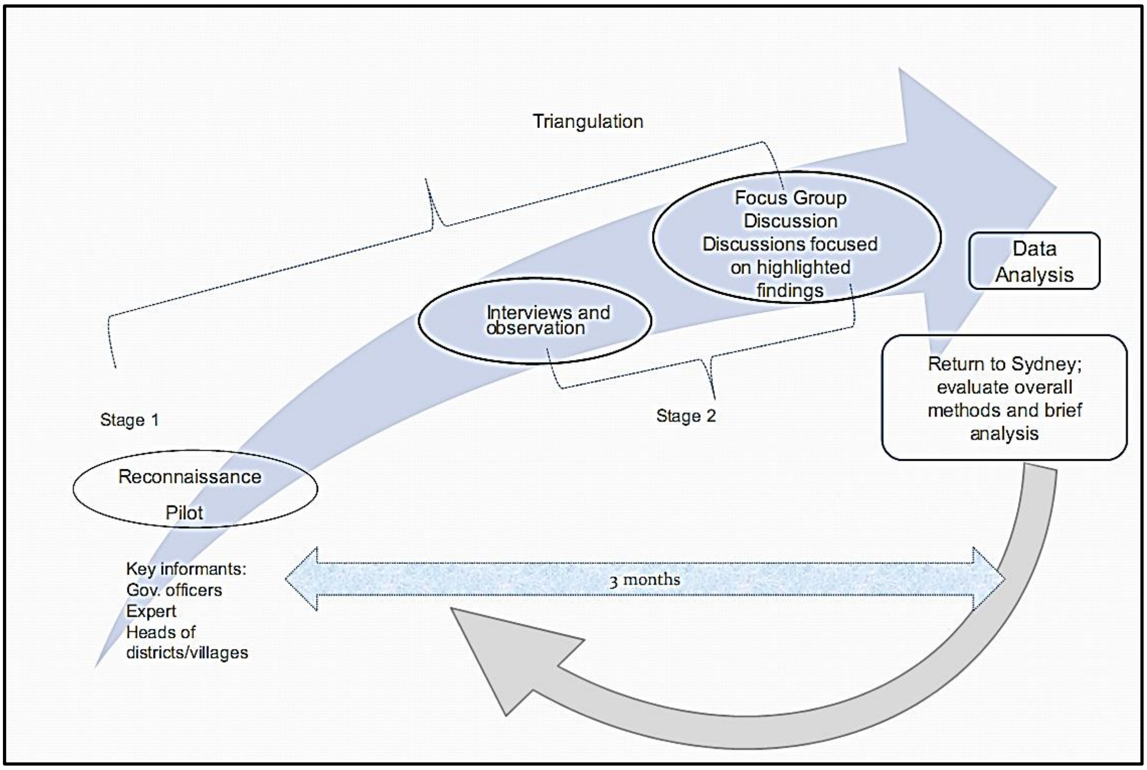


Figure 3.1 Phases of fieldwork in Indonesia

Each phase of fieldwork in Indonesia was conducted through the stages depicted in Figure 3.1. To begin, reconnaissance and pilot interviews with household-scale shrimp producers were conducted prior to the primary data collection. The aim of this stage was to ensure that the set of proposed questions provided the required information and captured unique local characteristics.

The reconnaissance involved interviews with key informants involved in the brackish aquaculture of shrimp, such as fisheries department officers, extension services, fisheries experts and heads of communities. There were several objectives of the reconnaissance. First, it was for socialisation of the research objectives.[5] Socialisation was very critical to the process of conducting research in Indonesia because it related to issuing permits to conduct a socio-economic research and gaining official and unofficial support to access the community. The Indonesian government requires researchers to obtain research permits from related Indonesian government agencies prior implementing socio-economic researches. For this study, the permit was obtained from the Directorate General of Aquaculture (DGA), MMAF. No adjustments were needed to the research plans in order to comply with permit conditions. It was also critical to ensuring that the objectives and the approach of the research were in line with social and cultural values pertaining to the studied areas. The second objective was to construct a general overview of the Indonesian shrimp aquaculture industry involving actors from the sector as well representations of its stratification, particularly in Aceh, North Sumatra and South Sulawesi Provinces. This enabled the identification of respondents from the Indonesian shrimp value chains and the classification of actors based on their business scale. The third objective of the reconnaissance was to consult officials from the Marine Affairs and Fishery Office (DKP) about the potential villages to study. Although this study had developed a criteria for selecting villages (explained in the Section 3.3.2), it also took into consideration the recommendations made by the local DKP to accommodate for local issues related to the government programs. The fourth objective was to obtain access and contacts for targeted villages to conduct interviews for household-scale shrimp producers and value chain actors at the village/sub-district level. The final objective was to conduct a pilot survey for household-scale shrimp producers. This was used to test the questionnaire for clarity of understanding because ambiguous questions can lead to biased answers from respondents. It was also necessary to ensure that the questions elicited the required information for gathering (Newman & McNeil 1998). Therefore, the pilot resulted in a revised and improved questionnaire.

[5] Research socialisation is an introduction process to the research for related stakeholders, informing them of the objectives and also about the research institution and researchers.

3.5.2 Selection of study villages

Household-scale shrimp farming villages were intentionally selected to capture a wide range of diversity in the endowment of livelihood capitals. The selected villages were Babah Krueng and Sangso villages in Aceh Province, Tanjung Ibus village in North Sumatra Province and Madello, Manyampa, Matiro Tasi and Pajukukang village in South Sulawesi Province. The geographical location of these villages is presented in Figure 3.2.

Tanjung Ibus village in Langkat District, North Sumatra Province was selected because the reconnaissance visit of this study found that villagers in Tanjung Ibus have better access to formal credit. Tanjung Ibus village is also geographically near to one of Indonesia's metropolitan cities (Medan),[6] which affects villagers' access to livelihood capitals (see Table 3.3).

Babah Krueng village in East Aceh District, Aceh Province was selected because it was heavily influenced by political conflict and was defined by local Acehnese as a base area for separatist groups during the region's conflict period. This village is also geographically isolated—391 kilometres away from the provincial capital city, Banda Aceh (Table 3.3). Thus, this study was interested in evaluating the impact of the political context and the geographical position upon the endowment of livelihood capitals for household-scale shrimp producers. Due to the political climate of the Babah Krueng village, it was excluded from external intervention and support, from government or international NGOs, during the post-tsunami and earthquake rehabilitation program. External intervention did not occur in the case of this village because of the high security risk to outsiders (VH_BK 2012). During the fieldwork, there was still a moderate sense of suspicion and caution exercised by the villagers. To avoid possible suspicions around the research team, the leaders of the village were consulted, who were also the leaders of the separatist group. The research team stayed in the house of one of the leaders during the fieldwork. This enabled trust to be built and clarification to be reached about the purpose of the research without any coercion to participate.

[6] Indonesia has three metropolitan cities namely Jakarta, Surabaya and Medan. Medan is the third biggest city in Indonesia

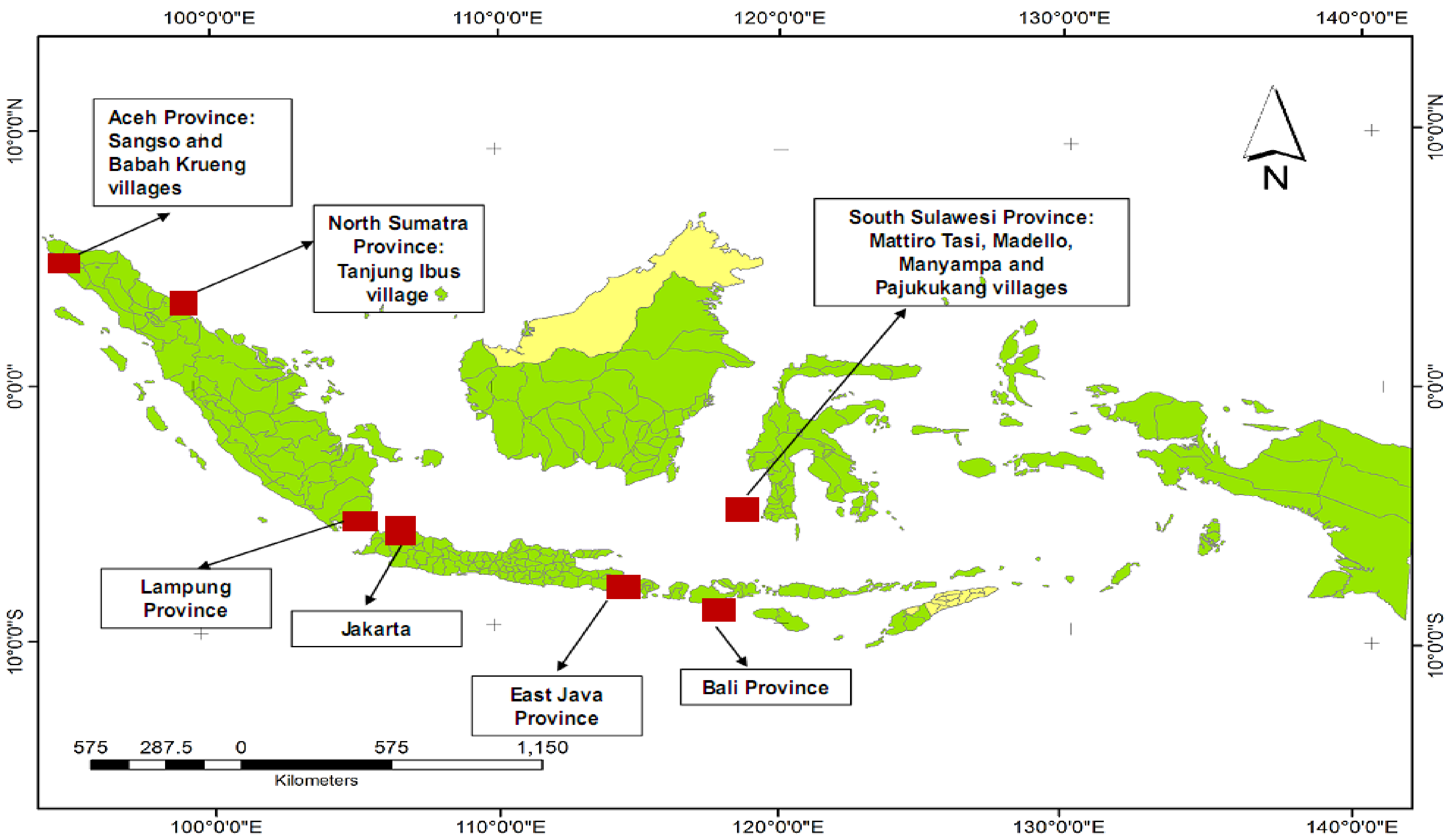


Figure 3.2 Map of Indonesia and areas involved in this study

Sangso village in Bireuen District, Aceh Province was selected because shrimp farmers there had been recipients of development interventions since 2005 from international organisations such as FAO, WWF and World FishCenter (World Fish) for tsunami rehabilitation (VF_Sg 2012; VH_Sg 2012). One of the projects was a trial to connect shrimp farmers with a buyer in the United Kingdom (UK). Thus, this village provided an opportunity to explore the effect of external intervention on shrimp farmers' capabilities (detailed demographic data is presented in Table 3.3).

Mattiro Tasi village in Pinrang District, South Sulawesi was selected because it is classified as a highly suitable shrimp farming area according to a mapping project on shrimp aquaculture funded by Australian Centre for International Agricultural Research (ACIAR 2011). During the reconnaissance visit and initial consultation with the village heads and South Sulawesi DKP officials, the area of shrimp ponds was found to be significantly larger than areas of the other studied villages in South Sulawesi (Table 3.3). This village is also somewhat geographically isolated compared to others studied in South Sulawesi Province. In addition, it is surrounded by other villages also producing shrimp. Therefore, the characteristics of Mattiro Tasi village enabled an evaluation of the complex interactions between these factors and household-scale shrimp producers' capabilities.

Manyampa village in Bullukumba District, South Sulawesi Province was chosen because its demographic characteristics contrast with Mattiro Tasi village. It is in a geographically disadvantaged location. According ACIAR mapping, coastal villages in Bulukumba District are not suitable for shrimp farming because the sandy soil is unsuitable for pond engineering. The soil also makes the maintenance of water flow through canals difficult (ACIAR 2011). The reconnaissance visit to Manyampa village found that shrimp farmers were relatively isolated compared to farmers in other villages, such as the Madello and Pajukukang villages in South Sulawesi Province. The area of shrimp farming was also smaller compared to other selected villages in South Sulawesi Province (Table 3.3). The reconnaissance visit found that surrounding villages also do not have a significant area for shrimp farming. Thus, Manyampa village was chosen to uncover the relationship between location disadvantage and the agglomeration of shrimp farmers and their capabilities.

Madello village in Barru District, South Sulawesi was chosen because this village is located along a national road. Thus, it has good transport access and is also close to hatcheries. There are also industrial-scale shrimp farms around to this village in Barru Distrct. Based on information gathered during the reconnaissance visit, there was a possibility that technology diffusion from the industrial-scale shrimp producers to household-scale shrimp producers was taking place. For example, it was noted that the majority of household-scale shrimp producers in this village had adopted vannamei cultivation. This contrasted with the sole cultivation of tiger shrimp by other villagers in the other villages studied. Therefore, vannamei cultivation by household-scale producers may have been connected to the existing shrimp hatcheries in Barru District, where there are several industrial-scale shrimp producers and nearby access to a paved road.

Pajukukang village in Maros District, South Sulawesi was selected because it is close to a provincial city (Makassar) and also to an industrial area where shrimp processors are located. The reconnaissance found that the villagers had better access to production inputs and markets. Thus, Pajukukang village was selected to draw comparisons with other villages possessing similar characteristics.

Table 3.3 Demographic information for studied villages in NAD and North Sumatra Provinces

	Tanjung Ibus (Tanjung Ibus 2011)	Babah Krueng (Kecamatan Peurlak Timur 2010)	Sangso (Sangso 2009)	Mattiro Tasi (Mattiro Tasi 2013)	Manyampa (Mayampa 2013)	Madello (Madello 2011)	Pajukukang (Hasbi 2005)
Province	North Sumatra	Aceh	Aceh	South Sulawesi	South Sulawesi	South Sulawesi	South Sulawesi
District	Langkat	East Aceh	Bireuen	Pinrang	Bullukumba	Barru	Maros
Total area of the village (ha)	2,554	1,332	195	1,351	202,480	721	183.3
Distance to provincial capital city (km)	20	391	128	210	172	110	42
Land use							
For housing (ha)	NA	204	40	28.85	2,621	66.4	11.7
Rice field (ha)	363	88	NA	50	2,131	298	25.1
Horticulture (ha)	117	52	5	430.5	17,443 (aggregated data)	3.5	NA
Plantation (ha)	462	693	NA	212.7		NA	NA
Ponds (ha)	500	62	40	628.7	40	145	127.3
Other (ha)	NA	233	25	NA	NA	NA	NA
Population							
Total population	4,433	508	1,133	2,690	4,599	4,524	3,655
Number of households	1,376	737	310	608	1,147	1,234	1,663
Female	2,162	263	591	1,421	2,360	2,316	2,110
Male	2,171	245	542	1,269	2,239	2,208	1,845

Type of houses[7]							
Number of permanent houses	450	4	309	NA	NA	99 (aggregated data)	NA
Number of semi-permanent houses	292	26	NA	NA	NA		NA
Number of wooden houses	450	95	1	NA	NA	953	NA
Water supply system							
PAM		0	NA	NA	NA	NA	NA
Well using pump		1	NA	NA	NA	115	NA
Traditional well	1,052	2	NA	NA	NA	531	NA

Notes: (1) The demographic data for the villages are taken from different years, following the latest demographic data published by village authorities. (2) Area of shrimp pond area for Manyampa Village was based on verbal information given by the Head of Manyampa Village. PAM is water supply given by the government.

[7] A permanent house has the main structure and walls built using concrete or cement and brick; a semi-permanent house has walls using a combination of concrete and wood.

3.5.3 Data collection

Data were collected for this study in tandem with a research project for ACIAR on domestic value chains for tilapia, milkfish and rabbitfish. The author undertook these projects simultaneously with the doctoral research. However, since the scope of the two studies was different, there was no overlapping of data. The data collection was scheduled separately across the two studies during the fieldwork period in Indonesia.

This study applied different data collection methods for the different types of respondents mentioned previously. Data collection involved semi-structured interviews, observation and focus group discussion (FGD). Semi-structured interviews are a method of data gathering which uses a set of questions, but allows for flexibility in the interview responses. This method has been used widely in social research and has been useful for studies that require exploration, discovery, interpretation and the understanding of complex processes and social phenomena (Blee & Tylor 2002). Semi-structured interviews allowed the interviewer to capture rich information, to digress and to probe for more information. This allowed for greater clarification during the interview and a honing in on the 'why' and 'how' questions. Thus, this method can address a wide range of identified variables (Babbie 1990) and enable the study to capture or identify issues that might be overlooked in a conventional structured survey. Semi-structured interviews capture not only information, but also themes and categories of analysis may be generated from responses. The open-ended interview makes it possible for respondents to generate, challenge, clarify and elaborate their own understanding (Blee & Tylor 2002).

Observation and FGD were used to enrich the information gathered through the mixed methods approach (Bryman 2006). Observation is a form of qualitative inquiry where the researcher observes the social interactions of participants or observes social phenomena more generally. To some degree, researchers may also participate in the interaction (Lichterman 2002). However, for this thesis, the researcher was positioned as outsider and minimised intervention in participants' actions.

FGD is defined as a method of collecting qualitative data through the discussion of a specific issue of set of topics between a number of people (group) (Wilkinson 2004). FGD was conducted at a village level in the areas studied (more details presented in Section 5.3.1).

3.5.3.1 Data collection for household-scale shrimp producers

The research team lived with the communities of each village for 1–2 weeks. This was in addition to the reconnaissance visits during the fieldwork periods in Indonesia. Living with the communities helped to foster good relationships and trust between the researchers and the communities. It also allowed the research to reflect the daily complexities facing the community, which might not be covered through the interviews alone.

The research team consisted of the researcher and three enumerators who assisted the survey of the household-scale shrimp producers. Different enumerators were hired for the Aceh, North Sumatra and South Sulawesi fieldwork periods. The enumerators were selected from among the local people from Aceh, North Sumatra and South Sulawesi Provinces. They spoke the local Aceh and Bugis languages. This facilitated the building of trust with communities and allowed the researcher to be introduced to the community. One enumerator was Acehnese from the Aceh Province, and he assisted field work in Babah Krueng, and Sangso villages. One from North Sumatra who helped the field work in Tanjung Ibus village. One Buginese from South Sulawesi helped to conduct the survesy for Mattiro Tasi, Manyampa, and Pajukukang villages. Enumerators with an aquaculture background who were familiar conducting surveys in social studies were chosen. The roles of the enumerators were to assist the researcher to conduct semi-structured interviews and to tabulate the gathered data into a data base system using Microsoft Excel.

Semi-structured interviews, observation and FGD were applied to gather information from respondents of household-scale shrimp producers. A paper-based questionnaire was used in the interviews to capture data about livelihood capitals and GVCs. The questionnaire included closed-questions with defined answer options as well as open-ended questions following the livelihood capital variables (presented in Table 3.4) and value chain analysis variables including access to inputs, production systems and access to buyers (Porter 1985).

Table 3.4 Variables of livelihood capitals

Human capital	**Financial capital**	**Social capital**	**Physical capital**	**Natural capital**
Farm owners' formal education level	Access to formal financial institution	Groups of shrimp farmers	Production of physical capital (Paddlewheel, water pump, harvesting facilities; water canal and water treatment facilities)	Size of shrimp farm area
Employees' education	Access to alternative financial capital	Shrimp farmers' networks with input suppliers	Non-production of physical capital (vehicle, type of house, sanitation facilities, mobile phone and computer)	Access to suitable location
Education of farm owners' children		Shrimp farmers' networks with buyers		
Workforce structure				

The open-ended questions enabled the further probing of information. This helped to fully investigate the complex relationships between livelihood capitals and to uncover respondents' logic as to why particular decisions were made. For example, detailed information was uncovered on how bank correspondents or officials affect household-scale shrimp producers' access to formal credit and why they chose to borrow money from a shrimp buyer rather than a bank.

The interviews were conducted at the houses of the respondents or other places convenient for them such as at their ponds. Prior to the interview, the research team made an appointment to schedule interview times with the respondents so that their availability could be accommodated for.

Prior to conducting interviews, enumerators were trained by the researcher, including class-based training. Each interview question and its objective were explained. According to Angen (2000), the credibility of research resides partly in the skill and competence of the researcher, which in this study included the work of the enumerators. Therefore, training helps to ensure the trustworthiness of the data (Tuckett 2005). Practical training was also given through interview observation. Enumerators were asked to attend and observe the interviews conducted by the lead researcher. The lead researcher also attended and observed initial interviews by the enumerators prior to allowing them to conduct interviews independently. Finally, interviews conducted by the enumerators were recorded and evaluated by the lead researcher to ensure accuracy in method and content.

Observation was also used to gain insight into household-scale shrimp producers' communities and into interactions with input and market suppliers. Observation developed an understanding of the complexities involved in the process of attaining livelihood capitals and access to the shrimp value chain. Observation was carried out during the stay in the villages and during the interviews. Observation data were only collected by the lead researcher. However, enumerators provided suggestions about particular issues for the main researcher to observe based on the insight they had gained during their interviews. For example, one enumerator highlighted that the villagers' behaviour regarding hygienic practices in Pajukukang village seemed to relate to culture and human capital. The researcher then explored this social phenomenon further.

At the end of the fieldwork for each village, FGDs were conducted in public spaces such as the village office and mosque. These meetings were organised by village authorities. The meetings were attended by household shrimp producers including non-selected respondents, village-level value chain actors (seed suppliers and buyers) and the heads of the villages. Meetings were facilitated and moderated by the researcher. The meeting discussed the findings reached at the village level, such as information about the supply chains of shrimp farming inputs and marketing, levels of education of household-scale shrimp producers and access to formal credit. The aims of the meetings were: (1) to gain understanding about and generate discussion on the findings captured in the semi-structured interviews and observations; (2) to validate the data through eliminating biases in the findings and ensuring rigorousness (Tuckett 2005); and (3) to facilitate the participation of the community and stakeholders in defining the research findings. The focus group meetings enabled the research team to also thank the communities for their participation and for their assistance during the research teams' stay in their village.

3.5.3.2 Data collection for other actors

Semi-structured interviews were also used to obtain information from industrial-scale shrimp producers, the transnational-scale shrimp producer and other actors in the ISGVCs, such as hatchery owners, seed nursery operators, agricultural store employees, feed distributors, shrimp wholesalers, coordinators and exporters. Interviews with these respondents were carried out by the researcher because the enumerators did not have capability to conduct the interviews. This is because the in-depth interviews required a deep knowledge and understanding of the context of the research. In addition, observation also needed to be conducted during the interview. For example, observation was carried out in parallel with the interviews with some industrial-scale shrimp producers who were approached during the Indonesian Aquaculture Symposium in Lampung (18–21 February 2013), of which the author was invited to attend. All interviews were recorded and notes were taken from the observation. All data were then transcribed.

It should be noted that an interview conducted with one of the CP Prima directors did not provide great insights into transnational-scale shrimp producers. Thus, this study primarily used the annual reports of CP Prima Indonesia to evaluate the capability of this company.

Guideline questions were used and were classified based on the types of respondents. For example, one of the main interview objectives for hatcheries was to investigate seed production and marketing systems, while the primary interview objective for exporters was to understand shrimp product requirements for the export markets. The interviews were conducted at various sites based on the respondents' location (location of the respondents is presented in Appendix 1).

Secondary data were used to fill any data gaps. This data included reports from various agencies, databases such as Euro Stat, Indonesian Stat, FAO FISHSTAT, data from company websites, as well as references from previous studies. For example, this study used Indonesian statistics data to supplement information about the human capital endowment for industrial-scale shrimp producers.

3.6 Fieldwork in the Netherlands

To extend the Indonesian shrimp supply chain beyond Indonesia, fieldwork was conducted in the Netherlands in September 2012. The fieldwork in the Netherlands was possible due to the ease of access to respondents. A contact person from this study recommended an importer from the Netherlands and key informants from NGOs involved in eco-label certifications (see Appendix 1). This fieldwork provided insight into the supply chain structures of importing actors and their functions. In addition, observation was also used to gather primary data on the supply chain, on retail prices for supermarkets and on traditional seafood retailers in Amsterdam.

3.7 Data analysis approach

This study applied a comparative approach as the framework for data analysis. As discussed in Chapter 1, comparing data across different types of shrimp producers provided insight into how household-scale shrimp producers' capabilities compared to the other groups of shrimp producers. The analysis applied mixed methods involving statistical frequency analysis (quantitative method) and thematic analysis (qualitative method). Thematic analysis involved encoding the qualitative information. The research develops codes, words or phrases that label sections of the data. The generated set of codes can reflect a complex model of social phenomena and can explain causal relationships between codes. Codes can be derived from the researcher's theory or previous studies (Boyatzis 1998). In this study, the codes were generated from the conceptual framework of capability to participate in lucrative export markets. The codes included variables related to livelihood capitals and GVCs, as well as the relations between variables and external factors such as geographical isolation (details are presented in Sections 3.7.1 and 3.7.2).

Figure 3.3 illustrates the steps taken in the analysis, beginning with the initial primary data set through to the interpretation of causal relationships between the identified variables and with capability to comply with export market requirements. The first step involved transcribing the interviews and tabulating data from the household-scale shrimp producer interviews. Transcriptions were written in Bahasa Indonesia (the researcher's national language) in Microsoft Word. Microsoft Excel was used to organise tabulated data following the questions and variables derived from the questionnaire and the villages studied. Subsequent analyses of the livelihood capitals and GVCs were based on this initial stage.

3.7.1 Measuring the endowment of livelihood capitals

3.7.1.1 Unit of analysis

This research used the business unit as the unit of analysis. This means that the household unit was used to analyse the livelihood capitals for household-scale shrimp producers. Although Scoones (1998) stated that the unit of analysis of livelihood capital can apply to a wide range of scales—individual, household, household cluster, group, village or even nation—this study followed the recommendation of Ellis (2000a, 2000b) that the household unit is the most appropriate unit for the investigation of livelihoods. Ellis (2000a) stated that insight into households and their varied livelihood capitals is necessary for advancing understanding of policy implications at the household level. The household unit was also suitable for this study because typical Indonesian small-scale shrimp farms are managed at the household level. Thus, this research used the household as the unit of analysis for the study of household-scale shrimp farms. It represents the business unit of the shrimp farm and or company

This analogical definition of the unit of analysis was used because it facilitated comparative analysis of the capabilities of household-, industrial- and transnational-scale shrimp producers. According to Falleti and Lynch (2009), unit homogeneity creates an analytical equivalent and is necessary for conducting comparative analysis.

Industrial- and transnational-scale shrimp producers were analysed at the company level. The household data was also applied for the industrial-scale shrimp producers. This was when household-level data captured in the interviews were available, such as the education levels of the children of industrial-scale shrimp producers.

3.7.1.2 Endowment of livelihood capitals

Frequency and thematic analyses were used to investigate the endowment of livelihood capitals for household-scale shrimp producers. Frequency analysis was used to measure the percentage of attainment of human, financial, social, physical and natural capital variables for household-scale shrimp producers in each of the villages (see Table 3.4 and Chapters 5 and 6 for more details). Statistical analysis was applied to capture a representation for the endowment of livelihood capitals for household-scale shrimp producers. Data were disaggregated at the village level (Chapter 5) and aggregated for all household-scale respondents (Chapter 6). The outcome of the statistical analysis was endowment level as a percentage to depict the degree of livelihood capital endowment for household-scale shrimp producers.

This study applied thematic analysis to explore the factors affecting the endowment of livelihood capitals for household-scale shrimp producers. For example, data related to level of education and numbers employed within the workforce were classified under the theme of human capital. Under this theme, sub-themes were created for those factors affecting the endowment of human capital such as geographic-human capital. Transcribed data including answers of questions and narratives representing relationships between variables were classified under this sub-theme.

While a mixed method approach was used for the data analysis of livelihood capitals endowment for household-scale shrimp producers, only the thematic analysis was applied for the study of industrial- and transnational-scale shrimp producers that reflected the qualitative approach. However, secondary data on the general characteristics of the Indonesian industrial-scale shrimp producers were used and quantified. This was an attempt to respond to the inability of the primary data on the livelihood capitals for industrial-scale shrimp producers to be generalised. Secondary data were sought regarding levels of education and percentage of skilled workers (Statistics Indonesia 2011). This supplemented the information gap for the respondents of this category of producers, which arose due to their unwillingness to provide detailed information and to due to the unrepresentative respondents.

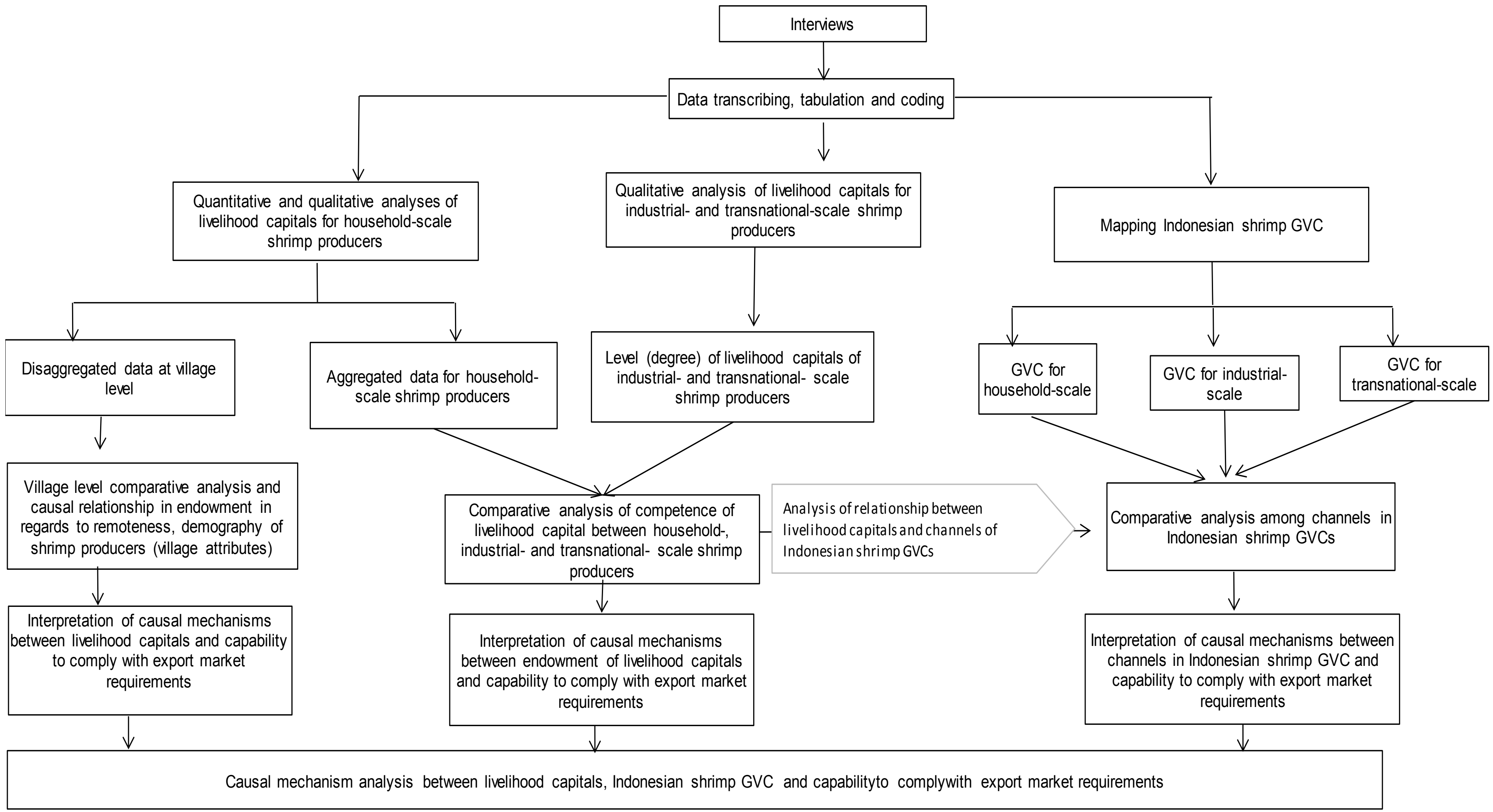


Figure 3.3 Approach for data analysis

3.7.2 Global value chain analysis

A thematic method was applied to map the Indonesian brackishwater shrimp aquaculture value chain. The thematic method reflects the approaches developed in previous studies (Gereffi, Korzeniewicz & Korzeniewicz 1994; Gibbon, Bair & Ponte 2008; Kaplinsky & Morris 2001). The themes were established through the questionnaire and product flows, such as access to shrimp seed and shrimp feed, and access to buyers, were mapped.

Commodity flows from inputs to export markets were mapped qualitatively, following the nodes of the ISGVC. The entry point for the analysis of the ISGVC was the production node (shrimp producers), as suggested by Kaplinsky and Morris (2001). The study then study mapped upstream from the production node to identify supply chains for inputs production and distribution, and moved downstream to through the marketing chain. Analysis of the business behaviours of value chain actors and the relationships between actors was also included. The outcome of this analysis was that various channels of the ISGVC were identified. They are presented in Chapter 7.

3.7.3 Causal relationship analysis

Within the thematic analysis, this study also applied the causal relationship (mechanism) analysis (Boyatzis 1998) to analyse the relationships between shrimp producers' livelihood capitals and their ability to comply with export market requirements. Causal mechanism analysis is 'a concept that explains how and why a hypothesised cause contributes to a particular outcome' (Falleti & Lynch 2009, p. 1143). In this study, causal mechanism analysis complements the capability concept explained in Chapter 1. Capability to comply with export market requirements is an outcome of causes or inputs. Thus, causal mechanism analysis is a tool which helps to explain how and why certain actors have or do not have the capability to access high value export markets.

The causal relationship approach was utilised to evaluate the relationships between endowment of livelihood capitals and external variables such as external intervention, the social and economic characteristics of the villages studied and the degree of remoteness. This revealed the complexities involved in endowment of livelihood capitals (see Chapter 5). A similar approach was also applied to investigate the causal relationships between livelihood capitals and the ability to participate in certain channels within the ISGVC, including the capability to comply with export market requirements. Finally, this study qualitatively compared the capabilities of household-, industrial- and transnational-scale shrimp producers (Chapter 6 and 7).

3.8 Ethics

This research was granted ethics approval by the UTS Human Research Ethics Committee (approval number: UTS HREC REF No. 2011–303 A). A high-level understanding of local culture, norms and customs were considered to mitigate any potential risks in conducting the research. For example, the female researchers wore scarves and enclosed outfits during the fieldwork, particularly in Aceh Province, to demonstrate respect for the local Islamic culture. Business information gathered from exporters and importers was treated with a high level of confidentiality. This is because business network and information are commercially sensistive and may have ramifications for the competitivity of the businesses.

This study did not require written consent from the respondents because formal signing often implies an obligation or a legal commitment in Indonesia. In the case of the post-conflict and post-tsunami area of Aceh, signed consent may be interpreted as a donor-related project or even a political issue. Therefore, verbal consent was sought for this research. Prior to the interview, researchers read the statement of purpose of the research and provided information about the objectives and about the research institution. Verbal consent from the participants was required for the interview process.

Chapter 4: Requirements for participating in lucrative export markets

4.1 Introduction

This chapter reviews the requirements for exporting fishery products to enter major lucrative markets, such as those in Europe and the US, to set the foundation for discussion in later chapters. Reports, academic articles and government documents were used in this review. Export market requirements such as food safety controls and traceability are established by governments and buyers from the lucrative market countries. Eco-label certification is also required by some retailers. This chapter describes the forces driving the adoption of these requirements, building knowledge about the type of governance that exists in the ISGVC, which is conceptualised in Section 4.6.

The export market requirements can be seen as a key aspect of governance within the GVC approach. This study uses the term ‘export market requirements’ rather than governance since they have a shared definition. Export market requirements are measures or standards for shrimp products required by buyers from the shrimp suppliers. This reflects the concept of governance presented in Chapter 1. To reiterate, governance within the context of the GVC relates to the dominant stakeholders who determine the overall character of a supply chain (Gereffi, Korzeniewicz & Korzeniewicz 1994; Humphrey & Schmitz 2000). The emphasis of this study is on export market participation, where ability to comply with the market requirements is an essential precondition for participation. Therefore, this discussion is limited to export market requirements and does not include other forms of governance such as forms of codifying transactions and type of relationships between suppliers and buyers (Gereffi, Humphrey & Sturgeon 2005).

4.2 Food safety and traceability requirements of importing states

The EU and US are the largest importers of Indonesian shrimp. Food safety regulations are intended to protect the health and safety of consumers in those markets. Thus, the standards and measures are formulated in a way that assures consumers that marketed products have met required standards (Athukorala & Jayasuriya 2003). From the perspective of producers, however, food safety requirements constitute an impediment to market access. Indeed, some of the very stringent requirements of the EU have been described as technical barriers to trade. The ability to comply with food safety measures affects market penetration for shrimp producers. Compliance with standards involves not only the exporters, but also all actors along the ISGVC, especially shrimp producers. Some food safety measures, such as traceability, require shrimp producers' active involvement.

Within the EU, food safety controls are managed by the European Commission's Directorate-General for Health and Consumer Protection (DG SANCO). The Commission's role is to provide assurance to European consumers that all imported products meet standards with respect to hygiene and consumer safety (Blaha & Steffen 2008). For the EU, the regulation is divided into several separate regulations introduced by the European Parliament in 2004. *Regulation (EC) NO. 852/204* on the hygiene of foodstuffs; *Regulation (EC) No. 853/2004* which outlines the specific hygiene rules for food of animal origin; and *Regulation (EC) No. 854/2004* which outlines the specific rules for organisations regarding products of animal origin intended for human consumption. In the US, the Food and Drug Administration (FDA) is the body responsible for overseeing hygiene and consumer safety standards. The relevant regulation in the US is the Safe and Sanitary Processing and Importing of Fish and Fishery Products (SSPIFF).

The EU and the US apply the (HACCP method to ensure the safety of imported seafood products. The HACCP is a system designed to prevent potential hazards along the whole supply chain, including production, processing and transport (FDA 1995; Josupeit, Lem & Lupin 2000). The processing activities also include harvesting, packaging and storing (FDA 2011). Potential hazards include biological, chemical and physical contaminations which affect the safety of fishery products. HACCP certification is a mandatory requirement for all seafood products sold in the EU and US. Every seafood exporter is required to comply and obtain a HACCP certificate (FDA 1995; Josupeit, Lem & Lupin 2000).

In addition to HACCP certification requirements, product traceability is another food safety measure required by the governments of importing countries. For example, under EU regulations:

> The traceability of food and food ingredients along the food chain is an essential element in ensuring food safety (European Commission 2004a, p. 23).

Traceability for EU and US regulations means the ability to trace 'one step backward, one step forwards' and this must be endorsed with specified documentations. The key points of traceability are that all products need to have a unique batch code and should be identifiable. Fishery products should have, at the minimum, information such as the name of the supplier, time of receipt, division and addition to batch, name of consignee and the date and time of dispatchment (International Trade Centre 2008). To ensure the adoption of traceability by exporting companies, the European Commission requires verification by a 'Competent Authority' in the producer countries (European Commission 2004a, 2004b). *Regulation 2006/236/EC* stipulates the process of reliable inspections from the Indonesian Competent Authority to ensure food safety of fishery products (European Commission 2004a).

Processing companies must be registered in the importing countries to allow them to conduct business transactions with buyers. For the EU, registration forms part of the verification process to ensure exporting countries comply with regulations. The registration number is issued by the Competent Authority in the importing countries. The Indonesia-based exporting companies' registration in the EU is facilitated by MMAF though a collective application arrangement. In the US, the registration process is managed individually by exporting companies.

In the case of government-managed registration in Indonesia, the Fish Quarantine and Quality Control Agency (BKIPM) is the Competent Authority that oversees the registration process. Processing companies are required to send their registration application to BKIPM, to endorse their business contract with potential buyers (importers) and provide their HACCP certificates. There is a possibility that the application will be rejected by BKIPM if non-compliance is found during the verification process. For those that comply, BKIPM forwards the registration application to the importing countries in the EU. The EU then issues an approval number for each processing company (BKIPM 2013).

4.3 Indonesian regulations for food safety

Indonesian regulations for quality control, food safety and institutional arrangements related to these matters have evolved over the last decade. Market pressure from importing countries has been the main driving force behind the transformation of Indonesian regulations and controls for food safety, in particular for commodities intended for export markets. This is a form of governance from importing countries, influencing the Indonesian government's handling of food safety. The Indonesian government's response to these pressures is important for the ability of Indonesian shrimp producers' to penetrate lucrative export markets.

Buyers' perceptions of Indonesian fishery products affects market acceptance of those products and are a major force driving policy improvement. The trigger for changes in Indonesian policy was sanctions from importing countries. There were several instances of Indonesian products being rejected from importing countries in 2006, 2007 and 2008. The European Commission banned imported fishery products from Indonesian producers due to the presence of histamines and heavy metals. The US and Japan also rejected products (Poernomo 2008). The seafood products were rejected due to inappropriate fish handling and a lack of capacity of Indonesian authorities to conduct regular audits (European Commission 2006). The decision to reject the products was articulated in a Commission decision issued on 21 March 2006:

> Histamine and heavy metals have been detected in fishery products imported from Indonesia and intended for human consumption. The presence of these substances in food presents a potential risk for human health. …. Member States should carry out the appropriate checks of fishery products from Indonesia on arrival at the Community border to prevent product unfit for human consumption from being placed on the market.

The decision triggered the creation of the Rapid Alert System for Food and Feed (RASFF) by European border food safety controls for all fishery products from Indonesia (European Commission 2006; Poernomo 2008). The incident also resulted in a ban on several Indonesian exporting companies. Each container of Indonesian fishery products was laboratory tested on arrival at the EU border. This cost around 1000–1300 Euros per container (Poernomo 2008) and was charged to the Indonesian businesses. Approximately 90 companies were expelled from the EU list of approved exporters (Poernomo 2008). There were approximately 47 rejection cases from EU in 2007 and 13 cases in 2008 from Japan (Poernomo 2008).

Responding to these rejections, the Indonesian government developed policy to transform management and institutional processes. The current controlling system for quality control and food safety is presented in Figure 4.1. The initial response was the development of a Ministerial Decree No. 01 2007 hereby abbreviated as *PER. 01/MEN/2007* on management for quality and food safety:

> The decision made by European Union as articulated in CD 2006/236 is the starting point of improvement and transformation of Indonesian fisheries quality control and food safety. The first step taken is to restructure Indonesian regulations related to this matter by developing the *PER. 01/MEN/2007* about control mechanisms for food safety and quality control assurance (Poernomo 2008).

The policy is enforced through government-based certification schemes covering the input production, grow out, marketing and processing nodes (Figure 4.1). This whole-chain certification aims to provide full control of quality and food safety throughout the supply chain. The schemes are subjected to all aquaculture commodities that are exported such as tilapia, milkfish, shrimp and catfish.

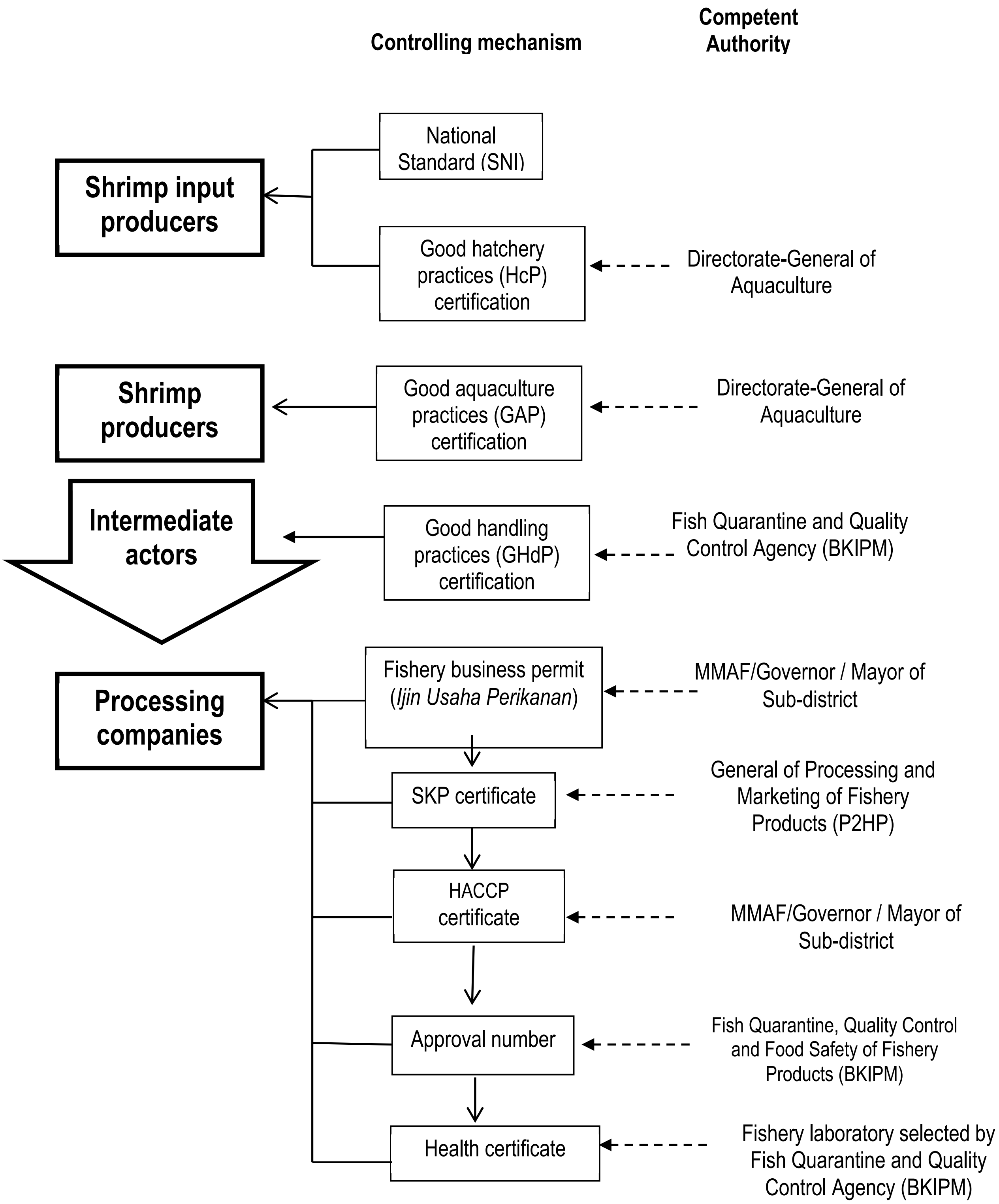


Figure 4.1 Quality and food safety control mechanism for Indonesian fisheries

Responding to the EU regulations, the Indonesian government has made it a compulsory requirement for processing companies that export to adopt the HACCP certification scheme to ensure food safety. The HACCP certificate is administrated under BKIPM. In Indonesia, the assessment involves three levels of HACCP compliance—class A, B and C (technical procedure is presented in Appendix 2). The EU requires the highest standard in HACCP compliance. Companies are only allowed to export their product to the EU if they maintain a class A HACCP Certificate (European Commission 2013).

In addition, as written in a decree of the Head of Fish Quarantine and Quality Control Agency (*BKIPM*) No. 03 2011 (*PER. 03/BKIPM/2011*), the Indonesian government also requires a health certificate issued by a dedicated and accredited laboratory to assure the food safety of fishery products for export markets (BKIPM 2011). The health certificate is viewed as the final control measure of the Indonesian Competent Authority to safeguard food safety and quality for exports. It ensures that all exported fishery products meet food safety requirements. The health certificate must be endorsed for each shipment of a fishery product that was articulated in Ministerial Decrees No. 26 2008 (*PER. 26/MEN/2008*). The health certificate will only be issued if the processing company has obtained the HACCP certificate and has demonstrated the traceability of their products (BKIPM 2013).

4.4. Eco-label certification

In addition to the government-based governance of fishery products for the global markets, eco-label certification is emerging as a form of global private governance in seafood markets. Several studies have suggested that eco-label certification can affect export market participation for household-scale producers (Gereffi & Lee 2009; Henson & Reardon 2005). Eco-label certification standards, therefore, affect the market possibilities for household-scale shrimp producers including those in this research.

Eco-label certification emerged in response to the 1992 United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro (Gardiner & Viswanathan 2004). Eco-label certification is intended to conserve and ensure the sustainability of future fisheries production and to provide a tool to mitigate possible negative effects by fisheries practices (May et al. 2003). In the context of aquaculture, eco-label certification schemes promote sustainable aquaculture practices (Lee 2008), which have been a concern in the past due to mangrove deforestation for shrimp farming (Gardiner & Viswanathan 2004). Most eco-label certification schemes are not specialised for a particular aquaculture commodity. They may cover various agricultural and fisheries commodities. For instance, some of the schemes are for fruit, vegetables, wild caught fish and other agricultural commodities (Lee 2008). In the case of Indonesian shrimp farming, there are three relevant eco-label certification schemes: Best Aquaculture Practices (BAP); Global Good Agricultural Practice (GlobalGAP), and Aquaculture Stewardship Council (ASC).

Tables 4.1, 4.2 and 4.3 summarise the main principles of the BAP, GlobalGAP and ASC certification schemes. There are shared principles for these three certification schemes. The first involves farm location management, aiming to ensure that a farm is located in accordance with local and national legal requirements. Legal rights relate to property rights to ensure that farmers can legally access land and other natural resources (Global Aquaculture Alliance [GAA] 2009). This legal right includes the requirement for legal documentation to prove the access was granted by the local authority. Ecological considerations are included to prevent potential environmental degradation generated from farming activities. Farming can degradate environmental biodiversity and increase pollution through discharging effluent into estuary ecosystems (ASC 2014; GAA 2009; GlobalGAP 2011).

The standards also govern seed supply including broodstock production procedures. The standards aim to prevent the potential degradation of wild stock. The three certification schemes require domesticated or hatchery-produced seed to be used in production. Disease screening to minimise the potential spread of infection is also a major standard. Such requirements are not only for broodstock, but also apply to seed (post-larvae and juveniles). The standard requires certification to prove regular disease surveillance for seed used in shrimp farming. In the case of the GlobalGAP, the standards include a requirement to use seed from GlobalGAP certified hatcheries (GlobalGAP 2011). In the case of the ASC, the standards require specific pathogen free (SPF) and specific pathogen resistant (SPR) seed to be used in shrimp farming (ASC 2014).

Moreover, all eco-label certifications require food safety measures be followed. Food safety measures include chemical usage, handling in production and the use of antibiotics and pesticides. Microbial contamination is also a food safety measure, which includes use of a sanitation system at the shrimp farm and post-harvest and transportation handling protocols. Practices should prevent contamination caused by human handling and from materials used in the post-harvest process such as ice (GAA 2009; GlobalGAP 2011).

As discussed, traceability is integrated in the regulations of importing governments. It is also a major requirement of the three eco-label certification schemes. The certifications schemes adopted traceability to ensure that all processes were conducted in compliance with environmental, social and food safety standards (GAA 2009). In the case of shrimp certification schemes under ASC, traceability begins with feed ingredients covering source, species and country of origin and harvest methods (ASC 2014). The GlobalGAP extends the traceability requirement to post-harvest and processing functions (GlobalGAP 2011). The methods of recording and managing data play a significant role because processes related to traceability require documentation. The GlobalGAP requires documents be retained for a minimum of three years for traceability compliance.

Table 4.1 Standards and criteria for shrimp farm certification under the Aquaculture Stewardship Council

No.	Standards	Criteria
1	Comply with all applicable national and local laws and regulations	Documented compliance with local and national legal requirements.
2.	Site farms in environmentally suitable locations while conserving biodiversity and important natural ecosystems	Biodiversity environmental impact assessment (B-EIA); conservation of protected areas or critical habitats; consideration of habitats critical for endangered species; ecological buffers, barriers and corridors; prevention of salinization of freshwater and soil resources.
3	Develop and operate farms with consideration for surrounding communities	All effects on surrounding communities, ecosystem users and land owners are accounted for and are, or will be, negotiated in an open and accountable manner. Complaints by affected stakeholders are resolved; transparency in providing employment opportunities within local communities. Contract farming arrangements (if practiced) are fair and transparent to the contracted farmers.
4	Operate farms with responsible labour practices	Responsible labour practices include: child labour and young workers' protection mechanism in place. Discrimination in the work environment not allowed; work environment health and safety conditions enforced; minimum and fair wages or decent wages provided; access available to freedom of association and the right to collective bargaining; harassment and disciplinary practices in the working environment causing temporary or permanent physical and/or mental harm not allowed; overtime compensation and working hours compensated. Worker contracts are fair and transparent; fair and transparent worker-management systems in place; living conditions for workers accommodated for on the farm.
5	Manage shrimp health and welfare in a responsible manner	Disease prevention and disease management and treatment.
6	Manage broodstock origin, stock selection and effects of stock management	Presence of exotic or introduced shrimp species manages; origin of post-larva or broodstock and transgenic shrimp managed.
7	Use resources in an environmentally efficient and responsible manner	Traceability of raw materials in feed; origin of aquatic and terrestrial feed ingredients; use of genetically modified (GM) ingredients in feed; efficient use of wild fish for fishmeal and oil; affluent contaminant load and energy efficiency; handling and disposal of hazardous materials and wastes.

Source: ASC (2014)

Table 4.2 Standards and principles for shrimp farm certification under Best Aquaculture Practice

No.	Standards	Principles
1	Community, property rights and regulatory compliance	Farms shall comply with local and national laws and environmental regulations and provide current documentation that demonstrates legal rights for land use, water use, construction and operation.
2	Community relations	Farms shall not deny local communities access to public mangrove areas, fishing grounds or other public resources.
3	Worker safety and employee relations	Farms shall comply with local and national labour laws to assure adequate worker safety, compensation and living conditions at the facility.
4	Mangrove conservation and biodiversity protection	Farms shall not be located in mangrove areas, seagrass beds or other coastal wetlands. Farm operation shall not damage wetlands or reduce the biodiversity of coastal ecosystems.
5	Effluent management	Farms shall monitor effluents at the frequency specified to confirm that water quality complies with BAP criteria.
6	Sediment management	Farms shall contain sediment from ponds, canals and settling basins and not cause salinization or other ecological nuisances in surrounding land and water.
7	Soil and water conservation	Farm construction and operations shall not cause soil and water salinization or the depletion of ground water in surrounding areas.
8	Post-larvae sources	Certified farms shall not use wild post-larvae and shall comply with governmental regulations regarding the importation of native and non-native shrimp seed stock.
9	Storage and disposal of farm supplies	Fuel, lubricants and agricultural chemicals shall be stored and disposed of in a safe and responsible manner. Paper and plastic refuse shall be disposed of in a sanitary and responsible way.
10	Drug and chemical management	Banned antibiotics, drugs and other chemical compounds shall not be used. Other therapeutic agents shall be used as directed on product labels for control of diagnosed diseases or required pond management, not prophylactic purposes. Shrimp shall be periodically monitored for residues of suspect pesticides, Polychlorinated Biphenyls (PCBs) and heavy metals that are confirmed in the vicinity.
11	Microbial sanitation	Human waste and untreated animal manure shall be excluded from shrimp grow out ponds. Domestic sewage shall be treated and not contaminate surrounding areas.
12	Harvest and transport	Shrimp shall be harvested and transported in a manner that maintains temperature control and minimises physical damage and contamination. Shrimp treated with sulphites or other allergens shall be labelled accordingly.
13	Traceability, record-keeping	The following data shall be recorded for each pond and for each production cycle: pond identification number, pond area, stocking date, quantity of post-larvae stocked, source of post-larvae (hatcheries), antibiotic and drug use, pesticide use, manufacturer and lot number of each feed used, harvest date, harvest quantity and processing plant (buyers).

Source: GAA (2009)

Table 4.3 Standards and criteria for aquaculture under the GlobalGAP

No.	Standards	Criteria	Level of compliance
1	Site management	Compliance with regulations related to food safety and animal welfare; environmental legislation and workers health and safety maintained.	Major
2.	Reproduction	Broodstock source is the only domesticated broodstock, screened and free disease. Seedling are sourced from breeding technique.	Major
3	Chemicals	Chemical storage system used; chemical containers discharge handling, transportation.	Major
4	Occupational and health safety	Safety and hygienic training for workers.	Major
5	Fish welfare, management and husbandry	Traceability; farmers' have an understanding of hygienic practices on water quality and cleanliness; growth measures and suitable feeding practiced; ensure water quality does not affect food safety and shrimp welfare; ensure ponds' infrastructure does not pollute the water, which is shown by a separated intake and outlet; biosecurity including contamination handled.	Major
6	Harvesting	Packing method preventing contamination; ice usage; traceability of harvest.	Major
7	Sampling and testing	Sampling produced to ensure free of contamination and residue.	
8	Feed management	Diet suitability; ability to identify feed compounds; feed traceability according to pond batch; feed storage management.	Major
9	Pest control	Preventive measures for pest infestation in buildings and other facilities.	Major
10	Environmental and biodiversity management	Waste management; compliance with environmental and biodiversity policy; infrastructure prevents animal escape. Farms are not built within protected areas according to International Union for Conservation of Nature (IUCN); mangrove rehabilitation and conservation.	Major; some aspects are minor
11	Water usage and disposal	Sewage or effluent discharge management; water quality control of sewage to environment.	Major
12	Post-harvest and traceability	Traceability of harvest and chain of custody.	Major

Source: GlobalGAP (2011)

Although compliance with eco-label certification is not required by governments, it has become a business requirement for major retail buyers. Therefore, suppliers have no option if they want to sell to those buyers. The dominant market share of these retailers limits market access for those producers unable to gain certification. One importer revealed that his company only purchases ASC certified shrimp from Indonesia (IM_ND 2012). Lyons Seafoods Limited, a prominent buyer from the UK, only purchases farmed shrimp from farms certified by BAP developed by the Global Aquaculture Alliance (Lyons Seafoods 2012). The biggest retailer outlet in the Netherlands, Albert Heijn has announced that they will only sell ASC certified farmed seafood by 2015 (Albert Heijn 2012; AngloINFO 2012). They have marketed ASC certified farmed pangasius and tilapia since August 2012 (Albert Heijn 2012). A prominent German retail company, the Real Group has also started to acquire ASC certified farmed fish:

> In a boost to environmental responsibility hypermarket chain, Real group, met the ASC seafood traceability standard and can now use the ASC logo across 120 fish counters in their stores (ASC 2013a).

The market power of these prominent retailers affects the strength of eco-label certification as a form of governance for aquaculture shrimp. For example, Albert Heijn operates in the Netherlands, Belgium and Germany and has more than 930 stores (Albert Heijn 2014). The Real Group manages around 300 large hypermarkets in Germany and 12 in Turkey. This market power can push the adoption of eco-label certification onto their suppliers, that subsequently also pushes the adoption into shrimp producers.

4.5. Drivers for compliance with the requirements of lucrative export markets

The above discussion suggests that stakeholders drive compliance with requirements, which can act as barriers to participation in lucrative export markets. Figure 4.2 provides a representation of the flow of export market requirements and the origin of the force for compliance. Stakeholders from importing countries such as governments, importing companies and international conservation NGOs play a role in driving the market requirements. This suggests that ISGVC governance is driven by multiple actors along the supply chain. This is in line with Oosterveer and Sonnenfeld's (2012) characterisation of global food supply governance which is defined as 'multi-actor governance'. Multi-actor governance arises when multiple actors from government agencies to private firms, such as non-governmental interest groups, control what and how products are produced:

> Governments are no longer the sole center of authority and control, entitled to make and enforce laws, and they have turned into more collaborative actors applying more indirect and softer forms of steering and involving various other societal actors, including private companies, in the process (Oosterveer & Sonnenfeld 2012; p. 65).

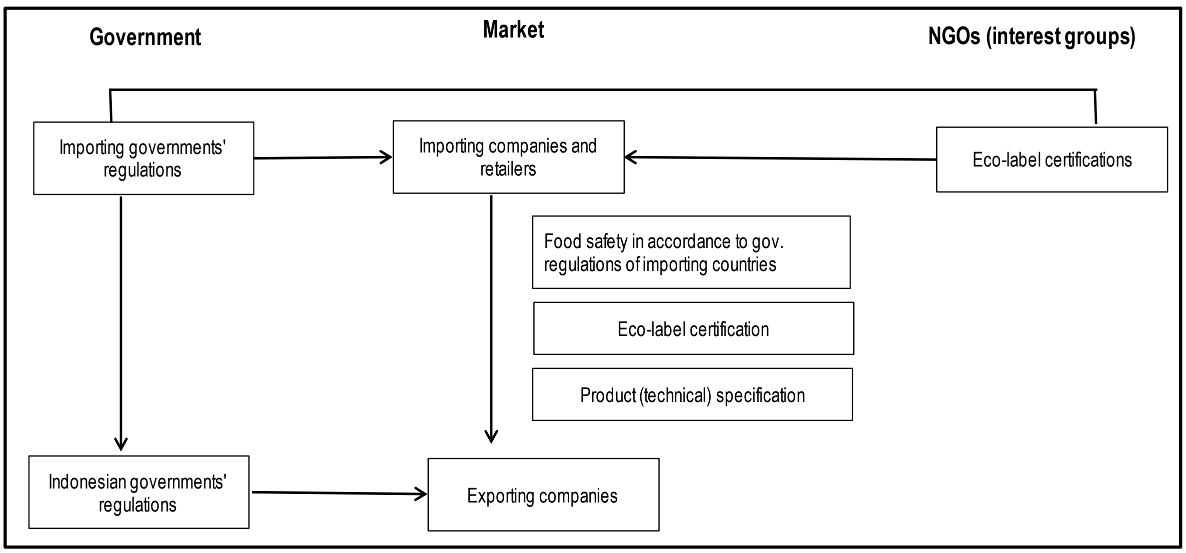


Figure 4.2 Export market requirements; origin of force of compliance and flow

Although government regulations for food safety and eco-label certification seem to present two different types of governance in food supply, the two schemes reinforce one another. As shown in Figure 4.2, food safety requirements originate from the governments of importing countries. Insufficient capacity of governments to solve food-related problems within the current globalised food production system triggered the involvement of non-governmental stakeholders in food supply governance (Oosterveer & Sonnenfeld 2012). Governments enforce the regulations through suppliers based in consuming countries and the governments of producer countries. Eco-label certifications reinforce the compliance and expand the standards, promoting their values through the power of the value chain actors. The involvement of multiple actors who shape the requirements for export markets may strengthen the force for compliance, which may increase the risk of exclusion for those who cannot comply with such requirements.

The type of ISGVC governance conceived of in this study is the ‘multi-actor governance’ approach. This approach differs from the type of governance seen in other agricultural commodities (see Gereffi & Lee 2009, Islam 2008; Vermeulen 2010). However, there is a shared understanding that actors in producer countries are not driving the value chains. Market requirements are set by governments, retail buyers and NGOs based in wealthy market countries. Indonesian suppliers and producers then adapt as possible to meet these requirements. For example, Islam (2008) suggested a twin-driven commodity chain for shrimp produced in Bangladesh. Islam defined the chain and one that is neither buyer-driven nor producer-driven, but buyers and NGOs contribute to shaping the governance of the chain:

> The wealthy buyer controls the supply network, while third-party certifiers and some environmental groups define the regulatory aspects of production, codification, and certification (Islam 2008; p. 210).

Although Islam’s study acknowledged the role of buyers and NGOs in the Bangladeshi shrimp GVC, the study did not assertively point out the role of governments in importing countries in governing the GVC.

Gereffi and Lee (2009) noted that the contemporary global food supply is predominantly driven by multinational lead firms including agro-businesses, diversified food manufactures and global retailers. A similar argument was also suggested by Dolan and Humphrey (2000) who argued that supermarkets in the consuming country were the main driver of the global food supply governance. Such a model of governance falls within the notion of the buyer-driven value chain as explained in Chapter 1, which is common to many agricultural products traded to developed countries and produced in developing countries (Gereffi & Lee 2009). However, the buyer-driven value chain excludes the role of government and NGOs, who have pivotal roles in driving the requirements explained above.

A comparable argument was also made by Vermeulen (2010) who viewed eco-label certification as a ‘market-based’ governance whereby the main actors driving the supply chain are marketing actors. That marketing actors play a significant role in driving the adoption of eco-label certifications certainly seems accurate as explined in Section 4.4 above. However, it is also necessary to include other actors’ roles in the development of certification schemes. For example, NGOs promote their own values, which are often centred on addressing social and environmental issues. This affects the regulation of the food production system and its ability to reduce the environmental effects of aquaculture, but also to incorporate social effects (ASC 2014; GlobalGAP 2011). Compliance with eco-label certification is then transferred through GVC actors in consuming countries, the intermediaries, and towards producers. For example, ASC development was initiated in 2010 by WWF and IDH (Dutch Sustainable Trade Initiative) to convey the idea of the 'best' environmental and social choices for seafood products. These NGOs later incorporated aquaculture producers, seafood processors, retail and foodservice companies, scientists, conservation groups and the consuming public into the scheme. Cooperation among the groups listed above exerts market force on producers to adopt eco-label certification. ASC is clearly stated: 'Its overarching strategy is to use market force to transform aquaculture' (ASC 2013b).Therefore, based on this evidence, eco-label certification is not entirely promoted by the marketing actors, as argued by Vermeulen (2010).

Further, the literature reviewed and the findings of this study indicated that pressure from NGOs was the main reason for the value chain actors' involvement in the eco-label certification movement. For example, Gulbrandsen (2006) claimed that most participation of value chain actors in eco-label certification schemes resulted from intensive pressure from environmental groups. Thus, Gulbrandsen (2006) suggested that the involvement of value chain actors was justified as a risk management strategy. Ponte (2008) similarly argued that genuine motivations to promote the eco-label certifications' value from wineries were rare. An importer in this study also suggested that when the eco-label certification scheme was first established in Europe, his company was an actor involved for the promotion of development and ratification. This action was mainly motivated by a desire to secure their business, as there were so many pressures from NGOs on the issue of sustainability in seafood products (IM_ND 2012). This provides evidence that eco-label certification is not purely a market-based-driven governance.

Despite there being different types of governance, which have suggested in this study and in previous studies, all types of governance have comparable mechanisms for the coordination of requirements along the supply chains. The enforcement of export market requirements is channelled through importers and transferred in the value chain upstream to producers. The requirements from importing countries may be included in their purchasing contracts. For example, this study found that the pressure to comply with requirements such as food safety measures and eco-label certification is embedded within purchasing contracts between importing companies and exporting companies from producer countries (*Purchase manual of an importing company* 2008). The force for compliance stemming from EU buyers is high because the relationship between shrimp importers in the EU with exporters in Asia is characterised as a captive relationship (Kelling 2012). Therefore, buyers are influential because they enforce compliance with export market requirements.

4.6. Conclusion

This chapter has detailed requirements for participating in lucrative export markets. These requirements have been driven by multiple actors such as government, market and interest group actors. Therefore, compliance with the requirements can determine participation in export markets. However, capabilities to comply with those requirements are determined by livelihood capitals and the type of value chains in which shrimp producers can participate. These two subjects are discussed in more detail in Chapters 6 and 7.

Chapter 5: Livelihood capitals of household-scale shrimp producers and complexities of endowment

5.1 Introduction

This chapter addresses the research question: What are the livelihood capitals of different kinds of Indonesian shrimp producers? The main focus is on evaluating and identifying the factors that affect the endowment of livelihood capitals of household-scale shrimp producers in the villages studied (livelihood capitals outlined in Figure 1.2, Section 1.3). This chapter applied mix method; qualitative and quantitative. Frequency analysis was used to measure the percentage of livelihood capital endowment for household-scale shrimp producers. The analysis covered 138 respondents for household-scale shrimp producers. First, this discussion outlines the level at which the variables of each livelihood capital have been attained. These include human, financial, social, physical and natural capitals. This chapter argues that household-scale shrimp producers generally have low endowment of livelihood capitals. The discussion follows a horizontal analysis of endowment of livelihood capitals between household-scale shrimp producers in the seven villages. This approach enables an understanding of how geographical, social and political attributes of an area affect the endowment of livelihood capitals among household-scale shrimp producers. Finally, this chapter conceptualises the complexities involved in the endowment of livelihood capitals. It is a process that involves reciprocal and even loop relationships between the different livelihood capitals. Thus, one livelihood capital can function as a means for endowment for another type of livelihood capital and it can also be the endpoint capital (details discussed in Section 5.7).

5.2 Human capital and complexities in human capital endowment

In this study human capital includes: level of schooling of shrimp farmers, children, their hired employees, the structure of their workforces and access to training. This section focuses solely on the level of education of shrimp farmers including husbands and wives for the household-scale group. The discussion focuses on evaluating the factors affecting the attainment of human capital in the studied villages, where farmers' schooling is utilised as the measurement of attainment. The other human capital variables are also relevant. However, application of all the variables may significantly expand the size of this chapter. Other variables are discussed in Chapter 6, which compares the endowment of human capital across different groups of shrimp producers.

Human capital is critical to executing business functions such as developing production strategies and product marketing (Belderbos & Heijltjes 2005; Kabst 2004; Tarique, Schuler & Gong 2006). In shrimp farming, it is a major input which, in turn, determines the upgrading capability of a shrimp farm. This is because qualifications enable the process and efficiency of knowledge transfer, which leads to upgrading (Mäkelä, Björkman & Ehrnrooth 2009). A study by Djomo and Sikod (2012) found that the formal education of agricultural crop farmers in Cameroon increased their productivity and efficiency, which improved their access to markets. However, productivity in conceived of in this study not only as the ability to farm or produce shrimp, but also the ability to produce shrimp that meet the export markets' requirements. Therefore, the ability to strategise shrimp production is necessary. Further, the role of human capital is not only limited to productivity; it also has a more complex role in the endowment of other capitals such as building social capital and accessing financial capital. Thus, human capital provides the means for capability accumulation (Lanzi 2007).

The data collected in this study showed that the majority of household-scale shrimp producers have a low level of formal education; the majority of farmers had received 1–6 years of schooling, which is equivalent to a primary school education (see Figures 5.1 and 5. 2). This strongly indicates that the majority of household-scale shrimp producers have only the ability to read, write and do simple math. During the interviews, some of the respondents added that they had not completed the six years of primary school (HSSP_MT 2013). Previous studies have also suggested that small-scale shrimp farmers have a low endowment of higher-level schooling, which in this study, is analogous to household-scale farmers (Bosma et al. 2005, 2012; Paul & Vogl 2013). However, it seems that household-scale shrimp producers in this study have had better access to primary schooling compared to the age group for the general population of Indonesia. Aggregated data from this study showed that 52.2 per cent of household-scale shrimp producers received more than six years schooling. By comparison, the latest population census in 2010 reported that only 44.1 per cent of Indonesians older than 25 years completed more than six years of formal schooling (Statistics

Indonesia 2010b).[8] Nevertheless, there is a need for further quantitative analysis to evaluate the significance of this difference and to capture a broader representation of shrimp farmers as this study focused only on seven villages in Aceh, North Sumatra and South Sulawesi Provinces.

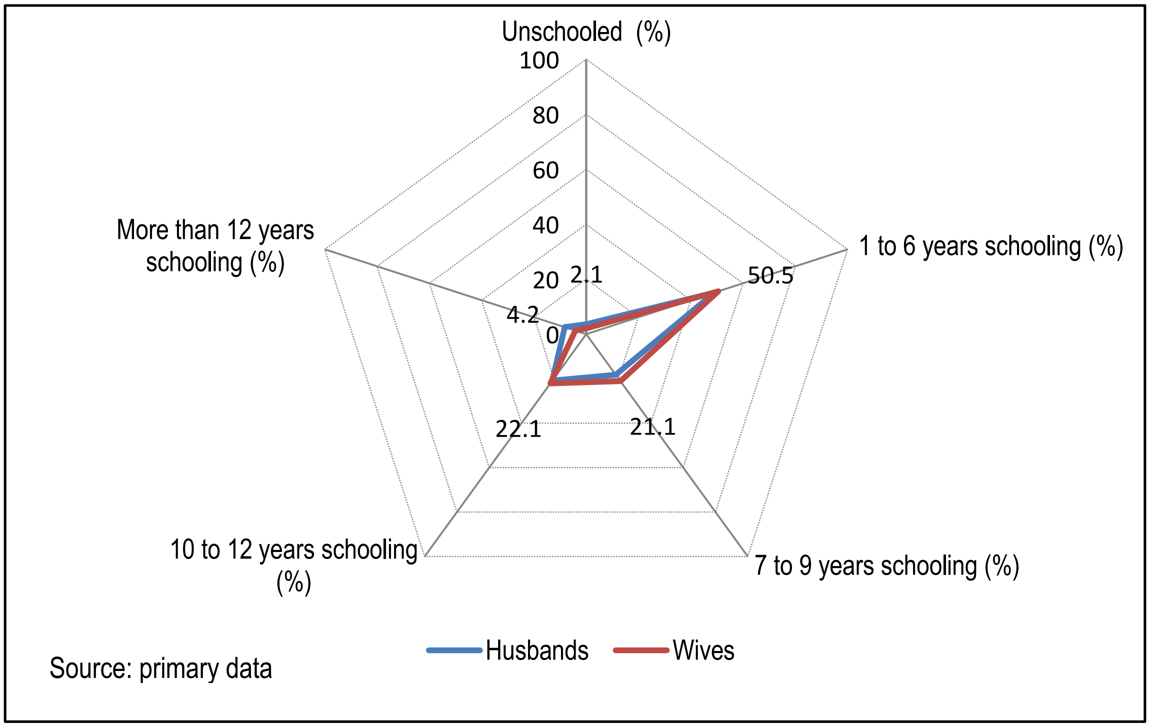
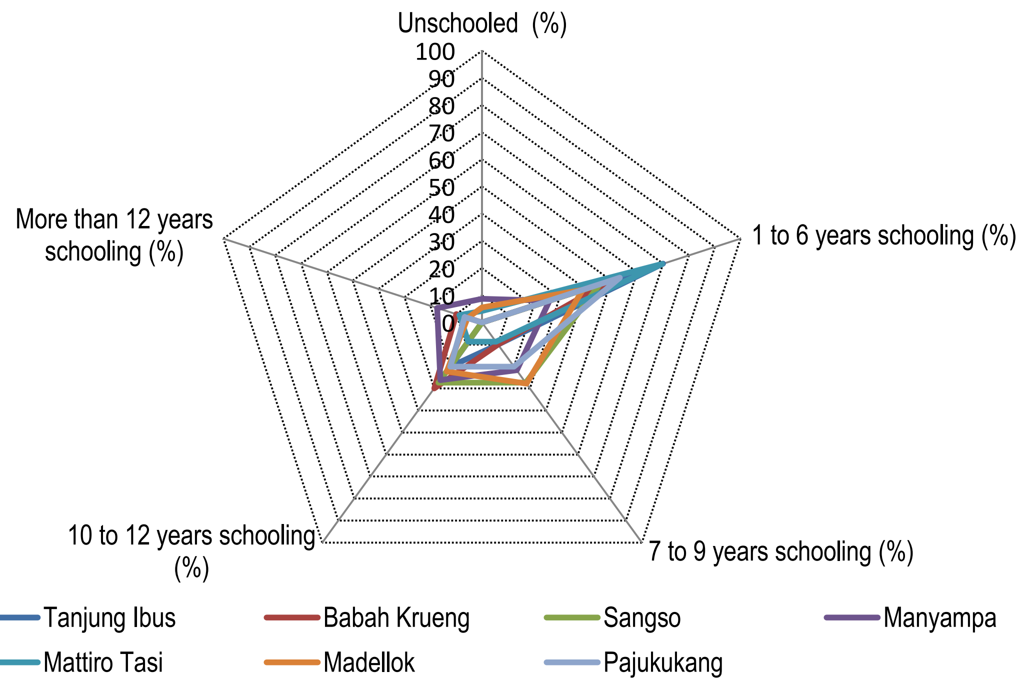


Figure 5.1 Average schooling for husbands and wives in all studied villages

[8] The household survey found that 80 per cent of the respondents are older than 25 years. To draw comparisons, this study used the statistical data for Indonesians within the age group of over 25 years-old.



Source: primary data

Figure 5. 2 Average schooling received by each village

Although household-scale shrimp producers have limited human capital in terms of levels of formal schooling, it is still necessary to carry out a comparative analysis between the studied villages to identify specific issues which hinder access to formal schooling, such as geographical location. This can extend our understanding of suitable human capital-related development interventions for different areas. The aggregated analysis of schooling showed that the endowment of formal schooling varied between the villages studied (see Figure 5.2). It was found that variations in level of formal schooling received because of geographical location were associated with public infrastructure and financial capital. Household perceptions of the importance of education also affected formal schooling despite the financial and geographical barriers. The next sub-section discusses the relationship between these factors and formal education endowment for household-scale shrimp producers.

5.2.1 Human capital and geographical position (physical capital)

A comparison of the villages suggests that geographical isolation affects the formal education endowment of household-scale shrimp producers. This study found that farmers from isolated villages such as Mattiro Tasi had less years of schooling than other villages (see Figure 5.2). Shrimp farmers in Mattiro Tasi village had the lowest percentage of those with more than six years of schooling (26.1 %) compared to Madello (55.6 %) and Sangso villages (54.6 %), which are relatively closer to larger urban areas that have better access to public facilities. Around 4.3 per cent of household-scale shrimp producers in Mattiro Tasi did not have any formal education; this figure was higher than the average for the aggregated data (3.6 %). General population statistics for Mattiro Tasi village confirmed this finding and showed that 7.3 per cent of the villagers had never gone to school and 6.4 per cent did not finish primary school (Mattiro Tasi 2013).

A lack of public facilities in isolated areas such as schools at a secondary level and public transport further hinder the ability for endowment of formal education. In the case of Mattiro Tasi, the situation of current public facilities was explained by the head of the village (village head of Mattiro Tasi [VH_MT] 2013).

> Mattiro Tasi village is located around 210 kilometres from the provincial capital and 20 kilometres away from the district city. Currently, the most accessible school close to the village is a primary school. The middle school (6 to 9 years of schooling) and high school (9 to 12 years of schooling) are located in the sub-district city which is 15 kilometres away from the village. There is no daily public transport; public transport is only available when there are weekly markets. The weekly markets are on Wednesday and Saturday, thus, public transport is only available during these days. However, the trip schedule is very limited; one in the morning and one in the afternoon.

The above narrative about Mattiro Tasi village indicates that the lack of public transport had constrained villagers from going to school. It was stated by a respondent:

> You have to have your own vehicle to go to school because the distance is quite far or you have to have enough money to rent a room for your children to live close to school or university (HSSP_MT 2013).

The case of Mattiro Tasi evidences the relationship between geographical position, public transport and access to schooling.

In contrast to those villages with poor access to schools, villages with better access such as Madello had better endowment for formal education. Although Madello village is located 110 kilometres away from the provincial capital city, it is located along the national highway, providing better access to public transport and schools. A teacher in Madello (VT_MD 2013) stated:

> In our area, there are two high schools which are only one kilometre away from our village … public transport (*pete-pete*) is also never late … It is always there every day, every time until 5 pm … most of the children here have gone to school and also university. There are a number of universities that established their branch units close by.

These factors resulted a higher rate endowment of formal education. Shrimp farmers in this village had a higher rate of completing schooling of more than 10 years (55.56%) compared to farmers in Mattiro Tasi, Tanjung Ibus, Babah Krueng and Pajukukang. This rate was also higher than the total average of farmers gained more than 10 years of schooling (47.3%). Farmers from Madello also had the highest rate for more than 12 years of education (college or university) than the other villages studied. Moreover, the children of shrimp farmers in Madello village had the highest rate for more than 10 years of education (70.9%) compared to other villages studied. Thus, the geographical location and public transport availability in Madello village might enable better access to a higher degree of formal education.

The relationship between geographical location and school access can also relate to the accessibility of the village for receiving government interventions. Such interventions are necessary to build schools and other public infrastructure that support the community's access to education facilities. Having greater physical accessibility may mean that more development interventions are received by some villages compared to other remote and isolated villages. This is in line with Symaco's (2013) argument that geographical remoteness in the Philippines led to social exclusion, resulting in marginalisation from government funding and resources intended to enhance access to formal education. The poorest provinces were the least supported. A study by Heyward and Sopantini (2013) also showed a disparity in access to higher education between urban and rural communities in

Indonesia. Public services such as the provision of roads and public transport play a role in human capital endowment.

5.2.2 Human capital and financial capital

Financial capital affects the ability of household-scale shrimp producers to gain a higher level of education. In this study, financial capability is associated with the size of the shrimp farming area operated by the shrimp producers. The relationship between financial capability and shrimp farm area is derived from the revenue generated from the yield. From this perspective, revenue generated from shrimp farming provides the means for developing human capital. This study found that very poor shrimp farmers with a small shrimp farm area (less than 1 ha), shrimp farm areas presented in Section 5.6, faced difficulties in supporting their children to attend university. For example, the children of farmers in the villages studied with less than 1 ha of shrimp farm only completed secondary school (6–9 years of schooling). The farmers stated:

> We did not have enough money to send our children to the city for university ... Our yield is only enough to support our daily needs and to buy inputs for the next cycle of farming … It is expensive to send our children to study to Makassar ... Only rich people can send their children to universities (HSSP_BK1 2012; HSSP_M16 2013; HSSP_ MT10 2013, HSSP_P3 2013).

In contrast, household-scale shrimp producers with larger shrimp farming areas did send their children to attend higher education. The farmers in the villages studied with high rates of university attendance by shrimp farmers' children such as Pajukukang (26.3 %), Mayampa (25.5 %), Sangso (19 %) and Madello (18.5 %) have average shrimp farm areas greater than 2 ha. For example, a shrimp farmer in Pajukukang village who sent all of his five children to university had 10 ha shrimp farm (HSSP_P8 2013). This indicates that the revenue derived from the yield is sufficient to finance household needs, shrimp farm costs as well as the children's education.

Although financial capital shows a positive relationship with access to higher levels of education, this study also noted a correlation between family backgrounds and the decision to invest in higher levels of education. This is line with Kane and Spizman (1994) who found that family education background affected endowment of children's higher education. Parents with a higher level of education were willing to invest in and encourage their children to gain a higher level of education. Data from Manyampa village showed that it had the highest attainment level of tertiary education for heads of households and their children. The majority of the children in this village who went to university came from households with family members who had also received a tertiary education.

Households often seek financial support from their relatives if they have limited access to financial capital. For instance, in the case of a household-scale farmer in Manyampa village, the family consisted of a mother and three mature-aged children (aged 38, 35 and 33) who had all undertaken tertiary education. The oldest worked as a government servant at the district level and the other two worked at a hospital as a nurse and as a pharmacist. During the interview, the study found that the older sibling had provided financial support to the younger siblings to cover their tertiary education costs (HSSP_M10 2013).

In this community or household, endowment of a higher level of education may be revered, and also draw admiration of the family members or the whole village. The villagers in Manyampa village mentioned that households with higher levels of education were more respected, indicating that higher education correlates with social status (HSSP_M5 2013; HSSP_M10 2013). This may also be driven by the expectation of economic return, which motivates households to prioritise education as an investment (Luo & Holden 2014). Such understanding about the importance of higher degree education can be embedded at the community level and can explain the different level of higher education endowment between different groups in community. A study by Luo and Holden (2014) showed a strong relationship between racial and ethnic groups and investment in a higher degree of education. The perspective placed on higher education in these communities may overcome the financial and geographical barriers to invest for higher levels of formal education.

5.3 Financial capital and factors affecting access

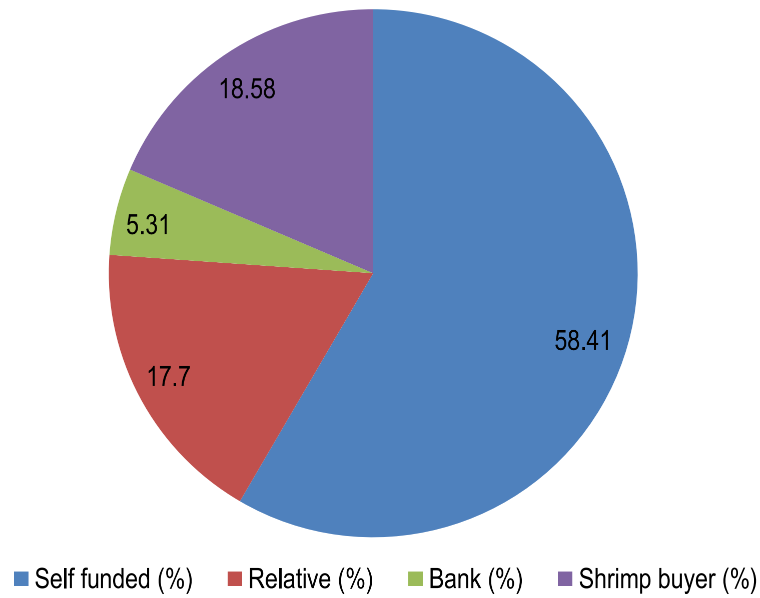
The concept of financial capital in this study relates to the ability of shrimp producers to access credit via formal financial institutions. As described in Chapter 2, access to formal credit contributed to the development of brackishwater aquaculture in Indonesia. This suggests that access to formal credit is an important means for shrimp farms to upgrade such as through adopting eco-label certification. Thus, financial capital is not merely the cash owned by shrimp farmers, but it is also the opportunity to access financial resources for upgrading. Ellis (2000a, p. 8) states:

> The term of financial capital is somewhat ambiguously designated an asset in the livelihood context, because financial stock (e.g. savings) may be used for either consumption or investment; moreover, loans obtained through credit contacts can be used for a variety of purposes of which investment designed to raise future productivity capacity is only one. Nevertheless, the access status of an individual or household with respect to savings, loans or other forms of finance or credit clearly makes a big difference to the livelihood choices that are open to them and therefore financial capital is recognizably an important component of individual or family assets.

The findings of this study highlight that access to formal credit (as the source of financial capital) for household-scale shrimp producers is still limited within the farming communities. Self-financing and credit from shrimp buyers and relatives were the predominant financial resources utilised by household-scale shrimp producers. The ability to access formal credit involves a complex set of livelihood capitals, such as the farmer's network with bank officials (social capital), human capital and the structure of the financial institution itself. Geographical location (level of remoteness) can also limit the ability of household-scale shrimp farmers to access formal financial institutions. External interventions such as government programs can enhance the ability of poor people to access formal credit. Details are presented in the following sections.

5.3.1 Type of financial capitals

The role of formal credit from banks in the establishment of household-scale shrimp farming was very limited. As shown in Figures 5.3 and 5.4, the frequency of borrowing money from a bank to establish shrimp farms was less than the frequency of borrowing from other types of financial sources. Only 5.3 per cent of household-scale shrimp producers borrowed money from banks to develop their shrimp farms. The vast majority were self-financed (58.41 %) and household-scale shrimp producers in Madello, Mattiro Tasi, Pajukuang, Manyampa and Tanjung Ibus villages had the highest levels of self-financing (Figure 5.4).



Source: primary data

Figure 5.3. Financial capital sources of household-scale shrimp producers in the early initial development of shrimp farms for all villages

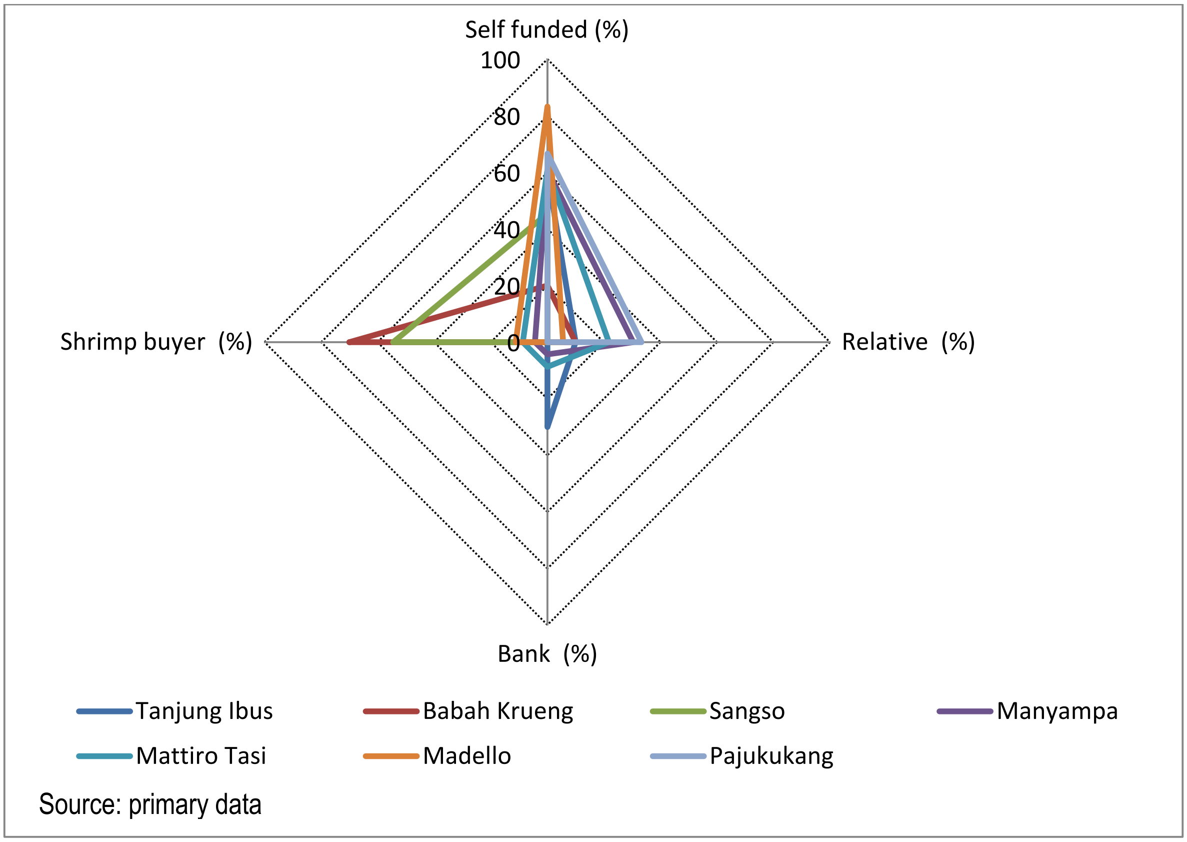


Figure. 5.4 Source of financial capital for household-scale shrimp producers at the initial development of shrimp farms at each village

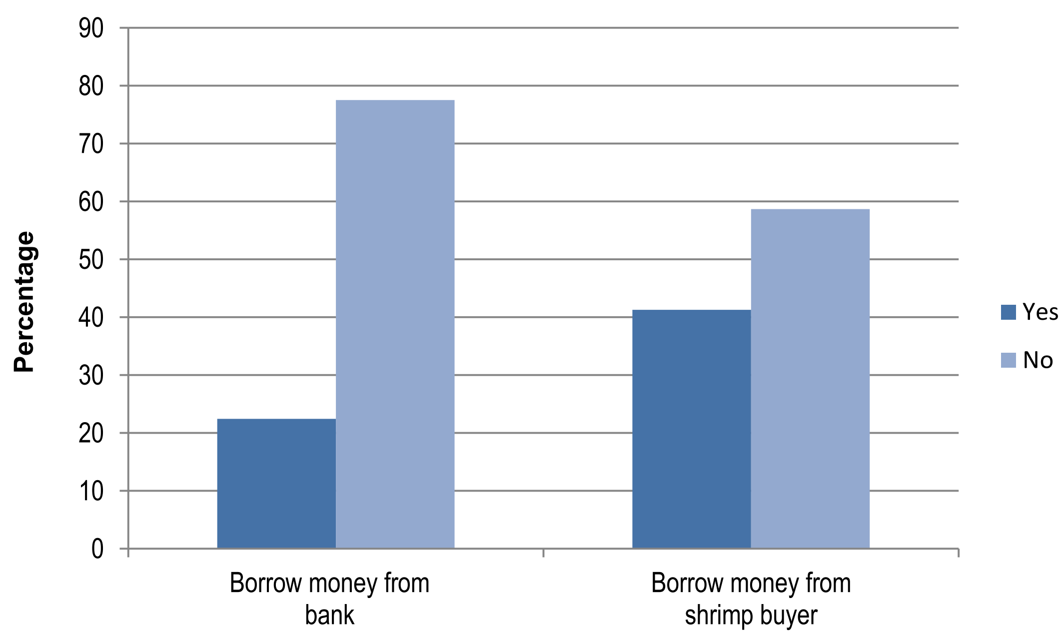
In addition to self-financing, credit from relatives and shrimp buyers (called *toke* in Aceh and *punggawa* in South Sulawesi) were the alternative financial sources accessed during the early stages of shrimp farm modernisation and development. The aggregate analysis of all studied villages showed that 18.58 per cent of shrimp farms were supported by shrimp buyers and 17.7 per cent of shrimp farms were supported by relatives. The data suggests that the establishment of shrimp farms, to some extent, was driven by shrimp buyers. This may be related to the business interests of shrimp buyers such as the desire to expand their access to shrimp. A former shrimp buyer in Tanjung Ibus village stated:

> In the early 80s until the 90s, I used to give money to villagers to open shrimp farms, during that time my money was everywhere …. They sold their shrimp to me (HSSP_TII7 2012).

The role of shrimp buyers in the early development of shrimp farms was more pronounced in the villages with a low frequency of self-financed farms. For example, Babah Krueng and Sangso villages had a lower rate of self-financed farms than the other villages (20 % and 45.45 % respectively), and had high percentages of farmers borrowing from shrimp buyers (70 % and 54.55 % respectively) (see Figure 5.4).

Although the provision of credit by shrimp buyers has been reduced in some villages (evidenced by observation and interviews), due to existing unpaid credit by borrowers, the frequency analysis found that 41.3 per cent of household-scale shrimp producers are still dependent on shrimp buyers as their financial source (Figure 5.5). This suggests the role of the shrimp buyer as an alternative financial source for household-scale shrimp producers has continued beyond the initial development of shrimp farms.

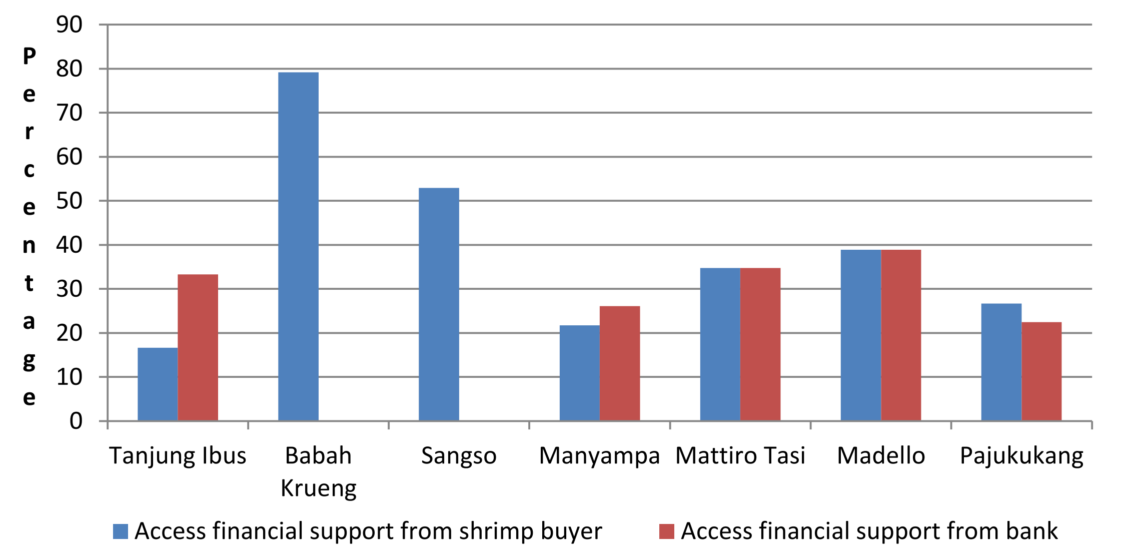
The rate of accessing credit from banks increased after the initial development of shrimp farms, however, the vast majority of shrimp farmers from the household-scale category still never borrow money from a bank. The closed-ended survey data using 'Yes' and 'No' answers showed only 22.46 per cent of interviewed household respondents had experience of borrowing money from banks and as high as 77.54 per cent stated that they had never borrowed money from a bank (see Figure 5.5).



Source: primary data

Figure 5.5 Household-scale shrimp producers' experiences of borrowing money from shrimp buyer and bank, across all villages

Access to formal banking institutions seems to alleviate the financial dependency of household-scale shrimp producers on shrimp buyers in the studied villages. Evidence is visible in the case of Tanjung Ibus village. The villagers in Tanjung Ibus had a higher rate of borrowing from banks (approximately 33.33 %) and a lower level of obtaining regular credit from shrimp buyers (16.67%) compared to other villages (Figure 5.6). This reinforces the argument suggested by Khoi et al. (2013) that informal and formal credit sources can complement each other. However, there may be several factors that affect household-scale shrimp producers' accessibility to and preference for certain financial capital sources (Gine 2011). These are discussed in the following section.



Source: primary data

Figure. 5.6 Regular credit sourced from shrimp buyers and banks for household-scale shrimp producers by village

5.3.2 Choices between formal and informal credit

There are several factors affecting household-scale shrimp producers' decisions to access informal or formal credit sources. Formal credit usually requires a longer period of time to obtain due to administrative procedures such as developing a credit rating that is favourable and attending meetings with bank officers prior to a loan being approved. Banks are often located in urban areas;

thus, distance and mobility may be limiting factors to formal credit access. In comparison, there are no administrative requirements for obtaining a loan from shrimp buyers.

Convenience is a major factor leading households to borrow credit from shrimp buyers or relatives. Convenience in this study related to the timing of the need for credit and also to the ease associated with its access. Household shrimp producers can obtain a loan from shrimp buyers at any time as most buyers are eager to loan to increase supply. Shrimp buyers are also usually located in the same or neighbouring village as the shrimp farmers. Therefore, there are no constraints associated with distance and transport when borrowing from shrimp buyers. As stated by some respondents:

> I just go him and he gives the money to me the day I requested it and there is no interest for the loan (HSSP_MT1 2013; HSSP_MT2 2013; HSSP_MT12 2013).

This statement shows that this shrimp farmer did not face the burden of interest payments. However, this was not the case for all the farmers. Respondents in Babah Krueng village mentioned that shrimp buyers deducted Rp. 1000 (estimated around US$ 0.10 cent) from the published shrimp price if they borrowed money from the shrimp buyers (HSSP_BK4 2012; HSSP_BK7 2012; HSSP_BK8 2012). The reduction in the shrimp price implies its substitution for interest on a loan.

The study has found that education level is linearly associated with the ability of household-scale shrimp producers to access formal credit. Less educated and poorer farmers are more socially disadvantaged and thus, faced barriers to accessing formal credit. For example, farmers in Mayampa village who regularly borrowed money from a bank had more than nine years of schooling; three of six borrowers (50 %) were university graduates. In Mattiro Tasi, two of eight farmers that borrowed money from the bank were university graduates. As high as 93 per cent of those who never borrowed money from a bank had education levels of less than six years of schooling attended and 13 per cent of this cohort had never been to school.

The role of education in accessing formal credit is in line with Khoi et al.’s (2013) research which found that less educated farmers in rural communities in Viet Nam had a lower capability to access formal credit. Although the present study was conducted in a different context and applied different methods from those of Khoi et al. (2013) (who used purely quantitative method), the central argument that there is a negative relationship between low levels of education and access to credit holds across both studies. Low levels of literacy constrain access to formal credit, which relates to the administrative requirements requested by formal credit institutions. A borrower stated:

> First we needed to write a proposal and send it to the bank …. We have to make a business plan …. Head of village sent the application to the bank …. A bank officer then visited the location to audit the feasibility of the proposed business. The preparation and the process were helped by the village authority and the bank officers (HSSP_MT12 2013; HSSP_M8 2013).

This statement shows that writing a business plan and proposal can pose challenges for shrimp farmers with low levels of education. A certain degree of intellectual capability is required to develop a business plan proposal, following the required bank standards. Some respondents with less than six years of schooling stated that they needed external assistance, such as from a village authority, to develop a credit proposal (HSSP_MT12 2013; HSSP_M8 2013).

The structure of the formal credit institutions (e.g. the credit collateral system requirement) is also a factor that inhibits the ability of household-scale shrimp producers to access formal credit. Interviews with the head of the shrimp club in Medan and an officer of a bank in North Sumatra Province stated that banks do not accept shrimp ponds (farms) as credit collateral. The reason for this is associated with the risk and value of the asset. The banker said during the interview:

> It is very hard for banks to finance shrimp farming with the collateral shrimp ponds … The risk is very high and it needs high financial capital. It is hard to calculate the value of the shrimp ponds … Comparing to other agricultural commodities such as palm oil, we can calculate the value of the land, production and the demand of palm oil plantation is always promising, so can easily sell palm oil plantation than shrimp farms (BO_NS 2012).

This shows that shrimp ponds are not considered valuable enough to secure financial access from a bank. This study also found a lack of formal land tenure certificates (this is explained in the physical capital discussion in Section 5.5) for some household-scale shrimp producers. This is a constraint on access to formal credit. Although there exists the possibility of using their houses as credit collateral, the lack of a land certificate hinders shrimp producers' access to formal credits. This situation is also described by Koi et al. (2013) who found farmers who had legal ownership of their agricultural farms had a better chance of obtaining formal credit. Further, the present study assumes that houses in remote and rural coastal areas are less valuable than those closer to cities. Banks would not grant credit if the value of the collateral is less than the value of the credit proposed (BO_NS 2012; BO_SS 2013). These factors may result in the inability of household-scale shrimp producers to access financial support from a bank.

Whether household-scale producers can access formal credit or informal credit may affect their upgrading capabilities. In this context, the amount of money that can be granted as well as the ability to meet the requirements of the formal bank institution can be seen as drivers of the upgrading process. Shrimp buyers and relatives are usually capable of only providing small loans. The survey data showed that the size of the loan borrowed from shrimp buyers ranged between Rp. 50,000 (US$ 5) and Rp. 2,000,000 (US$ 200). The purpose of the loan was limited to purchasing production inputs such as seed, to addressing immediate household needs such as a cash flow shortage between harvesting seasons and to emergency financial needs such as the children's school fees.

In the case of credit from a bank, microcredit provided a credit platform of Rp. 20,000,000 (US$ 2000) for individual borrowers and Rp. 500,000,000 (US$ 50,000) for groups (Bank Rakyat Indonesia 2012). As discussed, banks required borrowers to have a clear business plan that is validated by bank officers and the feasibility of the proposed business evaluated. Such a system of formal credit access can trigger an upgrading for their farms through the exposure in developing a business plan. However, informal credit did not provide the same opportunity. For instance, a farmer from Mattiro Tasi applied for credit from a bank to start a shrimp nursery business. In this case, he integrated his shrimp production and shrimp seed-rearing business which strengthened his business position. He also mentioned that the process had enhanced his business planning skills. Thus, formal credit can affect upgrading opportunities and assist in the development of business plans.

Several studies have highlighted the disadvantages associated with borrowing money from informal credit sources. Gine (2011) and Dev (2006) argue that credit from money lenders to poor farmers can draw high interest rates. In India, interest rates reached 50–60 per cent (Dev 2006). Informal money lenders can also exploit poor borrowers and develop unfair relationships between the borrowers and lenders (Gine 2011). Therefore, it is necessary to look at how famers' access to formal credit can be enhanced through government intervention into pro-poor credit provision and through building the social capital of farmers among bank officers.

5.3.3 Enhancing access to formal credit

According to Li, Gan and Hu (2011) formal credit institutions' are usually overregulated in terms of credit collateral and administrative requirements. Gine (2011) argued that formal credit institutions prefer to support technology-intensive business. This preference can constrain poor the capability of poor households to access formal credit institutions. Thus, government interventions can minimise these barriers. Through a specific loan program targeting small-scale business, government intervention can alleviate barriers and facilitate access to formal credit for the poor (Khoi et al. 2013; Li, Gan & Hu 2011). In Indonesia, the business *Kredit Usaha Rakyat* (KUR), which translated as 'credit for communities', was launched in 2007 by the government. The program provides credit to small-scale businesses that can demonstrate a feasible business plan, but are not yet bankable (KUR 2014). The program relaxes the minimum requirements for collateral. For instance, one credit recipient stated that his motorbike was sufficient collateral for a loan in this scheme. This enabled him to have his first experience of borrowing money from the bank in 2010 with a loan of Rp. 5,000,000 (US$ 500) and an interest payment of Rp. 700,000 (US$ 70) over a six-month period. The second loan was approved for Rp. 15,000,000 (US$ 1500) in 2012 (HSSP_MT22 2013).

Active engagement between bank correspondents and remote villagers can enhance the ability of rural households to access formal credit. This engagement may depend on the organisational structure of the formal credit institution; it may relate to the extent that banks deploy their officers to support rural communities and their financial needs. According to Diniz et al. (2011), correspondent networks of social groups play a significant role in improving access to banks in the Amazon. From this perspective, social capital may positively affect access to credit (Dowla 2006; Van Bastelaer 2002). The correspondents' function is to provide information and facilitate contact between banks and poor people, predominantly those who live in remote villages. The correspondent network may also reduce transaction costs for the poor living in remote areas (Sarma & Pais 2011). In this study, this factor has been observed as an explanation for the different levels of access to formal credit institutions in the studied villages. In-depth interviews with bank credit recipients in Tanjung Ibus and Mattiro Tasi villages detail the role of the correspondent. A recipient from Tanjung Ibus village stated:

> People from the bank came here and offered me a loan … but this is not the first time I took a credit from a bank ... I knew him because he came here many times. I also have his mobile number (HSSP_TI5 2012).

A recipient at Mattiro Tasi village also added:

> I received credit information from my friends. I heard that there was a promotion of a credit from a bank … some of my friends here also received similar credit …. We were also helped by our village authority *(*HSSP_MT22 2013).

While the KUR program was also available in Aceh Province, the survey data showed that none of the household-scale shrimp producers from the villages studied in Aceh Province had received credit from a formal institution. This study also observed that bank officers in Aceh Province were less active compared to bank officers in South Sulawesi and North Sumatra Provinces. This study did not find any farmers mentioned a visit to the villages by bank officers in Aceh Province. This condition may reaffirm that the active engagement of bank correspondents plays a significant role in the process of accessing credit among the poor. The absence of active bank correspondents in Aceh Provinces resulted in access to the KUR program being restricted. Based on these cases, it could be concluded that active correspondents from formal credit institutions facilitate the development of social capital between poor households in rural areas, thereby, enabling greater access to formal credit institutions.

Sarma and Pais (2011) found that paved roads and telephone and internet technologies are also significant factors that shape formal financial inclusion. These factors determine connectivity and information availability. Bank correspondents in remote villages can substitute for internet and telephone requirements because they provide a direct source of information and can respond to enquiries. Therefore, bank correspondents play a very important role in assisting household-scale shrimp producers who have low literacy of computer and internet technologies (details in Section 5.5).

5.4 Social capital and external drivers

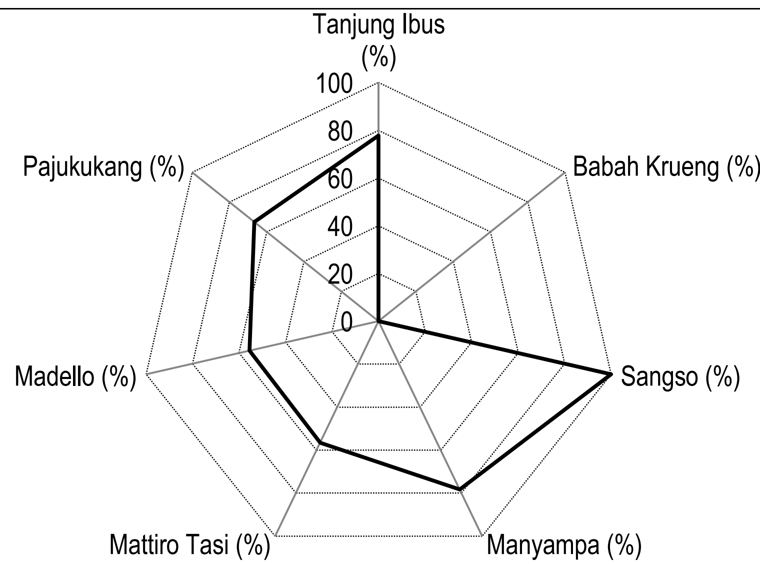
There are horizontal and vertical forms of social capital including relationships between farmers, relationship between farmers with government officials and value chain actors. As discussed in Chapter 1, social capital in economic development and poverty (Grootaert 1999; Helliwell & Putnam 1995; Knack 2002; Puttnam, Grootaert & van Bastelaer 2002; Woolcock & Narayan 2000). Social capital can contribute to access to other types of capital and to participation in export markets. For example, shrimp farmers' networks with government and bank officials play a significant role in access to formal credit as discussed in Section 5.3, which is a means for investment required to access export markets. Further, farmers' networks with value chain actors determine the type of value chains in which farmers can participate (discussed in Chapter 7), that can determine their ability to comply with traceability.

Despite the existence of various forms of social capital, this study focuses on shrimp farmer groups, and farmers with actors along the value chain (input and market actors). Further, this chapter focuses on shrimp farmer groups for household-scale farmers only. Details of farmers' networks with actors along the value chain are presented in Chapter 7 since they relate to the value chain analysis of each category of shrimp producers.

The importance of shrimp farmer groups lies in the collective action of the members who contribute to the capability of members to participate in lucrative markets. Collective action may also fill capability gaps that cannot be addressed by individuals. Collective action is essential for household-scale shrimp producers due to the fact that a large number of farmers with small area farm and small yields. Collective action in harvesting results in a higher volume of product and can minimise the complication of traceability requirements associated with marketing chains. Collective action may also enable farmers to shorten their supply chain by direct marketing to cold storage. This can also benefit the importer through the improvement of product freshness. A simple supply chain is more traceable than a complex supply chain (discussed furthered in Chapter 7). Simple supply chains can also reduce transaction costs, resulting in production cost efficiency (Key, Sadoulet & De Janvry 2000; Markelov et al. 2009). Farmers can receive a cheaper price for production inputs and share transport costs through collective action (Markelov et al. 2009). The approach can also develop market power comparable to other actors along the value chain due to the strength generated by the group's critical mass (Valentinow 2007). A study by Narrod et al. (2009) found that the collective action of smallholder farmers in Kenya and India contributed their capability to comply with food safety requirements set by the European markets. A similar effect, therefore, can be suggested for Indonesian household-scale farmers.

This study found groups of shrimp farmers across the six studied villages, with the exception of Babah Krueng (see Figure 5.7). Aggregated data for the six villages showed that the majority of farmers (60 %) were members of farmer groups. However, there were disparities in levels of group membership among the studied villages. Sangso village had the highest frequency of group membership; all respondents were members of shrimp farmer groups. The difference in the level of group participation by farmers across the six villages tends to relate to socialization of the existence of the farmer groups in villages. Some farmers said:

> I don't know if there is a shrimp farmers' group … I have never heard from the village authority if they build groups … I was never invited …. (HSSP_ M1 2013; HSSP_M2 2013; HSSP_MT12 2013; HSSP_MT13 2013).



Source: primary data

Figure 5.7 Frequency of shrimp farmers who are members of farmer groups

External intervention from governments or NGOs propels the development of small-scale agricultural farmer groups in developing countries (Hellin, Lundy & Meijer 2009). Intervention-driven small-scale business groups are common in Indonesia. A study by Standford et al. (2014) on small-scale fisheries groups in West Sumatra Indonesia also argued that the groups arose in response to the Indonesian government's poverty alleviation program. This study found that the formation of household-scale shrimp farmer groups in Tanjung Ibus, Manyampa, Mattiro Tasi, Madello and Pajukukang Villages was predominantly driven by the DKP at the district level. By forming a group, the farmers aimed to receive physical support such as shrimp seed provisions and other production input provisions. The head of aquaculture department from the DKP of East Aceh District (DKP_EA1 2012; DKP_SS1 2013) stated:

> One of the requirements to be eligible as a beneficiary is shrimp farmers should establish a group. Support is not given to individual recipients, but is delivered through shrimp farmer groups.

Thus, the groups arose out of the official requirements for project beneficiaries.

In the case of Sangso village in Aceh Province, group development was driven by NGOs' program for tsunami rehabilitation and reconstruction. This village had received extensive interventions from various international organisations since 2005. For instance, the ADB provided support for pond and canal reconstruction and for production inputs. The FAO, WWF and the Network of Aquaculture Centres in the Asia-Pacific (NACA) supported capacity building, particularly for better shrimp farming management practices. Recently, the WorldFish Center facilitated direct access for shrimp farmers to exporters to enhance their markets. In comparison to the project beneficiary criteria of the government project explained above, NGOs also required farmers to create groups to receive support (VH_Sg 2012; VF_Sg 2012).

However, political conflict can create security problems, which in turn, can inhibit the ability for organisations to implement interventions. This explains the absence of a shrimp farmer group in Babah Krueng village (Figure 5.7). None of the respondents from Babah Krueng indicated that they were members of a shrimp farmer group. As noted earlier, Babah Krueng village was a base for Free Aceh Movement (GAM). GAM was targeting government officers during the conflict prior 2005. This created insecurity and fear which were still sensed until 2010, constraining the ability of government officers to access the village. A respondent from the DKP of East Aceh District stated:

> We never went to that area because of insecurity …. We never wear our government uniform outfits and used our vehicles given by the government if went to villages during the conflict because we will be easily identified by them [GAM members], so will be easily targeted (DKP_EA 2012).

Feelings of insecurity and fear were also identified during interviews with several respondents from NGOs:

> That area is the base for GAM; it is quite risky to work together with them (NGO_NAD 2012).

Consequently, this village was excluded from development projects supported by the government and NGOs. This could explain why there were no farmer groups in the village. Thus, political instability can be a hindrance to the development of farmer groups. This can lead to marginalisation and a reduction in the potential benefits of social capital.

5.5 Physical capital

In this study, physical capital is classified into production facilities and non-production facilities. Production facilities refer to major equipment necessary for shrimp farming. The type of farming equipment used reveals the level of shrimp farming technology used, which determines overall productivity (Weidner & Rosenberry 1992). Production-related physical capitals evaluated in this study are limited to the equipment commonly used across the Indonesian shrimp farmer groups including paddlewheels, generators, water pumps and harvesting facilities. Public infrastructure such as water canals and electricity provision is also included in the production of physical capital. Public infrastructure significantly supports shrimp farming. The quality of the water canals determines the supply of sufficient and good quality water for brackishwater ponds. Water quality is a critical factor affecting the operation of shrimp farming aquaculture (Chien 1992). In shrimp farming, electricity is required to operate production equipment such as paddlewheels, aerators and pumps (Suyanto & Mujiman 1995; Weidner & Rosenberry 1992).

Non-production facilities are not directly required in production, but bring social and economic benefits to shrimp producers. These include vehicles, houses, computers and mobile phones. Vehicle ownership and type of house have been used to measure the welfare levels of rural households (Reardon & Vosti 1995). Vehicles enable mobility (Reardon & Vosti 1995) which can contribute to the endowment of other capitals such as social and human capital. Endowment of these capitals can assist shrimp farmers to upgrade. Computers and mobile phones are required to access information, which pertains to knowledge endowment.

The core argument of this physical capital section is that the majority of Indonesian household-scale shrimp producers only have basic production facilities, which restricts their productive capacities to the application of extensive technology. In addition, type of house and presence of a toilet indicate the farmers' level of financial capability to build these facilities. It also relates to the household's perspective on hygiene, which relates to understanding of food safety. Awareness of food safety practices may be required for the social change needed to facilitate upgrading.

Discussion about physical capital in this chapter focuses on household-scale shrimp producers' ownership of basic equipment (e.g. shovels and nets), paddlewheels, water pumps, generators, houses, toilets and vehicles. Other physical capital variables are presented in Chapter 6 in a comparison of physical capital endowment levels between different groups of shrimp producers.

5.5.1 Production facilities

In all of the villages studied, endowment of physical production facilities was very limited. The majority of small-scale producers had only basic equipment for manual work such as shovels and harvesting facilities such as harvesting nets and fibreglass boxes (Figure 5.8). In each village studied, the proportion of ownership of basic equipment among household-scale shrimp producers was 75 per cent or higher (Figure 5.9). Some did not even possess these basic production facilities. The absence of basic production facilities relates to financial capital endowment. Those who do not have these facilities are farmers with less than 0.5 ha of shrimp farms. They usually borrow equipment from their neighbours or relatives when it is required.

Household-scale shrimp producers' ownership of paddlewheels, generators and water pumps is even more limited. Figure 5.8 and 5.9 present the level of ownership of equipment in the studied villages. The paddlewheel's function is to aerate the water body to maintain dissolved oxygen concentrations (Avnimelech & Ritvo 2001; Weidner & Rosenberry 1992). Paddlewheels were owned by only 9.5 per cent of all household-scale shrimp producers. In the case of generators and water pumps, the data showed that only 6.5 per cent and 25 per cent utilised these facilities, respectively.

Paddlewheels and generators are seen as more advanced facilities for household-scale shrimp producers in Indonesia. Usage of these facilities relates to the type of shrimp farming technology applied (Donovan & Poole 2014). Farms that applied semi-intensive shrimp technology were likely to use these production facilities, as seen in Madello and Tanjung Ibus villages. Adoption of higher-level technologies increases production costs, as described in Chapter 2. Thus, semi-intensive farming systems have higher production costs than extensive systems.

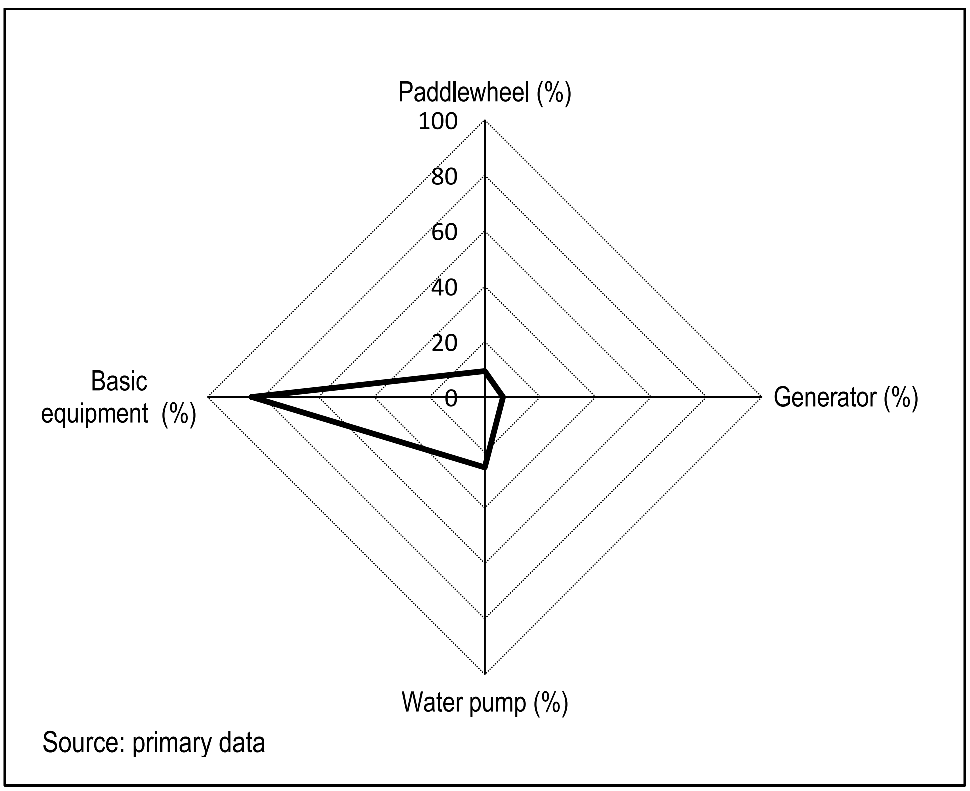


Figure 5.8 Production facilities owned by household-scale shrimp producers as a percentage of all villages

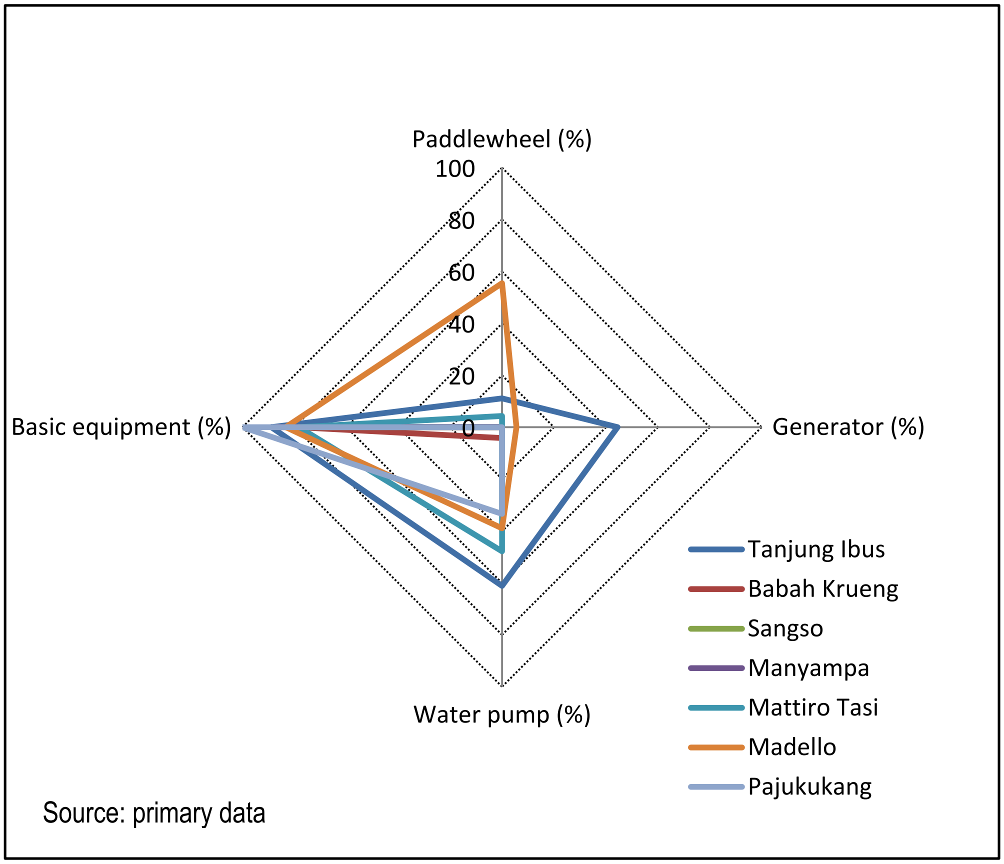


Figure 5.9 Household-scale shrimp producers' shrimp farming facility ownership, as a percentage, by village

Natural capital drives the requirement for certain shrimp production assets. Limitations in natural capability can affect ownership of physical assets. This was found in the case of the water pump.[9] Water pump ownership in Mattiro Tasi village related to the village's limited access to water because of the unsuitable water canal system design. Shrimp farms in the village were developed in former rice fields; irrigation was developed to support rice farming which required freshwater supply and inhibited seawater inflow from the ocean. Thus, shrimp farms in this village had problems accessing seawater; the salt level in the water is insufficient for shrimp farming. To solve this problem, shrimp

[9] The study also found that the use of a water pump was not limited to shrimp farming; it was also needed for households to access fresh water. This was found in Pajukukang village; as presented in the village description, this village is located along the seashore and plumbed fresh water supply (PAM) is limited. Thus, some of the households use the water pumps to meet their daily fresh waters from a bore.

farmers use water pumps to capture sea water from the river during high tide. However, a limited number of household-scale shrimp producers in the village were able to purchase a water pump. Most had to rent a water pump. This natural capital limitation can be considered the main issue restricting shrimp production. Shrimp farmers stated:

> Our problem is insufficient supply of salt water … We have to rent a pump to fill our ponds, the cost is Rp. 50,000 per hour (US$ 5) and we may need it for 8 hours to fill our ponds … and often we have to wait if the water pump is being used by others (HSSP_ MT3 2013, HSSP_MT4 2013, HSSP_MT8 2013, HSSP_MT9 2013).

5.5.2 Non-production facilities

5.5.2.1 Houses

Type of houses and sanitation facilities owned by household-scale shrimp producers varied for each village. Although type of house may not directly relate to the upgrading potential of shrimp producers, it can reflect their level of financial capital endowment (Ellis 2000a, 2000b; Lindenberg 2002). It also provides shelter and a space for interaction among household members, which supports the development of human capital. This can influence upgrading capability.

Table 5.1 Type of houses owned by household-scale shrimp producers (%)

Type of house[10]	**Tanjung Ibus**	**Babah Krueng**	**Sangso**	**Manyampa**	**Mattiro Tasi**	**Madello**	**Pajukukang**
	(%)	(%)	(%)	(%)	(%)	(%)	(%)
Wood	11.11	70.83	17.65	21.74	73.91	66.67	73.33
Semi-permanent	27.78	20.83	17.65	26.09	13.04	5.56	13.33
Permanent	61.11	8.33	64.71	52.17	13.04	27.78	13.33

Source: primary data

The abilities of household-scale shrimp producers to build their desired house differed. Permanent houses were the most desired house, particularly in North Sumatra and Aceh Provinces. However,

[10] Permanent refers to a house which has the main structure and walls built using concrete or cement and brick; semi–permanent refers to a house that has walls constructed using a combination of concrete and wood.

most shrimp farmers do not have permanent houses (see Table 5.1). The ability to build a desired house seems to strongly correlate with financial capacity. For example, a shrimp farmer stated that building a basic permanent house (excluding land costs) would cost at least Rp. 30,000,000 (US$ 3,000); while a basic wood house may cost less than Rp. 10,000,000 (US$ 1,000) (HSSP_BK17 2012). The relationship between financial ability and dwelling type was also visible in Tanjung Ibus. Respondents from this village stated that their permanent houses were funded by revenue gained from shrimp farming that peaked in the mid-1980s and late 1990s. Shrimp farmers enjoyed large profits during this golden era of tiger shrimp production due to the high exchange rate between the US dollar and Indonesian currency:

> At that time all shrimp farmers were rich, we had money to go to *haj* and we also built nice houses like what you see. If you see all permanent houses in this area, all were money from the golden era of shrimp farming. This village was like a city, people were busy making business. Many shrimp buyers and inputs suppliers did business here (HSSP_TI 18 2012).

This study noted that in Babah Krueng and Tanjung Ibus villages, families who lived in wooden houses tended to be poorer than those who lived in semi-permanent and permanent houses. In Babah Krueng village, the high numbers of households living in wooden houses may relate to the background of this village. As mentioned earlier, this village was formally a base for the GAM separatist group. Respondents stated that they could not do any agricultural farming during the conflict. Agricultural areas including shrimp ponds were used as battle fields. As a result, household-scale farmers' incomes were compromised through the conflict and were not able to invest in their desired houses. Therefore, it is reasonable to suggest that conflict had negatively affected farmers' livelihoods, constraining their ability to build desired houses.

Although the percentage of households with wooden houses in Babah Krueng, Mattiro Tasi, Madello and Pajukukang villages are comparable, there were differences in the social values attached to wooden houses. In South Sulawesi Province (Mattiro Tasi, Madello and Pajukukang villages), wooden houses did not necessarily imply that owners were from a lower economic position. This is because the architecture and the structure of houses in South Sulawesi relates to local cultural influences and history (Arsyal 2011). According to Robinson (1997), houses in these areas are an integral part of local identity; the houses have unique structures and wood is the main structural material in the traditional houses found in coastal villages in South Sulawesi (Arsyal 2011). For instance, a shrimp farmer in Madello was a feed broker and was perceived as having a higher degree of economic ability than others in the village, and had a wooden house. Several semi-intensive farmers in Madello also were also living in wooden houses, although they were viewed as highly financially-capable households (FD 2013; HSSP_MD4 2013). So despite their wealth, they built wooden houses following traditional preferences. However, there were differences in structure and materials used in wooden houses between wealthier families and poorer families, as presented in Plate 5.1.

Plate 5.1 The difference between the (a) desired and (b) poor wooden houses in South Sulawesi; a representation of the quality of materials and design

5.5.2.2 Sanitation facilities

Type of sanitation facilities (toilets) did not only reflect the social economic level of communities, it also reflected awareness of the importance of sanitation in food production by household-scale shrimp producers. Sanitation perspectives relate to the ability to meet food safety export requirements. As explained in Chapter 4, meeting sanitation requirements and health standards set by the EU and the US presents a major challenge for household-scale shrimp producers (European Commission 2013; FDA 1995, 2011). Thus, the type of sanitation facilities of producers influences their capability to meet food safety standards (Pinstrup-Andersen 2002; Roy & Thorat 2008).

Table 5.2 Type of toilets owned by household-scale shrimp producers

<table>
<tr><td rowspan="2">Type of toilet</td><td>Tanjung Ibus</td><td>Babah Krueng</td><td>Sangso</td><td>Manyampa</td><td>Mattiro Tasi</td><td>Madello</td><td>Pajukukang</td></tr>
<tr><td>(North Sumatra Province)</td><td colspan="2">Aceh Province</td><td colspan="4">South Sulawesi Province</td></tr>
<tr><td>Wood (%)</td><td>0</td><td>75</td><td>17.65</td><td>13.04</td><td>17.4</td><td>11.11</td><td>6.67</td></tr>
<tr><td>Semi-permanent (%)</td><td>16.67</td><td>4.17</td><td>17.65</td><td>47.83</td><td>56.52</td><td>44.44</td><td>33.33</td></tr>
<tr><td>Permanent (%)</td><td>83.33</td><td>25</td><td>64.71</td><td>30.43</td><td>21.74</td><td>38.89</td><td>33.33</td></tr>
<tr><td>Do not have (%)</td><td>0</td><td>8.33</td><td>0</td><td>8.7</td><td>4.35</td><td>5.56</td><td>26.67</td></tr>
</table>

Source: primary data

This study found sanitation levels in the villages studied to be very basic. It may affect their capacity to meet food safety requirements (discussed further in Chapter 6, Section 6.2.4). This study found some of the households did not have a toilet in their houses that channelled effluent to a sewerage system or that had any other means of preventing faecal matter from entering ponds (Table 5.2). Many farmers used shared toilets; some of these toilets discharged human waste into the same water source used for shrimp farming. This indicated that building a toilet that adequately manages waste was perceived as either not important, or, was not financially viable. Inadequate toilet systems were found particularly in Pajukukang village which had the lowest percentage of sanitation facilities (26.67 %). Although the percentage of interviewed households without toilets in the other villages was quite small, this finding still indicates that sanitation issues are present in the coastal shrimp-producing villages.

Sanitation awareness among Indonesian household-scale shrimp producers may be associated with financial and human capital endowments. Financial capital is associated with the ability to prioritise the expenses of building better sanitation units over other household expenses. Farmers from Pajukukang and Mayampa said:

> I do not have money to build a toilet … If I use the money to build a toilet how can I feed my family and there will be no money for children (HSSP_P4 2013; HSSP_P8 2013, HSSP_P10 2013; HSSP_M9 2013, HSSP_M10 2013, HSSP_M26 2013).

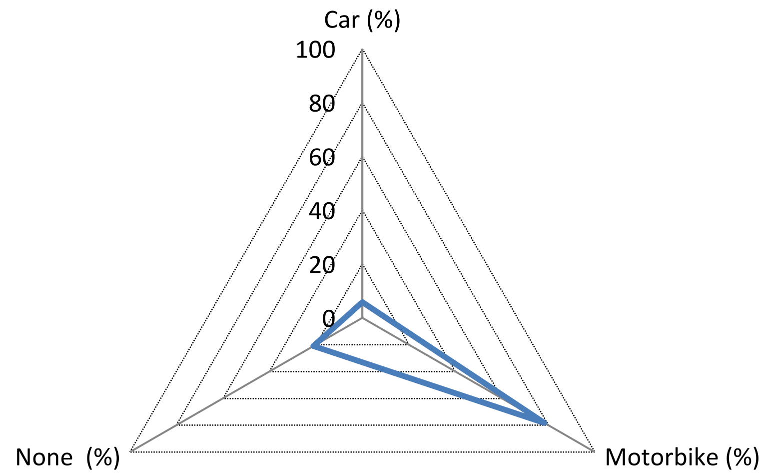
Level of financial capital is not only a factor that explains the absence of sanitation facilities. Human capital and cultural norms also affect understandings of good sanitation. For example, farmers may perceive good sanitation as not a crucial issue if there is still an alternative to a toilet that prevents waste entering the canal system. One respondent said:

> We do not need to build a toilet because we still can use the river (HSSP_P2 2013, HSSP_P8 2013, HSSP_M11 2013, HSSP_P15 2013; HSSP_M1 2013; HSSP_M3 2013, HSSP_M5 2013, HSSP_M7 2013).

Therefore, the level of understanding in this community meant that such sanitation practices were perceived as normal.

5.5.2.3 Mobility

This study found that household-scale shrimp producers have limited mobility. Motorbikes were found to be the dominant vehicle purchased by small-scale producers in all villages studied (see Figure 5.10 and 5.11). Approximately 78.2 per cent of the small-scale shrimp producers interviewed had motorbikes and only 5.8 per cent could afford to buy a car. A high number of household-scale shrimp producers are still unable to buy a vehicle (21 %). Having a vehicle not only provides access to information and financial systems, but also reduces the cost of transporting farm inputs.



Source: primary data

Figure 5.10 Percentage of vehicle ownership among household-scale shrimp producers and type of vehicle, all villages

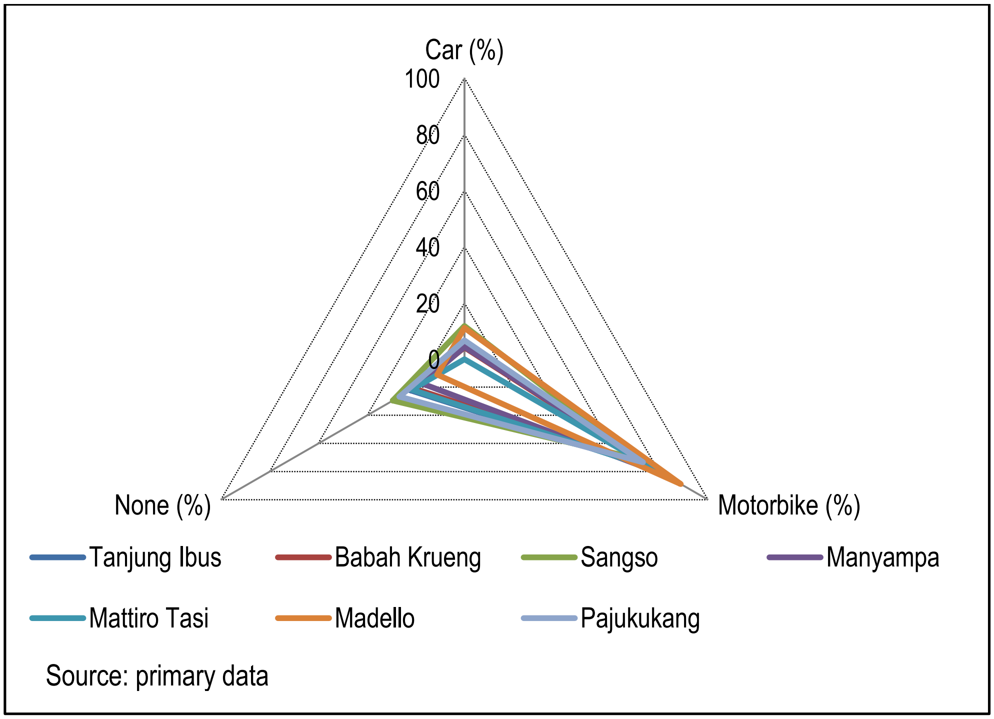


Figure 5.11 Percentage of vehicle ownership among household-scale shrimp producers and type of vehicle by village

Financial capital was the main factor affecting the ability to purchase a car. A car was considered a luxury vehicle and costly for household-scale shrimp producers in relation to their income; they could only afford to buy motorbikes. Those producers who could afford to buy a car for their families were viewed as 'well-off' households. This study found that shrimp farmers who had a car also had shrimp farms larger than 10 ha. They also conducted other profitable businesses such as trading.

Limited mobility restricts household-scale shrimp producers' potential to upgrade their livelihood capitals. Limited mobility has been found to constrain social capital development (Isham 2002; Porter 2002) and constrain access to information, thereby, reducing access to markets (Reardon & Vosti 1995). Although the majority of the small-scale producers had a motorbike, motorbike mobility is still limited when compared to a car (this is further discussed in relation to industrial- and transnational-scale farmers in Chapter 6). Further, those who do not own a vehicle are at the risk of becoming marginalised at an administrative village level (Porter 2002). This is because they must rely on public transport or other people to help. Based on observation, public transport in the rural villages was also limited. For instance, there were only two or three public transport trips per day in Mattiro Tasi village.

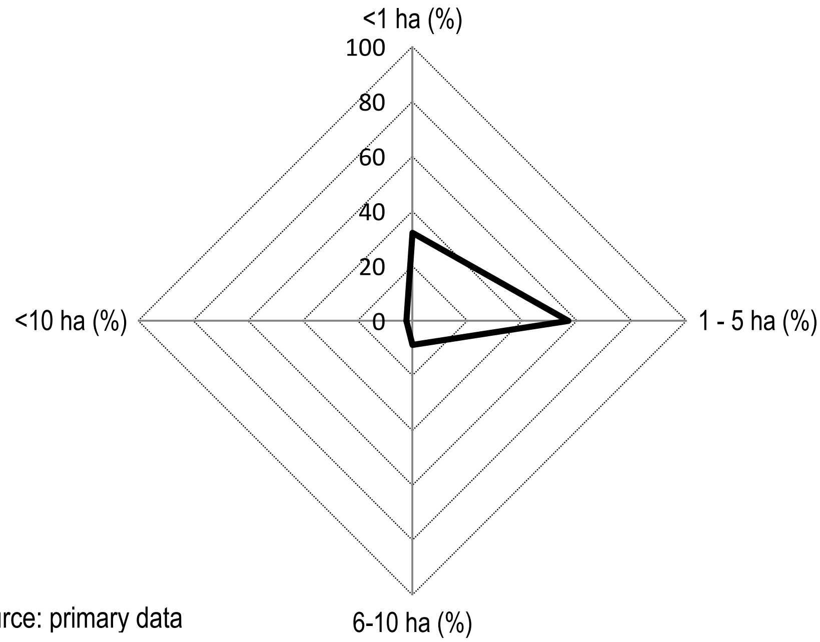
To re-emphasise, Mattiro Tasi is around 30 kilometres from the district town and 240 kilometres from the provincial capital city. Shrimp farmers without vehicles rely on public transport and the drivers to buy inputs for shrimp farming such as feed. Consequently, shrimp farmers have to pay an additional cost—as much as Rp. 10,000 (US$ 1)—for the driver's services in addition to the transport costs (HSSP_MT8,9,10,13,19,20 2013).

5.6 Natural capital

The analysis of natural capital here focuses on the size of shrimp farms and ability to access suitable areas for shrimp farming. The area of a shrimp farm is one factor that determines the quantity of production. As discussed, the size of the shrimp harvest can affect the ability of farmers to participate in lucrative export markets. First, the relationship between farm size and export market participation relates to transaction costs; a small shrimp farm requires lower inputs and produces a small yield, resulting in higher transaction costs. Second, the size of the shrimp harvest per farm affects the value chain in terms of product traceability. In Indonesia, household-scale shrimp producers with small harvests buy production inputs and sell their yield through intermediaries. This results in a longer value chain, complicating traceability (further discussed in Chapter 7).

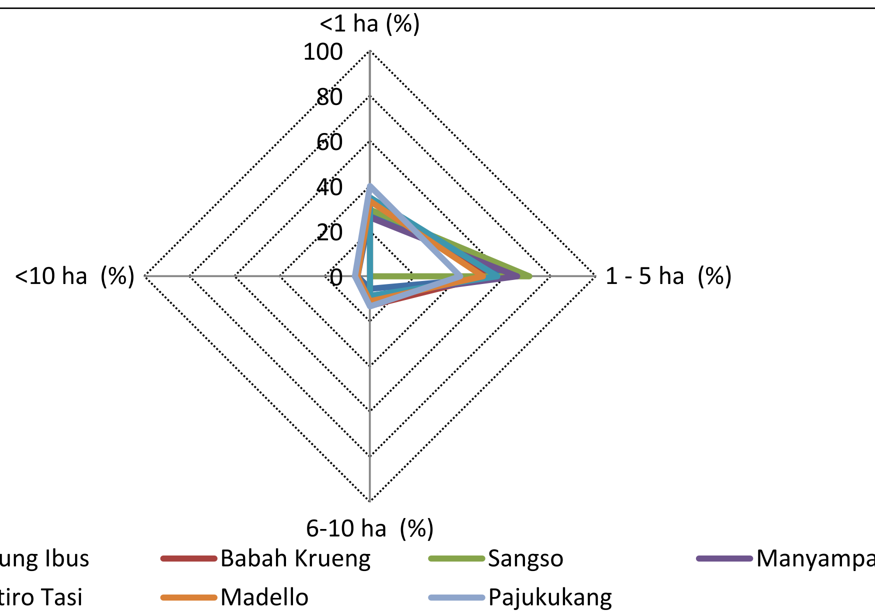
Access to suitable locations for shrimp farming is important because shrimp farming requires particular soil types, good quality water supply and the right terrain slope to manage water exchanges. The characteristics of the land used are a major factor determining the success of shrimp farming (Phillips 1995). Water quality includes salinity and pH levels and concentration of oxygen and minerals. These factors are determined by land characteristics and proximity to brackishwater and have a major impact upon the success of shrimp culture (Boyd & Tucker 1998; Palanikumar, Velmurugan & Citarasu 2011). Soil quality, tidal regime, water supply, topography and climate are important considerations for selecting shrimp farming sites (Poernomo 1990). Farms that are constructed in unfavourable environments are likely to fail (Kumlu, Eroldogan & Aktas 2000; Palanikumar, Velmurugan & Citarasu 2011; Ponce-Palafox, Martinez-Palacios & Ross 1997; Sammut & Hanafi 2002; Spanopoulos-Hernández et al. 2005; Zhang et al. 2007). For example, unsuitable pH level can cause shrimp mortality, disease and a poor quality of shrimp which make shrimp farmers' livelihoods more vulnerable (Palanikumar, Velmurugan & Citarasu 2011; Sammut & Hanafi 2002).

This study found that the vast majority of household-scale shrimp producers operate shrimp farm areas that are less than 5 ha (Figures 5.12 and 5.13). Around 89 per cent of all household-scale shrimp producers in this study had shrimp farms that are less than 5 ha. This supports the general argument that household-scale shrimp producers have small area of shrimp farm (Asniati 2009; Astuti 2007; Belton & Azad 2012; Bosma et al. 2012). In some villages, the percentage was higher; Sangso village (100 %), Manyampa (91.3 %) and Mattiro Tasi (91.3 %) villages had higher than the overall percentage of shrimp farmers operating farms on less than 5 ha of land.



Source: primary data

Figure 5.12 Size of household-scale shrimp farms, all villages[11]



Source: primary data

Figure 5.13 Size of household-scale shrimp farms, by village

[11]Shrimp farms operated by farmers include those owned, leased and shared.

The majority of household-scale shrimp producers have their shrimp ponds near to their house. It was found that approximately 45 per cent of respondents' shrimp ponds were located less than one kilometre away from their houses and 30 per cent were located 1–3 kilometres away. Plate 5.2 illustrates the typical distance between shrimp farmers' houses and their shrimp ponds. These distances suggest that the majority of shrimp ponds operated by household-scale shrimp producers were located in their villages or within neighbouring villages. This also indicates that decisions to select a certain location for their shrimp farms are based primarily on accessibility rather than based on a justification whether a location is suitable for a shrimp farming. For example, it was observed in Pajukukang village that some of the shrimp ponds were located below sea level. Shrimp famers in this village regularly faced floods which destroyed their ponds. This suggests that the selection of a suitable and successful shrimp farm location may come down to the luck of selecting a particular geographical location to live. This suggests that household-scale shrimp producers have a limited ability to seek and select suitable farm locations at further distances from their homes. In this study it was found that only two per cent of household-scale shrimp producers have shrimp ponds located in other provinces. The ability to select a shrimp farming area from a wider range of land options relates to the financial, mobility and human capitals of the farmers, which are explained in the following paragraphs.

Plate 5.2 Geographical proximity of household-scale shrimp ponds to farmers' homes in South Sulawesi

Financial capital is an important factor affecting access to an area for shrimp farming; it finances the cost to seek and acquire a suitable location for shrimp farms. A study by Donovan and Poole (2013) found that financial capital, including on- and off-farm income and credit, can enable smallholder coffee farmers to expand their farms. Donovan and Poole suggested that there was a positive linear relationship between financial capital and land access. Some of the respondents from the present study stated:

> You need lots of money to buy large and good area for shrimp farms … I did not have money to choose … You need money to travel to seek and look the location before making a decision of purchase the land … I did not have money to buy shrimp ponds at the other province [Kalimantan], so I only bought around here … that was the place available here (HSSP_M1 2013, HSSP_M3 2013; HSSP_P9 2013; HSSP_MT19 2013).

However, ability to access land also relates to the history of some household-scale shrimp producers for choosing certain land, and the level of household-scale shrimp producers' knowledge of the environmental requirements for shrimp farming. As presented in Chapter 2, early shrimp farmers justified engaging in aquaculture production as a way to fulfil their protein needs. Available water supply for shrimp ponds was the main reason why shrimp farms were built in a particular area. Shrimp ponds were built close to or along a brackishwater river. For example, aquaculture production in Manyampa village commenced following initial settlement, when settlers cleared and occupied the area for living. They cultivated various types of agricultural goods to supply their daily needs. The villagers gradually adopted brackishwater aquaculture. The occupied land was then inherited to the next generations. One respondent said:

> This area used to be a primary jungle … My grandfather was the pioneer of this area. He was a pioneer from Herlang, an area located in high land … around 20 kilometres away from Manyampa village. He came to this area and started to open this area in the 1930s prior to Indonesia’s independence. His initial aim was to make a settlement in this area and plant commodities such as coconut, corn and sugar palm trees … The country was still under Dutch control … The pioneer claimed this area and invited people from other areas to open access. He was defined as the landlord of this area and head of the area … Those who helped him were rewarded land with a size of 50 metres in width and from the road to the river in length ... At that time, he invited more and more people to come to this area by offering the land … the idea was just to make this area become more populated …. and then the land was passed to the younger generations … After a few settlers … the Dutch improved the road access around the late 1930s …. Aquaculture was started in the 1950s (VH_M 2013).

This narrative indicates that the sites for shrimp farms were selected for convenience, not informed by knowledge about which sites would be best for shrimp aquaculture. Thus, ponds were built without understanding the environmental requirements of shrimp farming.

Shrimp farmers still demonstrate limited knowledge about land suitability for shrimp farming. For example, Sammut and Hanafi (2002) found that the majority of household-scale shrimp producers in South Sulawesi lack the technical knowledge needed for site selection. Sammut and Hanafi showed that between 102,610 ha and 380,620 ha of household-scale shrimp farms distributed in South Sulawesi Province were built in acidic soils, which resulted in production problems. This may negatively affect farmers’ capabilities to export (discussed further in Chapter 6).

5.7 Complexity in livelihood capitals

The analysis of livelihood capitals presented above shows that there are complex relationships between livelihood capitals in the endowment process. The relationship is reciprocal and in some cases, loop-like. The endowment of a capital is a means for the endowment of another capital, although it can also be an end in itself (Anand & Sen 2000; Streeten 1994). For example, as discussed, farmers' relationships with bank officials (social capital) were a means to access formal credit (financial capital). Financial capital represents an end in itself; it also provides the means to buy an area for a shrimp farm. This transforming process of social capital into other types of capital evidences Bebbington's (1999, p. 2023) argument made in an early capabilities study:

> As rural people try and access resources they do so through engaging in relationships with other actors who are both present, but more often than not usually absent from the day-to-day activities of rural people. Indeed access to other actors is conceptually prior to access to material resources in the determination of livelihood strategies.

Endowment of a livelihood capital requires the accumulation of different forms of livelihood capitals. Thus, endowment of a capital has multivariate relationships with other livelihood capitals (Ellis 2000a; Donovan & Poole 2014; Pigg et al. 2013; Stanford et al. 2014; Stofferahn 2012). A recent study by Donovan and Poole (2013) showed that human capital (leadership, professionalism and skills), social capital (long-term commitments with buyers and networks with NGOs) and financial capital (access to alternative microcredit) played a significant role in building a cooperative of coffee farmers (reflecting social capital). Stofferahn (2012) suggested that cultural, social and human capitals were keys of endowment to political capital, which was needed to obtain the financial capital required to restore and build infrastructure. An example of this chain of capitals from the present study is that the accumulation of human, financial, social and physical capitals contributed to shrimp farmers' ability to select suitable locations for shrimp farms (natural capital). First, the farmer required human capital in the form of knowledge about the environmental requirements of operating a shrimp farm. This capital was complemented by networks with people who had access to targeted area. Financial capital was also critical to finance land acquisition as well as other administrative procedures required.

The need for multiple livelihood capitals for capital endowment does not only depict the multivariate relationship, it also suggests that initial capitals owned by individuals determine the ability of a person to access or to enhance livelihood capitals. This argument is in line with those suggested by Bebbington (1999) and Emery and Flora (2006). From this perspective, an individual or a group with higher stocks of capitals has a greater ability to accumulate capitals. As suggested by Bebbington (1999), the ability to access 'spheres' (a term to visualise an area of achievement) is significantly affected by initial capabilities, which are derived from previous endowment of various capitals. Emery and Flora (2006) defined this as the 'spiraling-up' process of capitals. This means that those individuals who have the least endowment of capitals may have a lesser ability to enhance or attain livelihood capitals to the same degree as those who have a greater initial endowment of livelihood capitals.

In addition to existing livelihood capitals driving endowment of other capitals, intervention also enables livelihood capital endowment. Interventions through policy and process can be favourable for poor farmers facing disadvantage and greater vulnerability; it enables people to access livelihood assets (Ellis 2000a, 2000b; Allison & Ellis 2001; Allison & Horemans 2006). While restricted access to formal credit has contributed to the marginalisation of small business, interventions such as KUR have enabled some household-scale shrimp producers to access formal credit. Interventions from NGOs play an important role in the formation of shrimp farmer groups such as those seen in Sangso village. These groups can create opportunities for individual farmers through collective action. Nevertheless, the complexities around capital endowment mean the attainment process involves multivariate relationships between various livelihood capitals, rather than a linear relationship between a particular capital endowment and a specific intervention.

5.8 Conclusion

The discussion in this chapter demonstrates the necessity of a mixed method approach for livelihood studies. Quantitative method was used to measure the percentage of endowment of livelihood capitals. The analysis also required a description of the social phenomena in the communities. For example, this involved describing the relationships between the history of aquaculture in Indonesia and household-scale shrimp producers' access to natural resources. Such processes can only be achieved through a qualitative approach. Thus, quantitative and qualitative methods complement each other in a livelihood study.

This study found that household-scale shrimp producers have limited endowment of the livelihood capitals. The majority of farmers have only a level of education equivalent to primary school and have limited access to formal credits. They also lack the independent initiatives for establishing collective actions such as purchasing production inputs through farmer groups. This study also found that the vast majority of household-scale shrimp producers practice extensive shrimp farming technologies within small shrimp farm areas. This finding evidences earlier studies which show that small-scale farmers have limited assets (Bosma et al. 2005, 2012; Paul & Vogl 2013; Tran 2013).

However, the general perspective of low endowment of livelihood capitals must be viewed at a geographical level. This study showed that there were variations in endowment of livelihood capitals by household-scale shrimp producers among the studied villages. Remoteness, external interventions from government and NGOs and security related to political conflict areas determined abilities to attain livelihood capitals. The combination of poor broader conditions and poor livelihood capitals endowment has the greatest impact upon the poor, resulting poorest among those poor. The importance of this understanding is that interventions to improve livelihood capital must prioritise the poorest, with an acknowledgement of the complexities involved in the endowment process.

The next chapter evaluates the different livelihood capital endowments of household-scale shrimp producers and industrial- and transnational-scale shrimp producers. It also explores how this affects ability to penetrate lucrative export markets.

Chapter 6: Livelihood capitals, shrimp producer scales and capability to participate in lucrative export markets

6.1 Introduction

This chapter extends the discussion on livelihood capitals presented in Chapter 5, expands the complex relationship between livelihood capitals, and demonstrating the relationship between livelihood capitals and capability to comply with export market requirements (Figure 1.2, Section 1.3). This relates to the research questions: What are the livelihood capitals of different kinds of Indonesian shrimp producers?; and How do shrimp producers' livelihood capitals affect their capability to participate in lucrative export markets?

Endowment levels of livelihood capitals differ based on the business scales of shrimp producers (household- , industrial- and transnational-scale). As noted, previous studies have suggested that household-scale shrimp producers have limited endowments of livelihood capitals (Bosma et al. 2005, 2012; Paul & Vogl 2013). However, these studies have not explored the differences across different producer scales. This approach enables a consideration of the extent to which the household-scale shrimp producers' livelihood capitals differ from the industrial- and transnational-scale shrimp producers', and identifies each group's level of capability to comply with export market requirements. In other words, this approach shows the effect of business scale on capabilities.

This chapter argues that household-scale shrimp producers have the lowest endowment of livelihood capitals compared to industrial- and transnational-scale shrimp producers. Low endowment results in limited capability to comply with export market requirements. In addition, this chapter also suggests that livelihood capitals can have direct and indirect effects on capability to participate in export markets. The direct relationship is that endowment of a livelihood capital or a set of livelihood capitals determines capability to comply with market requirements. For example, shrimp farmers' knowledge of food safety can directly affect their capabilities to meet food safety standards (this study assumed that farmers' act based on their knowledge). The indirect relationship refers to the endowment a livelihood capital or a set of livelihood capitals provide as a means of endowment of other types of capital, which then directly affects capability to comply with export market requirements. This flow-on effect was discussed in Chapter 5. For instance, physical and natural capitals can affect productivity (harvest volume), which later affects traceability. Therefore, the physical and natural capitals indirectly affect traceability. This is discussed in more detail in Section 6.7.

The structure of this chapter is firstly the endowment of livelihood capitals between business scales is compared. Second, causal relationships between the levels of livelihood capitals and with capability to participate in lucrative markets are explored. Finally, this chapter conceptualises the relationship between scale, capital endowment and capabilities required to enable better participation in lucrative markets.

6.2 Human capitals across different groups of shrimp producers

As outlined in Chapter 5, this chapter will now extend a discussion of the human capital variables including level of schooling of children, hired employees, workforce structure and access to training, which were not discussed in Section 5.2.

6.2.1 Education levels for farms' owners and their children

There is great contrast between the levels of formal schooling received by farm owners across the groups of Indonesian shrimp producers. These disparities can manifest in different livelihood capital attainment abilities, including for financial, social, physical and natural capitals. While the majority of husbands and wives in shrimp farming from household-scale group did not receive high levels of formal education (Chapter 5), all owners of industrial-scale shrimp farms interviewed had received a university education (SCI_NS1 2012; SSP_LP1 2013; ISSP_BL1 2013; ISSP_SS1,2 2013). Some industrial-scale producers had graduated from overseas universities (ISSP_BL1 2013; ISSP_LP1 2013). These producers came from a variety of business backgrounds (e.g. property business [ISSP_SS2 2013]). They had the capability to structure their labour force and to hire experts with qualifications meet the workforce structure design (discussed below). Interviews indicate that their literacy gained through formal education contributed to an ability to understand technical aspects of shrimp farming, so they could identify the expertise and skills needed for shrimp farming (ISSP_BL1 2013; ISSP_LP1 2013). This contributed significantly to the development of their shrimp farms.

Therefore, this study suggests that the lower level of schooling received by household-scale shrimp producers constrains their development possibilities.

The formal education endowment for the children of household-scale shrimp producers is lower than that of the children from other business scales. This study included education levels of children because some were observed to be involved in the workforce of the household- and industrial-scale farms. The data showed that the highest percentage (34 %) of schooling received among children of household-scale producers was for high school, which is 9–12 years of formal education. Only 15.7 per cent of household-scale shrimp producers' children gained a university education. In contrast, all industrial-scale respondents interviewed stated that their children had gone to university, with some graduating from overseas. Some children of industrial-scale shrimp producers selected disciplines that would support the development of their parents' business. For instance, an industrial-scale shrimp producer from Bali reported that his father sent him to business school in the US and he was then managing his father's shrimp farms (ISSP_BL1 2013). A similar story was also found in the case of an industrial-scale shrimp producer in Lampung (ISSP_LP1 2013).

However, there is no similar tendency of for household-scale shrimp producers' investments in education. The majority of household-scale shrimp farmers' children who went to university did not select courses that were relevant to the future development of their family shrimp farms. Although a few went to agriculture or aquaculture schools, the observations of this study suggested that their orientation was predominately driven to seek non-farm related works such as in corporate companies based in the big cities. Thus, differing levels of education as well as family perspectives on education investment may impact upon the potential development of shrimp farms. In this situation, the education of children of household–scale shrimp producers was unlikely to contribute to farm upgrading.

6.2.2 Structure and education level of hired workforce

To the best of the author's knowledge, there is no previous study that has included workforce structure to measure human capital endowment of agricultural farmers. This variable was required to measure the competency of human capital across industrial- and transnational-scale producers which have different workforce structures compared to those of household farmers.

Workforce structures can indicate the extent to which specialised functioning, knowledge and skills of the human workforce contribute to capability (Balwin & Gu 2004). In this respect, this study considered specialised workers to have high-level skills and knowledge. Thus, applying this understanding, the workforce structure for a shrimp farm will reflect the capabilities of the workforce to seek, adopt and improve technology. Labour can then, with these capabilities, contribute to improving production (Schultz 1961), growth, supporting modernisation (Tallman & Wang 1994) and improving the efficiency of shrimp farms (Pathumnakul, Piewthongngam & Khamjan 2009). This can improve participation in export markets.

There is significant workforce structure variation across the three scales of production. The household-scale shrimp producers' workforce structure is defined as the most disadvantaged. This implicates limitation in their workforces' capabilities; e.g. ability to seek, to adopt technology and to develop market participation strategies). Industrial- and transnational-scale shrimp farms have specialised workforce functions, resulting in higher capabilities. In this study, it was found that the workforces of household-scale shrimp farms were predominantly comprised of family members; there were 3–9 people per household. This finding is in line with previous studies in Kalimantan, Indonesia (Bosma et al. 2012). This study found that only 20 per cent of households interviewed hired permanent workers externally. Thus, the workforce of household-scale shrimp producers was made up of the husband and/or wife and their children. Comparable structures were also documented in other shrimp-producing countries dominated by household-scale shrimp producers such as Bangladesh (Paul & Vogl 2013) and Viet Nam (Bosma et al. 2005).

In comparison to household-scale shrimp producers, industrial- and transnational-scale producers had specialised functions within their workforce structure. Although the majority of industrial-scale shrimp farms were managed by families, and the farm owner did not always have an academic background in shrimp aquaculture, all of the industrial-scale shrimp producers hired permanent workers externally. These workers had the formal qualifications needed to perform certain functions within production (SCI_NS 2011; ISSP_NS1 2013; ISSP_SS1 2013; ISSP_SS2 2013). An interview with an aquaculture expert (Aqua_expt2 2012) who had formally worked for industrial-scale farmers and for CP Prima provided an outline of a typical workforce structure on the production line for the industrial- and transnational- categories. It is represented in Figure 6.1. It was implied that higher-scale farms required a more specialised labour force. A company generally has several directors or heads of departments with specialised roles in production, finance, logistics and harvesting. Employees with formal educations in shrimp farming and existing experience working in shrimp farming is required to support the workforce structure and for the application of highly technical farming practices. For example, a production director is often an aquaculture graduate (or even postgraduate) with extensive practical experience in shrimp farming. He or she is often assisted by a field manager who is also a university graduate (Aqua_expt2 2012). It was also observed in this study that some companies hire aquaculture specialists from overseas. Highly qualified staff are more capable to develop shrimp farms than the low human capital endowment of the workforce seen in the household-scale shrimp farms.

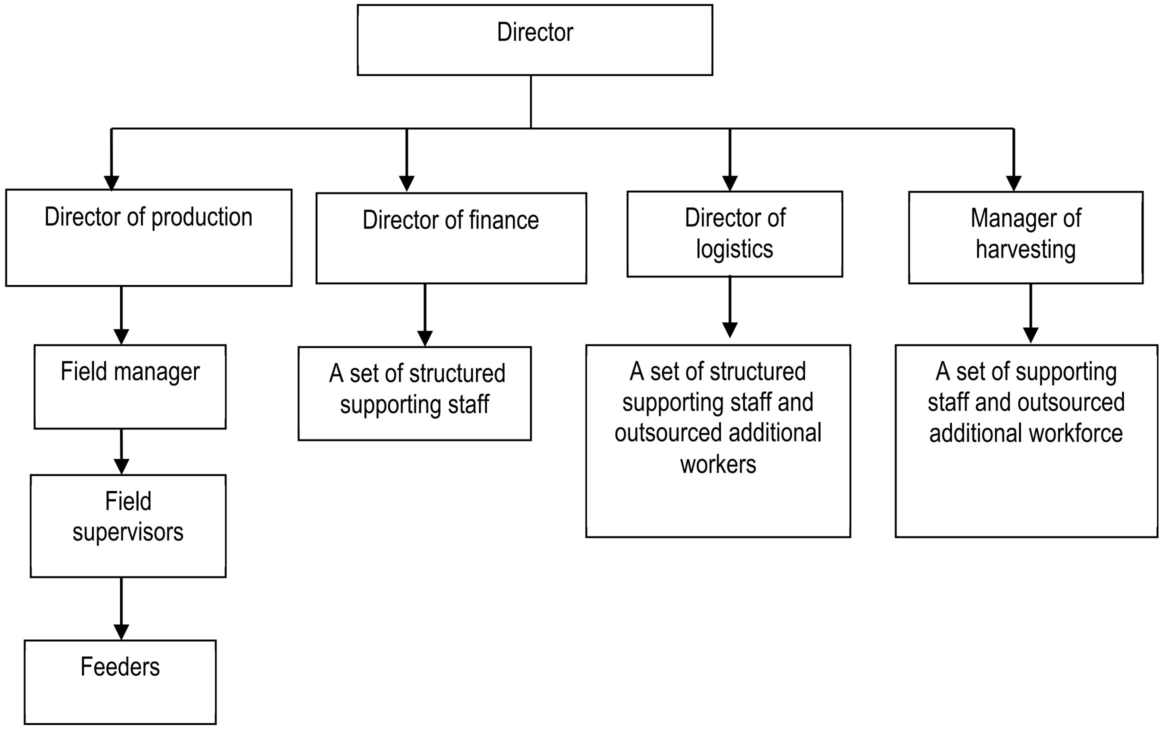


Figure 6.1 Common structure of workforce in an industrial-scale shrimp farm[12]

The transnational-scale company CP Prima had a more complex organisational structure comprised of subsidiaries (shown in Table 6.1). CP Prima has nine subsidiary companies with different specific functions. The structure of the subsidiaries of CP Prima clearly suggests that the workforce structure at this scale of shrimp producer is highly specialised. This has also been suggested by Goss, Burch and Rickson (2000). Each subsidiary has specific functions for each node of the shrimp value chain, from input nodes such as seed and shrimp feed production, up to the marketing node. This information allows the human capital of transnational-scale shrimp producers to be compared to the human capital of other Indonesian shrimp producers. This comparison clearly demonstrates that transnational-scale shrimp production possesses a higher human capital capability (greater knowledge, skills and expertise).

[12] Source: Author, synthesised based on interview (Aqua_ expt2 2012)

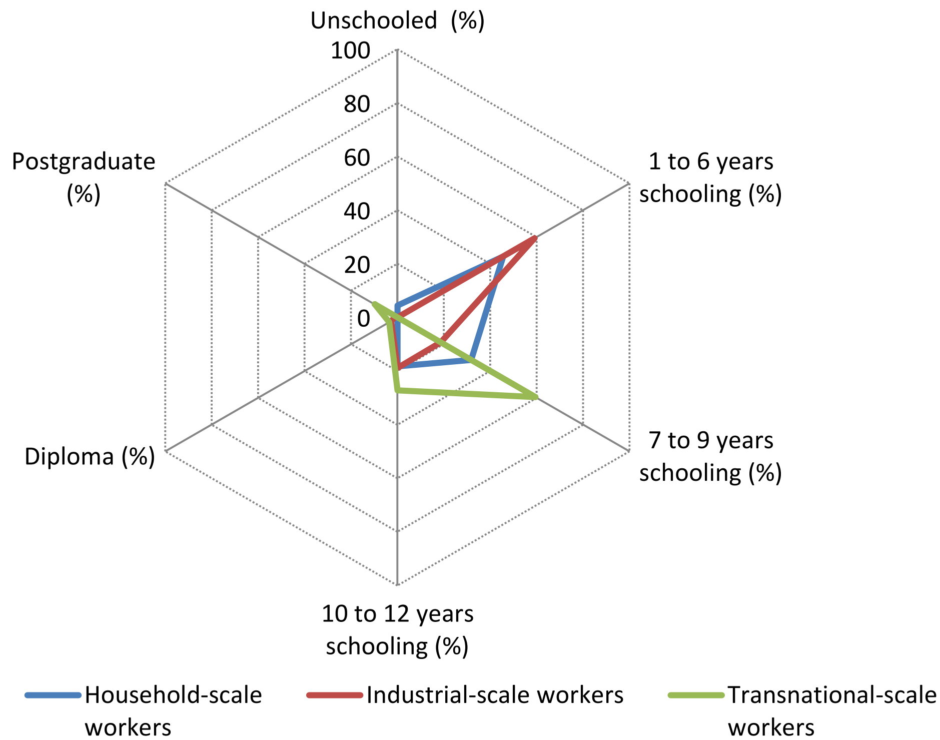
Table 6.1 Company structure of PT Central Proteinaprima Tbk

Subsidiary	Principle activities	Head office	Start of commercial operation
Direct ownership			
PT Centralpertiwi Bahari (CPB)	Integrated shrimp farming	Menggala Tulang Bawang, Indonesia	1995
PT Central Panganpertiwi	Fish farming; manufacture and trade of fish feed and fry	Karawang, Indonesia	1991
PT Centralwindu Sejati (CWS)	Processing, cold storage and trading of frozen shrimp	Sidoarjo (East Java) and Medan (North Sumatra), Indonesia	1993
PT Marindolab Pratama	Medicines for shrimp and fish	Serang, Banten Indonesia	1995
Isadoro Holding BV (Isadaro)	Investment holdings	Amsterdam, the Netherlands	1997
Blue Ocean Resources Pte. Ltd.	Investment holdings and trading business	Singapore	2006
PT Central Bali Bahari (CBB)	Shrimp hatchery, cold storage and feed	South Lampung,	2006
Central Proteina Prima International Pte. Ltd	Investment holdings	Singapore	2008
Shrimp Improvement System (SIS) British Virgin Islands (BVI) Pte. Ltd	Investment holdings	British Virgin Islands	2010
Ownership through CWS			
PT Andalas Windumurni (AWM)	Shrimp farming	Secanggang, Langkat Indonesia	1992
PT. Citra Windupertala (CWP)	Shrimp farming	Secanggang, Langkat Indonesia	1992
PT. Suryawindu Pertiwi (SWP)	Shrimp farming	Secanggang, Langkat Indonesia	1993
Pt. Windusejati Pertiwi (WSP)	Shrimp farming	Secanggang, Langkat Indonesia	1992
Ownership through SIS BVI			
Shrimp Improvement System LLC	Supplier of shrimp stock	Florida, United States	2000
Shrimp Improvement System Hawaii LLC	Supplier of shrimp stock	Hawaii, United States	2006

Source: CPP 2011 annual report

As stated, workforce structure reflects the formal education level of the hired workforce. This study found a disparity between hired workers' formal education across the Indonesian shrimp producer groups (Figure 6.2). In the case of household-scale shrimp producers, 4.5 per cent of hired permanent workers had never received formal schooling; 45 per cent had received 1–6 years of schooling and 31.8 per cent received 7–9 years of schooling. None of the household-scale shrimp producers' hired workers had received a university-level formal education. In the case of industrial- and transnational-scale shrimp producers, some of their workers had obtained higher education qualifications. Approximately 3.63 per cent of industrial-scale shrimp producers' employees were university graduates (Statistics Indonesia 2011) and 9.73 per cent of transnational-scale employees (total employees—11,615 people) had postgraduate qualifications (CPP 2009). Although the percentage of workers for industrial-scale shrimp producers with 1–6 years schooling was higher than for workers of household-scale shrimp producers, the roles of these low-educated workers was confined mostly to feeding and security provision (Aqua_expt2 2012).

Production in industrial-scale shrimp farms is managed by highly qualified employees (Aqua_expt2 2012). Within the employment structure of the shrimp farms, farm management and operation, including developing the upgrading strategy, is the responsibility of the field manager or director of production. Thus, less educated employees are only responsible for manual labour. For household-scale shrimp producers, however, management, production and any upgrading strategy is the responsibility of the owners who have a low level of schooling and do not have highly qualified employees to assist them.



Source: CPP 2012 & Statistics Indonesia 2011

Figure 6.2: Percentage of farm workers who had received certain education levels, by farm scale[13]

The hired labour of household-scale shrimp producers were usually recruited from their neighbourhoods or villages adjacent to the farms location. The hired labour in small-scale farms tended to have comparable roles to those unskilled workers in industrial and transnational shrimp farms. They were responsible for land preparation prior to stocking, pond cleaning, feeding (if the natural algae stocks were depleted) and harvesting. Permanent hired labourers also guard against theft of shrimp stocks. As stated by household-scale shrimp farmers:

> His job includes preparing the ponds before stocking, but I also often hire additional people to remove the sludge from the ponds' sediment, prepare water before stocking, feed the shrimp and look after the ponds (HSSP_BK 2012, HSSP_Sg 2012; HSSP_TI 2012; HSSP_MT 2013).

[13] Diploma in Indonesia refers to a three year university program, which is comparable with an undergraduate degree in other countries.

Other farmers also stated:

> His work is to look after the water gates during high tide and harvest fish. He also often sleeps in a hut built at the ponds if the shrimp are big in size (HSSP_TI2 2012).

Within this scope of responsibilities, hired workers of household-scale farms may not be able to contribute to upgrading farms. The management and decisions related to shrimp farming are mostly the responsibility of the shrimp farm owners, who also have limited schooling. Hired workers who also own shrimp farms stated:

> I only do what the owner asks …. Sometimes the boss asked me take seed from our suppliers … He paid to the suppliers and I just took them from the suppliers …. He usually decided how many shrimp seed were going to be grown … Often he asked me to stay overnight in the shelter when the shrimp were close to harvesting … My job included to open and close the water gate to allow water exchange (HSSP_BK19 2012; HSSP_TI18 2012).

The workers of industrial- and transnational-scale shrimp producers are more able to contribute to the upgrading of farms. This argument is evidenced by a published employment vacancy by CP Prima. The vacancy requires a specified level of formal education; applicants should hold a postgraduate degree in specific subject areas, such as fisheries, husbandry, mechanical engineering, electrical engineering, industrial engineering, accounting and marketing, with minimum grade point average (GPA) of 3 (maximum possible GPA is 4). The applicants also should be fluent in English, both in writing and speaking (Fieldofbusiness 2012). Interviews with some industrial-scale shrimp producers also indicated a similar recruitment strategy, whereby workers are recruited from across Indonesia (ISSP_SS1 2013; ISSP_SS2 2013; SCI_ SS 2013). Technical and English language skills within the workforce may lead to the further development of farms.

6.2.3 Access to training programs

In addition to the knowledge and skills gained through formal education, as a component of the human capital of a shrimp farm, investment in training for human capital upgrading is also essential for shrimp farm development. This study found that training for household-scale shrimp producers was very limited. The majority of small-scale producers depended on development interventions provided by the government and NGOs to access and participate in formal training. Nevertheless, only 35 per cent of household-scale shrimp producers stated that they had attended training organised by the government or NGOs. The absence of training programs for the majority of respondents may be associated with the inclusion and exclusion criteria for training programs. According to a fisheries officer in South Sulawesi Province:

> We cannot bring all the shrimp farmers from all villages here for training because the budget is limited (Ext_Prg 2013).

For example, some training programs provided by the government may only be available to the heads of shrimp farmer groups. The programs expected that the heads of the shrimp farmer groups would transfer the knowledge to other shrimp farmers. However, the heads of groups did not always disseminate the knowledge gained in the training program (VH_Sg 2012; VH_MT 2013).

Moreover, training programs usually cover certain production areas due to limitations in the government budget. For example, the South Sulawesi DKP only included Pinang District in their 2014 program due to budget limitations (DKP_SS 2013). NGOs also tend to work in a limited area. For example, this study only found training programs by NGOs in Tanjung Ibus and Sangso villages. Thus, although there are training programs designed for household-scale shrimp producers, many farmer groups are excluded due to the limited scope of the programs. This is due to budget constraints.

This study observed that private companies provided training programs for household-scale shrimp producers. However, they provided training when it supported their business interests. For example, this study observed that a feed company provided training to some farmers in Aceh Province who adopted semi-intensive vannamei farming. The company could sell shrimp feed to these household-scale shrimp producers if they continued to grow vannamei, which requires a higher quantity of shrimp feed than the traditional farming system. Thus, supporting household-scale shrimp producers to adopt vannamei developed a good relationship between the company and the shrimp producers, and expanded the company's shrimp feed markets. Although there was the potential to upgrade upon adopting vannamei farming technology, this study observed that there were challenges to achieving this. First, restricted access to seed vannamei in Aceh Province was observed. This is because there were a limited number of hatcheries producing vannamei post-larvae. Second, adopting such practices also required major investments in pond structure upgrading and production facilities. These complex factors affecting the adoption of vannamei also impacted upon the ability to participate in a training program provided by the private company.

Industrial- and transnational-scale shrimp producers and their workers have better access to training programs. This study observed that they invested in training programs independently. This was confirmed through interviews with several industrial-scale shrimp producers. It was stated that they trained their employees before deployment (SCI_NS 2012; ISSP_SS1 20013; ISSP_SS2 2013). It is in the producers' interests to provide training schemes that ensure that their workers are able to carry out their duties. For example, an industrial-scale shrimp producer organised a workshop in February 2013 and invited experts from various countries. Workers from the industrial-scale shrimp farms also participated; some of them stated, 'I come here because my boss asked me to come' (ISSP_tech_LP1 2013; ISSP_tech_LP2 2013). The interest that transnational-scale shrimp producers' have in training their workers through programs is also captured in a CP Prima annual report:

> CP Prima always provides its workforce with regularly scheduled training, which is in addition to matters specifically related to production techniques (CPP 2009).

Based on these excerpts, this study suggests that industrial- and transnational-scale shrimp producers have structural systems for the dissemination of knowledge. They provide information that is coherent with the company's upgrading plans and which reaches all targeted workers. This enables workers to access updated knowledge.

6.2.4 Human capital and the capability to participate in lucrative export markets

Chapter 1, Section 1.3 explained the role of human capital in the development of rural communities. This study argues that human capital is a critical livelihood capital that facilitates participation in lucrative export markets. Human capital means refers not only to the ability to comply with export market requirements (Chapter 4), but also to the 'spiraling-up' effect (Emery & Flora 2006). It is also an initial capital that leads to endowment of other capitals required for greater participation in export markets (Bebbington 1999; Bingen, Serrano & Howard 2003). For example, Poole et al. (2013)

argued that schooling is important for enabling an engagement with the wider world and a foundation for developing appropriate skills needed to enhance businesses. So for shrimp farming, schooling can lead to the upgrading of technological and non-technological aspects of shrimp production and marketing, and may maximise the function of physical assets in benefiting livelihoods. It also can enhance the ability to interact with other actors throughout the value chain.

This study found that the level of human capital endowment for household-scale shrimp producers can constrain possibilities for upgrading, which is required for better participation in export markets, and that this constraint manifested differently for the other categories of shrimp producers. As discussed in Chapter 5, household-scale shrimp producers demonstrated a higher level of endowment of primary schooling than their similar age cohort across the Indonesian population. However, basic formal education is not a sufficient initial capital endowment that can be converted to other types of capitals or skills such as enhancing social capital to support the development of agribusiness in rural areas (Poole et al. 2013). In the context of export market participation, it requires a wide range of skills such as the ability to develop relationships with other value chain actors, to negotiate with buyers and management, marketing skills (Bingen et al. 2003), organisation function skills (Jacinto & Pomeroy 2011) and skills to manage input and yield data recoding for traceability. Consequently, the low attainment of human capital by household-scale shrimp producers cannot support self-driven development for better lucrative export market participation. Their ability to accumulate other types of capitals that could strengthen their position in export markets is also compromised. Poor household-scale farmers located in remote villages are even less capable than other household-scale shrimp producers because remoteness and a lack of public infrastructure negatively affect the endowment of formal education.

As discussed in Chapter 5, household-scale shrimp producers have limited knowledge and awareness of hygiene and food safety measures including post-harvest practices. This aspect of human capital has a direct relationship with capability to meet traceability measures (GlobalGAP 2011). This is because farmers' understanding of hygiene in their practices is related to food safety. For example, limited knowledge about the need for sanitation facilities affects the ability of farmers to manage or treat effluent. Through poor sanitation practices as discussed in Chapter 5, the farmers are also subjected to the effects of human waste. A further example, some farmers perceived that selling shrimp without ice was better than chilled shrimp, because it indicated that the shrimp was fresh (HSSP_TI9 2012; HSSP_Sg5 2012; HSSP_BK15 2012). However, not chilled shrimp quickly leads to deterioration in its quality and is inconsistent with post-harvest management systems suggested by GlobalGAP (2011) and the better management practices (BMP) adopted by various international organisations (ADB et al. 2007).

Bingen, Serrano and Howard (2003) suggested that management skills for collective action can increase small-scale farmers' market participation. Management ability also requires English, computer and internet literacies and these skills are largely gained through a university education, which is rare among household-scale shrimp farmers. Thus, the endowment of this capital by the household-scale shrimp producers is unlikely able to enhance their participation. For example, there was an attempt to facilitate direct market access for shrimp producers in Sangso village to a buyer based in the UK (Aqua_expt1 2012; VF_Sg 2012). However, household-scale shrimp farmers depended on external support to establish their business network directly with the buyer. The process was facilitated by international NGOs involving experts and village facilitators. The Project employees organised farmers' collective action such as in the developing schedule and the management for stocking, inputs purchasing, harvesting and product shipment. This suggested that the existing endowment levels of human capital for household-scale shrimp producers could not support upgrading. Thus, household-scale shrimp producers' development may depend on development interventions to support targeted development outcomes in the foreseeable future.

Industrial- and transnational-scale shrimp producers possessed a high initial endowment of human capital, which formed a foundation for developing skills and for accumulating other capitals. To re-emphasise, some of these workers had obtained graduate and postgraduate qualifications (Figure 6.2). This may have been a sufficient initial capital which was used to enhance and accumulate other types of livelihood capitals. In addition, the workforces of industrial- and transnational-scale producers were also specialised into categories (Figure 6.1 and Figure 6.2). According to Becker and Murphy (1994) specialised workers have a higher level of knowledge and expertise than non-specialised workers. Figure 6.1 shows that industrial- and transnational- scale shrimp producers had workforces with specialised harvesting skills. Thus, they had a greater capacity to understand and comply with food safety measures. As demonstrated by the overview of CP Prima subsidiaries (Table

6.1), the workers with higher marketing skills also had a greater ability to promote their products and develop market penetration strategies. Consequently, these groups of shrimp producers may have greater capabilities to strengthen their positions in lucrative export markets.

Moreover, workers for industrial- and transnational-scale producers had better possibilities to upgrade their knowledge than household-scale shrimp producers through independently initiated training programs. This enabled these groups to independently seek and gain new knowledge which suited their upgrading needs. However, as stated, household-scale shrimp producers relied on external interventions to participate in training programs. Thus, household-scale shrimp producers do not have control over the knowledge or information delivered in training programs that can benefit their business interests. Difference in opportunities to upgrade workers' knowledge may affect the development of capabilities that are related to export markets.

Therefore, based on the discussion above, this study argues that the level of endowment of human capital for Indonesian household-scale shrimp producers is significantly lower than that of industrial and transnational-scale shrimp producers. This limited human capital restricts their capability to comply with export market requirements, limiting their participation.

6.3 Financial capital across different groups of shrimp producers

This section compares the type of credit accessed by household-, industrial- and transnational-scale shrimp producers and assesses how this affects upgrading possibility. In Chapter 5 it was argued that small-scale producers have limited access to formal credit. Comparing this context to the other groups of shrimp producers, farmers from the household-scale category are the most disadvantaged group regarding ability to access formal credit. Thus, the limited ability to access formal credit leads to less upgrading opportunities for household-scale shrimp producers compared to other groups. This is because financial constraints negatively affect households' entrepreneurial capacities (Paulson & Townsend 2004).

As outlined in Chapter 5, the majority of household-scale shrimp producers were dependent on informal financial sources such as their shrimp buyers and relatives. In contrast, all industrial shrimp producers interviewed had access to formal credit sources such as banks (SCI _NS 2012; SCI_SS 2013). CP Prima had the greatest access to formal financial sources. For example, Barclays Capitals and BNP Paribas provided financial support to CP Prima (Kresna Securities 2007). PT Bank Negara Indonesia (BNI) provided working capital loans with a credit limit of US$ 20 million. On 11 November 2009, the company entered into a loan agreement with Bank Capital, providing a working capital loan (KMK) facility with a credit limit of US$ 7.425 million. On 31 October 2007, the company received a short-term loan facility with a credit limit of US$ 2 million from PT Bank Chinatrust Indonesia (CPP 2009). In addition, CP Prima also has national and international shareholders (see Table 6.2) who invest in and support the company through providing financial capital (Gillan & Starks 2000). The wide financial access to various formal financial intuitions available for the transnational-scale shrimp producer indicates that there is a high degree of financial capability to support the company's development plans.

Table 6.2 Shareholders of CP Prima

Shareholders	**Percentage of ownership (%)**	**Number of shares (Rp)**[14]
Public	51.7	20,665,302,015
PT. Surya Hidup Satwa	22.99	9,302,791,456
PT. Pertiwi Indah	9.54	3,861,1005,514
Red Dragon Group Pte. Ltd	6.95	2,666,621,250
Charm Easy International Limited	4.95	2,004,207,226
Regent Central International Limited	4.33	1,753,608,019
PT Central Pertiwi	0.27	110,896,074
Perfect Companion Group Company	0.17	70,110,438
Iceland International Limited	0.09	36,097,754
Total	100	40,470,473,746

Source: CPP 2012

6.3.1 Differences in access to formal credit

Chapter 5 made the argument that banks' collateral requirements and limited human capital have constrained the ability of farmers from the household-scale category to borrow. In the case of industrial-scale shrimp producers, although their shrimp ponds could not be used as collateral, they had other physical assets which could be used as collateral such as valuable houses and other type of physical assets:

> Although the farmers cannot use their shrimp farm's pond as credit collateral because of the banks' requirement, but most of them have other highly valuable physical assets which can be used as credit collateral to borrow money from the banks (SCI_NS 2012).

Industrial-scale shrimp producers' ability to possess valuable physical assets is related to their incomes generated from shrimp farming and other businesses. Although household-scale shrimp producers could also accumulate physical assets (Ellis 2000a), the total asset value was lower due to the group's limited financial capital endowment. Respondents from the industrial-scale category were reluctant to provide details about their wealth during the interviews; it was found that the majority of

[14] Rupiah is used as written in the report

industrial-scale producers had other businesses and physical assets. For instance, one respondent from Surabaya had a shrimp farm in South Sulawesi and also a manufacturing company located in East Java Province. Another respondent from South Sulawesi was also a property developer. Further, an industrial-scale shrimp producer from Medan had a business in agricultural mechanical trades. Thus, a higher financial capability gained from shrimp farming and other businesses enabled the industrial-scale shrimp producers to accumulate physical assets with high economic value. These could be used as collateral for accessing formal credit.

In addition, the industrial-scale shrimp producers' human capital endowment favoured access to formal credit. This was related to their backgrounds in business and their formal education. Their experiences conducting businesses developed their tacit skills to seek opportunities to access formal credit. Interviews with some industrial-scale shrimp producers suggested that producers at this scale had extensive experience in seeking financial resources and hence, were familiar with administrative requirements (SCI_NS 2012; ISSP_LP1 2013; ISSP_NS1 2013). During a seminar about shrimp farming in Lampung 2013, this study observed that industrial-scale shrimp producers interacted with each other when one was trying to promote a product to the others. One producer demonstrated high skills in business negotiation, which can be considered favourable for the process of submitting loan proposals to banks.

As suggested in Section 5. 3, social capital also affects ability to access formal credit. This applied in the case of industrial- and transnational-scale shrimp producers. Interviews with respondents found that good relationships with several banks contributed to their abilities to access formal credit (SCI_NS 2012). Such networks are a result of conducting businesses and seeking financial sources.The industrial-scale shrimp producers also always involved banks in business transactions with their business clients.

> Well, we have to deal with banks if we are doing business …. Today you do not pay in cash to make a business transaction (SCI_NS 2012; ISSP_SS 1 2013).

Trust gained through the accumulation of social capital is also a critical factor for accessing formal credit (Dowla 2006; Shoji et al. 2012). Banks' perceptions of the borrowers' ability to pay back credit affect the likelihood that they will grant loans to the credit applicants (Dowla 2006). In this study it was observed that banks tended to offer credit to their loyal customers and the level of trust they instilled in the borrower was higher if the customer had a good record of paying back credit. An interview with a bank official in North Sumatra also showed that banks do not want to take risks through providing credit to applicants with low reliability or a bad repayment reputation (BO_NS 2012; BO_SS 2013). However, trust is built through interactions (Shoji et al. 2012). Only a limited number of household-scale shrimp producers had relationships with bank officials. The majority had never borrowed money from a bank. Conversely, industrial- and transnational-scale shrimp producers demonstrated fluid access to formal credit. The greater number of financial support forms from various financial institutions provided to CP Prima suggests that this company had been able to develop relationships of trust with their credit providers. In the case of household-scale shrimp producers, there is a need to establish and to strengthen their relationships of trust with banks.

6.3.2 Financial capital and upgrading capabilities

As discussed in Chapter 5, few household-scale shrimp producers have access to formal credit; approximately 5.3 per cent of small-scale producers were supported by a bank during the initial development of shrimp farms and around 22.46 per cent had borrowed money from a bank in the last five years. However, this study found differences between the type and size of credit accessed by shrimp producer groups. Disparities in credit availability can affect upgrading capability. The data showed that formal loans accessed by household-scale shrimp producers were classified as microcredit loans; the maximum loan amount was only Rp. 20,000,000 (US$ 2000). In fact, survey data showed that the largest amount lent to household-scale shrimp producers was Rp. 15, 000,000 (US$ 1,500). An interview with a key respondent indicated that an industrial-scale shrimp producer obtained Rp. 50 billion (US$ 5 million) in credit from a bank (SCI_ NS 2012). As stated above, a transnational company was granted US$ 7.425 million by Capital Bank. These disparities in loan size are significant because they can determine the type of investment and determine upgrading potential of producers, which can enhance their capabilities to penetrate lucrative export markets. The household-scale shrimp producers are excluded from larger loan access because of restrictions in their ability to pay back the loans.

Transnational-scale shrimp producers can invest in their businesses to improve production technology, supply chains and marketing strategies such as adopting the eco-label certification to enhance market acceptance. Investment is not only limited to a national level, but can expand their commodity chain to other countries, strengthening their competitiveness at the global level. Although this study was not able to source data on investment via credits approved, the annual financial reports of CP Prima showed a gradual upgrading of the company through the development of subsidiaries with different functions. Table 6.1 shows the year in which each subsidiary was established and then integrated into CP Prima. For instance, CP Prima acquired the Shimp Improvement System LCC (SIS) in 2000, which was based in Florida, US. It produces shrimp broodstock, integrating seed production functions into the company. This upgrading transformed the company to become global and fully integrated. Full integration means that the company can produce shrimp seed enables it to provide a completely traceable product. In addition, the company also invested in various eco-label certification schemes such as GlobalGAP and ACC (CPP 2012) which have the potential to enhance their participation in export markets.

By contrast, the upgrading opportunity for household-scale shrimp producers with a smaller amount of credit is limited to micro-scale investments. Respondents of household-scale shrimp producers stated that the loan given by a bank was for the development of a shrimp nursery (HSSP_MT7 2013; HSSP_MT12 2013; HSSP_MT20 2013; HSSP_MT22 2013). Another respondent in Tanjung Ibus village stated that he used the credit to expand his seafood retail business within the traditional village market (HSSP_TI 2012). This kind of upgrading is not significant enough to alter their position in the globalised lucrative export markets. Household-scale shrimp producers' investments are more about diversifying their livelihoods for better income security at the local level (Ellis 2000a, 2000b). Transnational-scale shrimp producers' upgrading strengthens their competitive advantages in the lucrative export markets.

6.4 Social capital across different groups of shrimp producers

6.4.1 Social capital and factors affecting its endowment

There are different motivations behind the formation of shrimp farmer groups and different scope between groups across the categories of shrimp producers. While the formation of household-scale shrimp producer groups is usually driven by external forces (as explained in Chapter 5), industrial-scale shrimp producer group formation is independently formed (SCI_IND 2012). This study found that Indonesian industrial-scale shrimp producers developed an association known as the Indonesian Shrimp Club, which has members from across Indonesia. There are approximately 400 industrial-scale shrimp producer members in the group. SCI has regional coordinators in shrimp-producing areas such as North Sumatra, Lampung, South Sulawesi and East Java Provinces. Although SCI is considered an informal group, the group operates like a structured organisation from the national level to the provincial level. The members elect a national-level head and subsequently appoint one regional coordinator who is responsible for one or a group of provinces. The group holds a regular meeting both at the provincial and national level at least once every two years.

While household-scale shrimp producers' social capital is limited to the networks fostered in the areas where they live, the social capital of industrial- and transnational-scale producers is present at the national and international level, fostered by their business networks. They have a range of horizontal connections with other shrimp producers from overseas and vertical networks with other actors within shrimp value chains, such as inputs producers, and exporters. The business networks of this group of shrimp producers also include experts related to shrimp farming and government authorities. For example, the head of SCI stated that the organisation had a network with some shrimp farmers from Thailand and with private companies related to shrimp farming from Singapore, Thailand, Europe and the US. Moreover, this study also observed during the seminar in Lampung 2013, the SCI invited experts in shrimp aquaculture from Bangkok, technical consultants from the US, and inputs suppliers from Singapore. Although it is difficult to analyse the social capital of the transnational company due to its large scale, CP Prima's network is reflected in its subsidiaries located across different countries (Table 6.1). In addition, a few key respondents stated that CP

Prima had business networks with importers from Europe and the US (IM_ND 2012; Exp_expt_SY 2013).

The different endowment of livelihood capitals contributes to the different scales of social capital across the groups of shrimp producers. According to the head of SCI Medan, the SCI is an open organisation and any farmer can participate. However, household-scale shrimp producers do not have the capacity to participate in social networks to the same extent as industrial shrimp producers. First, household-scale shrimp producers do not have sufficient human capitals, either gained through formal education or through life skills such as networking skills. A certain level of capability such as knowledge and understanding of conducting a business is necessary. For example, while industrial-scale farmers are interested in the latest technologies in shrimp farming, such topics are not relevant to household-scale shrimp producers. They may not have the technological knowledge required to participate in the conversation. Second, shrimp farmers also require a level of financial capital to participate in SCI activities, which are quite costly for household-scale shrimp groups, even for average, middle class Indonesians. For instance, SCI members often held meeting at high-end restaurants and hotels or travel together overseas to observe shrimp farms. To participate in the SCI annual meeting, each member is required to contribute at minimum amount of Rp. 2,000,000 (US$ 200). However, this sum of money is equivalent to the monthly expenses of a household. Moreover, financial capital is also significant to enabling mobility. For example, while having a car for household-scale shrimp producers is considered a luxury asset, for industrial-scale shrimp producers it is defined as a basic need to support their mobility (physical capital is discussed below). Thus, different levels of capabilities for these capitals contributes to ability to access and or participate in a social network of group of shrimp producers where information is exchanged and opportunities to work as a group are available.

6.4.2 Social capital and capability to participate in lucrative markets

This study found that the motivations underlying shrimp producer group formation (explained in Chapter 5 and above) affect the function of the groups to achieve the benefits of social capital. It also affects the possibility to enhance other livelihood capitals needed to participate in lucrative export markets. This study suggests that the social capital of household-scale shrimp producers is less likely to enhance their capabilities to participate in export markets than the social capital of other groups of shrimp producers.

Previous studies have suggested that there is a positive relationship between social capital in the form of collective action and export market penetration (Hellin, Lundy & Meijer 2009; Narrod et al. 2009; Gyau et al. 2014). However, the potential for a positive effect relies on group members being empowered through the endowment of other capitals needed for export market participation, in particular human capital such as business knowledge and skills (Hellin, Lundy & Meijer 2009; Standford et al. 2014). Section 6.2.5 above explained the relationship between these aspects of human capital and export market penetration. This study observed projects in Tanjung Ibus, Sangso, Mattiro Tasi and Pajukukang villages whereby group formations for household-scale shrimp producers did not result in the significant upgrading of shrimp farmers' human capital. This included no significant rise in awareness about the importance of collective action and food safety. Rather, the groups developed dependency on development support with minimal human capital upgrading. A lack of human capital upgrading via group formation was also reflected in the interviews with some farmers in relation to accessing credit. The respondents were still not able to independently develop a credit proposal and to directly negotiate with exporters (HSSP_Sg 2012; HSSP_MT 2013; HSSP_TI 2012). Therefore, social capital cannot enhance the capabilities of household-scale farmers to better participate in markets in the absence of this human capital. This finding is consistent with Bingen, Serrano and Howard (2003) who suggested that training skills such as management and marketing should be included in the development of community groups under empowerment projects.

This study observed that groups established with an intention to receive financial or production input support under a development project (support-driven groups) do not result in strong and sustainable groups because their activities stop once the project has finished. Bingen, Serrano and Howard (2003) have suggested that there is a similar phenomenon in the case of African international development projects focused on credit and production inputs supplies. The study by Bingen, Serrano and Howard found that it was rare for a new farmer organisation to continue after the program had finished. The present study showed that household-scale shrimp producers did not continue with the collective organisation introduced under the project, such as collective seed procurement and marketing. It was observed that most of the farmers from the groups returned to their individual activities, purchasing seeds individually from the seed suppliers. Thus, support-driven group formation does not develop the willingness of farmers to pursue a common action together, as was suggested by Gyau et al. (2014).

Moreover, the level of collective action exhibited by household-scale shrimp producers is sufficient for the development of a larger social network for this group of shrimp farmers. It was found that the members of the groups of household-scale shrimp producers more focused on village-level activities such as the improvement of canals and shrimp ponds, and the distribution of production inputs given by the programs. Although there were several groups of shrimp farmers at the sub-district and district level, this study observed a lack of collective action at the higher administrative levels. Thus, such scale of group activities and networks do not favour the development of household-scale shrimp producers' business networks.

On the other hand, industrial-scale shrimp producers are driven by the potential to upgrade through gaining new knowledge about better technologies and practices, harnessing the benefits of collective action and exploring the possibility of business network expansion. Therefore, this group of shrimp producers are more likely to be able to enhance their capabilities. As stated by some respondents:

> Yeah I gain benefit from being a member of SCI. If I go to Sulawesi or other places I have a contact person that I can refer to … We always discussed if we wanted to try a new farming technology, often I or he tried, and we shared our experiences … Often other members offered us if we want to buy seed collectively (ISSP_ NS2 2012; ISSP_SS 1 2013; ISSP_SS2 2013).

During an interview with an industrial-scale shrimp producer, it was stated that collective action in purchasing seed and feed by industrial-scale farmers from Medan had minimised members' transaction costs (ISSP_NS1). The purchase was coordinated by the head of Medan shrimp club (SCI_NS 2012). A consortium was developed comprised of several shrimp producers. The head of the Medan shrimp club stated:

> My group requires around 80 billion seed for this coming stocking season, and I am talking with several hatcheries across Indonesia to seek the best bargain …. I am also talking to several feed companies to secure the feed demand and also the best bargain (SCI_NS 2012).

Hence, other consortium members benefited through the minimisation of costs and through time and resources saved in searching, quality auditing and negotiating production inputs purchases (Key, Sadoulet & De Janvry 2000).

Although the industrial-scale shrimp producers in South Sulawesi did not establish a consortium, there was a more informal example of collective action involving collective seed procurement by several shrimp producers (ISSP_SS1 2013; ISC_SS 2013). Such collective action can enhance their abilities to comply with export market requirements. For example the collective action applied to access seed and feed can simplify the supply chain of these production inputs, which enhances traceability.

Further, as stated previously, this group invited experts from overseas, exporters and companies related to shrimp production to join. Producers for probiotics, feed and mechanical equipment for shrimp farming were all present during the seminar in Lampung 2013. These participants presented the latest information and research in their field. This study did not evaluate the benefits of these presentations to shrimp producers. Nevertheless, it can be noted that the presentations exposed members to the latest knowledge about shrimp farming and markets. For example, one of the seminar respondents was an expert on seafood markets in the US. The expert led a presentation on seafood markets and consumer preferences. This knowledge can be beneficial to shrimp producers which can contribute to better market access.

In addition, the seminar also facilitated the building of networks between farmers and international and national experts. This can result in the diffusion of skills, knowledge and support from the experts to industrial-scale shrimp producers, which can improve shrimp production practices. For example, an interview with an international consultant involved in an eco-label certification scheme found that the consultant provided direct support to an international-scale shrimp producer to obtain an eco-label certification. The consultant and one of the company officials had met at a seminar. The support included advice related to administrative procedures and practices to meet the eco-label certification standards (Aqua_expt3 2012).

Based on the discussion above, it can be concluded that the different motivations driving group formation and driving the scale of social capitals can lead to different opportunities for upgrading and for the development of livelihood capitals. Shrimp farmers at the household-scale require further empowerment to enable upgrading.

6.5 Physical assets across different groups of shrimp producers

6.5.1 Production facilities

The equipment used in shrimp farming by household-scale shrimp producers was less advanced than that used by industrial- and transnational-scale shrimp producers. This resulted in household-scale shrimp farmers having the lowest yield per unit of production (ha/year) compared to other groups.

6.5.1.1 Aerator, water pump and harvesting facilities

As discussed in Chapter 5, the vast majority of household shrimp producers have limited production facilities and consider paddlewheels, generators and water pump assets as advanced production facilities. For industrial- and transnational-scale shrimp producers, these production facilities are considered basic necessities. Interviews with several industrial-scale shrimp producers from Medan, Makassar, Lampung and Bali indicated that all farmers from this group had paddlewheels, generators and water pumps (ISSP_NS1 2012; ISSP_SS 2013; ISSP_LP 2013; ISSP_BL1 2013). Observations during farm visits confirmed this finding. Moreover, industrial- and transnational-scale farms use more advanced equipment, such as automatic feeders and blowers, to maximise oxygen supply.[15] They also actively sought out the latest technology to support their production. One industrial-scale shrimp producer (ISSP_LP1 2012) in Lampung stated:

> I went to Thailand a few years ago and I saw they used an additional blower in the bottom of their ponds. I modified one of my machines to copy the technology.

[15] An auto feeder is a machine that replaces the manual labour required to distribute shrimp feed based on a feeding schedule.

This study also observed that industrial-scale shrimp producers were enthusiastic about trying new production equipment to improve shrimp production. For instance, there was an exhibition on shrimp farming facilities during the seminar in Lampung in 2013. One of the exhibited shrimp farming facilities was an auto feeder. A few weeks after the exhibition, one industrial-scale shrimp producer from South Sulawesi purchased several auto feeder units for a pilot trial in his ponds. He stated:

> I ordered five units of auto feeders and will try them in my ponds … it would be good if we could minimise manual labour to feed shrimp (ISSP_SS1 2013).

This study was unable to gather primary information about CP Prima's production facilities. However, CP Prima's annual report indicated that intensive stocking density existed (CPP 2009). This suggests that their physical capital is comparable to that of the industrial-scale shrimp producers. Another annual report also stated that the company had a dedicated research and development department for the development of new technologies requiring even more advanced physical equipment (CPP 2010). Therefore, it is reasonable to suggest that the transnational-scale producer has the most advanced physical assets.

6.5.1.2 Canal and water supply

There were also differences between household-scale producers' and other Indonesian shrimp producer groups' water supply systems and facilities. Water supply systems relate to the endowment of other livelihood capitals such as financial capital. Household-scale shrimp farms access water from canals, which are classified as primary or secondary canals. Primary canals access water from the main stream, while secondary canals access water via the primary canal. The primary canal is public infrastructure; however, this study observed that there was a limited degree of maintenance being carried out by the local government. This affected the water quality and supply for those shrimp producers who relied on the government for canal maintenance. The majority of household-scale shrimp producers were affected by poor government maintenance of primary canals. Plates 6.1 and 6.2 show the poorly maintained canals for household-scale shrimp ponds. Poor maintenance causes sedimentation of the primary and secondary canal, causing low water circulation and a decline in water quality (Buwono 1993). As a consequence, household-scale shrimp producers may face water supply and quality problems that negatively affect shrimp growth (Ma'sum 1989). Industrial- and transnational-scale producers, on the other hand, access their water supply directly from the ocean. To do so, they invest in additional facilities which may include a larger capacity water pump, water pump shelter and a water filtration system. Plate 6.3 shows the water supply facilities of an industrial-scale shrimp farm including water pumps and water treatment facilities such as sedimentation ponds and water purification devices.

Plate 6.1 Water canal and wooden water gate for household-scale shrimp farms' water access in Aceh. The pictures show sedimentation of the water canal basin. Water access is dependent upon the tides.

Plate 6.2 Household-scale shrimp producers’ ponds with earthen lining in Lampung. There are electricity pylons, but no electricity installation

Plate 6.3 Water access facilities for industrial-scale shrimp producers in Lampung. The plate shows (a) the water pump and (b) treatment facilities. Water is sourced directly from the ocean and treated prior to distribution to ponds.

Plate 6.4 Industrial-scale shrimp ponds with concrete lining and facilitated with production facilities in Lampung; paddlewheel (a) and aerators (b).

Industrial- and transnational-scale shrimp producers require a greater power supply to operate their production facilities compared to household-scale shrimp producers. According to DKP data, electricity costs comprise 7.46 per cent the total production costs for industrial-scale shrimp producers (Statistics Indonesia 2011).

It was observed that access to electricity in shrimp farming areas is limited. There is little government support for this public infrastructure because shrimp ponds are often located in isolated areas. Based on observation, this study found there were no electricity connections in shrimp farms of household-scale producers. Plate 6.2 confirms the absence of electricity access in household-scale shrimp producers' ponds. The picture shows electricity pylons that are yet to be connected to the electricity supply. Industrial-scale shrimp producers must invest in installing an electricity supply which adds extra costs to the establishment of shrimp ponds. Household-scale shrimp producers who require electricity must use a generator because they have limited financial capability to install an electricity supply from the nearest grid. However, some industrial–scale farmers stated that generators are less efficient than the electricity supply from the grid (ISSP_SS1 2013; ISSP_SS2 2013; HSSP_TI9 2012; HSSP_M13 2013). Thus, for household-scale famers who require electricity in shrimp production, the cost of electricity per unit of production may be less efficient than for other groups of farmers. This is because their production scale per farmer is much smaller than for other groups and the investment required for electricity installation is a fixed cost (Asniati 2009).

While investment in water access facilities results higher production costs, the facilities improve pond productivity and increase yields. In the absence of these production facilities, household-scale shrimp producers are totally dependent on the natural supply of water and dissolved oxygen (Boyd & Tucker 1998).Oxygen concentrations and circulation cannot be controlled without aerators and blowers. Water supply for household-scale shrimp producers is dependent upon the tide being high, when the water can be channelled through the canals. As stated, the government supports primary canal maintenance, but this support appears to be limited. Thus, the absence of a water pump and a generator reduces the ability of household-scale shrimp to access the water supply from their ponds. A shortage of clean water and insufficient waste removal leads to the degradation of the water quality, which can increase the risk of shrimp disease outbreaks (Kautsky et al. 2000).

The finding discussed above reconfirm among the Indonesian shrimp producers. Stratification affects the volume of production and the efficiency of farms (Rao et al. 2012). However, human and financial capitals determine the ability of shrimp farmers to access a higher level of production technology. For example, a highly skilled workforce with technical skills are required to upgrade from extensive and traditional shrimp farming systems to intensive systems. Moreover, such upgrading also requires significant financial investment. Interviews conducted with shrimp farmers suggested that financial barrier was the major factor determining the selection of intensive technology to grow vannamei (HSSP_TI 2012; HSSP_BK2 2012; HSSP_M 2013). The heads of Indonesian SCI and Medan SCI also mentioned that vannamei adoption required more intensive feeding compared to tiger shrimp. Table 2.5 presented the stocking densities for intensive farming of vannamei. The head of SCI suggested that approximately 80–100 vannamei post-larvae farmed per square metre, with a production cost of approximately Rp. 40,000 (US$ 4.20) per kg, a size of 50[16]. This provided productivity levels 12 tonnes per cycle, per ha. Based on these calculations, the minimum production cost per cycle ha for intensive vannamei farming is estimated to be approximately Rp. 480,000,000 (US$ 48,000).

---

[16] Size 50 means 50 pieces of shrimp for one kilogram.

Due to the low endowment levels of livelihood capitals for household-scale shrimp producers, these producers would not be able to upgrade to the intensive shrimp farming detailed above. For example, from a financial perspective, the production cost per cycle ha for industrial-scale shrimp producers is higher than the average of total annual revenue for a household-scale shrimp farmer. For example, one household-scale farmer whose had various businesses had been performing better than the average household-scale farmer stated that his annual total revenue was around Rp. 300,000,000 or approximately US$ 30,000 (HSSP_BK 2 2012). Furthermore, approximately 80 per cent of household-scale farmers earn around Rp. 35,0000,000 (US$ 3,500) of their total annual revenues including revenues from various businesses. Thus, given these lower revenues and the restricted forms of credit available to household-scale shrimp producers explained in Chapter 5, household-scale producers do not have sufficient financial capital to adopt the technology used by the industrial-scale shrimp producers.

6.5.2 Non-production facilities

Industrial- and transnational-scale shrimp producers have a higher endowment of non-production facilities compared to household-scale shrimp producers. All respondents from the industrial group stated that they had permanent houses located in urban areas or large cities in Indonesia and owned a car. Some respondents had more than one house and one car (ISSP_NS 2012; ISSP_LP1 2013; ISSP_LP2 2013; ISSP_SS1 2013; ISSP_SS2 2013). This contrasts significantly with the assets of household-scale shrimp producers as discussed in Chapter 5.

The mobility capacity of industrial-scale farmers extends beyond the direct needs of their livelihood activities. This includes mobility to pursue leisure activities, to seek good sites for shrimp farming, to access the latest technology and to develop business networks. Such a capacity can lead to the enhancement and further accumulation of livelihood capitals (Bebbington 1999; Emery & Flora 2006). Household-scale shrimp producers can also travel to other areas for recreation or for other activities that can benefit their livelihoods. However, there is a difference between the distances that industrial shrimp producers and household-scale shrimp producers can travel. According to the heads of Medan SCI and Indonesia SCI, industrial-scale shrimp producers often travel overseas for holidays, conferences or for visiting shrimp farms (SCI_IND 2012; SCI_NS 2012). In contrast, some household-scale shrimp producers never visit other provinces in Indonesia (HSSP_MT5 2013; HSSP_MT9 2013; HSSP_MT18 2013; HSSP_M18 2013; HSSP_M19 2013; HSSP_M21 2013; HSSP_MD12 2013; HSSP_MD13 2013; HSSP_MD18 2013). This mobility disadvantage is likely to impact upon the level of opportunities available to shrimp producers to enhance their capabilities.

The majority of Indonesian shrimp producers across all scales have mobile phones. However, mobile phones are utilised in different ways between groups. It was found that mobile phone usage was linked to the limited social capital of household-scale producers. Household-scale shrimp producers use mobile phones for basic functions such as connecting with their family members. They also use mobile phones to access inputs and markets, but the scale of the network coverage is limited by their endowment of social capital. Household-scale shrimp farmers stated:

> I used my mobile phone to call or text my family or if I want to buy seed. I also use my mobile phone to call the supplier …. I also sometimes call the buyer before I sell my shrimp to him (HSSP_BK 2012; HSSP_Sg 2012; HSSP_TI 2012; HSSP_MT 2013; HSSPM 2013: HSSP_MD 2013; HSSP_P 2013).

The interviews with household-scale shrimp producers indicated that they did not use a mobile phone to seek information about shrimp farming via an internet connection.

For industrial-scale shrimp producers, mobile usage is expanded to operating their business through their business networks. It was observed that mobile phones owned by industrial-scale shrimp producers were of a better quality and had the ability to connect to the internet. Industrial-scale shrimp producers sent emails to communicate their shrimp farming stocking schedules and to access production inputs from other provinces (SCI_NS 2012). In addition, industrial shrimp producers were keen to share their contact number exchanges with people to expand their social capital. Thus, although household-scale farmers had access to mobile phones, the level of benefits they obtained through owning a mobile was still limited compared to benefits accrued to other groups of farmers. These benefits relate to other capitals such as the social capital and financial capital required to purchase a ‘smart’ phone and the human capital required to effectively use the internet and to communicate with others.

Household-scale shrimp producers' computer literacy skills were also limited compared to other shrimp producer groups. Although it was found that 16.8 per cent of household-scale shrimp producers had computers, the reason for purchasing computers was to facilitate their children's education rather than using the computer for their business. This study also found that none of the computers used by household-scale shrimp producers were connected to an internet network (HSSP_M 2013). This suggests that they do not use computers to strengthen their business operations. However, the villages studied only had slow internet connections with a low information transfer capacity. Babah Krueng, Sangso, Mattiro Tasi, Manyampa and Pajukukang villages had access only to the Enhanced Data for GSM Evolution (EDGE) via phone-based modem networks. These two networks are too slow for downloading large information files or watching streamed videos. Internet infrastructure limitations may affect the ability of household-scale farmers to access the internet.

Industrial-scale shrimp producers stated that they could operate computers and that their computers were connected to the internet. This was observed during the seminar in Lampung whereby most producers had advanced digital devices such as tablets, which were also used to connect to the internet. This group of shrimp farmers owned computers to facilitate communication and the expansion of their business networks:

> I use a computer for sending email, interacting with the membership of groups or also just browsing stuff (ISSP_L 2013).

Based on above discussion, this study argues the initial physical capitals owned by household-scale shrimp producers did not favour the accumulation of livelihood capitals. Industrial-scale farmers had greater initial physical capitals which favoured the accumulation of other capitals. However, the endowment of physical capital is also determined by other types of livelihood capitals as discussed above.

6.5.3 Physical capital and capability to participate in lucrative export markets

This study suggests that physical capital indirectly affects capability to participate in markets. Physical assets relate to shrimp farming technologies which determine the volume of production.

Physical assets also contribute to the endowment for other types of capitals, which can improve capability to participate in lucrative markets.

6.5.3.1 Production facilities and capability to participate in lucrative export markets

This study found a relationship between applied technology associated with the scale of production, and export market penetration. First, as mentioned above, modernised technology results in a higher shrimp yield. This can affect an ability to sell shrimp to a type of shrimp buyers (discussed further in Chapter 7). Thus, technology associated with production facilities can be used as a measure of harvest volume which leads to capability to participate in lucrative markets.

The simple technology practiced by household-scale shrimp producers disadvantages this group compared to the other shrimp producer groups. The traditional farming system produces a smaller output per unit of production. Interviews with household farmers indicated that their productivity was 20–300 kg per ha, per cycle. Some producers often failed to produce any volume of shrimp. Low yields can affect the type of value chain that producers can participate in, leading to (discussed more detail in Chapter 7). This leads to complications in their value chains. This can affect ability to meet traceability requirements (discussed in Chapter 7).

According to Stanton and Burkink (2008), buyers require a minimum quantity of shrimp per product shipment and consistent supply. Interviews with some exporters evidenced this. The minimum quantity per product shipment is 20 tonnes and detailed traceability information is mandatory (SCI_2012; Exp_expt_SY 2013; EX_SS 2013). This volume equates to the combined production quantities of 400 household-scale farmers. To achieve this, management and coordination of detailed information about shrimp produced by each household-scale farmer is required. Consequently, traceability is a significant challenge. Therefore, the production of small quantities of shrimp is a major constraint to better participation in lucrative markets.

The relationship between productivity (technology) and markets can be complex (Barrett 2008), rather than being in a linear relationship. However, this study argues that higher yields enable greater penetration of lucrative markets. A similar argument was suggested by Roa et al. (2012) who focused on modern market participation in Kenya. While their study was conducted in another country and involved different endowment levels of livelihood assets to the Indonesian household shrimp producers, the study by Roa et al. evidenced a strong relationship between the quantity of production and participation in the modern market chain. They found a significant yield disparity between those who were able to have direct access to modern markets and those who could not. They concluded that farmers participating in a modern market chain are larger producers. Based on the findings from this study and the study by Rao et al., it is reasonable to suggest that the scale of production associated with production assets and the type of shrimp farming practices established, contributes to the capability to participate in lucrative market chains.

6.5.3.2 Non-production facilities and capability to participate in lucrative export markets

The endowment of non-production physical assets can provide the opportunity to upgrade for better participation in lucrative export markets. The level of endowment of non-production facilities such as mobile phones and computers (and computer literacy) can enable shrimp producers to access knowledge related to markets. Such knowledge can enable shrimp producers to analyse and define their own market intelligence. For example, access to market information shaped smallholder farmers' production and marketing strategy decisions in Zambia (Milligan et al. 2011). A World Bank policy research working paper also concluded that access to market information enabled rural farmers in Rwanda to promote commercial products (Diop, Brenton & Asarkaya 2005). Production strategising can be a step towards improving competitive advantage among other groups of producers participating in similar markets (Porter 1985). Kelling (2012) confirmed this argument in a study about shrimp produced in Bangladesh, which are marketed to the EU. Kelling (2012) concluded that knowledge is power to be competitive in the lucrative export market. In the case of export market requirements discussed in Chapter 4, access to information about the consumers' demands on traceable, eco-label certified and organic products may help shrimp producers to develop their production and marketing strategies.

However, household-scale shrimp producers are less likely to be able to identify their competiveness because they are disconnected from market information. This disconnection is associated with their limited mobile phone, computer literacy and internet access endowments explained above. For example, none of the household-scale shrimp producers interviewed were aware of the eco-label certification and traceability requirements (HSSP_BK 2012; HSSP_Sg 2012: HSSP_TI 2012; HSSP_M 2013; HSSP_P 2013; HSSP_MT 2013). This reflects the disconnection that household-scale shrimp producers have from the end buyers' interests, which affects their ability to promote their products.

In the case of organic products which have a higher economic value, some shrimp produced by household-scale shrimp producers could be promoted under this category because less artificial feed is used compared to that used in industrial- and transnational-scale production. The farmers could also sell their product as 'naturally produced shrimp' because the production systems do not place great pressure on the environment. This is due to low stocking densities and the fact that mangrove and other estuary ecosystems can be retained, as depicted in Plate 6.5. Branding that promotes farming practices can deliver a higher price to the producers and strengthen their competitiveness within the niche market. For example, banana retailers differentiate organically produced bananas, which are more expensive, from other type of bananas. Similar branding techniques may also be applied to shrimp produced by household-scale shrimp producers. However, they do not have the capabilities to promote their products and to take advantage of this market opportunity.

Plate 6.5 Household-scale shrimp farms within estuary ecosystems; Tanjung Ibus and Babah Krueng

6.6 Access to natural capital by different groups of shrimp producers

6.6.1 Factors affecting access to natural capital

Chapter 5 provided details about shrimp farm size and household-scale shrimp producers' abilities to choose suitable areas for shrimp farming. This section compares natural capital endowments across different groups of shrimp producers. This study argues that the natural resources endowment of household-scale shrimp producers is the least advantaged compared to other groups of shrimp producers. This can lead to different upgrading possibilities.

While the majority of household-scale shrimp producers had less than 5 ha of farm (Chapter 5), land, other groups of shrimp producers had a greater ability to acquire larger areas for farming. The average land area per farm for industrial shrimp producers varied from 4.7 ha to 521 ha (see Table 6.3). The transnational-scale shrimp producer had a significantly larger area for farming; the company had access to 186,250 ha for its shrimp farms, of which 48,850 ha had been developed, with 10,618 shrimp ponds established (UOB Kay Hian 2008).

Table 6.3 Land ownership and scale of operation for industrial-scale shrimp producers

Province	**Owned (%)**	**Rented (%)**	**Average land area per business (ha)**
East Java	68.70	28.03	521
South Sulawesi	100	0	60.75
Bangka Belitung	100	0	57.5
Lampung	100	0	11.24
Bali	54.7	45.3	10.97
West Kalimantan	99.9	0.037	7.28
North Sumatra	100	0	4.93
West Java	98.9	1.06	4.7

Source: Statistics Indonesia 2011

There also are differing abilities between Indonesian shrimp producers to acquire optimal shrimp farm areas. As discussed in Chapter 5, household–scale shrimp producers have limited capabilities to choose an appropriate location for their shrimp farms. Other groups of shrimp farmers have shown a greater capability to choose suitable locations. For example, during the seminar in Lampung 2013, the organizer took the participants visiting few shrimp farms owned by industrial-scale shrimp producers, it was observed that the shrimp farms were located in isolated and unpolluted locations. Such locations had better water quality and less risk of contamination from other ponds.

Higher ability to buy and to choose areas for shrimp farms may relate to the higher endowment of livelihood capitals by industrial- and transnational-scale shrimp producers. For example, acquiring larger areas requires significant financial capital which industrial- and transnational-scale shrimp producers are more likely to have. The ability to choose suitable locations seemed to relate to farmers' networks with the Indonesian government. The history of Indonesian aquaculture development (Chapter 2) provided earlier showed that the Indonesian government provided support to the private sector to access locations for shrimp farming during early modernisation of Indonesian shrimp farming in the 1980s. In the case of CP Prima, for example, although this study could not uncover the history of land acquisition by this company, this study assumes that the development of its shrimp farms distributed in Sumatra, Lampung and Java (some farms had been closed) might relate to Indonesian government intervention. This assumption is made due to the company being established in 1980 in Indonesia (CPP 2013), the same period that the Indonesian government developed a strategy to build the shrimp farming industry. Government support may have favoured the company's ability to access suitable locations for shrimp farms.

The acquisition of land by corporate groups to establish intensive shrimp farming echoes findings by Hall (2011) on land acquisition for shrimp farming and for other crops such as coffee, cacao and palm oil in South–East Asian countries. According to Hall, there are several ways that the private sector access land. One way is through utilising the existing power relationship between the 'outsider' (or investor) and government authorities. Village officials can use their power and connections to state authorities to wield control over land, determining who can access it and which location can be accessed. Although an industrial-scale shrimp producer respondent did not clearly state that they had used a government connection to acquire their optimal farm location, the following narrative indicates the role of the government in this arrangement:

> The farm is owned by an outsider from Central Java Province and hired a local person who had 20 years of experience working in intensive shrimp farms to manage the daily

operation of the farm. It is located in a remote area in South Sulawesi Province and was established in 2007. The original land was 'traditional forest' planted with teak trees and other mixed unproductive commodities. There was no proper road access to the farm. Total land area is 120 ha. In the early development plan, the company sought the best location. No industrial activities, so no significant pollution. By observation, water quality was very good. Water quality was the main determinant for the land selection, although water supply is 200 metres away from the farm's water reservoir. The company consulted the local authority for the farm establishment and sought support to gain access to the land. They established a team consisting of district officials and local NGOs to mediate the negotiation between the company and local communities (ISSP_tech_SS 2013).

However, Hall (2011) argued that the involvement of elites in land acquisition was not limited to corporate business since smallholders also used a similar approach. Interviews with farmers in Tanjung Ibus, Babah Krueng and Manyampa villages evidence this point, some farmers suggesting that they acquired the location through their relationships with the heads of villages (HSSP_TI7 2012; HSSP_BK18 2012; HSSP_M1 2013; HSSP_M3 2013). However, the extent of areas occupied by household-scale producers is likely to be more limited due to their lower endowments of financial, human and social capitals compared to the larger scale of shrimp producers. Further study on land acquisition by household-scale farmers may be necessary.

6.6.2 Natural capital and capability to participate in lucrative export markets

This study suggests that there is an indirect relationship between natural capital and capability to participate in lucrative markets. This research was not able to identify any previous studies that have evaluated this relationship.

First, the size of the shrimp farms and the type of shrimp farming practices affect the volume of production, which affects capability to comply with buyers' requirements as discussed previously in Section 6.5. Although the type of shrimp farming practice (i.e. extensive, semi-intensive or intensive) was the main factor affecting shrimp yield, the size of shrimp farms that could be cultivated also determined the quantity of shrimp. As explained in Chapters 2 and 5, the majority of household-scale shrimp producers used extensive shrimp farming practices and a small farm area, allowing them to produce only small yields. As explained briefly in Section 6.5 that a small yield results in a complex value chain which negatively affects the process of traceability of the products. In contrast, industrial- and transnational-scale producers can have shorter and simpler value chains which favour traceability because they are able to meet the volume required by downstream buyers (further explained in Chapter 7).

Household-scale shrimp producers' inability to select suitable locations for shrimp farms has resulted in vulnerability of increased production failure risks and complexity in their livelihoods. Further, those already farming in unfavourable conditions did not have the financial capability to overcome harvesting problems through, for example, liming acidic soils, fertilising pond soils, exchanging water to manage water quality and vegetating erodible soils to reduce soil erosion. Although household-scale shrimp producers could develop strategies to overcome problems related to natural capital, these problems still constrain their upgrading capability. For example, household-scale shrimp producers in Manyampa village face annual seasonal floods between April and June every year. Shrimp farmers adapted to this annual natural threat by adjusting their shrimp farming schedule. They started shrimp farming after the flood season and harvested before the flood season. This limited farmers' access to good quality shrimp seed because they are purchasing shrimp seed outside the normal stocking season. Hatcheries usually produce more seed during the stocking season so that there is a greater variety of seed quality and competitive prices.

The livelihood complexity associated with the annual flood faced by farmers in Manyampa village also means that shrimp farmers could only stock shrimp for one cycle in a year. Therefore, they must seek other livelihood activities for the remainder of the year. Shrimp farmers also have additional post-flood pond and dyke rehabilitation costs, which raises their production costs. In the event of a very big flood, shrimp ponds and dykes can be completely destroyed, requiring significant resources to rebuild them. Moreover, as farmers can only stock in certain periods, the service qualities of the natural resources at the time they need it may not favour shrimp farming. For instance, water supply becomes limited during the dry season when the farmers usually schedule their shrimp farming. Consequently, shrimp farmers could not adjust production times in response to buyers' demands or provide consistent supplies to buyers.

Limited capability to select suitable areas forces commodity diversification. This was found in Mattiro Tasi village. Although most coastal areas in Pangkep District were classified as suitable for shrimp farming (ACIAR 2011), this study found that shrimp farmers in Mattiro Tasi faced difficulties in accessing sea water.[17] This generates low salinity levels in the water supply, which can inhibit shrimp growth. As described in Chapter 3, limited water supply in this village related to the initial irrigation system design, which was developed for rice farming. Limited sea water supply has led some shrimp farmers to diversify their pond crops. Some household-scale shrimp producers stocked gold fish which is more resistant to low salinity. Although this strategy of diversifying the crop is important for livelihood and income security for poor households (Ellis 2000a; Giesbert & Schindler 2012), it has a negative relationship with the commercialisation of agricultural commodities. Specialisation can improve the efficiency in agricultural production which leads to reducing in production cost and higher profit (Emran & Shilpi 2012; Locay 1990). Therefore, commodity diversification by household-scale shrimp producers negatively production cost efficiency.

Based on the discussion above, this study concludes that household-scale shrimp producers have the lowest natural capital endowment of all shrimp producer groups. Small shrimp farms and their limited ability to select farm locations has resulted in small yields per farmer and increased production risk. These limitations are seen to hamper the capability of small-scale producers to upgrade to export markets through accessing more efficient value chains. This will be discussed further in Chapter 7.

6.7 Business scale, livelihood capitals, capabilities and export markets

The relationship between business scale, livelihood capitals and the capability to participate in lucrative export markets is shown in Figure 6.3. This figure forms an integral component of the conceptual framework used in this study (Figure 1.2, Section 1.3) and is captured in all studied villages. It also attempts to provide a simple and conceptual understanding of the relationship between these factors.

[17] The difference between the findings of this study and the mapping team may be associated with the design, rather than ecosystem attributes.

First, Figure 6.3 presents the variables of livelihood capitals that represent more specific attributes of the livelihood capitals. For example, this study used various variables within the human capital concept, such as level of education, life skills and English and computer literacy. Thus, human capital is not solely about education level. The competence or the extent of endowment of a person's livelihood capital involves the ability to accumulate a wide range of livelihood capital variables. For instance, someone who accumulates a wide range of human capital variables may have a higher competency of human capital. Referring to Figure 6.3, if someone is able to access a higher level of education or gain knowledge about sanitation, technology, group management, English and life skills such as business negotiation skills, they are more competent to carry out a task compared to a person with a similar level of schooling, but an absence of the other variables.

The above argument extends a comparable argument suggested by previous study by Lanzi (2007), which focused on the study of human capital. The human capital variable in Lanzi's study included basic skills, professional competencies and complex functions such for performing businesses. The level of competency (Lanzi's term for human capability) for a person's human capital is determined by the extent of endowment accumulation of these variables. For example, an understanding of the theoretical disciplines gained through basic formal learning can facilitate the acquisition of specific knowledge. However, this needs to be grounded in professional competency to enable someone to transform theoretical notions into operational practices. Such an approach can be materialised by integrating the education system into local production systems as a strategy to utilize and mobilises local resources.

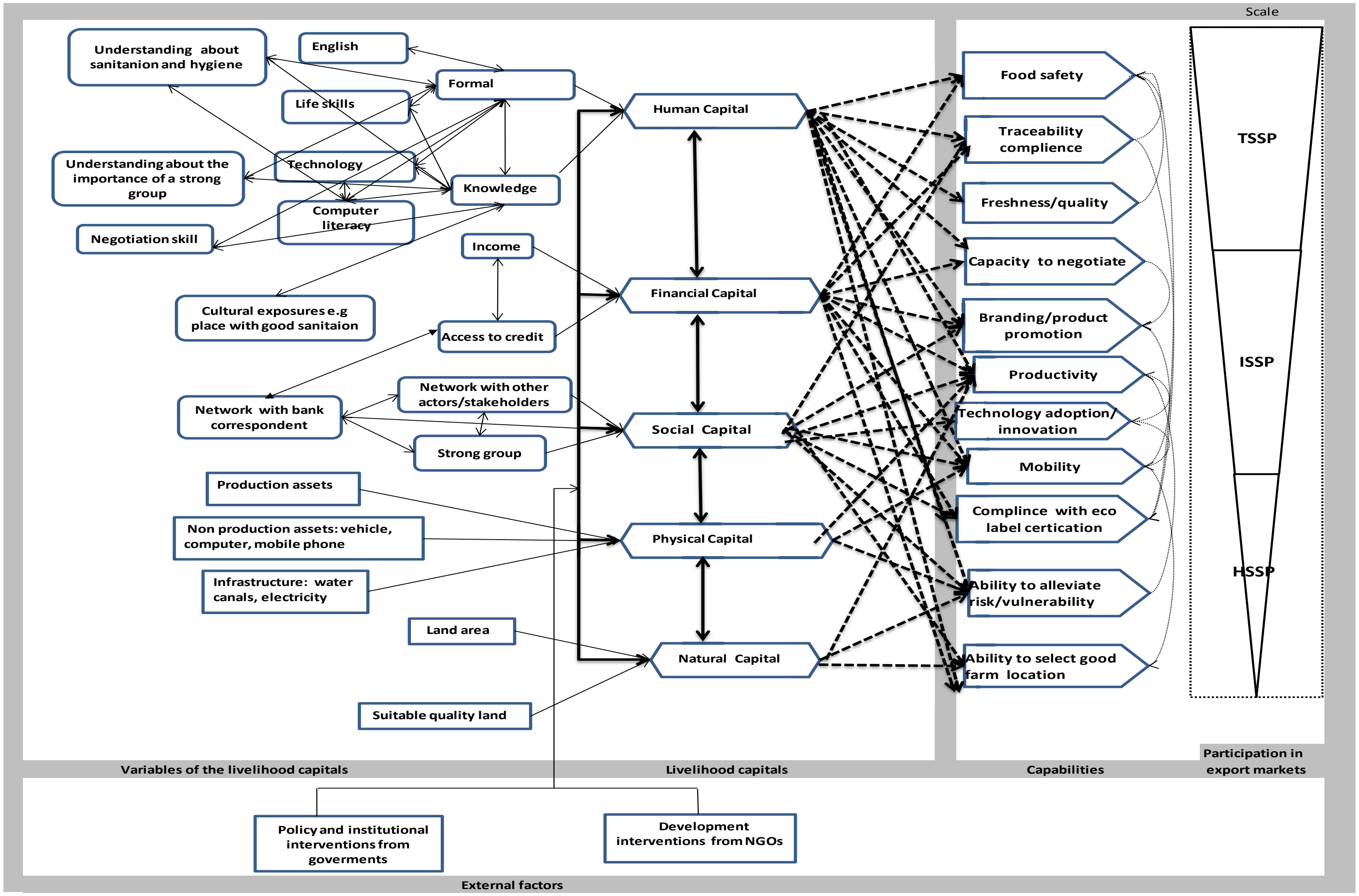


Figure 6.3 Stylised relationships between livelihood capitals, business scale and capability to participate in lucrative export markets[18]

[18] Note: Traceability is a part of food safety, but it is also included in some eco-label certification standards. This study separates traceability and food safety to identify capitals required for traceability.

Second, business scale has a positive relationship with the initial endowment and potential accumulation of livelihood capitals. A larger-scale farm has a greater potential to facilitate the accumulation of other livelihood capital variables, which makes it more competent than a smaller scale farm. This argument relates to the process of livelihood capitals endowment of, which is explained in Chapter 5. A further example is that initial financial, human and social capitals endowment for industrial- and transnational-scale shrimp producers contributed to their wider range of business networks. In contrast, the initial financial, human and social capitals held by household-scale shrimp producers were not sufficient to achieve a similar level of business networking. This process of capital enhancement, therefore, suggests that 'success builds on success' Emery and Flora (2006, p. 22).

Third, capability should be understood as the accumulation of a set of livelihood capitals. The ability to undertake a particular function (the definition of capability explained in Chapter 1), requires a set of capitals and an absence of a particular capital may distort functioning for upgrading. For example, human capital can support compliance with eco-label certification standards. However, financial and social capitals such as networks with certifying bodies and consultants are necessary for obtaining eco-label certification for a farm. A further example is the case of gaining direct access to buyers. A group of farmers may have a sufficient endowment of human and social capitals, which can facilitate direct access to buyers. However, productivity rates which are determined by physical capital (e.g. production facilities and technologies) and natural capital (e.g. suitable location) are also required to ensure there is consistent supply and that the quantity required by buyers is met. Furthermore, within a specific livelihood capital, there is also the need to accumulate other variables to enhance the capability. For example, investment in formal education itself, without the development of group management, negotiation and English skills will not ensure greater market participation for household-scale shrimp producers. This also needs to include other aspects related to understanding and knowledge of export market demands and food safety standards.

Further, capability also requires the accumulation of capabilities. This was also noted by Robeyns (2005); a capability consists of a set of capabilities. For instance, as presented in Figure 6.3, there are various capabilities that can determine the capability to participate in lucrative markets, such as the capability to produce a hygienic product to comply with food safety standards, the capability to meet traceability requirements and the capability to comply with eco-label certification. The endowment of limited capabilities may not be sufficient to secure an upgrade to farmers' participation in lucrative markets. It can be concluded that capability for greater participation in markets requires complex sets of livelihood capitals and even more complex sets of variables of livelihood capitals. Thus, upgrading for better export market penetration requires complex upgrading. This complexity is not only at the level of livelihood capitals, but also at the level of the variables of livelihood capitals.

Referring to the concepts above, larger business scales are able to carry out complex upgrading to improve their capability to participate in lucrative markets. In other words, the larger the scale of a business, the more capable it becomes. Therefore, in the case of the stratified Indonesian shrimp producers, the transnational-scale producer has the highest capability to enhance its penetration into lucrative markets. In contrast, household-scale shrimp producers are the least capable at enhancing their participation levels.

6.8 Conclusion

The findings of this chapter demonstrate the complexities involved in the endowment of livelihood capitals extending the argument suggested in Chapter 5. The endowment of a livelihood capital may have a reciprocal, loop-like with other types of livelihood capitals. This confirms that complexities in the endowment of livelihood capitals are not only limited to rural communities, but are a social phenomenon in wider society, such as Indonesian shrimp producers from different groups of business scales.

Household-scale shrimp producers have the lowest attainment levels of livelihood capitals compared to the other groups of shrimp producers. This was found in every livelihood capital—human, financial, social, physical and natural—and variable used in this study. The limited livelihood capitals of household-scale shrimp producers constrain their upgrading capabilities for better participation in lucrative export markets. This demonstrates that shrimp producers' business scale is positively associated with their initial endowment of livelihood capitals and determines their ability to enhance livelihood capitals and capabilities in the future. This means that self-driven development is only feasible for industrial- and transnational-scale shrimp producers. In contrast, household-scale shrimp producers depend on external help or intervention for their development.

The next chapter assesses the relationship between livelihood capitals and the GVC for each group of shrimp producers.

Chapter 7: The Indonesian shrimp global value chain and capability to participate in export markets

7.1 Introduction

This chapter describes the relationships between livelihood capitals (presented in Chapter 5 and 6), Indonesian shrimp global value chains (ISGVCs) and the capability to participate in lucrative export markets (Figure 1.2 Chapter 1). The discussion relates to the research sub-questions of the thesis: What kinds of GVCs are available to Indonesian shrimp producers? How do shrimp producers' livelihood capitals affect their access to channels in the ISGVC? How do the different channels within ISGVC affect shrimp producers' abilities to participate in lucrative export markets?

The argument suggested in this chapter is depicted in Figure 7.1. The chapter posits that the endowment of livelihood capitals associated with the scale of shrimp farms (Chapter 6) determines shrimp producers' access to certain types of channels within the ISGVC. Types of channel in turn, affect the capability of shrimp producers to comply with lucrative export market requirements. This then determines their capability to participate in lucrative export markets. This chapter, therefore, fills the knowledge gap in understanding how endowment of livelihood capitals among different groups of shrimp producers shapes their participation in GVCs.

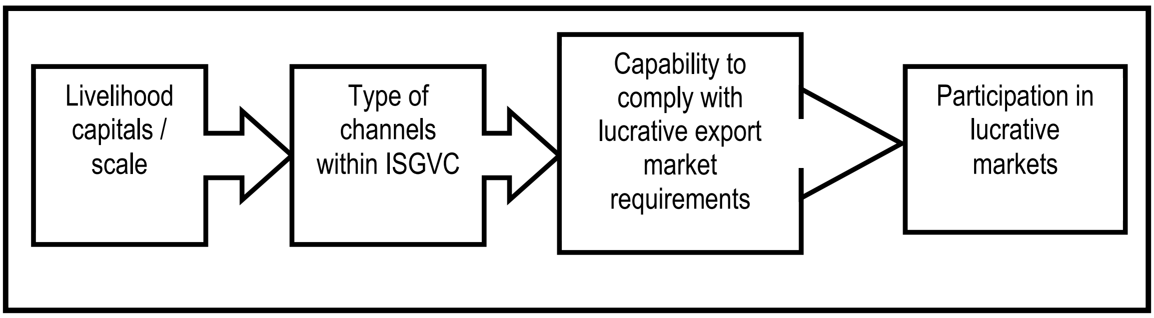


Figure 7.1 Conceptualised linkages suggested in this chapter

There are three concepts related to ISGVC used in this chapter: 1) Indonesian shrimp value chains (ISGVC describes the overall supply chain including inputs and marketing supplies across the three groups of shrimp producers; 2) Channel within ISGVC refer to the supply chains, from inputs nodes to marketing nodes, of a group of shrimp producers. In this study there are three channels: (a) the channel for household-scale shrimp producers (HSSP_GVC); (b) the channel for industrial-scale shrimp producers (ISSP_GVC); and (c) the channel for transnational-scale shrimp producers (TSSP_GVC); and 3) Route refers to inputs and marketing supply chains within a channel of the ISGVC. For example, the ISSP_GVC has three routes from inputs, production and marketing supply chains.

This chapter first describes a typology of inputs and marketing actors in Indonesian shrimp value chains. This typology explains the stratification in these value chain actors, and different class of these actors has different business behaviour. The discussion is followed by presenting the ISGVC. Due to the complexity of the ISGVC, a general overview is first provided (Section 7.3). This overview is then disaggregated by presenting each type of the channels within the ISGVC. This is followed by a discussion of the livelihood capital factors that determine access to particular types of channels (Section 7.4). Section 7.5 then discusses the implications of the different ISGVC channels for shrimp producers' capabilities to comply with lucrative export market requirements.

7.2 Typology of actors in Indonesian shrimp global value chains (ISGVC)

This study found that the stratification of input and marketing actors shapes the ISGVC (presented in more detail in Section 7.3). It affects the upgrading capabilities required for greater participation in export markets (further discussed in Section 7.4).The stratification of the inputs and marketing actors is summarised in Table 7.1.

Table 7.1 Summary typology of Indonesian shrimp global value chain actors

<table>
<tr><td rowspan="22">Direction of value chain</td><th colspan="3">Value chain nodes</th><th>Stratification</th></tr>
<tr><td rowspan="12">Production inputs</td><td rowspan="9">Shrimp seed</td><td rowspan="3">Broodstock</td><td>Tiger broodstock (Penaeus monodon)</td></tr>
<tr><td>Vannamei Nusantra 1 (Litopenaeus vannamei); called as N1</td></tr>
<tr><td>Imported Vannamei (Litopenaeus vannamei); called as F1.</td></tr>
<tr><td rowspan="3">Hatchery</td><td>Small-scale hatchery</td></tr>
<tr><td>Medium-scale hatchery</td></tr>
<tr><td>Large-scale hatchery</td></tr>
<tr><td colspan="2">Post-larva nursery</td></tr>
<tr><td rowspan="2">Seed supply middle actors</td><td>Post-larva agent</td></tr>
<tr><td>Juvenile agent</td></tr>
<tr><td colspan="2" rowspan="3">Shrimp feed marketing</td><td>Company marketing department</td></tr>
<tr><td>Shrimp feed distributor (wholesaler)</td></tr>
<tr><td>Agricultural inputs store</td></tr>
<tr><td colspan="3" rowspan="3">Shrimp production</td><td>Household-scale</td></tr>
<tr><td>Industrial-scale</td></tr>
<tr><td>Transnational-scale</td></tr>
<tr><td rowspan="6">Marketing</td><td colspan="2" rowspan="2">Wholesaler</td><td>Small wholesaler</td></tr>
<tr><td>Big wholesaler</td></tr>
<tr><td colspan="3">Coordinator</td></tr>
<tr><td colspan="3">Processing/exporter</td></tr>
<tr><td colspan="3">Importer</td></tr>
<tr><td colspan="3">Retailer</td></tr>
</table>

Source: primary data

7.2.1 Broodstock

Shrimp seed production begins with broodstock production. There are two types of shrimp broodstock marketed in Indonesia based on production technique. The types are wild caught and engineered broodstock. Tiger broodstock is wild caught, while vannamei is engineered and produced. In Indonesia there are two types of engineered vannamei broodstock including a type of imported broodstock produced by Shrimp Improvement System (SIS) distributed from Florida, Hawaii and Singapore (in Indonesia this is called F1). Another type of vannamei broodstock is Nusantara 1 (N1), which is produced by Indonesian Brackish Water Aquaculture Research

Centre (BBAP), owned by MMAF. The detailed typology of these broodstock is presented in Table 7.2

Table 7.2 Typology of Indonesian shrimp broodstock

Type of brood stock	Type	Producers	Species	Viral resistance	Production technology	Price per broodstock Rp. (US$)	Marketing actor
Engineered broodstock	F1	SIS	Vannamei	SPF[19]	Laboratory based production	400,000 ($ 40)	Marketing agent based in Singapore
	N1	Brackishwater aquaculture research centre (BBAP) Situbondo , under MMAF	Vannamei	SPF	Laboratory based production	60,000 ($ 6)	BBAP Situbondo; Brokers from nearby areas may also be involved
Wild broodstock	Not defined	Fishers	Tiger	Non-SPF	Captured	250,000 ($ 25) for female 70,000 ($ 7) for male	Broodstock agents around landing areas across Indonesia

Source: primary data

[19] Specific Pathogen Free (SPF)—broodstock which is guaranteed free of a particular pathogen.

7.2.2 Hatchery production system

There are three types of seed suppliers: those direct from hatcheries, post-larvae agents and post-larvae nursery farmers. This section focuses on hatcheries (seed production) and its marketing system. Nursery farmers are actors who buy post-larvae from hatcheries and grow it for 2–3 weeks before selling it on as juvenile shrimp (see Appendix 3 for more details).[20] Shrimp producers' access to shrimp seed is presented more detail in section 7.3.3 below.

Indonesian shrimp hatcheries are classified into small-scale, medium-scale and large-scale hatcheries (see Table 7.3). This classification is consistent with hatcheries classifications in other Asian countries, as highlighted by Weidner and Rosenberry (1992) and Shang, Leung and Ling (1998). Indonesian small-scale hatcheries are also identified as backyard hatcheries. The scale of the hatchery affects the quality of the post-larvae produced. The type of broodstock, technology and facilities used plays a significant role in production, which determines shrimp quality. Water quality problems often cause failures within backyard hatchery production (Shang, Leung & Ling 1998). This may be related to the lack of laboratory and water treatment facilities, as well as the type of broodstock used in this type of production.

Medium-scale hatcheries that produce tiger shrimp have stronger relationships with broodstock wholesalers around broodstock landing sites. The wholesalers can function as an extension of the hatchery, auditing the broodstock quality at the landing sites caught by fishers (BF_Ach 2012). These relationships develop because medium-scale hatcheries buy more broodstock than small-scale hatcheries. Small-scale hatcheries also principally use Nauplius as seed, which is produced by larger-scale hatcheries, rather than using broodstock in post-larvae production (Table 7.3). Thus, small-hatcheries do not interact with broodstock wholesalers as often as larger hatcheries. This can limit their ability to obtain the history of broodstock used to produce Nauplius, which can affect abilities to comply with traceability (Discussed in Section 7.5.3).

Each hatcheries group have different marketing routes involving different types of marketing actors (see Table 7.3). This relates to the minimum sales quantity. Hatcheries prefer to sell larger quantities because it reduces their transaction costs (Key, Sadoulet & De Janvry 2000). Large-

[20] A nursery farmer is type of seed middleman who adds value by growing post-larvae for two weeks before selling the product to shrimp producers.

scale hatcheries have stricter quantity requirements compared to those of smaller hatcheries. A large-scale hatchery owner suggested that the average quantity for purchase is one million post-larvae per transaction (HL_SS 2013). However, an industrial-scale shrimp producer stated that he purchased approximately nine million post-larvae per transaction (ISSP_NS 2013). Although backyard- and medium-scale hatcheries have a minimum quantity per transaction, it is much smaller than the quantity required by large-scale hatcheries. Interviews with backyard-scale hatchery owners indicated that their average orders were for 200,000–300,000 post-larvae per transaction (HBT1_SS 2013; HBT2_SS 2013; HBV1_SS 2013). Medium-scale hatchery respondents stated that the average transaction quantity purchased by brokers were between 500,000 and one million post-larvae (HM_ Ach 2012; HM_SS 2013).

Although large-scale hatcheries require larger quantities, this quantity can be met by industrial-scale shrimp producers. For this reason, large-scale hatcheries usually target industrial-scale shrimp producers and often have a dedicated marketing division to deal with buyers. The backyard- and medium-scale hatcheries usually target household-scale shrimp producers. However, the minimum quantity is still too large for household-scale shrimp producers. Thus, brokers and nursery farmers are the most likely types of buyer who can purchase seed with the quantity required by the hatcheries and later sell them on to household-scale farmers.

Table 7.3 Typology of hatcheries

Hatchery type		Seed type	Species	Production management	Annual production post-larvae	Tank capacity (tonnes)	Human workforce per hatchery	Production cost	Marketing actors
Outdoor	Small-scale (backyard)	Nauplius	Tiger and vannamei[21]	Simple management by household unit; located in backyard of household owner	10–20 million (Yi et al. 2009)	5–10	3 workers	Tiger: Rp. 10 /pl 12 (Yi et al. 2009); Rp. 13–14 pl 12 Vannamei: Rp. 19–21/pl 12 (this study)	1.Direct 2.Agent 3.Nursery farmers
Indoor	Medium-scale	Broodstock and vannamei, predominantly N1	Tiger and vannamei	Managed by family, but hires experts	30–100 million	10–20	5–15 workers	Tiger: 18–20/pl12 Vannamei: Rp.20/pl 12	1.Direct 2.Agent 3.Nursery farmers
	Large-scale	Broodstock predominantly F1	Mainly vannamei	Corporation.	A range between 100 million to 3 billion (MMAF 2010); CP Prima total production capacity 7.25 billion post-larvae (UOB Kay Hian 2008)	Estimated at minimum 20 Weidner and Rosenberry (1992) reported tank capacity at up to 500 tonnes	Number is not identified; workers are not limited to local/national experts since they may also hire international experts (Weidner & Rosenberry 1992)	Tiger: Rp. 14 /pl 12 (this study) Vannamie: Rp. 22/pl (Yi et al. 2009) Rp. 27–35/pl 12 (this study)	Company (marketing division)

[21] Tiger is the predominant species produced in backyard hatcheries. Vannmei has just been introduced in the last five years and its adoption is still limited. The owner usually acts as the technician and the manager. Hired labour is limited to a technician or supporting worker.

7.2.3 Shrimp feed suppliers

The feed production chain begins with feed manufactures who later distribute through their marketing chains. The discussion about shrimp feed suppliers only considers feed suppliers because this study was not able to contact feed companies. However, feed is predominantly used in intensive farming technology (explained in Chapter 2), which is practiced by industrial- and transnational-scale shrimp producers. Household-scale shrimp producers are more likely to use natural feed (algae) than artificial feed. Artificial feed is only used when there is a shortage of algae in the shrimp ponds.

There are three ways that Indonesian shrimp producers can access feed suppliers: (1) directly from a feed company through its marketing department; (2) through feed wholesalers (distributors); and (3) through agricultural input stores. Feed wholesalers are usually appointed by feed companies and specialise in selling one specific brand of artificial feed. Their profits are derived from commission received from the feed company (FD_SS 2013). The stores are not specialised, selling various agricultural inputs such as fertilisers and other chemicals. Agricultural input stores are further classified based on their administrative level including feed stores located in sub-district or district towns and provincial cities. Stores in provincial cities are usually larger than those located in sub-district or district towns. The smaller stores buy shrimp feed from stores in provincial cities, which access feed through the marketing departments of feed companies (ST_Ach 2012). This means that the supply chains of smaller stores are longer than those for larger stores located in provincial cities and the feed price is likely to be higher for smaller stores.

7.2.4 Shrimp wholesalers

In Bahasa, wholesalers are called '*pengumpul'* (collector). There are also other terms used for wholesaler. In Aceh Province, shrimp wholesalers are called '*toke bangku'* and in South Sulawesi they are called '*punggawa'*. *Pengumpul, toke bangku and punggawa* have similar functions. They purchase shrimp from farmers and derive profits from the margin between purchasing and selling prices. Wholesalers are classified into small and large wholesalers. This classification is mainly determined by the business scale and area of market coverage. Their characteristics are presented in Table 7.4 below.

Table 7.4 Typology of small and big wholesalers

	Trading quantity	Coverage of trading area	Traded commodities	Location relative to shrimp farmers	Sales destinations
Small wholesalers	50–500 kg	Sub-district to district level	Tend to be specialised in farmed aquaculture commodities; shrimp, milkfish, tilapia	Usually based in villages of production area; a few small wholesalers may live in the same village	Big wholesalers
Big wholesalers	1 tonne +	Inter-districts to inter-provincial	Can be specialised, but may also trade captured fish as well	Big wholesalers predominately located in district towns	Processor coordinators

Source: primary data

7.2.5 Coordinators

Coordinators or agents are known as brokers for processing companies and their function is to supply shrimp to processors (SCI_NS 2012). Coordinators obtain shrimp from large wholesalers and directly from the industrial-scale shrimp producers. Although the industrial-scale shrimp producers produce large volumes, they do not sell directly to the processors:

> We do not sell directly to BMI [a processor]. I sell to agent who sells to BMI. Similar business institution is also occurred in Java; BMI has business relationship with several coordinator buyers called agents (SCI_NS 2012).

Coordinators generate profits on a commission basis from processors. One coordinator in South Sulawesi Province said that he earned a commission of around Rp. 1,500–3,000 (US$ 0.15–0.3) per kg of shrimp (C_SS1 2013). Coordinators and processors are connected by an informal relationship; no formal contract is issued between them. Coordinators often deal with more than one processor. One big wholesaler (WB) in Aceh Province stated that a coordinator who he had dealt with usually supplied to two different processors (WB _Ach1 2012).

Processors tend to retain good relationships with the coordinators who supply the shrimp to big wholesalers and industrial-scale shrimp producers. Coordinators play a significant role for processors by ensuring the continuity of raw material supplies to processing companies. Coordinators achieve a continual flow of supply through long-term relationships with many big wholesalers and industrial-scale shrimp producers. A coordinator may have relationships with wholesalers from various production areas. For example, one shrimp coordinator in Pinrang District, South Sulawesi obtains shrimp from 20 wholesalers across various sub-districts. The relationships have been developed over 15 years. Coordinators may also have networks with industrial-scale shrimp producers, which may extend across provinces. A coordinator from

Surabaya, East Java Province, for instance, had access to industrial-scale shrimp producers in South Sulawesi Province (SCI_SS 2013). Therefore, coordinators' relationships with wholesalers and industrial-scale shrimp producers are important for their business supplying processors.

7.2.6 Processors and importers

Shrimp processors also provide cold storage and act as exporting companies. As stated above, processors obtain raw materials through coordinators. Processors deal with overseas importers via legal contracts. A purchasing contract consists of product specification, product price, the payment system from importer to buyer and delivery the system (Ept_expty_SY 2013; EX_SS 2013). Processors carry out activities such as peeling, deveining, beheading and freezing (EX_NS 2012; Ept_expty _SY 2013; EX_SS 2013).

Importers have direct business connections with retailers in importing countries (IM_ND 2012; Ept_expty_SY 2013). They also act as wholesalers in importing countries. They supply modern retailers (supermarkets) and traditional retailers in wet markets from importing countries. They may also sell shrimp to seafood restaurants (IM_ND 2012). They can sell frozen shrimp and can conduct further processing, such as preparing thawed and seasoned shrimp ready to cook, adding value to the imported products (IM_ND 2012; EX_SS 2013; Super market observations in Amsterdam 2012).

Importers usually have preferred exporters and existing relationships which have developed over long periods of time. Trust between the two actors underpins the continuity of the long-term business relationship. One exporter articulated:

> Everything relates to trust … a business transaction is not only driven by how cheap the product is … the importer considers also the safety of the product … If the product is not safe … They can have trouble later … As an exporter we have to maintain trust with the buyer … This is because the exporter has to understand product specifications requested by frequent importers (Ept_expt_SY 2013).

Previous studies have also suggested that trust is one of the major determinants of long-term business relationships (DeWitt et al. 2006; Doney & Cannon 1997; Ganesan 1994; Ganesan & Hess 1997; Lee & Dawes 2005). This suggests that the continual supply of products which meet buyers' expectations is a necessary capability for penetration into export markets.

7.3 Indonesian shrimp global value chain (ISGVC)

This section brings together an understanding of the overall ISGVC. As mentioned above, there are three channels which are stratified according to the scale of the shrimp producer: (1) channel for transnational-scale shrimp producers (TSSP_GVC); (2) channel for industrial-scale shrimp producers (ISSP_GVC); and (3) channel for household-scale shrimp producers (HSSP_GVC).

The complexity of the ISGVC is presented in Figure 7.2. This complexity is related to the stratification of Indonesian shrimp producers and other actors along the chain. The findings of this study suggest that the livelihood capital endowments of Indonesian shrimp producers (discussed in Chapters 5 and 6) contribute to their ability to access different input and marketing actors (explained in Section 7.3). The HSSP_GVC is very fragmented and complex, while the other types of ISGVC are simpler; the ISGVC for the transnational-scale producer demonstrates a fully vertically integrated chain (Figure 7.2). Production is directly connected from inputs production and the feed and seed processes, to the point of sale to importers or even retailers. Although some of industrial-scale shrimp producers are not vertically integrated in terms of owning other functions in the chain (seed production and processing), the scale of their production in the case of purchasing seed and feed and producing large harvest volumes still results in a fairly simple value chain (Section 7.3.2).

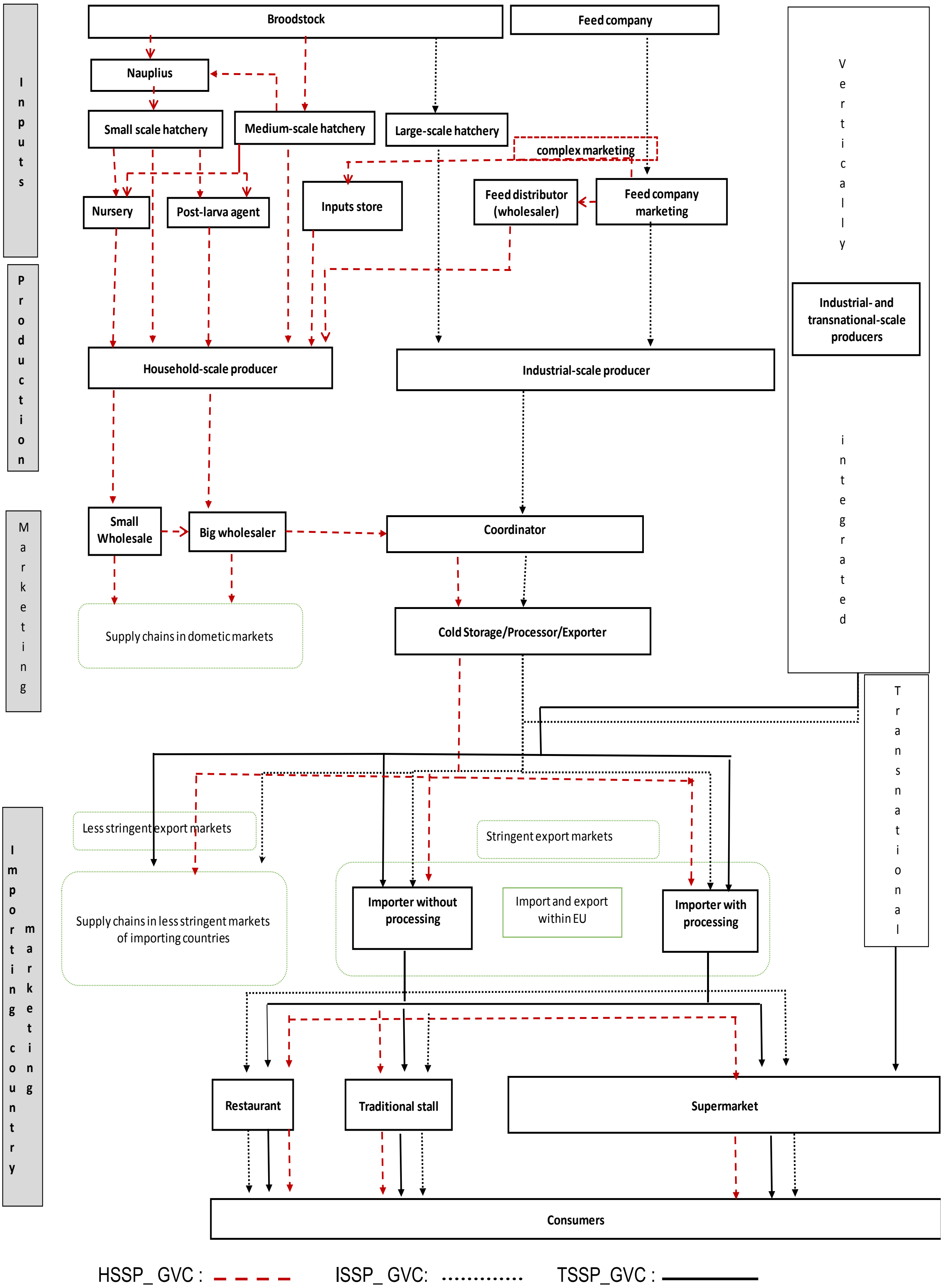


Figure 7.2: Indonesian shrimp global value chain; presenting three types of channels for export markets

7.3.1 Transnational-scale shrimp producers (TSSP_GVC)

The channel for transnational-scale producers is presented first because it provides a comparison for analysing the channel for household-scale shrimp producers, presented later. The vertically integrated route for the TSSP_GVC is structured through company subsidiaries. As stated in Chapter 6, CP Prima has subsidiaries that function to produce broodstock (LLC SIS and Hawaii LLC), shrimp post-larvae (CBB), shrimp feed (CBB), drugs (PT Marindolab Pratama) and marketing products. Although the shrimp farming and marketing processes are the responsibility of other subsidiaries (PT Central Pertiwi Bahari and PT Central Windu Sejati), these subsidiaries are positioned under the same umbrella as CP Prima's management, which has strategised and developed a vertically coordinated system among its subsidiaries to achieve its development targets. This favours coordination and optimisation of all functions (Kelling 2012; Porter 1985).

The findings of this study are consistent with those of a previous study by Goss, Burch and Rickson (2000), which reported that the CP Group has a vertically integrated GVC from input production, to shrimp production and processing, to exporting and marketing. However, their study focused on the corporate development that shaped the structure of the global shrimp industry. In terms of penetrating export markets, this study found that CP Prima's export sales are direct to retailers and in other cases, sales take place via importers. The financial report of CP Prima stated that it had direct business partnerships with Costco, Safeway, Tesco's, Sainsbury's and Japan McDonald's (UOB Kay Hian 2008). Moreover, CP Prima has wide business relationships with importers across developed countries. For example, an importer in the Netherlands mentioned that PT Central Pertiwi Bahari (CPB) was one of their Indonesian suppliers. The relationship had developed as a semi-formal relationship which tied the two companies together. The respondent added that his company was expected to prioritise CPB when sourcing their supplies. They should not purchase products from other suppliers if CPB was able to fulfil the specification of the product required by the importer (IM_ND 2012). Therefore, an informal business contract and a strong relationship favour market penetration for transnational-scale shrimp producers in importing countries.

7.3.2 Industrial-scale shrimp producers (ISSP_GVC)

This study suggests that the channel for industrial-scale shrimp producers (ISSP_GVC) has three route types for producers' accessing export markets: these are the (1) vertically integrated route;

(2) a combination between the vertically integrated and fragmented route; and (3) completely fragmented route. These routes are presented in Figure 7.2 and are simplified in Figure 7.3 below. This finding builds upon the findings of a previous study on the value chain of this group of Indonesian shrimp producers, which did not define the vertical and combination value chains (Yi et al. 2009). However, the study by Yi et al. classified this group of shrimp producers as large intensive shrimp farms based on their shrimp farming systems.

The vertically integrated routes for ISSP_GVCs are not as integrated as that for CP Prima. The industrial-scale shrimp producers' access to export markets still depends upon importers from the consuming countries. The highest integration to the downstream node is at the processing/exporting stage, and at the hatchery production node for the upstream node. This type of channel was found in South Sulawesi Province. The company had a shrimp farm and had begun building a large-scale indoor hatchery. When the interview was conducted, the indoor hatchery was being designed. The company marketed their shrimp predominantly to Japan and to a lesser extent, to the US (EX_SS 2013).

The combination routes are where supply is only integrated either to the input production nodes or to the marketing nodes as a processor (Figure 7.3). For example, an industrial-scale shrimp producer may have a processing company, but not a hatchery or feed manufacturing company. This study found several examples of combination routes in South Sumatra, Lampung, East Java and South Sulawesi Provinces. One shrimp processor in South Sumatra also owned a shrimp farm (EX_NS 2012). Lampung and South Sulawesi shrimp producers had indoor shrimp hatcheries (ISSP_LP2 2013; EX_SS 2013). A shrimp producer in East Java Province also had a shrimp feed manufacturing company (ISSP_SY 2013: Exp_expt_SY 2013).

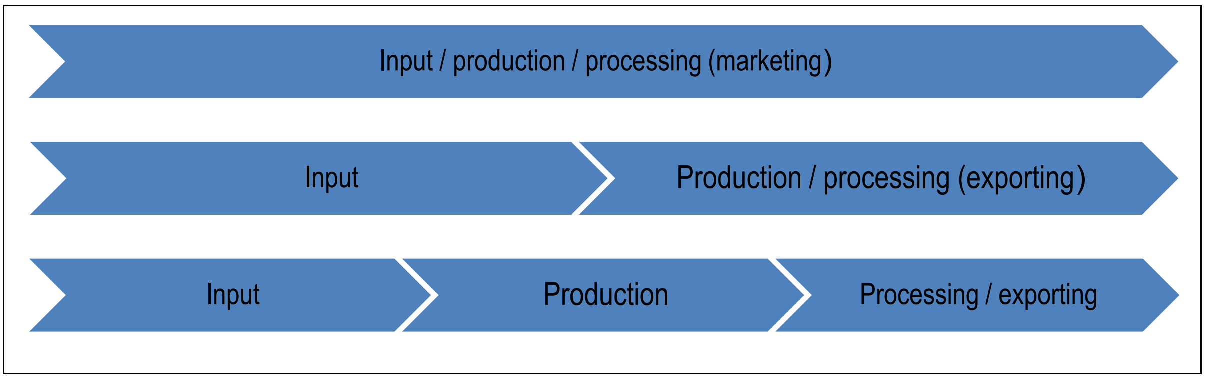


Figure 7.3 Three routes for a simplified channel for industrial-scale shrimp producers

The third route for a totally fragmented channel is when the shrimp producers only farm shrimp. Household-scale shrimp producers also have fragmented routes (discussed in Section 7.3.3 below). However, there is a significant difference between the fragmented route of the ISSP_GVC and the fragmented route of the HSSP_GVC. The difference is found in the type of supplier and marketing actors. The industrial category of shrimp producers purchase seed directly from large-scale indoor hatcheries, feed from feed producing companies and sell their yield to coordinators of shrimp processors. While their access may be mediated by a broker, the broker usually conducts direct transactions or is connected with a marketing agent for the processor and feed company. Industrial shrimp producers' access to buyers is also only mediated by one actor (the coordinator) before reaching the processing company.

7.3.3 Household-scale shrimp producers (HSSP_GVC)

The channel for household-scale shrimp producers to access export markets is more fragmented and complex than for the other categories of Indonesian shrimp producers. Yi et al. (2009) also concludes that this group of Indonesian shrimp producers have a fragmented and complex value chain. Several studies had similar findings for small-scale farmers in Bangladesh (Islam 2008) and Viet Nam (Tran et al. 2013). The HSSP_GVC involves more intermediaries with stratified business scales than the ISSP_GVC. For example, while most of industrial-scale shrimp producers obtain shrimp seed from large-scale hatcheries, household-scale shrimp producers access seed from backyard hatcheries, agents or nursery farmers. There are at least 16 different routes within the HSSP_GVC based on how household-scale shrimp producers buy seed and feed and sell their harvest onto export markets. These routes are simplified in Figure 7.4. Due to the large number of routes, this study was not able to theorise each complete route. The discussion, therefore, focuses on the types of sub-routes followed to access seed, feed and markets.

<table>
<tr><th>Routes</th><th colspan="2">Inputs supplier</th><th colspan="4">Marketing actors</th></tr>
<tr><td rowspan="2">1</td><td>Seed</td><td>Post-larva agent</td><td rowspan="17">Small wholesalers</td><td rowspan="35">Coordinators</td><td rowspan="35">Exporters</td><td rowspan="35">Importers</td></tr>
<tr><td>Feed</td><td>Inputs stores</td></tr>
<tr><td rowspan="2">2</td><td>Seed</td><td>Nursery farmers</td></tr>
<tr><td>Feed</td><td>Inputs stores</td></tr>
<tr><td rowspan="2">3</td><td>Seed</td><td>Backyard hatcheries</td></tr>
<tr><td>Feed</td><td>Inputs stores</td></tr>
<tr><td rowspan="2">4</td><td>Seed</td><td>Medium-scale hatcheries</td></tr>
<tr><td>Feed</td><td>Inputs stores</td></tr>
<tr><td colspan="3"></td></tr>
<tr><td rowspan="2">5</td><td>Seed</td><td>Post-larva agents</td></tr>
<tr><td>Feed</td><td>Feed distributors</td></tr>
<tr><td rowspan="2">6</td><td>Seed</td><td>Nursery farmers</td></tr>
<tr><td>Feed</td><td>Feed distributors</td></tr>
<tr><td rowspan="2">7</td><td>Seed</td><td>Backyard hatcheries</td></tr>
<tr><td>Feed</td><td>Feed distributors</td></tr>
<tr><td rowspan="2">8</td><td>Seed</td><td>Medium-scale hatcheries</td></tr>
<tr><td>Feed</td><td>Feed distributors</td></tr>
<tr><td colspan="3"></td><td></td></tr>
<tr><td rowspan="2">9</td><td>Seed</td><td>Post-larva agents</td><td rowspan="17">Big wholesalers</td></tr>
<tr><td>Feed</td><td>Inputs stores</td></tr>
<tr><td rowspan="2">10</td><td>Seed</td><td>Nursery farmers</td></tr>
<tr><td>Feed</td><td>Inputs stores</td></tr>
<tr><td rowspan="2">11</td><td>Seed</td><td>Backyard hatcheries</td></tr>
<tr><td>Feed</td><td>Inputs stores</td></tr>
<tr><td rowspan="2">12</td><td>Seed</td><td>Medium-scale hatcheries</td></tr>
<tr><td>Feed</td><td>Inputs stores</td></tr>
<tr><td colspan="3"></td></tr>
<tr><td rowspan="2">13</td><td>Seed</td><td>Post-larva agents</td></tr>
<tr><td>Feed</td><td>Feed distributors</td></tr>
<tr><td rowspan="2">14</td><td>Seed</td><td>Nursery farmers</td></tr>
<tr><td>Feed</td><td>Feed distributors</td></tr>
<tr><td rowspan="2">15</td><td>Seed</td><td>Backyard hatcheries</td></tr>
<tr><td>Feed</td><td>Feed distributors</td></tr>
<tr><td rowspan="2">16</td><td>Seed</td><td>Medium-scale hatcheries</td></tr>
<tr><td>Feed</td><td>Feed distributors</td></tr>
</table>

Direction of the routes

Figure 7.4 Simplified channel for HSSP_GVC, presenting 16 possible route types to access export markets

This study showed that household-scale shrimp producers buy shrimp seed from four different types of seed supplier: post-larvae agents, nursery farmers, backyard hatcheries and medium-scale hatcheries. However, only three per cent of household-scale shrimp producers bought seed from medium-scale hatcheries. This group of shrimp producers mostly bought seed from nursery farmers (67 %), which may involve the marketing chain for nursery farmers adding the number of intermediaries in the seed supply chains. Nursery farmers can also sell juvenile shrimp though agents. Many shrimp farmers believe that juveniles are stronger than post-larvae because they have adapted to natural earthen ponds during the period in nursery farms (HSSP_Sg1–6 2012; HSSP_TI9 2012; HSSP_BK5 2012; HSSP_MT11–13 2013; HSSP_P1–7 2013). To a lesser extent, farmers bought seed from post-larvae agents (17.72 %) and backyard hatcheries (11.39 %). Post-larvae agents may source their seed from backyard and medium-scale hatcheries. Further, nursery farmers may also obtain post-larvae either directly from hatcheries or through post-larvae agents (NF_Aceh 2012; NF_SS1 2013; NF_SS2 2013).

The involvement of intermediaries in accessing seed in the HSSP_GVC has been demonstrated in previous studies. Tran et al. (2013) and Barmon, Choudhury and Munim (2010) found that small-scale shrimp producers accessed seed from intermediaries or hatcheries. However, these earlier studies did not specify the type of intermediaries involved in shrimp seed supplies, which this study has identified as seed agents, nursery farmers and backyard and indoor hatcheries. Further, this study also evaluated the relationship between this stratified seed suppliers and capabilities to participate in global markets (discussed further in Section 7.5).

There are two ways that household-scale shrimp producers can buy shrimp feed: from agricultural inputs stores and from feed wholesalers. This was also identified in a study by Tran et al. (2013) This study found that the majority of household-scale shrimp producers bought artificial feed through agricultural inputs stores (82.3 %), usually located less than 25 kilometres from farmers (sub-district or district towns). Interviews did not indicate a difference in shrimp feed quality between feed purchased through stores and feed distributors. However, household–scale shrimp producers were restricted in their ability to buy feed directly from food distributors since the distributors had minimum purchase requirements and household-scale farmers required only small quantities for their shrimp farming (further discussed in Section 7.4.3 below). Nevertheless, artificial shrimp feed is not an important input for Indonesian extensive shrimp producers or in other countries such as Viet Nam because they use natural algae for feed (Tran et al. 2013).

Household-scale shrimp producers either sell their harvest to small wholesalers or to large wholesalers. This is consistent with another value chain study on Indonesian shrimp (Yi et al. 2009). However, in the present study, the household-scale shrimp producer farmers included those farmers categorised as modernising small farms in Yi et al.'s study. Thus, modernising small farms are still considered household–scale farmers since they are farmers who produce vannamei using semi-intensive systems. It was found that the majority of household-scale shrimp producers sell their harvest to small wholesalers (84 %). Subsequently, the shrimp follows a length chain with small wholesalers selling the shrimp to big wholesalers, who then sell the shrimp to coordinators in export markets (Figure 7.2).

7.4 Livelihood capitals and channels within the ISGVC

The previous section described the ISGVC channels for household-, industrial- and transnational-scale shrimp producers. This section continues this discussion by explaining the relationship between the attainment of livelihoods capitals (Chapters 5 and 6) and ability to access the different channels. The endowment of livelihood capitals, including human capital, financial capital, social capital, technological development and geographical location, determines the abilities of different shrimp producer groups to participate in particular ISGVC channels. To date, no previous study has looked at how livelihood capitals affect the ability of groups of shrimp producers to access certain inputs and market supply chains.

7.4.1 Livelihood capitals and channels for transnational-scale shrimp producers (TSSP_GVC)

Paik and Ando (2011) suggest that a high accumulation of means (livelihood capitals) can ensure the optimal functioning of a transnational corporation. Insufficient capitals may limit optimisation of the whole company function. The efficiency of a firm depends on the compatibility between skills, physical assets, how capitals are managed (Traversac, Rousset & Perrier-Cornet 2011) and business networks (Kabst 2004). An interview with the head of an Indonesian SCI confirmed this, he suggested that direct market penetration into consuming countries requires the accumulation of livelihood capitals. Market penetration requires a set of human, financial and social resources to establish marketing agencies within export markets (SCI_IND 2012). Therefore, CP Prima may have accumulated significant livelihood capitals to operate its businesses.

High degrees of accumulation of livelihood capitals discussed in Chapter 6 contributed to CP Prima's ability to achieve a fully vertically integrated chain. A fully integrated chain positions CP Prima as the most capable producer when compared to other types of shrimp producers. For instance, to operate and manage the vertically integrated chain and its subsidiaries, the company is supported by a highly capable human workforce comprised of postgraduate and graduate employees (Chapter 6) who support the company's functions. High competency of human capital is necessary to enable the process and efficiency of knowledge transfer between and within subsidiaries (Mäkelä, Björkman & Ehrnrooth 2009). The highly competent human workforce must be accomplished with financial capital, physical facilities and business networks. CP Prima's access to various financial sources (explained in Chapter 6) enables them to finance the development of highly integrated functions in the company.

Moreover, CP Prima has business partners in consuming countries who can benefit from its market competiveness. According to one key respondent, CP Prima has marketing divisions based in the US and Europe (Exp_expt_SY 2013). The international network of CP Prima also includes other value chain functions such as broodstock, seed production and financial sourcing (as shown in Table 6.1, Chapter 6). The global networking of different functions is a common practice for transnational companies producing primary commodities. Girvan (1987) suggested that competitive strategy for transnational-scale corporations in primary commodities is achieved through accessing global financial flows, global production and marketing networks and engaging international cheap labour. In addition, a study by Paik and Ando (2011) showed that international affiliates can enhance their global integration as part of their competitive strategy. Some transnational companies delegate expatriates to gatekeeper positions in host countries or subsidiaries to ensure that knowledge is well transferred from the parenting company located in the developed country, to the host company that usually located in developing countries (Kabst 2004). A company may develop various strategies in relation to the roles of their international affiliates (Bartlett & Ghoshal 1987; Jaw & Liu 2004; Venaik, Midgley & Devinney 2005). For example, a company may deploy an international affiliate to assess niche consumer demand in a specific market. The populations of many developed countries are becoming more international because the populations include migrants from various countries. As a result, markets become more fragmented. Thus, to enhance company penetration, it is necessary to understand the segmentation of consumption behaviour in such countries.

7.4.2 Livelihood capitals and channels for industrial-scale shrimp producers

As discussed previously, livelihood capitals directly and indirectly determine the quantity of inputs and output. The quantity of purchases and sales determines the ability of industrial-scale shrimp producers to buy larger-scale inputs from large suppliers such as indoor large-scale hatcheries and feed manufacturing companies. It also determines their ability to market their yield to coordinators of processing companies.

The capacity of industrial-scale shrimp producers to buy feed in large quantities enables them to buy feed directly from feed companies. For example, the minimum quantity required for buying shrimp feed directly from a feed company is 20 tonnes (FD_SS 2013). As described in Chapter 2, industrial-scale shrimp producers use intensive systems with a productivity of around 15 tonnes per ha, per production cycle, and a FCR of 1.7. Thus, one farmer from this group with 5 ha of shrimp ponds requires 127.5 tonnes of artificial feed. Therefore, by purchasing this quantity, it enables the industrial-scale shrimp producers to buy shrimp feed directly from the feed companies.

The scale of production also contributes to the ability to buy shrimp seed from large-scale hatcheries. Access is not limited by distance and geographical position, even if the farmer and seed producers are some distance apart. For example, this study found industrial-scale shrimp producers from South Sulawesi purchased shrimp post-larvae from Surabaya (775.31 kilometres from Makassar) and Lampung (around 1,562.41 kilometres from Makassar). Industrial-scale shrimp producers from Medan stated that they purchased shrimp post-larvae from Lampung (1267.25 kilometres from Medan), Surabaya (1973.14 kilometres from Medan) or South Sulawesi (2503.03 kilometres from Medan) (ISSP_SS1 2013; ISSP_NS1 2013). The distances were estimated based on aerial measures. In terms of practical transport, these distances can be further away considering hatcheries and shrimp farms are usually located in remote coastal areas (the locations of these cities were presented on the map in Chapter 3).

The quantity of purchase and level of financial capital endowment are the core factors determining the ability explained above. For example, one industrial-scale shrimp producer from Medan had a 20 ha shrimp farm and a stocking density of 120 post-larvae per metre square. This farm required 24,000,000 post-larvae shrimp per stocking. The farm owner stated that one post-larva vannamei price was Rp. 35 (US$ 3.5 cents) when purchased from Lampung Province.

Thus, the total cost for post-larvae for one stocking was Rp. 936,000,000 (US$ 93,600). The farmer stated that the cost for air cargo was 10 per cent of the total cost, which is an additional US$ 9,360. In sum, this farmer offered a business transaction value of Rp. 1,029,600,000 (US$ 102,960) to hatchery businesses per stocking. This large value means that large-scale hatcheries deal directly with industrial-scale shrimp producers.

Significant production quantities not only enable industrial-scale shrimp producers to sell their yield to coordinators, but it also enables them to choose buyers who might offer better prices. For instance, if a farmer produces 300–400 tonnes of shrimp in a total harvest,[22] such a quantity attracts coordinators interested in direct business transactions, without involvement of wholesalers. It also attracts coordinators from other provinces. For example, some industrial-scale shrimp farmers in South Sulawesi sold through a coordinator from Surabaya (ISSP_SS1 2013). According to the head of Indonesian Shrimp Club (SCI_IND 2012):

> We do not always sell to the same person. The selection of the agent is based on who offers the best price. Although all agents may sell to the same cold storage, there is a possibility that one coordinator offers a higher price. I usually make phone calls to several coordinators before making a decision.

The above discussion demonstrates that production scale determines ability to gain direct access to larger scale of inputs and marketing actors. It also determines the ability to choose suppliers and buyers who will serve the interests of the shrimp producers. This capability favours participation in export markets (presented in detail in Section 7.5).

7.4.3 Livelihood capitals and channel for household-scale shrimp producers (HSSP_GVC)

While the industrial-scale shrimp producers' livelihood capitals endowment enables them to access 'sophisticated actors' for inputs and marketing (large-scale hatcheries, feed companies, processing company coordinators), household-scale shrimp producers are constrained by the small scale of their farm and a lack of endowment of livelihood capitals which could facilitate their access to similar types of value chain actors. This results in stratification in accessing value chain actors. Even within the household-scale shrimp producer group, there is further ability stratification in accessing certain types of inputs suppliers and marketing actors due to the

[22] The farmer has 20 ha of a shrimp farm, with productivity rates at approximately 15-20 tonnes per ha harvest.

difference in endowment of livelihood capitals by different areas (as explained in Chapter 5). In other words, some household-scale shrimp producers have more efficient supply chains than others.

While remoteness and limited social capital can dictate poorer access to certain types of input suppliers and buyers for shrimp producers, collective action can enhance their capabilities (Fischer & Qaim 2012; Hellin, Lundy & Meijer 2009). A study by DeWitt, Giunipero and Melton (2006) suggested that geographical clustering had a positive effect on the efficiency of supply chains. However, this process relies on human capital competencies such as the skills to manage collective action.

The following sections present several examples from the research which demonstrate the relationship between household-scale shrimp producers' livelihood capitals and access to shrimp seed, shrimp feed and buyers.

7.4.3.1 Livelihood capitals and access to seed suppliers

Household shrimp producers who buy shrimp seed from post-larvae agents and nursery farmers are those with small farms (and with small quantities of inputs and outputs), those with limited ability to buy seed directly from hatcheries and those who do not participate in shrimp farmer groups.

Household-scale shrimp producers with small farms purchase small quantities of seed per stocking session. For example, a household-scale shrimp farmer with 1–5 ha shrimp farm only requires 10,000–50,000 post-larvae per stocking (stocking density 1/m^2). As explained in section 7.2, a backyard hatchery prefers orders of between 200,000–300,000 post-larvae per transaction. Thus, household-scale shrimp farmers with farms less than 5 ha are unlikely to be able to directly purchase from hatcheries. Household-scale shrimp producers with larger farms may have sufficient order quantities to buy seed from hatcheries.

Geographical distance between farmers and seed producers also determines household-scale shrimp producers' capabilities to purchase shrimp seed directly from backyard hatcheries. Shrimp farmers can buy seed directly from backyard hatcheries located near to their villages. For example, two backyard hatchery owners in Madello village indicated that they had sold post-larvae to farmers who lived in adjacent villages (HBT_SS1 2013; HBV_SS1 2013). This meant that the ability of shrimp farmers to buy seed directly from hatcheries was limited. The hatchery owners added that only 10–20 per cent of their production was sold directly to farmers, and the remainder was sold to agents and nursery farmers (HBT_SS1 2013; HBV_SS1 2013).

However, there is also tendency that shrimp producers often prefer to buy shrimp seed from agents rather than purchasing them directly from backyard hatcheries. This is the case even when road conditions enable them to purchase seed directly. This tendency is due to the nature of the business relationship between agents and hatcheries. Hatcheries usually charge higher prices to household-scale shrimp producers than agents or nursery farmers. In Madello village, shrimp farmers who purchased shrimp seed directly from hatcheries paid Rp. 1 (US$ 0.0001) more than the seed price paid to agents and nursery farmers (HBT_SS2 2013; HBV_SS2 2013). The additional cost and time spent going to hatcheries hinders shrimp farmers' access to hatcheries (HSSP_TI1–9 2012; HSSP_BK10–24 2012: HSSP_MT8–23 2013; Key, Sadoule & De Janvry 2000). Post-larvae agents and nursery farmers delivered the seed to shrimp farmers (NF_Aceh 2012; NF_SS2 2013). Therefore, buying seed from these types of suppliers was more convenient.

Collective action could alleviate the disadvantaged position that household-sale shrimp producers face when buying inputs from larger-scale seed suppliers. As discussed in Section 5.4, the collective action facilitated by the WorldFish Center in Sangso village and Biureun District, Aceh, enabled the shrimp farmers to sell their harvest to processors. The project also helped shrimp producers to collectively purchase seed from an indoor shrimp hatchery. By acting collectively, the shrimp producers also had greater bargaining power to request laboratory tested seed to prevent viral infection. However, as argued in Chapter 5, there is still a need for human capital empowerment for the farmers to ensure that the collective actions initiated by the WorldFish Center are sustainable. As mentioned in Chapter 6 that all the processes were facilitated by a field assistant who was hired by the project. There is a risk that the farmers may not continue with the processes when the field assistants leave.

7.4.3.2 Livelihood capitals and access to feed suppliers

The quantity of feed purchased is connected to the type of shrimp farming practiced. This connection affects access to feed suppliers. Geographical distance between shrimp producers and feed wholesalers also contributes to limited access to feed suppliers for shrimp producers.

It was found that all household-scale shrimp producers with small farms using extensive shrimp farming systems bought shrimp feed from agricultural inputs stores. Some household-scale shrimp farmers bought a maximum amount of 10 kg of shrimp feed because they used algae as shrimp feed. Often, this category of shrimp farmers purchased shrimp feed in several transactions. For instance, some farmer only bought 5 kg of shrimp feed per transaction (HSSP_BK24 2012; HSSP_Sg11–14 2012; HSSP_MT10 2013). One feed wholesaler mentioned that the minimum amount sold was approximately 25 kg (FD_SS 2013). Feed wholesalers do not sell smaller volumes because they seek to minimise transaction costs. Thus, those household-scale farmers using smaller quantities of shrimp feed are excluded from his supply chain.

Demand for shrimp feed within a production area motivates the development of feed distributors. This influences the ability of household-scale shrimp producers to buy feed from feed distributors. Geographical distance is a factor that affects the ability of farmers to access higher-scale feed suppliers. Among the seven villages studied, only one feed distributor was found where shrimp farmers practiced semi-intensive shrimp farming, in Madello village. As discussed in Chapter 2, this farming system requires a higher quantity of shrimp feed than the extensive shrimp farming system. Therefore, the demand for shrimp feed is higher in this area compared to the other villages studied where the farmers use extensive shrimp farming systems. Higher demand for shrimp feed in Madello village may have driven the appointment of a feed distributor by the feed company. As a result of this, shrimp producers can buy shrimp feed from a feed distributor. However, access is still constrained by the minimum quantity requirements for purchase as discussed above.

7.4.3.3 Livelihood capitals and access to shrimp buyers

There are complex factors that affect the ability of household-scale producers to sell their harvest to shrimp buyers. The size of the shrimp farm, geographical distance from marketing actors, type of technology employed and social capital endowment are all major factors that affect the ability of household-scale shrimp producers to access particular marketing actors; small wholesalers or big wholesalers (Section 7.2; Figure 7. 3)..

Household-scale shrimp producers with a small yield predominantly sell their yields on to small wholesalers. The majority of farmers that practiced extensive shrimp farming systems in the villages studied sold their harvest to small wholesalers. As mentioned in Section 7.4, approximately 84 per cent of all respondents in South Sulawesi sold their shrimp harvest to small wholesalers. This type of farmer could produce only 30 kg of shrimp in one production cycle (HSSP_BK13 2012). In the South Sulawesi villages, farmers might practice selective or partial harvesting (HSSP_MT16–23 2013). This results in an even smaller yield quantity per transaction that can be sold by the farmers.

The higher percentage of household-scale shrimp producers selling their harvest to small wholesalers is also driven by geographical distance. This study found that those farmers usually sold their shrimp to small wholesalers who lived in the same village. The majority of small wholesalers who bought shrimp from household-scale shrimp producers lived less than five kilometres away from the farmers. The geographical barrier to accessing buyers that are located further away may be related to the limited endowment of vehicles by household-scale farmers (as discussed in Chapters 5 and 6).

Farmers who practice semi-intensive production generate larger harvests, allowing them to sell their harvest on to large wholesalers. The relationship between production scale and ability to access the big wholesalers is similar to the case of farmer access to the feed distributor in Madello village presented above. The relationship is independent of the size of the shrimp farm because small farms using semi-intensive farming systems produce a relatively larger yield than extensive ones. To re-emphasise, in Madello village household-scale producers grow vannamei using semi-intensive technology. One shrimp farmer in Madello village with a 1.4 ha farm could produce 1–1.5 tonnes of vannamei per cycle using a semi-intensive shrimp farming system. With this harvest, he was able to attract a big wholesaler located 10 kilometres from his farm. This harvest volume could fill three cooling boxes and be directly shipped to processing companies via coordinators (HSSP_MD17 2013). This demonstrates that the harvest quantity, which is determined by the shrimp farming technology employed, can eliminate the effect of geographical distance in limiting access to marketing actors discussed in the following paragraph.

Proximity is a significant factor influencing household-scale shrimp producers' access to big wholesalers. Household-scale shrimp producers who lived close to big wholesalers could sell their harvest to them despite their small production quantities. However, this study found that only 15 per cent of interviewed household-scale producers sold their shrimp to big wholesalers. Big wholesalers are located in towns at the sub-district or district level, so they can be 15 kilometres or more from the villages. For example, one big wholesaler in Aceh said that he also bought shrimp directly from poor household shrimp producers who lived less than one kilometre from his place. However, farmers had to deliver their yield to him (WB_Ach1 2012). Thus, it is reasonable for big wholesalers to accept a harvest from the shrimp farmers that is delivered directly to them because there are no transport costs.

Household-scale shrimp producers' limited social capital explained in Chapter 5 and 6 hindered their ability to choose among buyers. Approximately 39 per cent of household-scale shrimp producer respondents indicated that they had were unable to choose between buyers. For example, respondents from Mattiro Tasi and Manyampa villages in South Sulawesi Provinces stated:

> I do not have other option; he is the only buyer in this area … He is the only shrimp buyer I know … (HSSP_MT1, 6,7,11 2013; HSSP_M3–23 2013)

The above suggests that the farmer has a lack of business networks. However, an inability to choose among shrimp buyers also relates to the shrimp producers' financial dependency on shrimp buyers. This dependency can mean that farmers are tied to a specific shrimp buyer. As discussed in Chapter 5, shrimp buyers often provide credit to shrimp producers, hindering the ability of shrimp producers to sell their yield to other buyers. There is a common-held understanding that shrimp farmers must sell their shrimp to shrimp buyers who provide them credit (HSSP_MT18–23 2013; HSSP_M10–22 2013). The debt is not limited to cash, but it also extends to shrimp seed as some shrimp buyers also act as seed suppliers. This arrangement was predominantly found in South Sulawesi whereby 21 per cent of all respondents of household-scale producers in the province had this relationship with buyers. When asked why they sold their shrimp to a particular buyer, their answers were 'I borrowed money from him' (HSSP_MT20–23 2013). Others said 'I took seed from him too' (HSSP_M1–18 2013). They also added that there was a risk of being excluded from the opportunity to access credit if they sold their shrimp to other shrimp buyers (HSSP_MT20–23 2013). Moreover, shrimp buyers often do not want to accept shrimp from farmers who have borrowed money from other shrimp buyers. One shrimp buyer stated:

> Sometimes there are shrimp farmers who never sell their harvest to me, come and offer to sell their harvest. For that kind of farmer, I have to ask whether they have taken any credit from other buyers. We have to do this because we do not want to create a conflict between us in this area. I am not the only shrimp buyer in this village and all of us are the members of this community and need to keep good relationships among us (WS_SS2 2013).

Therefore, social custom in the community has limited the ability of shrimp farmers to choose among shrimp buyers.

Additionally, the lack of accumulation of livelihood capitals presented above can increase household-scale shrimp producers' vulnerability, as price takers with no ability to bargain on prices. The combination of geographical position (including distance from value chain actors and presence of transport facilities), number of shrimp producers in an area, production scale, low social capital endowment concerning networks with various buyers, and financial dependency worsen shrimp producers' capability to access the best inputs and markets. This was evidenced in the geographically isolated South Sulawesi, Manyampa village. As described in Chapter 3, this village is geographically isolated. It is located in Bulukumba District, even though according to ACIAR (2011) mapping, the majority of villages in Bulukumba District are not suitable for shrimp farming. The total population of shrimp farmers is approximately 50 households, with a total shrimp farm area of around 40 ha (Manyampa 2013). Other villages such as Mattiro Tasi, Pajukukang and Madello have 628.69 ha; 127.31 ha and 145 ha of shrimp farm area, respectively (Figure 3.2, Section 3.5). Due to an inability to build a critical mass of shrimp farming activities, there was also a lack of businesses required to support shrimp farming, such as suppliers and traders for inputs and yields. There was only one shrimp wholesaler located at the sub-district level and he was also the only seed supplier. Consequently, as high as 96 per cent of all respondents in Manyampa village bought inputs and sold their yields to the same person.

By monopolising seed supply and market access it has given this wholesaler a powerful position and conversely, given the farmers a weak position. During a visit to the wholesalers' house, it was observed that the price was set as an 'absolute' deal by the shrimp buyer. The farmers were not able to bargain for a better price for their shrimp. It was observed that one farmer sold 3.3 kg of tiger shrimp at size 18 per kg to this wholesaler. The wholesaler's worker argued that the shrimp quality was not good enough and gave the farmer a price of Rp. 73,000 /kg (US$ 7.3/kg). The price set by processors for this kind of shrimp was Rp. 76,000/kg (US$ 7.6/kg). The wholesaler then sold the same shrimp for Rp. 120,000 (US$ 12/kg) to another buyer who came to the wholesaler's house approximately ten minutes after the farmer had left. This observation demonstrates the vulnerability of poor shrimp producers who produce small yields, lack the social capital required to access other buyers, and live in isolated production areas. They must accept any prices offered by the wholesaler.

7.5 Channels and capability to participate in lucrative export markets

This section discusses how the channels within the ISGVC can affect the capabilities of shrimp producers to access lucrative export markets. Previous studies have also evaluated the relationship between value chain and participation in export markets (Lee, Gereffi & Beauvais 2012; Tran et al. 2013). However Lee, Gereffi and Beauvais (2012) have only provided a general conceptualisation of the relationship for agricultural produce, and have not provided comprehensive empirical evidence. Moreover, a study by Tran et al. (2013) did not compare different groups of shrimp producers and did not incorporate the effect of the business behaviour of intermediaries or micro governance between value chain actor nodes upon export market participation. The study also did not differentiate between tiger and vannamei shrimp, which is an important distinction because the two species have different broodstock production systems (explained in Section 7.2) that which can affect compliance capability

This study argues that the way that shrimp producers are integrated into other nodes (inputs and markets) affects their capability to participate in lucrative export markets. This argument is consistent with Tran et al. (2013), who found that vertical relationships between upstream and downstream nodes in a supply chain was key to the ability of farmers to meet product standards required by government and retailers, including food safety and quality standards.

The mechanism by which the channels in ISGVC affect capability to participate in export markets is complex. First, the route types in the ISGVC shape coordination among the actors. Coordination in long and complicated chains is harder than simple and short chains. Coordination in a supply chain is critical to communicating the required specifications from the final buyers (van Tilburg et al. 2012), as well as communicating the transfer of knowledge and the quality control system of a supply chain (Fischer & Qaim 2012; Fałkowski 2012; Lee, Gereffi & Beauvais 2012;

Ponte & Gibbon 2005). Close coordination between nodes is necessary to communicate and manage targeted staregies including inputs production and supply, product specification and marketing (Lee, Gereffi & Beauvais 2012). Creating strategies that account for fluctuations in the market, such as changing product specifications and regulations, can be easily coordinated in sort and simple routes, such as those that are vertically integrated. Coordination also includes organizing information sources from each node in the supply chain to meet traceability requirements (María Angeles, Ángel Martín & Oreja-Rodríguez 2012). Thus, coordination between value chain actors on these factors shapes the competitiveness of a firm in its markets (Porter 1985).

Second, route types followed affect capability to comply with food safety requirements. They also affect ability to access quality inputs and produce quality outputs. This leads to the ability to meet the standards of eco-label certification schemes. These relationships are subject to the business behaviours of the intermediaries involved in each node of the ISGVC. Finally, accessing inputs via 'sophisticated' inputs suppliers also benefits shrimp producers to obtain technical assistance from private companies. This can result in the upgrading of shrimp farming technology and knowledge diffusion from private companies to the shrimp producers.

This discussion shows that the complicated routes within HSSP_ISGVC limits the capability of household-scale shrimp producers to comply with export market requirements. Therefore, household shrimp producers are the most disadvantaged compared to other groups of shrimp producers. This argument is consistent with Belton et al. (2011) who argued that large- and small-scale farmers across other aquaculture commodities were polarised with respect to their capabilities to comply with certification schemes. Thus, the limited capability of small-scale farmers can hamper their participation in lucrative markets. A study by Rivera-Ferre (2009) also suggested that only the industrial intensive shrimp producers were able to comply with the complex international export market requirements.

The following section explains how the ISGVC's stratified channels affect shrimp producers' capabilities to meet export market requirements.

7.5.1 Quality of production inputs

The quality of the production inputs relates to productivity since poor inputs can increase risk of production failure. Good quality seed positively affects shrimp farming, (Bachere 2000) enabling a consistent supply to buyers. The determinants of seed quality include whether it is SPF seed, the grade of broodstock and age of post-larvae. The relationship is that the type of seed supply routes in which shrimp farmers can access determines farmers' ability to buy and choose good quality of shrimp seed.

Shrimp seed routes for industrial- and transnational-scale shrimp producers to large- and medium-scale hatcheries enable shrimp producers access to SPF vannamei shrimp seed. This is because large- and medium-scale hatcheries produce post-larvae using engineered SPF vannamei broodstock as described in Section 7.1. Thus, post-larvae are more tolerant to viral infections (Briggs et al. 2004). According to Bachere (2000), shrimp immunity plays a significant role in preventing disease and infection, leading to higher shrimp survival rates. At the post-larvae production level, for example, this study found that the survival rate of tiger shrimp was lower than vannamei. A backyard hatchery owner who was adopting vannamei reported that one million vannamei Nauplius produced 400,000 post-larvae. This produced a survival rate of 40 per cent. In contrast, the survival rate of one million tiger Nauplius was 10–25 per cent. This example may reflect a higher risk associated with using wild caught broodstock, which is non-SPF broodstock. However, a scientific laboratory experiment comparing the survival rates between the two species may be necessary because there seems to be a false understanding that vannamei is resistant to viral infection. A report by Rangkuti (2007) stated that vannamei is also prone to several diseases such as taura syndrome virus (TSV) and infectious myonecrosis virus (IMNV).

Although both medium- and large-hatcheries produce SPF vannamei post-larvae, there is a quality disparity in the seed produced by large–scale and medium-scale hatcheries. The disparity relates to the type of vannamei broodstock used by the different hatcheries scales in post-larvae production (Table 7.3). While the Indonesian government has stated that vannamei N1 has a good growth rate and has greater resistance against viral infections, this study indicates that 80 per cent of vannamie farmers preferred to use F1 post-larvae produced by SIS. They stated that this type of post-larvae had a better growth rate and morphological homogeneity (SCI_NS 2012; ISSP_NS1 2013; ISSP_LP 1 2013; ISSP_SS1 2013). A hatchery owner also stated that N1 broodstock were smaller than F1 and N1 broodstock tended to produce non-homogeneous post-larvae (HM_SS 2013). As explained in Section 7.3 and 7.4, household-scale shrimp producers do not have the ability to buy seed from larger-scale hatcheries. This means that although vannamei is being increasingly adopted by Indonesian household-scale shrimp producers, such as by those in Madello village, household-scale farmers are still unable to buy the seed purchased by industrial- and transnational-scale producers of a comparable quality, because they can only buy seed from medium-scale hatcheries.

In addition, large-scale hatcheries have laboratory facilities such as bio security facilities and advanced water treatment facilities, including ozonisation and water purification systems (HL_SS 2013). These facilities can minimise the potential of disease and infection at an early stage of post-larva production which may reduce the risk of disease and lead to a higher quality seed.

In contrast, routes that depend on accessing seed via backyard hatcheries (see Figure 7.4) are unlikely to obtain the seed quality that is produced by larger-scale hatcheries. The majority of backyard hatcheries produce post-larvae from Nauplius to minimise production costs, rather than breeding from broodstock (HBT_SS1 2013; HBT_SS2 2013; HBV_SS1 2013; HBV_SS2 2013). Backyard hatcheries most commonly buy Nauplius from agents and there is no assurance that they were produced from a tested broodstock. There is also no guarantee that the Nauplius supplied to the hatcheries are of the best grade. One hatchery owner reported that the quality of Nauplius for tiger shrimp was determined by the number that had spawned. The best grade Nauplius are those produced at the first and second spawning. After this, the quality decreases and such quality is difficult to morphologically codify. Information about the number of spawning can only be obtained from hatcheries (HM_Ach 2012; HM_SS 2013). This study found that agents often did not tell the truth regarding the quality of their Nauplius (HBT_SS2 2013; HBV_SS1 2013). Therefore, there is a risk that hatcheries will not supply the level of quality promised by the suppliers, which consequently affects farmers.

Moreover, as presented in Table 7.3 Section 7.2, backyard hatcheries producing tiger shrimp use wild broodstock that are not laboratory tested for disease and infection. The Indonesian government has developed a quality standard for tiger shrimp broodstock, including several laboratory test requirements, to eliminate microbial infection (BSN 2006a, 2006b). In practice, however, not all marketed broodstock are tested in compliance with the laboratory procedures. According to interviews with broodstock fishers in Aceh Province, laboratory tests are only conducted if it is requested from the buyers. Such requests usually originate from medium-scale hatcheries because it generates extra costs for laboratory tests (BF_Ach 2012). Backyard hatcheries tend to purchase cheaper broodstock (HBT_SS1 2013; HBT_SS2 2013; HBV_SS1 2013; HBV_SS2 2013). They also do not have laboratory facilities and water treatment facilities (Observation in Madello 2013; HBT_SS1 2013; HBT_SS2 2013; HBV_SS1 2013; HBV_SS2 2013). Operators do not have the capacity to assess the possibility of viral infection in backyard seed production. This can result in greater risk due to the lack of water treatment facilities. As a result, household-scale shrimp producers who buy seed from the backyard hatcheries marketing chain have a limited ability to access seed that is laboratory tested. Therefore, they may have higher risk in shrimp production.

Buying shrimp seed via different routes affects the ability to choose between different seed qualities. This leads to ability to access good quality shrimp seed. Purchasing directly from those medium- and large-scale hatcheries using broodstock in post-larvae production allows shrimp producers to obtain the history of shrimp broodstock. Broodstock quality such as grade and origin are also used to identify the quality of post-larvae (HM_Ach 2012; HM_SS 2013).[23] Industrial-scale shrimp producers stated that it was important for them to obtain information about the type of broodstock used in post-larvae production because, as mentioned above, farmers considered F1 broodstock produced by SIS to be better than N1 produced by BBAP Situbondo (ISSP_SS1 2013; ISSP_SS2 2013). Identifying shrimp broodstock type as part of the general auditing measures for post-larvae quality is important because some hatcheries, particularly medium-scale hatcheries, may use different types of broodstock in different production cycles:

> We do not use F1 SIS broodstock all the time, sometimes we use N1 broodstock … but we always tell buyers which type of broodstock was used during the transaction with the buyer …. We have to tell them, because we do not want to disappoint buyers … if we use N1 broodstock (HM_SS 2013).

Direct access to hatcheries also enables shrimp producers to obtain post-larvae age information, which is a widely used determinant of seed quality (BSN 2006a; BSN 2010). The interviews with farmers indicated that post-larvae age of 12 days (pl 12) was commonly used for the tiger species and a post-larvae age of 10 days (pl 10) was the standard for vannamei (HSSP_BK10 2012, HSSP_Sg8 2012; HSSP_MD11 2013, HSSP_MT12 2013). The transfer of information occurred

[23] The broodstock wholesaler indicated that the grade was determined by size, maturity and morphological characteristics. The grade is classified into Grade A, B or C.

through verbatim exchanges between shrimp hatchery owners (or workers) and buyers (HM_SS 2013). However, when the demand was high and there were post-larvae supply shortages, hatcheries also sold younger post-larvae:

> We tell them … and we also tell if the size of post-larvae is smaller … We also inform buyers the age of post-larvae. During peak demand periods, buyers may force us to harvest earlier (HM_SS 2013).

Younger post-larvae may not be strong enough to adapt to the pond environment, making them more fragile during shipment (BSN 2006a, 2006b; BSN 2010). This increases the mortality risk for shrimp farmers (HSSP_BK1–24 2012; HSSP_TI1–18 2012; HSSP_P1–15 2013; HSSP_MT1–23 2013). Thus, shrimp producers who do not have the ability to buy seed directly from hatcheries face greater constraints upon access to good quality shrimp seed; as a result they may have higher risk shrimp production.

Vertically integrated supply chains to the seed production node enable the best post-larvae quality assurance. For example, in the case of CP Prima (vertically integrated to broodstock and hatchery productions), the quality and history of post-larvae production could be easily coordinated within a company system. This enables CP Prima to achieve optimum seed production.

In contrast, household-scale shrimp producers who are totally dependent on buying seed from seed supplier agents (routes 1, 2, 5, 6, 9, 10, 13 and 14, see Figure 7.4) are the least capable of auditing their inputs. As mentioned above, seed agents often hide critical quality information such as seed age and source of broodstock. When seed demand is high, there may be a shortage in seed supply, which encourages hatcheries to shorten the production cycle (HM_SS 2013). This post-larvae production history may not reach household-scale shrimp producers through their longer supply chain.

Poor household-scale shrimp producers' capability to access information about seed quality was worse in remote production areas with a small number of shrimp producers and low productivity rates. Poor access to information relates to how geographical isolation and quantity of production affect the presence of seed suppliers in production areas, as well as the social capital needed to access seed suppliers (explained in Section 7.4). The causal relationship between these factors was similar in the case of Manyampa village concerning ability to access input suppliers and buyers. The input supplier had monopolised supply and shrimp buyers forced the poor farmers to accept any type of seed delivered by the seed supplier.

However, household-scale shrimp producers could obtain a greater capability to classify and access good quality shrimp seed when there was mass production in their area. Even if the production area was also quite remote and the individual production rate per farmer low, combined production could increase the ability to access to better quality seed. Greater ability to audit seed quality seems to be related to competition among seed suppliers. For example, Mattiro Tasi village. As stated the village had around 200 households and a total production area of 628.69 ha (Mattiro Tasi 2013). Villages adjacent also had comparably large shrimp farming areas. Although the nearest hatchery was around 200 kilometres from Mattiro Tasi, strong demand for seed stimulated to establish businesses in seed supply in the area. Around six seed suppliers were located in the village and specialised in seed provision. In Mattiro Tasi, seed suppliers did not act as shrimp buyers, so there was no monopoly function like that which occurred in Manyampa village. Therefore, the farmers were in a stronger bargaining position to control and audit seed quality. The seed suppliers added value to their services by allowing a seed performance test to be conducted in the farmers' ponds prior to purchasing. Farmers tested the quality of the seed by keeping the seed in their ponds for three days before making their purchase:

> Seed is kept in the ponds using net for 2–3 days, the seed is considered good if mortality is less than three juveniles per 100 juveniles. If the quality is low, they will seek other seed sample from other seed supplier. Seed purchasing decision is based on the best performance during the tryout (HSSP_MT6–23 2013).

Above discussions demonstrate that household-scale producers' seed supply chains affect their capability to obtain good quality shrimp seed, including their ability to test the quality. The discussions also shows that geographical factors can intensify the effects upon farmers' capabilities to access good quality shrimp seed. The concentration of shrimp production results in the accumulation of small yields into a larger produce quantity, as found in Mattiro Tasi village, which can increase the capability. However, even with an improved capability, household-scale shrimp producers are still less capable when compared with the significantly larger production levels of industrial- and transnational-scale shrimp producers.

7.5.2 Shrimp quality, freshness and food safety

Lengthy routes can deteriorate the quality of shrimp in term of freshness. Lengthy routes can also increase the risk contamination that can hinder food safety compliance.

Freshness relates to the time taken for the harvested shrimp to move throughout the supply chain till it reaches the exporters. How long this process takes is related to the quantity of the yield and how the business transaction travels between upstream nodes to the lower nodes. Upstream nodes such as those involving small wholesalers need to collect a sufficient quantity of shrimp prior to reselling the yield to larger wholesalers. Subsequently, the larger wholesalers also require time to reach a sufficient quantity before transporting the produce to coordinators and exporters. For instance, a shipment from a small wholesaler is at least 50–100 kg, while an individual household-scale farmer may only harvest 10 kg at a time. Sometimes the quantity sold is smaller, which was the case in Tanjung Ibus village where one shrimp farmer sold only 2.5 kg of shrimp. Given these small quantities, a wholesaler may collect over 1–3 days before a shipment is made to a larger wholesaler (WS_NS 2012). Lengthy waiting times may reduce the freshness of shrimp and the risk increases if wholesalers (small or big) do not have sufficient knowledge about post-harvest handling. For instance, ice should be used to keep the shrimp at the correct temperature.

Lengthy channels can also increase the risk of contamination, which affects the safety of the products (Lee, Gereffi & Beauvais 2012). For example, shrimp sold through channels 1 to 8 (see Figure 7.4) is more exposed to extra handling processes, such as grading and storing (WS_Ach1 2012; WS_Ach2 2012; WS_NS 2012; WS_SS2 2013). There can be repeated handlings conducted by small and big wholesalers, coordinators and processors. Thus this and can increase the risk of contamination of the produce.

In contrast, shrimp sold directly to a coordinator can be shipped directly to a processor, such as in the industrial shrimp producer channel. This shortens the transportation time, so the risk that quality will deteriorate prior to reaching the processing company is smaller. In addition, coordinators who participate in the ISSP_GVC usually assist with the shrimp harvesting process (ISSP_SS1 2013). The harvesting team is mobilised to the farm and is responsible for harvesting, cleaning, grading, icing and transporting the shrimp to the processor. The team are specialised in the skills of shrimp harvesting and are well-equipped with the facilities required to maintain shrimp quality, such as sufficient quantities of ice and foam boxes (ISSP_SS1 2013; SCI_SS 2013). These facilities also appear to meet the standards of several eco-label certification schemes:

> Are fish transported in clean conditions, which prevent contamination during handling (GlobalGAP 2011).
>
> Shrimp shall be harvested and transported in a manner that maintains temperature control and minimises physical damage and contamination (GAA 2009).

This suggests that shrimp producers that sell directly to coordinators who have the capacity to carry out a good practice harvest and post-harvest handing techniques have a better chance to produce high quality and less contaminated products. This increases the farmers' ability to comply with export market requirements. In contrast, household-scale shrimp producers that sell their yields through lengthy, complicated marketing chains face greater challenges to supplying market-acceptable products. Therefore, their capabilities to comply with food safety regulations and with the standards of eco-label certifications (discussed more in detail below) are also very limited. This demonstrates a negative relationship between lengthy and complicated marketing routes and capability to access the lucrative export markets.

7.5.3 Traceability

Chapter 4 demonstrated that traceability is a critical requirement embedded in the food control systems established by government regulations and eco-label certification schemes.

Coordination competence, which is related to the route types within the ISGVC, affects ability to perform traceability. Traceability requires a high level of interaction across whole nodes of a food supply chain and requires structures to link up the actors (María Angeles, Ángel Martín & Oreja-Rodríguez 2012). As discussed in Chapter 6, close coordination in complicated and fragmented routes within the HSSP_GVC is more difficult due to the involvement of large number of farmers and intermediaries in inputs and market supply chains. This is the main obstacle to performing traceability for products marketed through highly complicated and fragmented chains. Such complicated routes require large extent management to produce shrimp with a unique batch code at the shrimp pond level that includes the name of the supplier, time of receipt, division of and additions to batch, the name of the consignee (International Trade Centre 2008), and the post-harvest and processing functions (GlobalGAP 2011). One of the traceability measures developed by the Global Aquaculture Alliance (GAA) also require each processed batch to be traceable back to the pond and to the origin of the inputs (GAA 2009). An example of the traceability requirements stated as:

> Are fish traceable to the previous farm(s) and back to its origin, including identification of corresponding batch(es) of parent broodstock? …. Are all fish movements within, to and from the farm recorded and traceable? …. Are all fish identified (on a batch level) to a specific batch throughout the growing period? Is traceability of the harvested fish maintained up to the process line? (GlobalGAP 2011).

As described above, the majority of household-scale farmers have only the ability to buy seed from nursery farmers, seed agents and backyard hatcheries. Those who purchase seed from nursery agents can only obtain information about juvenile shrimp (see Appendix 3 for details on stages of shrimp growth). Thus, they are unlikely to be able to provide information about the origin of the seed and parent broodstock.

Although some farmers buying seed from post-larvae agents and backyard hatcheries can obtain some information about post-larvae production, they are still not able to access information about the origin of the broodstock. This is because the majority of backyard hatcheries produced shrimp post-larvae using Nauplius rather than using broodstock as mentioned above. This was particularly the case for the South Sulawesi Province. As mentioned above, often Nauplius suppliers hid or lied about the broodstock origin because they wanted to maintain their competitiveness (HBT_SS2 2013; HBV_SS1 2013). In addition, as presented in Table 7.2, the wild broodstock marketing chains involve a number of broodstock intermediaries who mediate between broodstock fishers and hatcheries. This further extends the chain, increasing the complexities involved in accessing information about the origin of the shrimp seed.

Household-scale shrimp producers with fragmented feed supply chains would not be able to disclose information about the feed ingredients such as origin, which is a requirement of the traceability measures.

> Has compound feed been manufactured by and obtained from a recognized source? … Are batches of fish feed traceable from the feed manufactured to the batch of fish? (GlobalGAP 2011).

Aquaculture Stewardship Council (ASC) measures the standard for feed traceability presented as:

> Evidence of basic traceability of feed ingredients, including source, species, country of origin and harvest method demonstrated by feed producers… Demonstration of chain of custody and traceability for fishery product in feed (ASC 2014).

For household-scale shrimp producers, it is unlikely that they will have access to information about feed ingredients. As discussed, the vast majority of household-scale farmers buy shrimp feed from stores (Section 7.3) which have their own complex input supply chains. (Section 7.2).

Lengthy and complex marketing routes involving small and big wholesalers, as well as the production of small quantities per household increases the difficulty of tracing production batches or ponds during the growing period. For household-scale shrimp producers, this means that farmers must codify shrimp ponds and provide detailed information about where the shrimp were grown and pass this on to small wholesalers. This information is subsequently gathered and recorded by big wholesalers, coordinators and processors. However, in practice, this does not seem to occur. In the current practice, the traceability of shrimp can only be started at the coordinator level. Coordinators are registered and the registration number is used as a traceability code by processing companies. While big wholesalers may send shrimp directly to processing companies, they have to register the shrimp using the identity of a coordinator rather than the wholesaler's identity (WB_Ach2 2012). Field observation at a processing company in South Sulawesi confirmed that codification utilised the coordinators' registration codes during the unloading at the processing company. Each coordinator had dedicated production areas (EX_SS 2013). If there were any problems, the processor could trace the origin of the product through the coordinators' identity codes (WB_Ach2 2012). However, it is still remains a significant challenge to trace the origin of the shrimp, from broodstock history to the origin of ponds or farmers due to the complicated marketing routes.

In contrast, industrial-producers' simpler and shorter routes have a greater ability to achieve traceability. Although some of the routes within the ISSP_GVC channels are not completely integrated, farmers can access production inputs and marketing actors quite easily. For example, access to feed is only mediated by one actor (the feed company marketing representative) and farmers have direct access to indoor hatcheries. Vannamei shrimp fry, in particular F1, is also more traceable since it is produced by certified hatcheries (Pradadimara 2009). There is only one actor in between the farmers and exporters—the coordinator. Thus, gathering information related to inputs, production and marketing is more manageable.

Comparing the three channels within the ISGVC, the vertically integrated routes for transnational-scale shrimp producers, and for industrial-scale shrimp producers to a lesser extent, has the greatest capability for traceability. This conclusion was also reached by Trifković (2014) who explored relationships of vertical integration between pangasius producers and exporters.[24] All nodes are integrated and structurally managed, so information gathering and recording may not be a significant challenge. Enhancing ability to meet traceability, as well as food safety were the main reasons for the development of vertically integrated value chains by shrimp farmers. One respondent believed that a fully vertically integrated route improved coordination among nodes, favouring compliance capability with buyer requirements. For example, integrating with seed production enabled a processing company to assure their consumers that seed used in their shrimp products were produced following food safety standards:

> Having an integrated business allows us to integrate the production and marketing plans. By having a hatchery, we can control the time for seed supply because the production demand is governed by market dynamics which vary by time and season. Because we supply to various buyers and every buyer has different specifications, by doing so we are able to meet the buyer specifications. A fully vertical integrated business will allow us to ensure food safety from seed production to export product. This is also our strategy to ensure continuity in production (EX_SS 2013).

Based on the above discussion, thus household-scale shrimp producers have the least capability to comply with the traceability requirement. They also lack the ability to upgrade their compliance capability to meet traceability requirements compared to the other shrimp farmer groups.

7.5.4 Eco-label certification

The fragmented and complicated routes within the HSSP_GVC result in an incapability to comply with eco-label certification standards. This conclusion was also reached by Tran et al. (2013) for a similar group of shrimp producers in Viet Nam. Although several eco-label certification schemes such as GlobalGAP have developed standards for small-scale producers, the standards are still beyond the reach of household-scale producers' capabilities. To reiterate, this study used the standards for smallholders outlined by the GlobalGAP certification. The HSSP_GVC does not

[24] Panggasius is a fish commodity produced through aquaculture farming in Viet Nam.

favour compliance ability with food safety and traceability for shrimp feed, seed used in production and produced shrimp.

Moreover, household-scale shrimp producers also face obstacles in complying with broodstock and hatchery management standards which require domesticated broodstock, SPF and certified and laboratory tested seed:

> Are broodstock prior breeding screened and verified free of disease potentially vertically transmitted? …. Is there only seedlings source from domesticated broodstock? … Are seedlings purchased from a GlobalGAP certified supplier hatcheries and certified according to official legislative requirements? … Do seedlings suppliers provide analytical test certificates of routine surveillance disease monitoring, at least for known disease for the specific species? … Are documented procedures in place to prevent cross contamination through all production stages, including separate equipment? (GlobalGAP 2011)

Similar parameters were also outlined for the ASC eco-label certification scheme:

> Post-larva and broodstock have appropriate disease-free status and source meets regional, national and international importation guidelines (ASC 2014).

These standards are classified as major requirements for eco-label certification, so compliance is critical. However, household-scale shrimp producers cannot comply with these standards because, as described above, all farmers from this group are farming tiger shrimp using wild broodstock and non-SPF seed. Seed purchased from backyard hatcheries is also not laboratory tested.

In contrast, the channels for industrial- and transnational-scale shrimp producers enable them to meet such standards. Seed supply chains are concentrated among several large-scale hatcheries that produce SPF and certified post-larvae, and use domesticated broodstock in their post-larvae production. Thus, these groups have the capability to comply with the eco-label certification standards. This finding was also suggested in previous studies (Dolan & Humphrey 2000; Vandergeest & Unno 2012). Vandergeest & Unno (2012) argued that only large shrimp producers were capable of obtaining eco-certification schemes. This seems accurate for the present study too. It was found that only CP Prima had adopted GlobalGAP and BAP certifications (CPP 2012). In Indonesia, this was also found for other aquaculture commodities such as tilapia, whereby eco-label certifications were only adopted by a transnational-scale tilapia producer —Regal Springs Group, PT Aquafarm Nusantara (ASC 2013b).

Adopting certifications can strengthen market penetration. Some companies may adopt different types of eco-label certification for different markets. This was the case for CP Prima which adopted two types of eco-label certifications. GlobalGAP and ASC are widely expected in European markets and GlobalGAP is emerging as a mandatory certification (IM_ND 2012). BAP is established and widely accepted in the US (Vandergeest & Unno 2012). Although the two certification schemes convey similar principles, adopting both types may strengthen the acceptance of shrimp producers' production by retail buyers in both markets.

7.5.5 Strategic production: branding or adding product value

Routes within the ISGVC affect capability to develop production strategies according to changing consumer behaviours, necessary to develop greater product acceptance. The relationship between the factors relates to a causal relationship between route types in the ISGVC and coordination and knowledge diffusion explained above. Shrimp farmers participating in short routes to the final buyers may have greater exposure to consumers' consumption behaviours, enabling the diffusion of market knowledge (Trienekens & Willems 2007). This knowledge provides a means for developing market oriented products (Yusuf & Trondsen 2013, 2014). One exporter from South Sulawesi reaffirmed that an ability to carry out further value added process requires a full understanding of consumers' behaviour. This also relates to capabilities to design, develop and directly promote value added products to foreign markets, such as cooked products:

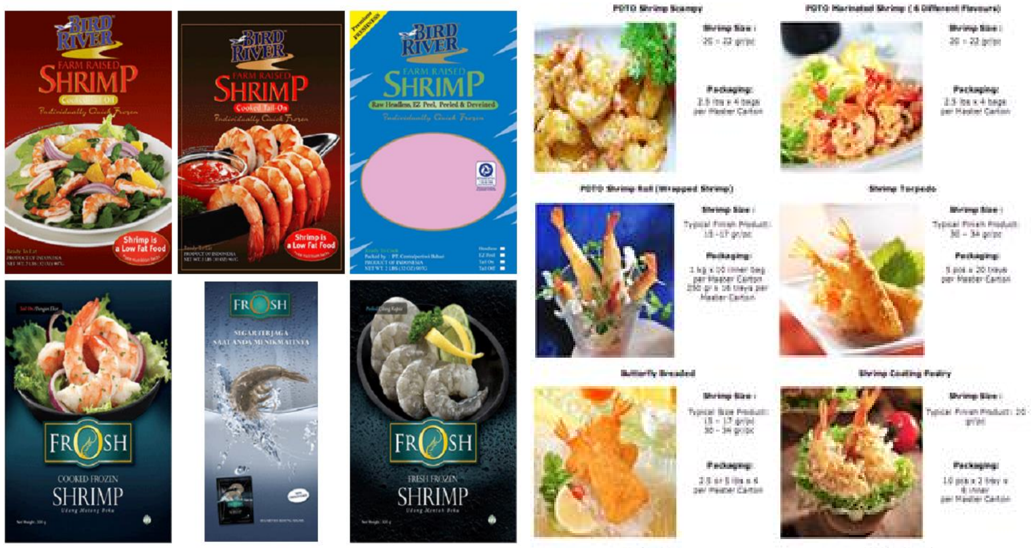
> For cooked products … we have to understand the eating behaviour of consumers and we have to promote it … Manufactured products relates to branding … Branding is expensive and takes time: investment for product design, advertisements and so on (EX_SS 2013).

The power of knowledge about consumers that can enhance the ability to add value to products was also captured during an interview with an importer from the Netherlands. The importer developed value added products following their research about consumers' preference. The importer's top product was the fresh product which is processed and marketed on the same day compared to other types of processed shrimp, such as frozen breaded, battered and seasoned shrimp sold (IM_ND 2012). Thus, the knowledge about consumer behaviour enabled the importer to gain the flexibility required to develop more diverse value added niche products. Subsequently, the insight about consumers' behaviours is more easily coordinated to shrimp production functions in vertically integrated chains than in fragmented and complex chains. This was demonstrated through the example of retailers, exporters and producers of pineapple in South Africa (Trienekens & Willems 2007). These actors had developed more integrated chains between production and marketing to improve the coordination of information and quality systems. Therefore, consumer demand could be translated efficiently and effectively to producers in more integrated chains.

This study also found that CP Prima, with its totally integrated chain to retailers, could adjust their product specifications (such as shrimp size) according to changing consumer preferences brought about by shifts in their buying capacity:

> The global monetary crisis in late 2008 led to severe economic recessions in the key market regions of CP Prima, namely North America, Europe and Japan. This had an effect on the market demand for shrimp products, which among other things manifested itself in changing consumption patterns from large shrimps to smaller ones (CPP 2009, p. 20).

CP Prima also developed new products and brands, which are presented in Plate 7.1.



Source: CPP (2014)

Plate 7.1 Different brands and processed shrimp products by CP Prima

In contrast, routes that are disconnected from consumers can hamper the diffusion of knowledge regarding consumer preferences. This means that the shrimp producers participating in these chains just produce shrimp without strategising around changing market demands (HSSP_BK1–24 2012; HSSP_Sg1–17 2012; HSSP_TI1–18 2012; HSSP_M1–23 2013; HSSP_MT1–23 2013; HSSP_P1–15 2013 HSSP_MD1–18 2013). As discussed in Chapter 6, the inability of household-scale shrimp producers to promote their product as 'naturally' or 'organically' grown was related to their limited knowledge about consumer behaviour. Lacking this knowledge may be a result of their disconnection from the consumers. Therefore, the extent that their shrimp products are branded depends upon the exporters who access export markets via importers and develop their product brands.

7.5.6 Access to technical assistance through private extension services

The type of route used to access shrimp feed affects the ability to access technical support through extension services from feed producers. Extension services can enhance the human capital endowment of farmers through knowledge diffusion (Feder, Murgai & Quizon 2004). Altenburg et al. (2004) reported that large feed and chemical companies contributed to the development of technological knowledge and skills of shrimp farmers in Thailand. This included skills related to the use of aerator pumps, stocking densities and feeding. In the present study, there was a capability disparity between the extension services provided by feed companies and those provided by the Indonesian government. This may result in different levels of support required for upgrading farms.

The Indonesian government and feed companies provide extension services to shrimp producers as explained in previous chapter. There is a human capital disparity between the technical assistants hired by private companies and those employed by the Indonesian government. Private companies only hire technical field assistants who have qualifications in shrimp pond farming, which could be assumed by how the company seek employees presented in Chapter 6. In contrast, this study found issues relating to the skills and expertise of assistants from the Indonesian government providing extension services. For instance, one extension officer in East Aceh District stated that the government extension service officers were not directly managed under the Marine Affairs and Fisheries Office (DKP), but were managed under an extension department (BAPELUH). BAPELUH covers various sectors such as fisheries, horticulture and other agricultural sectors (Ext _EA 2012). One extension service official can have responsibilities across many sectors. Some officials did not have strong backgrounds, skills or expertise in shrimp farming (Observation in East Aceh 2012). So, such qualities differentiate the capacity between private and government extension services.

In addition, there are different level of relationships between farmers and the two groups of extension service officers. A close relationship was observed between farmers and private company hired extension service officers during a visit to the shrimp farms during the Indonesian Aquaculture Symposium in Lampung in 2013. The extension officers were hired by a feed company and were familiar with the position of the ponds and the shrimp farming technology applied in the shrimp farm visited. The officer stated that it was his responsibility to provide technical support at all stages of the production cycle: pond preparation, growing and harvesting (FC_FA 2013). In Banda Aceh, the farm manager said that the extension service officer conducted a field visit to the farm once per month during the growing period. Farm visits would also occur after a critical request and if the extension service officer could not come to the farm, the extension service officer still can give advices by phone (ISSP_tech _Ach 2012).

In contrast, an effective relationship between shrimp farmers and government extension officers was not found during the fieldwork of this study. The extension services were often limited to the villages that were already included in government programs, as the project beneficiaries. Several shrimp farmers interviewed said that they did not know and had never met the government extension officers assigned to their village (HSSP_BK18 2012; HSSP_BK19 2012; HSSP_BK20 2012; HSSP_M1 2013; HSSP_M5 2013; HSSP_M17 2013; HSSP_MT2 2013; HSSP_MT4 2013; HSSP_MT23 2013; HSSP_P9 2013; HSSP_P14 2013; HSSP_P15 2013). According to the extension officers, their limited interactions with shrimp farmers were due to insufficient government support for covering operational costs and facilities (Ext_Prg 2013).

As discussed in Section 6.2, shrimp farmers can access extension services from feed companies if they buy feed directly from their marketing departments. This means that this opportunity is higher for industrial-scale farmers practicing intensive shrimp farming systems to receive services. Industrial-scale shrimp vannamei producers in Banda Aceh, North Sumatra, South Sulawesi and Lampung Provinces received technical assistance from the feed companies. A study by Altenburg et al. (2004) confirmed that private companies such as feed and chemical producers are more interested in developing relationships with shrimp producers with high inputs and outputs. Within such a practice, household-scale shrimp produces who predominantly buy seed from feed stores are, thus, excluded from accessing technical assistance. Therefore, they cannot gain an upgrading opportunity given from the extension officials hired by private companies who might have better knowledge in shrimp farming.

7.6 Conclusion

The chapter answered the research questions stated in the introduction, Section 7.1. Section 7.3 answered the question of what kind of GVCs are available to Indonesian shrimp producers. Section 7.4 explained the relationship between livelihood capitals and access to different value chains. Section 7.5 explained how the different channels within the ISGVC affect shrimp producers' abilities to better their participation rates within lucrative export markets.

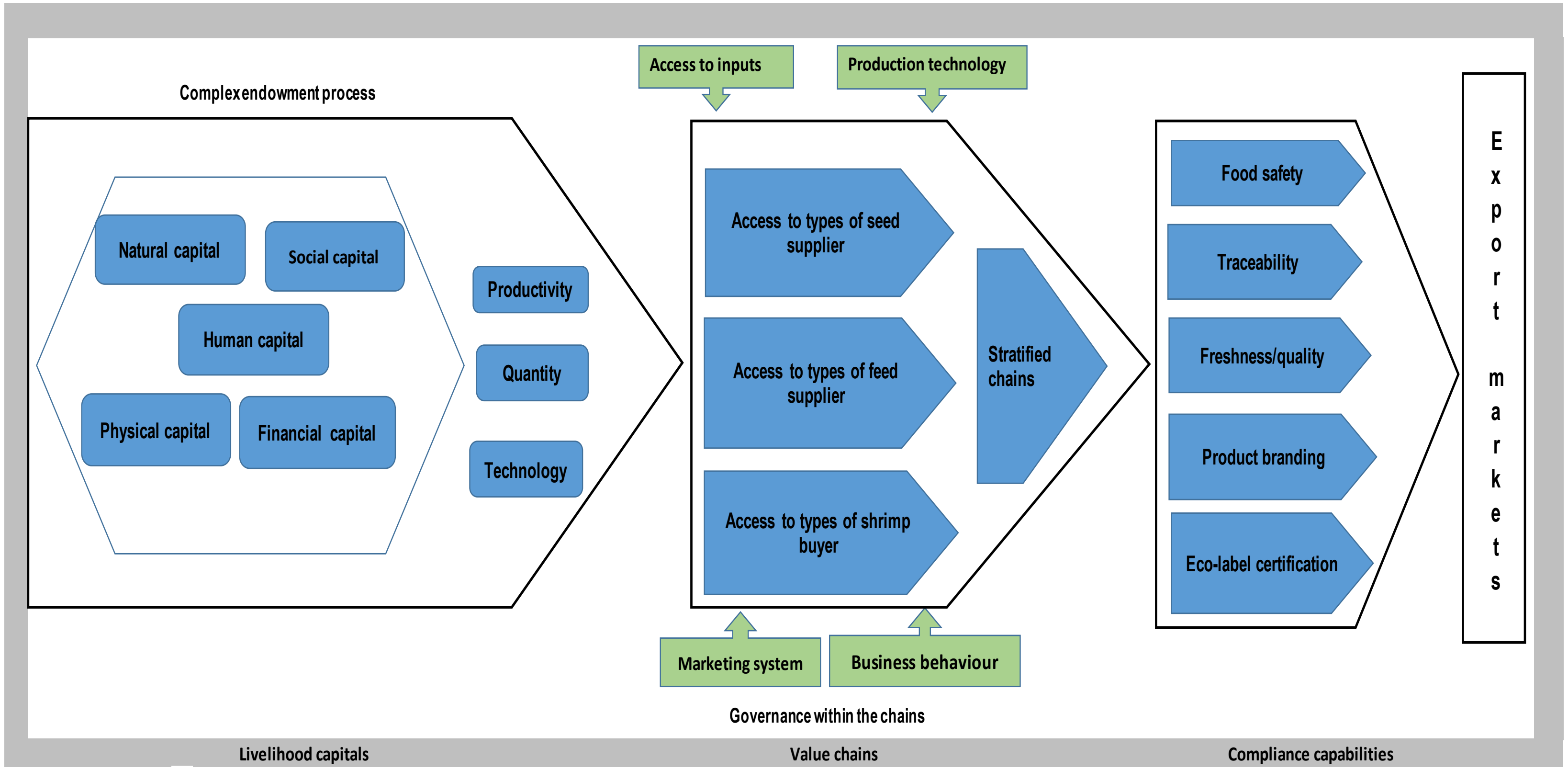


Figure 7.5 Conceptualised relationships between livelihood capitals, ISGVC and capability to participate in lucrative export markets

Based on the discussion in each section, the relationship between the endowment of livelihood capitals, differential access to channels within the ISGVC and capability to participate in export markets is conceptualised in Figure 7.5. The flowchart expands the initial concepts shown in Figure 7.1. The ability of shrimp producers to participate in certain types of channels and routes within the ISGVC is determined by the endowment of livelihood capitals. Livelihood capitals of shrimp producers affect ability to acquire or produce the minimum quantity requirements to buy inputs, or to sell their harvest to certain types of inputs suppliers and buyers. However, this is not a linear process; the ability to participate in certain routes in the ISGVC is a complex process involving all livelihood capitals in an interrelated web. The process is also determined by micro governance between the actors within the value chains, such as the business behaviours of different actors, pursuing their business interests. This results in stratification within the ISGVC, with some value chain actors becoming more capable than others. For example, as explained above, small wholesalers are less able to conduct post-harvest practices compared to processor coordinators. Subsequently, the types of routes affect capability to meet food safety measures and the requirements of traceability, quality of produce and the eco-label certification schemes.

This study concludes that Indonesian shrimp global value chains are segmented according to the business scale of the shrimp producers. The household-scale shrimp producers' global value chains are fragmented in which there is lack of integration between nodes. This occurs at input and production nodes resulting fragmented, complex and lengthy routes. The industrial-scale shrimp producers' global value chain are varied. For some extent, the industrial-scale shrimp producers have developed supply integration with other functions, such as processing or input production. However, none of industrial-scale shrimp producers have direct integration to importing function at the export markets. The transnational-scale shrimp producer has shown a fully vertical integration for its shrimp global value chains. The integration includes direct penetration to the importing countries, it is able to sell their products to retailers at the export lucrative markets.

The study has demonstrated that low endowment of the livelihood capitals contributes to the fragmentation of the HSSP_GVC. Lack of shrimp farming skills and modernised production facilities, unsuitable shrimp farming location, small production area and lack of collective activities lead to small quantity of harvest and inputs needs. This forces the household-scale shrimp producers to sell their yield and purchase production inputs from chains of intermediate actors, resulting fragmentation and complication of their global value chains. In comparison, higher quantity of harvest and production inputs, due to higher livelihood capital endowment for intensive shrimp farming, have enabled the industrial-scale shrimp producers to purchase production inputs and sell their harvest to larger scale of suppliers that favour shorter supply chains. High endowment for livelihood capitals by industrial-scale shrimp producers has also enabled some of shrimp producers to integrate their business into other shrimp value chain functions, such as seed production and processing companies.

The type of routes in which household-scale shrimp producers can participate, limits their capability to participate in lucrative export markets. This hinders their ability to upgrade to comply with lucrative export market requirements. This is because complex and fragmented value chains increase complexities in the coordination of information required to meet traceability. It also increases the risk of contamination, resulting in problems meeting food safety standards. This also disadvantages their ability to meet eco-label certification scheme standards. Based on these findings, this study argues assertively that household-scale shrimp producers' capability to participate in lucrative export markets is the least capable compared to other two groups of producers. The household-scale of shrimp producers are positioned as the marginalised group in the ISGVC.

Chapter 8: Conclusion and recommendations

8.1 Introduction

The overall objective of this thesis was to explore the endowment of capabilities for household-scale shrimp farmers in Indonesia to participate in the lucrative export markets. The thesis has also demonstrated how the complex linkages between livelihood capitals and the ISGVC influenced their capacity to participate in such markets. Chapters 5, 6 and 7 demonstrated that household-scale shrimp producers in Indonesia face significant challenges associated with their limited capabilities. The purpose of this chapter is to conceptualise the relationship between the livelihood capitals and the GVC, and capability to participate in the lucrative export markets. This chapter also summarises the main findings of the research, establishes its contribution to knowledge in the field and offers recommendations for future research and management interventions that could build the capacity of household-scale farmers.

8.2 The concept of integrating livelihood capitals, the ISGVC and capability to participate in lucrative export markets

This section summarises the comprehensive concept that integrates the complex relationships between livelihood capitals, ISGVC and capability to participate in lucrative export markets as hypothesized in Figure 1.2; Chapter 1. Previous chapters have presented information on the relationship between livelihood capitals and capability to participate in lucrative markets (Chapter 6) and the causal mechanisms between the ISGVC and capability of farmers to participate in those markets (Chapter 7). The complex relationship between these factors is presented in the framework below (see Figure 8.1). It details the initial framework as depicted in Figure 1.2. This framework may be adopted to evaluate the capabilities of other types of agricultural producers.

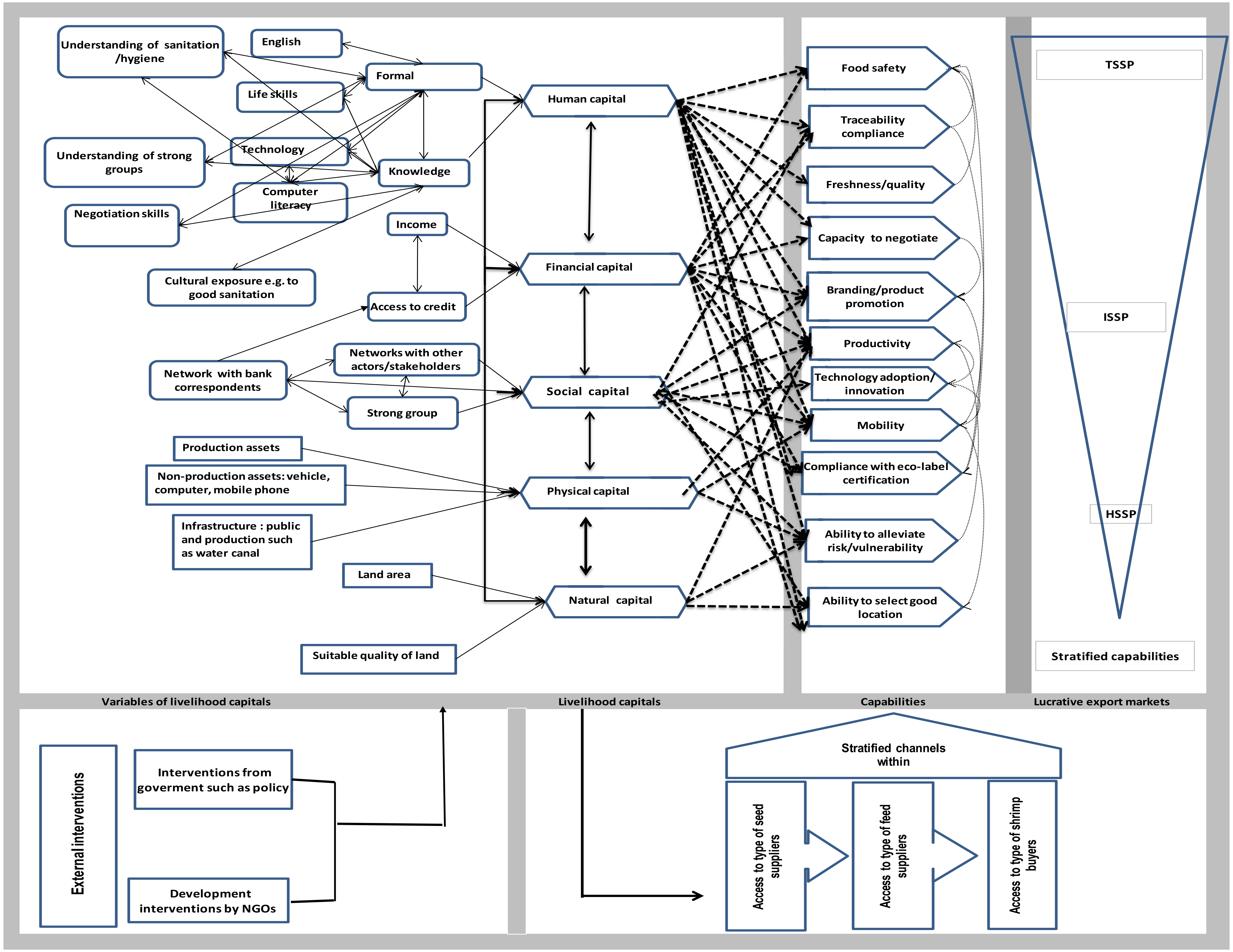


Figure 8.1 Livelihood capitals, GVC and capability to participate in lucrative export markets

Based on discussion in Chapters 5, 6 and 7, the framework places the endowment of livelihood capitals as the central to the capability for household-scale shrimp producers to enhance their participations in the lucrative export markets. It is does not only directly affect the capability to comply with export market requirements, but also a means in the endowment of livelihood capitals itself. These capitals are also the factors that enable participation in certain types of value chains. Value chain type determines the potential to upgrade, to adopt new production systems and improve post-harvest handling in accordance with export market requirements as conceptualized in Chapter 6 and 7. This means that the capability to participate in lucrative export markets comprises a complex interaction between human, financial, social, physical and natural capitals and access to the types of channels and routes within the ISGVC.

Chapters 5 and 6 demonstrated that the direct and indirect influence of livelihood capitals is subject to the variables of livelihood capitals. For example, the shrimp farmers' understanding of sanitation as a human capital variable was a direct means to the ability to produce hygienic products. Other variables such as social exposure to different hygienic practices are a means to accumulate understanding about food hygiene. From this perspective, human capital directly affects the ability to produce hygienic products and social capital indirectly affects this ability. However, human capital can also indirectly affect capability to comply with food safety standards. For example, communication and organisational skills are needed to build vertically integrated value chains. This type of supply chain advantages coordination within the supply chains, which then affects the ability to comply with food safety and traceability requirements.

This study demonstrated that the SLA and GVC approaches, which have been applied independently in previous studies (Allison & Ellis 2001; Allison & Horemans 2006; Hussein 2002; Islam 2008; Kelling 2012; Neely, Sutherland & Johnson 2004; Smith, Khoa & Lorenzen 2005) are both compatible. As mentioned in Chapter 1, to date, there is only one study that has attempted to combine these two methods (Challies & Murray 2011). However, this previous study failed to demonstrate the relationship between livelihood capitals and GVCs. This study has filled this research gap, integrating the SLA with GVC.

This integrated approach had strengths and weaknesses. It developed a more holistic and comprehensive understanding on livelihood capitals and value chains in relation to capability endowment. However, to some extent, this study has not provided any in-depth micro analysis, such as at the village or individual level. Nor has the study been able to quantitatively analyse all findings. This also did not systematically evaluate the significant differences between types of capabilities. Some of the capacities presented in Figure 8.1 may be more fundamental than other capacities. For example, the capability to alleviate production risk may be more significant for shrimp farmers and difficult to achieve than the capability to meet reporting requirements for importers. However, such evaluation of differences between capabilities was not part of this study. Further study is suggested as this may be important in prioritizing capability upgrading for development interventions.

The mixed method was well-suited to evaluate the capability of primary producers to participate in export markets. The quantitative approach enabled this study to provide, to some extent, a generalisation of the endowment level of livelihood capitals for household-scale shrimp producers. The qualitative methods contributed significantly to capturing complex data, which provided further insight into causal relationships in the endowment process. This understanding is important in the development discourse because each community has unique social, political and economic attributes. Development must be grounded in an understanding of context because one blueprint for development in a community may not be applicable to other communities.

8.3 Household-scale shrimp producers' capability to participate in lucrative export markets

As raised in Section 1.2 of the research question, What are the capabilities of household-scale shrimp producers to participate in lucrative export markets? This was addressed in Chapters 6 and 7. It was demonstrated that the livelihood capitals and types of value chain determine the capability to participate in lucrative markets. Although the capability was mostly studied in terms of livelihood capitals, the type of supply chain was also discussed as a critical aspect determining participation in lucrative export markets. The core issues in the GVC analysis were the extent to which intermediaries existed between the nodes and the extent of the fragmentation of the value chains. Inputs into the production system and the existence of intermediaries shaped the capability of household-scale shrimp producers to choose their routes within the ISGVC.

This study demonstrated stratification in capabilities across different scales of Indonesian shrimp producers. This reinforces the importance of incorporating the business scale for shrimp producers into evaluations of global markets (as argued in Section 1.4, Chapter 1). The classification of shrimp producers must be viewed beyond shrimp farming technologies as explained in Chapter 2. Household-scale shrimp producers do not have sufficient capabilities, both from the perspective of livelihood capitals and the type of GVC, which could enable them to participate in the most lucrative markets. Chapters 5 and 6 showed that household-scale shrimp producers had low endowment levels of human capital, which was evidenced by a low-skilled human workforce, limited social networks, limited access to formal banking, low use of technology in shrimp farming, and predominantly have small shrimp farms. They were unable to access efficient supply chains. In contrast, the transnational-scale shrimp producer was the most capable at pursuing upgrading for greater export market penetration. This group of shrimp producer had a high degree of accumulated capitals and had developed an efficient supply chain through vertical integration. Industrial-scale shrimp producers' capabilities fell in between the capabilities of household- and transnational-scale shrimp producers.

This demonstrates that the business scale of primary aquaculture producers is important in globalised markets, where stringent market governance is imposed by the consuming countries. Stringent market governance leads to the marginalisation and exclusion of the smallest and the least capable producers in export markets. As stated before, this risk of exclusion has been identified in previous studies (Dolan & Humphrey 2000, Farina & Reardon 2000, Reardon & Farina 2001; Okello & Swinton 2007, Barret 2008; De Schutter 2010; Okello, Narrod & Roy 2011). This risk is not limited to the shrimp producers in Indonesia, but is also relevant for other types of primary producers from less developed countries. For example, Dolan and Humphrey (2000) found that small-scale vegetable growers in Kenya and Zimbabwe were excluded from UK markets due to their inability to meet buyers' quality, consistency, product variety and processing procedure specifications.

Human capital is a crucial means to the development of relationships with other actors in horizontal and vertical supply chains. It is also the means to choose suitable farm locations and access formal credit. The human capital competency of household-scale shrimp producers was not only low due to low levels of formal education attainment, but the producers also had limited technological knowledge and skills related to shrimp aquaculture. Their perception of and motivation for collective action was limited to the immediate benefits from projects such as financial and physical support. They could not comply with basic hygiene and sanitation practices due to their limited awareness and cultural and social practices. These findings demonstrate that their low initial endowment of human capital, as the crucial means, limited their abilities to accumulate other capitals required for enhancing capability to access lucrative export markets.

To some extent the household-scale shrimp producers could access formal credit because the Indonesian government developed a microcredit program. However, access was still limited due to complex aspects of access to credit information, ability to fulfil administrative procedures, as well as preference between formal and informal credit from shrimp buyers and relatives. This limited access to formal credit not only placed constraints on their ability to upgrade, but also can limited their ability to choose between inputs suppliers and buyers. This led to complications in farmer–buyer relationships which resulted complexities to household-scale producers' capabilities.

The lack of horizontal and vertical networks by household-scale shrimp producers hampers the benefits they can attain in regard to capability to participate in export markets. Horizontal relationships between shrimp farmers did not foster business-oriented, collective actions. Their vertical relationships with other actors within the supply chains were geographically limited. Although there had been several attempts to facilitate group formations by the government and NGOs, the competence of household-scale shrimp farmers was still not sufficient to enable capability accumulation for upgrading, to respond to the requirements of the lucrative global markets.

Production and non-production facilities owned by household-scale producers were limited compared to the facilities owned by larger-scale producers. Less modernised production facilities were associated with a lower level of shrimp farming technology, which occurred in conjunction with barriers to financial and technological knowledge. As well as the fact that the vast majority of household-scale producers were restricted by their small shrimp farms, they were constrained by their unsuitable locations. These factors affected farm productivity. Lack of knowledge about land suitability for shrimp farming, financial capital deficiency, and a relative lack of social capital to facilitate connections to the government were the reasons for these conditions.

Stratification within the ISGVC was related to the disparity in livelihood capital competencies between the groups of shrimp producers. While industrial- and transnational-scale shrimp producers demonstrated capability to access integrated and efficient supply chains, the poor household-scale farmers were trapped in very fragmented and complex supply chains. The fragmented chain involved various levels of intermediaries in production and marketing of broodstock, post-larvae, juvenile shrimp and artificial feed. These chains also included more actors between shrimp production and the processing node— as the gate to export markets. This was the result of small production quantities, limited financial ability, geographical isolation and limited endowment of social capital.

The lack of livelihood capitals and the presence of fragmented value chains hindered shrimp producers' ability to use their initial assets as the 'means' to reach the 'ends' of development—participating in lucrative markets. For example, fragmented chains and limited organisational skills, and a low ability to codify production information constrained the coordination needed to integrate information along the value chains. Consequently, traceability requirements became impossible to meet. Lengthy chains and bad post-harvest handling practices by farmers and the intermediaries within the marketing segment also increases the risk of contamination and quality degradation. In addition, household-scale shrimp producers did not have sufficient financial resources to make the physical investments required to fulfil the standards of eco-label certification schemes, such as hiring consultants or conducting laboratory tests. Production systems for input producers and the business practices of the intermediaries in the inputs supply chains of the HSSP_GVC also increased the complexities in capability required to comply with food safety and traceability.

In sum, household-scale shrimp producers did not have the means to meet the necessary preconditions for participation in the highest value global market transactions. Regarding Sen's notion of Capability explained in Chapter 1, the household-scale shrimp producers in this study did not have the ability to choose among business strategies or choose to participate in global markets. Although the industrial-scale shrimp producers did not have the same capabilities as the transnational-scale shrimp producers, to some extent, they still had more options to pursue their business interests. While some industrial-scale farmers had decided to integrate their supply chains into exporting nodes, others retained their businesses in shrimp growing nodes. However, there may be also stratification in the capabilities within industrial shrimp producers was not considered in this study and should be evaluated in future studies.

A study by Kelling (2012) argued that the Fair Trade scheme was a possible solution for household-scale shrimp producers from developing countries looking to add value in lucrative export markets. Such a scheme was claimed to support small-scale agricultural producers through trade partnerships between farmers and traders, businesses and consumers, and through providing a better deal for farmers (Fairtrade International 2011). However, compliance with these schemes also requires organisational and managerial skills, which a majority of household-scale shrimp producers do not yet possess. Adoption may also be constrained by limited financial ability to hire the auditors from the certification body (Fairtrade International 2011). Household-scale shrimp producers may also not be aware about such schemes due to their limited access to information, knowledge and social capital. Therefore, it may be assumed that household-scale shrimp farmers are still unable to access such schemes independently and to identify the competitiveness of their products. Therefore, their abilities to adopt such schemes still depend on external interventions, such as those from the government, NGOs or private businesses.

The findings reached in other studies suggest that household-scale shrimp producers should focus on less demanding domestic markets, known as downgrading (Humphrey 2005). A study by Ponte and Ewert (2009) also suggested that agricultural producers from developing countries target their markets to the less demanding export markets, rather than ones with stringent requirements. However, participation in lucrative markets is not only about the financial revenue that flows to the producers through the sale of a commodity, it must also be viewed from the perspective of equity to access and the possibility to participate in any market within the idea of globalization. The globalised world should not only benefit those who are capable to participate; it should also provide a space for those less advantaged. This concept approach is based on the idea of common good and espouses the principles of social justice and equal access. Despite the importance of the lucrative export markets, it is still suggested to look an upgrading opportunity for domestic markets which may require lower level of capabilities.

The concept of downgrading for household-scale shrimp producers must be considered from a long-term perspective of development under globalisation. Despite the negative effects of governance acting as a barrier to the lucrative global markets, access to this markets enables access to the stock of knowledge that contributes to developing competitive advantage (Altenburg 2006). This market information drives the upgrading and development of primary producers (Gibbon 2001). Additionally, it also needs to look to the development history of the development of modern market chains, which began as traditional market chains. In the globalised world, foreign direct investment (FDI) has triggered the development of modern transnational giant retailers (supermarkets) in developing countries (Reardon & Hopkins 2006), including Indonesia (Chowdhury, Gulati & Gumbira-Sa'id 2005). Along with the changing economic and social aspects, lifestyle changes for consumers who prefer to purchase their groceries from modern retailers may increase in developing countries (Chowdhury, Gulati & Gumbira-Sa'id 2005).

Modern market retailers may push to replace traditional market chains. Eventually, the modern retailers in developing countries could also reshape the governance of food supply in developing countries by imposing similar stringent requirements (Reardon & Hopkins 2006). This could place pressure on the producers and result in another exclusion risk if their capabilities are not enhanced.

8.4 Implications and further research

Due to household-scale shrimp producers' limited initial assets, external interventions from government and NGOs played a significant role in facilitating greater participation in export lucrative markets. Development interventions require the holistic development of all aspects of livelihood capitals. This is because effective upgrading can be achieved through the development of multiple capitals. However, development interventions must have greater emphasis on human capabilities while strengthening competency in social capital to develop business-oriented shrimp farmers' collective actions.

Physical and natural capitals are also important, particularly shrimp farming technologies and the size of shrimp farms. These capitals are less easy to address through intervention, but improving technology and knowledge can compensate for their limited endowment. For example, improved harvest quantity through better technologies and the application of knowledge can enable farmers to improve production without having to expand the area of their farms to achieve greater returns.

Shrimp farmer groups are critical for household-scale shrimp producers. Collective action enables a higher collective harvest. As discussed, collective action must be combined with improved technical knowledge and financial ability. Intervention related to the formation of shrimp farmer groups must also consider existing traditional community institutions such as the existing local institutions between shrimp farmers and buyers. For example, there are community-based organizations in some Indonesian rural communities such indigenous groups called *gotong royong* groups. Such groups were originated from cooperative practices providing supports among agricultural farmers (Beard 2005). This practices was also found in Mattiro Tasi, Manyampa, and Tanjung Ibus villages such a cooperative in removing sludge from secondary canals. However, the development of a household-scale shrimp producers' group often undermine such micro-local level institutions. There is a need to prioritise the existing community institutions to strengthen farmers' groups. This is because the relationships between farmers have been built based on trust and such institutions have existed for decades (Beard 2005). Therefore, the possibility that these groups will be sustainable in the future may be higher.

Interventions to improve access to formal credit, including granting higher loans, are also crucial to support the upgrading attempts of farmers. However, any large increases in credit must be implemented with careful consideration of the capacity for such investments to be successful. Otherwise, farmers may find themselves in even worse situation. Development interventions for household-scale shrimp producers should also be directed towards a pathway of self-dependent development capability. This is important to enable self-driven development and to ensure long-term and sustainable affects flow from the development interventions.

Despite their limited livelihood capitals, household-scale shrimp producers can pursue upgrading. Upgrading can be achieved through developing their competitive advantage by creating a niche high value market such as the extensive 'natural' product. This would allow farmers to sustain extensive shrimp farming practices, which have less economic risk and fewer effects upon the environment compared to intensive shrimp farming. This may also provide an incentive to farmers to adopt more natural shrimp farming practices. However, this must be accompanied with strengthening shrimp farmer groups and enhancing their marketing capabilities and networks.

Intermediaries should also be involved in development interventions because they affect the capability of shrimp farmers to gain greater participation in the lucrative export markets. To date, development projects, in particular those supported by the Indonesian government, have only targeted the development of shrimp farmers; intermediaries are still being excluded. In the context of participation in export markets, upgrading the knowledge and practices of intermediaries, particularly around post-harvest handling, is crucial to improving the quality of the product and to minimising risks of contamination.

While improving post-harvest handling by intermediaries is important for food safety, but there is also a need to improve the efficiency of household-scale shrimp producers' value chains. This could be achieved through building linkages between shrimp producers and more downstream buyers such as exporters or importers. Upgrading the value chain towards vertically integrated chains has been proposed as a solution for farmers to meet certification schemes and product branding (Cooke 2008). However, such interventions must be carried out with caution to prevent any social conflict between farmers, wholesalers, coordinators and processing companies. A more detailed study looking at the relationships between these actors is critical to supporting such initiatives.

As suggested that there is a knowledge transfer from private companies to shrimp farmers. Given the high capabilities, knowledge stock and technologies generated by transnational-scale producers, it is necessary to build a linkage between transnational- and household-scale producers. From this perspective, transnational-scale producers are expected to be involved in the capability development of the household-scale shrimp producers. Although CP Prima has been involved in a community development project under the corporate social responsibility (CSR) program, the project activities appear to be duplicating the conventional community development investments, such as providing schooling facilities and, to some extent, mangrove planting in coastal areas around CP Prima's farms (CPP 2011). Although these activities are important, the CSR program would perhaps be more beneficial if the company could transfer its resources and enhance the technological and managerial knowledge and skills to household-scale producers. This would directly affect their capabilities to participate in export markets. This approach would be effective if it could also tie into the business of CP Prima. For example, CP Prima may be able to use its supply chain capability to help household-scale shrimp producers to access niche high value markets, such as those for organic or socially responsible products. It would also need to promote the notion that the relationship extends beyond the economic interests of the private company. For instance, as outlined, the feed company only provided technical support for those farmers who purchased inputs from the company. Such initiatives should be enforced and coordinated through government policy and regulations.

Given the complexities involved in the endowment process for livelihood capitals and multivariate relationships between them, interventions for shrimp farmers, input producers and intermediaries along the value chains suggested above must be holistic. This means that enhancing a capability requires a set of, or the accumulation of variables of livelihood capitals, different types of livelihood capitals and different levels of capability. The endowment process also takes time and requires persistent attempts because poor farmers have very limited initial capitals to begin with. Thus, for capital or capability accumulation to reach a certain level may take longer compared to those who have higher initial livelihood capitals or capabilities. In addition, the social and political aspects within farmers' communities, such as social customs regarding hygienic practices, beliefs and political conflict, played a role in the capability attainment process. Therefore, the attainment of livelihood capitals may also occur alongside broader processes of social change.

While eco-label certifications convey ideas about better practices in aquaculture such as preventing degradation of wild stock and the environment, ensuring food safety for human consumption, and ensuring workers' wellbeing for sustainability. Given to the powerful forces for compliance for eco-label certifications in EU and US markets, the eco-label certifications must also able to identify and promote competitiveness of shrimp produced by household-scale shrimp producers. Despite the limitations in knowledge about food safety standards, shrimp farming practices by household-scale shrimp producers seem more sustainable. The extensive usage of chemical inputs low stocking densities and use of polyculture, which allows for the higher biodiversity of shrimp farms are also more environmentally safe. These non-intensive shrimp farming practices should be recognised as market advantages. In fact, the history of aquaculture development in Indonesia presented in Chapter 2 suggested that household-scale shrimp producers are more sustainable, while many industrial shrimp producers could not survive due to high losses from disease outbreaks. In the current context, eco-labels act in the opposite way and disadvantage this more sustainable mode of production.

Eco-label certification standards must be revised from the perspective of household-scale shrimp producers' capabilities. Although GlobalGAP has developed standards dedicated for this group of shrimp producers, household-scale farmers still do not have the means to comply with the current objectives. To ensure household-scale farmers can meet these standards in the future, there is a need to consider revising the standards that can favour the incapability of household-scale farmers, while still meeting the objectives of the eco-label certification schemes.

Global markets seemingly offer equality with similar opportunities for all players (Rodrik 2002). However, the notion of equality in opportunity must also incorporate an understanding about capability. It is reasonable to expect that decision making regarding global markets should consider whether all players have similar capitals or similar opportunities to develop their initial capitals and therefore similar capabilities. However, this is not the case when the access and opportunities to enhance the initial means are restricted by the external factors faced by individuals, such as governance enforced through social institutions. The equality scope in globalised markets must provide space for those less capable and work towards improving the capabilities of the disadvantaged groups. To do so, global trade policy and regulations must provide more shelter for commodities produced by the least advantaged producers, enabling greater market participation. Global trade governance that adopted the principle of developmentfriendly international trading regimes is one that could do more than enhance poor countries' access to markets (Rodrik 2001). Such regulations and policies should allow disadvantaged groups to pursue their economic interests and to grow as a pathway to poverty alleviation and to development for all.

Appendices

Appendix 1: List of respondents

Nodes and geographic location			Number of respondents	Respondent codes
	Inputs node			
	Feed	Feed company Surabaya	1	FC_SY 2013
		Field assistant of feed company	1	FC_FA 2013
		Feed distributor in Madello village	1	FD_ SS 2013
		Inputs store at Julok District	1	ST_Ach 2012
	Broodstock	Monodon broodstock fishers Cot Keh (Aceh)	1	BF_Ach 2012
		Monodon broodstock wholesaler Cot Keh (Aceh)	1	BW_Ach 2012
	Hatcheries	Indoor vannamei (F1) hatchery in South Sulawesi	1	HL_SS 2013
		Monodon indoor hatchery in Aceh	1	HM_Ach 2012
		Monodon vannamei indoor hatchery South Sulawesi	1	HM_SS 2013
		Backyard tiger hatchery in Madello village, South Sulawesi	1	HBT_SS1 2013
		Backyard tiger hatchery in Madello village, South Sulawesi	1	HBT_SS2 2013
		Backyard vannamei hatchery in Madello village, South Sulawesi	1	HBV_SS1 2013
		Backyard vannamei hatchery in Madello village, South Sulawesi	1	HBV_SS2 2013
	Nursery farmers	Nursery farmer in Cot Keh village, Aceh Province	1	NF_Aceh 2012
		Nursery farmer 1 in Pajukukang village, South Sulawesi	1	NF_SS1 2013
		Nursery farmer 2 in Pajukukang village, South Sulawesi	1	NF_SS2 2013
	Production node			
	Household-scale shrimp producers	Babah Krueng (Aceh)	24	HSSP_BK1–24 2012
		Sangso (Aceh)	17	HSSP_Sg1–17 2012
		Tanjung Ibus (North Sumatra)	18	HSSP_TI1–18 2012
		Mayampa (South Sulawesi)	23	HSSP_M1–23 2013

		Mattiro Tasi (South Sulawesi)	23	HSSP_MT1–23 2013
		Madello (South Sulawesi)	18	HSSP_MD1–18 2013
		Pajukukang (South Sulawesi)	15	HSSP_P1–15 2013
	Industrial-scale shrimp producers	Technician in Aceh	1	ISSP_tech _Ach 2012
		Technician in Lampung	1	ISSP_tech_LP1 2013
		Technician in Lampung	1	ISSP_tech_LP2 2013
		Technician in South Sulawesi	1	ISSP_tech_SS 2013
		North Sumatra	1	ISSP_NS1 2012
		North Sumatra	1	ISSP_NS2 2013
		South Sulawesi 1	1	ISSP_SS1 2013
		South Sulawesi 2	1	ISSP_SS2 2013
		Lampung 1	1	ISSP_LP 1 2013
		Lampung 2	1	ISSP_LP 2 2013
		Lampung 3	1	ISSP_LP 3 2013
		Bali	1	ISSP_BL1 2013
		Surabaya	1	ISSP_SY 2013
	Transnational-scale shrimp producer	CP Prima	1	TSSP 2012
	Marketing Node			
	Wholesalers	Small wholesaler in Babah Krueng (Aceh)	1	WS_Ach1 2012
		Small wholesaler in samalanga (Aceh)	1	WS_Ach2 2012
		Small wholesaler in Tanjung Ibus (North Sumatra)	1	WS_NS 2012
		Small wholesaler in Madello (South Sulawesi)	1	WS_SS1 2013
		Small wholesaler in Mattiro Tasi (South Sulawesi)	1	WS_SS2 2013
		Large wholesaler		
		Large wholesaler in East Aceh (Aceh)1	1	WB_Ach1 2012
		Large wholesaler in East Aceh (Aceh)2	1	WB_Ach2 2012
		Large wholesaler in Tanjung Ibus (North Sumatra)	1	WB_NS 2012
		Large wholesaler in Pinrang (South Sulawesi)	1	WB_SS1 2013
		Large wholesaler in Mayampa (South Sulawesi)	1	WB_SS2 2013
		Large wholesaler in Mattiro Tasi (South Sulawesi) 1	1	WB_SS3 2013

		Large wholesaler in Mattiro Tasi (South Sulawesi) 2	1	WB_SS4 2013
		Large wholesaler in Pinrang (South Sulawesi)	1	WB_SS5 2013
	Coordinators	Coordinator in Surabaya	1	C_EJ 2013
		Coordinator in Pinrang (South Sulawesi) 1	1	C_SS1 2013
		Coordinator in Pinrang (South Sulawesi) 2	1	C_SS2 2013
		Coordinator in Pinrang (South Sulawesi) 3	1	C_SS3 2013
	Exporters	Exporter in North Sumatra	1	EX_NS 2012
		Exporter in South Sulawesi	1	EX_SS 2013
	Importer	Importer from the Netherlands	1	IM_ND 2012
	Retailers	Wet market retailer in Makassar (South Sulawesi) 1	1	R_SS1 2013
		Wet market retailer in Makassar (South Sulawesi) 2	1	R_SS2 2013
		Wet market retailer in Makassar (South Sulawesi) 2	1	R_SS3 2013
		Mobile retailer in Makassar (South Sulawesi) 1	1	R_SS4 2013
		Mobile retailer in Makassar (South Sulawesi) 2	1	R_SS5 2013
		Mobile retailer in Tanjung Ibus (North Sumatra)	1	R_NS 2012
	Government institutions			
	Village heads	Babah Krueng (Aceh)	1	VH_BK 2012
		Sangso (Aceh)	1	VH_Sg 2012
		Tanjung Ibus (North Sumatra)	1	VH_TI 2012
		Manyampa (South Sulawesi)	1	VH_M 2013
		Mattiro Tasi (south Sulawesi)	1	VH_MT 2013
		Madello (South Sulawesi)	1	VH_MD 2013
		Pajukukang (South Sulawesi)	1	VH_P 2013
	Village secretaries	Babah Krueng (Aceh)	1	VS_BK 2012
		Aquaculture Directorate-General, MMF Indonesia	1	MMAF 2012

		Head of Aquaculture Department DKP Aceh Province	1	DKP_Ach 1 2012
		Staff of Aquaculture Department DKP Aceh Province	1	DKP_Ach 2 2012
		Head of Aquaculture Department DKP Each Aceh District	1	DKP_EA 2 2012
		Head of Extension Service (Bapeluh), East Aceh District	1	Ext _EA 2012
		Head of Aquaculture Department, DKP North Sumatra Province	1	DKP_NS1 2012
		Staff of Aquaculture Department, DKP North Sumatra Province	1	DKP_NS2 2012
		Head of Aquaculture Department, DKP South Sulawesi Province	1	DKP_SS1 2013
		Head of Laboratory, DKP South Sulawesi Province	1	DKP_SS2 2013
		Staff of Laboratory, DKP South Sulawesi Province 1	1	DKP_SS3 2013
		Staff of Laboratory, DKP South Sulawesi Province 2	1	DKP_SS4 2013
		Extension officer, DKP Pinrang District	1	Ext_Prg 2013
	Non-government stakeholders			
	Shrimp groups for household-scale shrimp producers	Household-scale Babah Krueng village	1	Grp HSSP_BK 2012
		Household-scale Sangso village	1	Grp HSSP _Sg 2012
		Household-scale Tanjung Ibus village 1	1	Grp HSSP _TI 1 2013
		Household-scale Tanjung Ibus village 2	1	Grp HSSP _TI 2 2013
	Shrimp Club Indonesia	Head of SCI	1	SCI_IND 2012
		SCI North Sumatra Province	1	SCI_NS 2012
		SCI South Sulawesi Province	1	SCI_SS 2013
	Village facilitators	Village facilitator (ALSC) Sangso	1	VF_Sg 2012

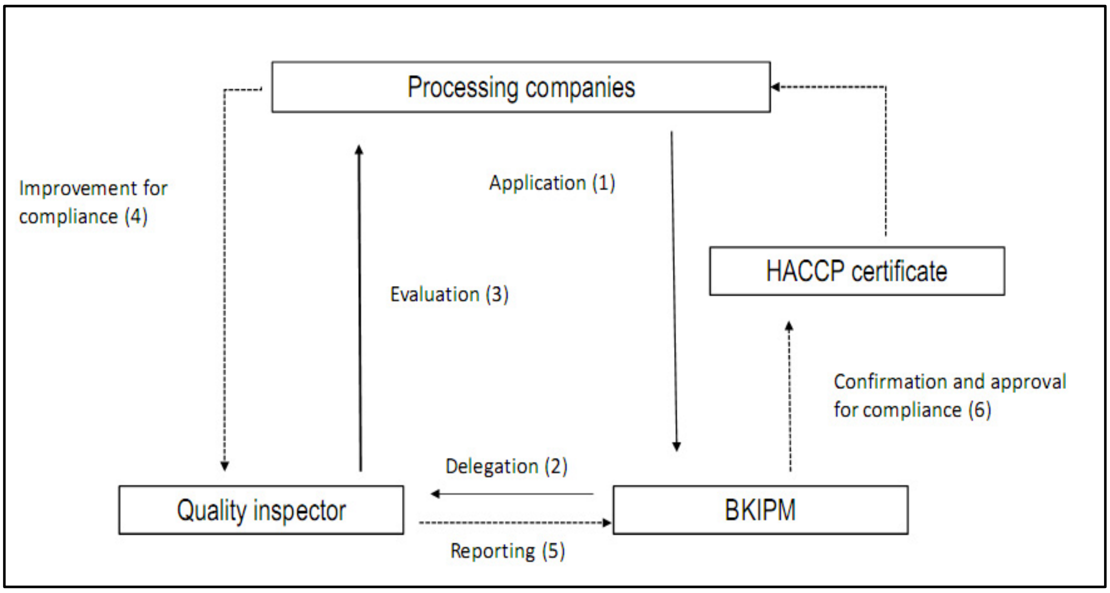
		Village facilitator (World Bank project) Tanjung Ibus1	1	VF_TI11 2012
		Village facilitator (World Bank project) Tanjung Ibus 2	1	VF_TI2 2012
		Teacher at Madello	1	VT_MD 2013
	Experts	Export expert Surabaya	1	Exp_expt_SY 2013
		Aquaculture expert 1	1	Aqua_expt1 2012
		Aquaculture expert 2	1	Aqua_expt2 2012
		Aquaculture expert 3	1	Aqua_expt3 2012
		WWF contact person	1	NGO_IND 2012
		NGO in the Netherlands 1	1	NGO_ND1 2012
		NGO in the Netherlands 2	1	NGO_ND2 2012
		Bank officer in Medan	1	BO_NS 2012
		Bank officer in Makassar	1	BO_SS 2013
	Total respondents		**234**	

Appendix 2: Supplementary information on technical procedures for obtaining HACCP certificate in Indonesia

The HACCP certificate is administrated under the Fish Quarantine and Quality Control Agency (BKIPM). The certificate is issued by the sub-department of BKIPM. The HACCP certification process is as follows: (1) processing companies must apply for HACCP certification to BKIPM; (2) BKIPM delegates a quality inspector (*Inspektur Mutu*) to carry out the inspection and assessment for the processing companies. The quality inspector is a qualified MMAF officer and is accredited to perform the inspection and the assessment; (3) based on the inspection and assessment, the quality inspector provides a recommendation to the processing company for any improvements; (3) processing companies must respond to the improvement recommendations, which are later evaluated and validated by the quality inspector; (5) the quality inspector reports and evaluates the degree of compliance to determine the class compliance of the companies for BKIPM; (6) the head of BKIPM delegates an approval commission to evaluate the quality inspector's confirmation prior to issuing a HACCP certificate; (7) the assessment result and the degree to which the standards are met determines the HACCP certificate class. The classes are determined based on the following criteria:

- Class A is given if incompliance is Critical = 0; Serious = 0; Major = 0; Major = maximum 5 cases, Minor = maximum 6 cases
- Class B is given if incompliance is Critical = 0; Serious = maximum 2 cases; Major = 10 cases, Minor = maximum 7 cases (the total of Serious and Major cannot exceed 10 cases)
- Class C is given if incompliance is Critical = 0; Serious = maximum 4 cases, Major = 11 cases, Minor = >7 cases

The ministerial decrees of *PER. 19/MEN/2010* and *KEP 01/MEN/2007* have conditions that processing companies can enter EU markets if they obtain a Class A HACCP certificate. Class B and C HACCP certificates are required to upgrade the practices of those targeting EU markets.

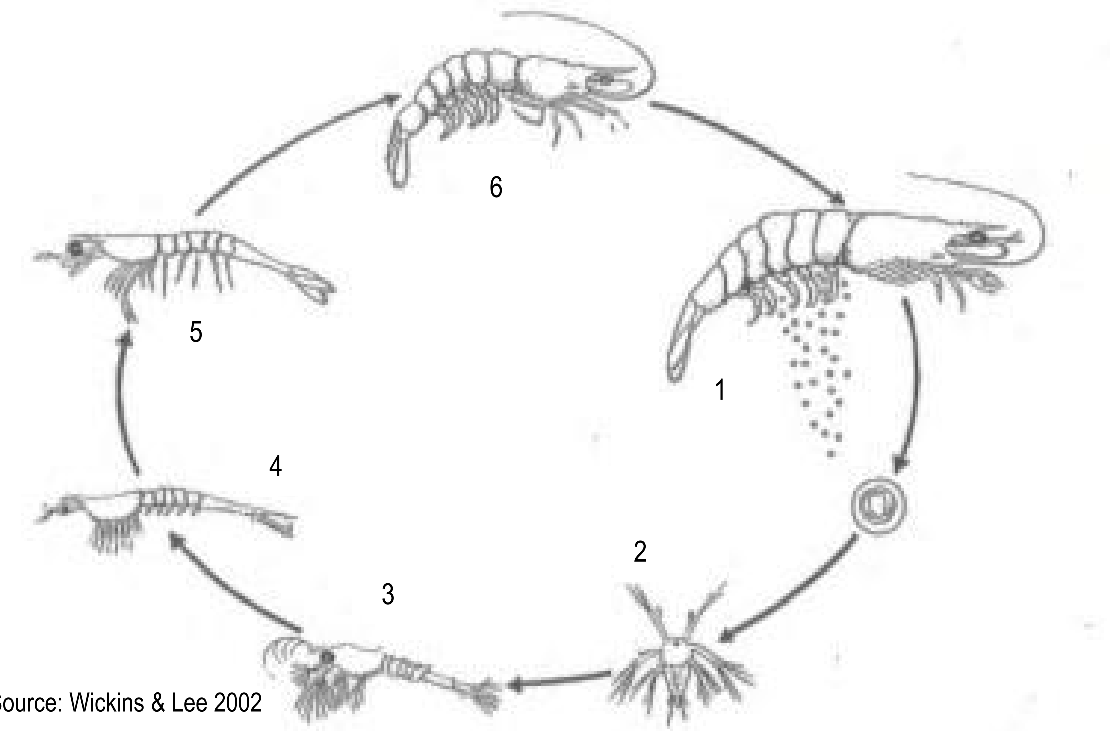


Source: MMAF 2011

Figure A.2.1 Indonesian HACCP certification procedure for fishery products

Appendix 3: Supplementary information on the shrimp's biological cycle and on nursery farmers

Figure A3.1 displays the life cycle of marine shrimp. This life cycle relates to the seed stage used in hatchery and shrimp farming. It depicts the general life cycle of penaid shrimp including tiger prawn and vannamei shrimp (Wickins & Lee 2002). The life cycle is the metamorphosis (development) of penaid shrimp through the following stages: (1) the cycle starts by the releasing (spawning) of eggs by mature shrimp into the water body; (2) the eggs are then fertilised when they are spawned, which can lasts up to 24 hours before Nauplius develops; (3) protozoa; (4) mysis; (5) post-larva; (6) juvenile and; (7) mature. Each life stage takes 2–3 days as Nauplius; 3–4 days as protozoa; 3–5 days as mysis; 3–35 days as post-larva and 180–300 days as juvenile and mature shrimp.



Source: Wickins & Lee 2002

Figure A3.1 Generalised live cycle of penaeid shrimp

Shrimp hatcheries may produce post-larvae using either broodstock or Nauplius purchased from other hatcheries. Shrimp nurseries usually buy post-larvae and grow them in either earthy ponds or *happa* net for two weeks (Picture A.3.1) and sell the seed at the juvenile stage. Shrimp nursery farmers are seen as the intermediaries who cover the extended rearing period to produce larger sized shrimp seed. These actors can sell the juvenile shrimp directly to farmers or to juvenile agents who can later sell them on to farmers. Therefore, Indonesian shrimp producers use shrimp seed across different life stages. Some farmers use twelve-day-old post-larvae while others use juvenile shrimp (26 days old) which can reduce mortality rate in ponds during grow out (Shang et al. 1998) and shorten the production cycle. This can reduce production costs.

Picture A.3.1 Nursery system using *happa* net

Appendix 4: Questionnaire for shrimp producers

Date	
Village	
Sub-district	
District	
Province	
Type of shrimp farmer	

1	**Demographic**				
2	Name				
3	No telp				
4	Gender	1.Male 2.Female			
5	Age				
6	Ethnicity				
	History				
7	What commodity do you farm?				
8	When did you start farming shrimp?				
	Human Capital				
9	Education level	SD	SMP	SMA	Universitie s
10	Did you have experience working on a shrimp farm before starting your own farm?	1.Yes 2.No			
11	If yes, what was your role and how did help your shrimp farm?				
12	Have you ever participated in a shrimp farming trading?				
13	What agencies did provide the training?	1. Government 2.NGO 3.Private companies 4.Other			
14	What was the training material about?				
15	**Household information (includes relative who permanently stay with family)?**	Age	Last formal education level	Occupation	
a)	Wife				
b)	Children (list all of them)				
16	Have your family member involved in shrimp farming (if yes, please elaborate how)?				
17	Do you and your family members have health insurance?	1. Yes (no. 35)		Elaborate since when, who does provide it, and how much does it cost you if you have to	

			pay?
		2. No	
Workers			
18	Do you hire worker for your shrimp farm?	1. Yes 2. No	
19	How old are they?	Worker # 1	Age
		# 2	
		# 3	
		Etc.	
20	What is the highest formal education of the hired workers?	Worker # 1	Education:
		Worker # 2	Education:
		Worker # 3	
21	What type of workers are they?	1. Permanent 2. Daily	
22	What are the responsibilities of the permanent workers?		
23	What are the task of the daily paid workers?		
24	Do your worker have experience working in shrimp farming previously? If Yes, what were their tasks? And what was the type of shrimp farming they worked for and for how long?		
25	Have your workers ever participated in a training? If yes, what organisation did provide the training and what was the training about?		
Social Capital			
26	Are you a member of shrimp farmer organization? If yes, what organization did establish the organisation, what is the aim of the organization?		
27	What are the benefit being a member of a shrimp farmer group?		
28	Do your group do collective actions? If Yes, what are the activities?		
29	Have you ever received supports from government? If Yes, what kind of suppers were provided?	1.	

<table>
<tr><td></td><td></td><td colspan="2"></td></tr>
<tr><td></td><td colspan="3">Physical capital</td></tr>
<tr><td>30</td><td>What are the type of house?</td><td colspan="2">1. Permanent
2. Semi-permanent
3. Wooden house</td></tr>
<tr><td>31</td><td>What is the ownership of the house?</td><td colspan="2"></td></tr>
<tr><td>32</td><td>What is the area of the house (m^2)</td><td colspan="2"></td></tr>
<tr><td>33</td><td>What is the type of toilet?</td><td colspan="2"></td></tr>
<tr><td>34</td><td>What is the source of water supply?</td><td colspan="2"></td></tr>
<tr><td>35</td><td>What is the source of power supply?</td><td colspan="2"></td></tr>
<tr><td>36</td><td>What is the area of your shrimp farm (ha)?</td><td colspan="2"></td></tr>
<tr><td>37</td><td>How did you get your shrimp farm?</td><td colspan="2">1. Heritage
2. Purchased
3. Grant from government</td></tr>
<tr><td>38</td><td>What is the origin of your shrimp farm?</td><td colspan="2"></td></tr>
<tr><td rowspan="7">39</td><td rowspan="7">Do you have these shrimp facilities for your shrimp farms?</td><td>Type</td><td>Number</td></tr>
<tr><td>paddlewheel</td><td></td></tr>
<tr><td>aerator</td><td></td></tr>
<tr><td>generator</td><td></td></tr>
<tr><td>harvesting facilities</td><td></td></tr>
<tr><td>other (listed)</td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td rowspan="7">40</td><td rowspan="7">What kind of vehicles do you have?</td><td>Type</td><td>Number</td></tr>
<tr><td>Bicycle</td><td></td></tr>
<tr><td>Motorbike</td><td></td></tr>
<tr><td>Car</td><td></td></tr>
<tr><td>Truck</td><td></td></tr>
<tr><td>Other…</td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td>41</td><td>Do you have mobile phone? How do you use it for your daily activities and shrimp farming activities?</td><td colspan="2"></td></tr>
<tr><td>42</td><td>Do you have computer? How do you use it for your daily activities and shrimp farming activities?</td><td colspan="2"></td></tr>
<tr><td colspan="4"></td></tr>
</table>

Financial capital		
43	How did you get your initial capital to build/purchase your farm?	1. Bank 2. Relative 3. Self-financed 4. Buyer
45	What is your stocking density	
46	What is your yield per production cycle per ha (kg)	
47	List production cost per production cycle	
48	What are other sources of your household income? Please list them	
49	What the household expenses per month? List them	
50	What kind of financial credit can you obtain? How do you access them??	
51	What were the purpose of the credit?	
	Natural Capital	
52	How did you select the location of your shrimp farm?	
53	How do you access water supply for your farm?	
54	How did you design the development of your shrimp ponds? Do you have a separate inlet and outlet water supply?	

Value Chain Analysis

	Inputs	
55	What are your production inputs for farming shrimp? And how do you buy them? (ask for every input)	
56	What constrains do face to access your production inputs?	
57	Do you do daily book keeping? If yes, what kind of data do you record. And if Not, why you do not have a book keeping?	
58	How do you maintain the hygienic, sanitation around your shrimp farm?	
59	Have you ever heard about food safety? If yes, how did you know it?	
	Harvest	
60	What are the process do you to harvest your shrimp, from the beginning to the end?	
61	Do you put ice on your harvest? And what do you do to maintain the freshness of your harvest?	
	Marketing	
62	Who do you sell your harvest to and why do you chose him/her?	
63	What is the price for one Kg of shrimp? How the price is determined?	
64	Do you know who your buyer sell their products to?	
65	Do you know whether your shrimp is being sold to export or domestic markets? Which market do you prefer?	
66	How is the payment process from your shrimp buyers?	
67	Do your buyer require any condition to sell your harvest to them?	

Appendix 5: Questionnaire for marketing actors

Question guidelines for marketing actors

Respondent	
Date and time of interview	
Village	
Sub district	
District	
Province	

A. History
- What kind of commodities do you buy and sell?
- How long have you been doing the business?

B. Traceability

- Where do you buy your product from?
- How many farmers do sell their shrimp to you?
- What do you do for traceability?
- What kind of recorded information of the product do you acquire?
- Who did require you the information? Your buyer?

C. Quality control
- What do you do for quality control?
- How do you determine the quality? Is the quality determined at the beginning of the production?

D. Transaction and economic profit
- How is the transaction conducted? By phone and casual or regular business network?
  How much do you buy their product per Kg?
- Is there any minimum quantity required?
- What are the determinants of the product price? Quality/traceability/recorded information/ size?
- Who did determine the product price? You? Farmer? Or your buyer?
- What capital do you acquire for the business? Transport/physical capital/financial capital?

- What is your estimated production/business cost?

E. Shrimp trader perception on eco-label certification
- Have you ever heard about eco-label certification requirement?
- Who did you get the information from?
- What do you think about the eco-label certification requirement?
- Transaction dynamics related to eco-label certification? Have you done any different business system in relation to the eco-label certification requirement standards?
- What are the risks if you do not comply to the requirements?

F. Transaction with buyer
- Who do you sell your product to?
- What are the requirements from the buyer?
- Is there any minimum quantity of each supply/shipment? If so, how many Kg?
- Do you sell your product to a specific buyer/s?
- How much do you sell your product per/kg?
- What are the determinant of the price? Quality/ traceability/recorded data/ size?

Bibliography

Ahmed, N., Allison, E.H. & Muir, J.F. 2008, 'Using the sustainable livelihoods framework to identify constraints and opportunities to the development of freshwater prawn farming in southwest Bangladesh', *Journal of the World Aquaculture Society*, vol. 39, no. 5, pp. 598–611.

Albert Heijn 2012, *WNF and Albert Heijn collaborate to promote conservation and sustainability*, zaandam, Netherlands, viewed 22 November 2012, <https://www.ahold.com/Media/Albert-Heijn.htm>.

Albert Heijn 2014, *Ahold Media, Albert Heijn B.V.*, Netherlands, viewed 15 May 2014, <https://www.ahold.com/Media/Albert-Heijn.htm>.

Allison, E.H. & Ellis, F. 2001, 'The livelihoods approach and management of small-scale fisheries', *Marine Policy,* vol. 25 pp. 377–388.

Allison, E.H. & Horemans, B. 2006, 'Putting the principles of the sustainable livelihoods approach into fisheries development policy and practice', *Marine Policy,* vol. 30, no. 6, pp. 757–766.

Altenburg, T. 2006, 'Governance patterns in value chains and their development impact', *The European Journal of Development Research*, vol. 18, no. 4, pp. 498–521.

Altenburg, T., Gennes, M., Hatakoy, A., Herberg, M., Link, J. & Schoengen, S. 2004, 'Strengthening knowledge-based competitive advantages in Thailand', *Reports and Working Papers 1/2004*, German Development Institute, Born, Germany.

Anand, S. & Sen, A. 2000, 'Human development and economic sustainability', *World Development*, vol. 28, no. 12, pp. 2029–2049.

Angen, M.J. 2000, 'Evaluating interpretive inquiry: reviewing the validity debate and opening the dialogue', *Qualitative Health Research*, vol. 10, no. 3, pp. 378–395.

AngloINFO 2012, *Dutch supermarkets and grocery stores*, Netherlands, viewed 22 November 2012, <http://southholland.angloinfo.com/information/lifestyle/food-and-drink/grocery-shopping/>.

Apud, F.D. 1985, 'Extensive and semi-intensive culture of prawn and shrimp in the Philippines', *First International Conference on the Culture of Penaeid Prawns/Shrimps*, 4–7 December 1984, Aquaculture Department, Southeast Asian Fisheries Development Center, Iloilo City, Philippines, pp. 105–113.

Aquaculture Stewardship Council 2013a, *German retailer real helps raise farm standards*, ASC, Utrecht, Netherlands, viewed 3 September 2013, <http://www.asc-aqua.org/index.cfm?act=update.detail&uid=167&lng=1>.

Aquaculture Stewardship Council 2013b, *About the ASC*, Utrecht, Netherlands, viewed 3 September 2013, <http://www.asc-aqua.org/index.cfm?act=tekst.item&iid=2&lng=1>.

Aquaculture Stewardship Council 2014, *ASC shrimp standard*; version 1.0, March 2014, ASC, Netherlands, viewed 21 June 2013, <http://www.asc-aqua.org/index.cfm?act=update.detail&uid=148&lng=1>.

Arsyal, M. 2011, 'Arsitekture rumah adat bugis', *Sulawesi Selatan Indonesia*, viewed 13 January 2014, <http://archzal.blogspot.com.au/2011/02/arsitektur-rumah-adat-bugis-sulawesi.html>.

Arthur, R. & Sheriff, N. 2008, 'Fish and the poor', in R.M. Briones & A.G. Garcia (eds.), *Poverty reduction through sustainable fisheries,* Institute of Southeast Asian Studies, Singapore, pp. 15–38.

Asfaw, S., Mithöfer, D. & Waibel, H. 2010, 'What impact are EU supermarket standards having on developing countries' export of high-value horticultural products? Evidence from Kenya', *Journal of International Food & Agribusiness Marketing*, vol. 22, no. 3–4, pp. 252–76.

Asian Development Bank, Australian Centre for International Agriculture Research, Food and Agriculture Organization of the United Nations, Aquaculture without Frontiers, International Finance Corporation of the World Bank Group, Badan Rehabilitasi dan Rekonstruksi, Balai Perikanan Budidaya Air Payau, Ministry of Marine Affairs and Fisheries of Indonesia, Network of Aquaculture Centres in Asia Pacific 2007, *Practical manual on better management practices for tambak farming in Aceh,* ADB Earthquake and Tsunami Emergency Support Project , Australian Centre for International Agriculture Research, Food and Agriculture Organization of the United Nations, International Finance Corporation of the World Bank Group, Banda Aceh Indonesia.

Asniati 2009, 'Analisis financial tambak traditional sistem polikultur udang windu *(Penaeus monodon)* dan ikan bandeng *(Chanos chanos)'*, Undergraduate thesis, Hasanuddin University, Makassar, Indonesia.

Astuti, P. 2007, 'Analisis saluran distribusi dan pendapatan petani tambak udang windu (*Penaeus monodon*) di Desa Tasiwalie Kecamatan Suppa, Kabupaten Pinrang', Undergraduate thesis, Hasanuddin University, Makassar, Indonesia.

Athukorala, P.C. & Jayasuriya, S. 2003, 'Food safety issues, trade and WTO rules: a developing country perspective', *The World Economy*, vol. 26, no. 9, pp. 1395–1416.

Atkinson, R. & Flint, J. 2001, 'Accessing hidden and hard-to-reach populations: snowball research strategies', *Social Research Update*, vol. 33, no. 1, pp. 1–4.

Australia Centre for International Agricultural Research 2011, *Project report for land capability assessment and classification for sustainable, pond-based aquaculture systems (Project FIS/2002/076)*, ACIAR, Australia.

Avnimelech, Y. & Ritvo, G. 2001, 'Aeration, mixing and sludge control in shrimp ponds', *Global Aqua. Alliance Advocate,* vol. 4, pp. 51–53.

Azqueta, D. & Sotelsek, D. 2007, 'Valuing nature: from environmental impacts to natural capital', *Ecological Economics*, vol. 63, no. 1, pp. 22–30.

Babbie, E.R. 1990, *Survey research method*, Wadsworth Publishing, California.

Badan Standarisasi Nasional 2006a, *Standar nasional Indonesia (SNI), induk udang Penaeus Monodon*, SNI 01-6142-2006, BSN, Jakarta.

Badan Standarisasi Nasional 2006b, *Standar national Indonesia (SNI), produksi benih udang windu Penaeus monodon kelas benih sebar,* SNI 01-6144-2006, BSN, Jakarta, Indonesia.

Badan Standarisasi Nasional 2010, Standar nasional Indonesia (SNI), pengemasan benih udang vaname (Litopenaeus vannamei) pada sarana angkutan udara, SNI 7586 2010, BSN, Jakarta, Indonesia.

Bair, J. 2009, 'Global commodity chains: genealogy and review', in J. Bair (ed.), *Frontiers of commodity chain research*, Stanford University Press, California, pp. 1–34.

Baldwin, J.R. & Gu, W. 2004, 'Trade liberalization: export-market participation, productivity growth, and innovation', *Oxford Review of Economic Policy*, vol. 20, no. 3, pp. 372–392.

Barmon, B.K., Choudhury, M. & Munim, S.S. 2010, 'Value chain and marketing channels of shrimp/prawn sector of Gher farming system in Bangladesh', *World Review of Business Research,* vol. 1, no.1, pp. 10–24.

Barrett, C.B. 2008, 'Smallholder market participation: concepts and evidence from eastern and southern Africa', *Food Policy*, vol. 33, no. 4, pp. 299–317.

Bartlett, C.A. & Ghoshal, S. 1987, 'Managing across borders: new strategic requirements', *Sloan Management Review,* vol. 28, no. 4, pp. 7–17.

Beard, V.A. 2005, 'Individual determinants of participation in community development in Indonesia'. *Environmental Planning and C: Government and Policy*, vol. 23, pp. 21-39.

Bebbington, A. 1999, 'Capitals and capabilities: a framework for analyzing peasant viability, rural livelihoods and poverty', *World Development*, vol. 27, no. 12, pp. 2021–2044.

Becker, G.S. & Murphy, K.M. 1994, 'The division of labor, coordination costs, and knowledge', in G.S. Becker (ed.), *Human capital*: *a theoretical and empirical analysis with special reference to education*, 3rd edn*,* The University of Chicago Press, Chicaho Illinois, pp. 299–322.

Becker, G.S. 1962, 'Investment in human capital: a theoretical analysis', *Journal of Political Economy*, vol. 70, no. 5, pp. 9–49.

Becker, G.S., Murphy, K.M. & Tamura, R. 1990, 'Human capital, fertility, and economic growth', *Journal of Political Economy*, vol. 98, no. 5, pp. S12–S37.

Belderbos, R.A. & Heijltjes, M.G. 2005, 'The determinants of expatriate staffing by Japanese multinationals in Asia: control, learning and vertical business groups', *Journal of International Business Studies,* vol. 36, no. 3, pp. 341–54.

Belton, B. & Azad, A. 2012, 'The characteristics and status of pond aquaculture in Bangladesh', *Aquaculture,* vol. 358–359, pp. 196–204.

Belton, B., Haque, M.M., Little, D.C. & Sinh, L.X. 2011, ‘Certifying catfish in Vietnam and Bangladesh: who will make the grade and will it matter?’, *Food Policy*, vol. 36, no. 2, pp. 289–299.

Bergman, M.M. 2008, *Advances in mixed methods research*, SAGE Publications, UK.

Bingen, J., Serrano, A. & Howard, J. 2003, ‘Linking farmers to markets: different approaches to human capital development’, *Food Policy,* vol. 28, no. 4, pp. 405–419.

Blaha, F. & Steffen, J. 2008, ‘Exporting seafood to the EU’, *Bulletin,* no.84, International Trade Centre (ITC), Switzerland.

Blair, M.M. 2011, ‘An economic perspective on the notion of human capital’, in A. B. Jones & J. C. Spender (eds.), *The Oxford handbook of human capital*, Oxford University Press, New York. pp. 49–70.

Blee, K.M. & Taylor, V. 2002, ‘Semi-structured interviewing in social movement research’, in B. Klandermans & S. Staggenborg (eds.), *Methods of social movement research*, University of Minnesota Press, Minneapolis, pp. 92–117.

Bosma, R.H., Udo, H.M., Verreth, J.A., Visser, L.E. & Nam, C.Q. 2005, ‘Agriculture diversification in the Mekong Delta: farmers’ motives and contributions to livelihoods’, *Asian Journal of Agriculture and Development*, vol. 2, no. 1 & 2, pp. 49–66

Bosma, R., Sidik, A.S., van Zwieten, P., Aditya, A. & Visser, L. 2012, ‘Challenges of a transition to a sustainably managed shrimp culture agro-ecosystem in the Mahakam delta, East Kalimantan, Indonesia’, in *Wetlands Ecology and Management*, pp. 1–11.

Boyatzis, R.E. 1998, *Transforming qualitative information: thematic analysis and code development,* Sage, UK.

Boyd, C. & Tucker, C. 1998, ‘Ecology of aquaculture ponds’, in Claude E. Boyd & Craig S. Tucker (eds), *Pond aquaculture water quality management,* Kluwer Academic Publishers, Norwell, Massachusetts, pp. 8–86.

Bryman, A. 2006, ‘Integrating quantitative and qualitative research: how is it done?’, *Qualitative Research*, vol. 6, no. 1, pp. 97–113.

Budhiman, A.A., Paryanti, T.S. & Sunaryanto, A. 2005, ‘The present status of *Penaeus vannamei* and other exotic shrimp culture in Indonesia’, *Regional technical consultation on the aquaculture of p.vannamei and other exotic shrimps in southeast asia*, SEAFDEC Aquaculture Department, Manilla, the Phillippines, pp. 42–49.

Bush, S.R., Khiem, N.T. & Sinh, L.X. 2009, ‘Governing the environmental and social dimensions of pangasius production in Vietnam: a review’, *Aquaculture Economics & Management*, vol. 13, no. 4, pp. 271–293.

Buwono, I.D. 1993, *Tambak udang windu*, Penerbit Kanisius, Bandung, Indonesia.

Central Proteinaprima Tbk 2009, *2009 Annual report*, PT, CPP, Jakarta, Indonesia.

Central Proteinaprima Tbk 2010, *2010 Annual report*, PT, CPP, Jakarta, Indonesia.

Central Proteinaprima Tbk 2011, *2011 Annual report*, PT, CPP, Jakarta, Indonesia.

Central Proteinaprima Tbk 2012, *2012 Annual report*, PT, CPP, Jakarta, Indonesia.

Central Proteinaprima Tbk 2013, *Profil Usaha*, PT, CPP, Jakarta, Indonesia, viewed 15 May 2013, <http://www.cpp.co.id/entries.aspx?entry_id=10>.

Central Proteinaprima Tbk 2014, *Frozen shrimp products*, PT, CPP, Jakarta, Indonesia, viewed 18 March 2014, <http://www.cpp.co.id/entries.aspx?entry_id=14>.

Cha, M., Young, L. & Wong, K. 1997, 'The fate of traditional extensive (*gei wai*) shrimp farming at the Mai Po marshes nature reserve, Hong Kong', *Hydrobiology*, vol. 352, no. 1–3, pp. 295–303.

Challies, E.R.T. & Murray, W.E. 2011, 'The interaction of global value chains and rural livelihoods: the case of smallholder raspberry growers in Chile', *Journal of Agrarian Change*, vol. 11, no. 1, pp. 29–59.

Chambers, R. & Carney, R.G. 1991, *Sustainable rural livelihoods: practical concepts for the 21st century*, Institute of Development Studies, UK.

Charoen Pokphand Foods 2014, *The company at a glance*, PCL, viewed 24 February 2014, <http://www.cpfworldwide.com/cpd/en/page/about/about_cpf.aspx>.

Cherni, J.A., Dyner, I., Henao, F., Jaramillo, P., Smith, R. & Font, R.O. 2007, 'Energy supply for sustainable rural livelihoods: a multi-criteria decision-support system', *Energy Policy*, vol. 35, no. 3, pp. 1493–1504.

Chien, Y.H. 1992, 'Water quality requirements and management for marine shrimp culture', *Proceedings of the special session on shrimp farming,* World Aquaculture Society, Baton Rouge, Louisiana, US , pp. 144–156.

Cholik, F. 1989, 'Research program of the Research Institute for Coastal Agriculture for supporting shrimp culture industry in Indonesia', *Shrimp culture industry workshop*, Food and Agriculture Organization of the United Nations (FAO), 25–28 Sep 1989, Jepara, Indonesia , viewed 16 January 2013, <http://www.fao.org/docrep/field/003/ac058e/AC058E00.htm#TOC>.

Chowdhury, S.K., Gulati, A. & Gumbira-Sa'id, E. 2005, 'The rise of supermarkets and vertical relationships in the Indonesian food value chain: causes and consequences', *Asian Journal of Agriculture and Development,* vol. 2, no. 1 & 2, pp. 39–48.

Cockerill, M.P. 2014, 'Beyond education for economic productivity alone: the capabilities approach', *International Journal of Educational Research*, vol. 66, pp. 13–21.

Cohen, R.B. & Hymer, S. 1979, *The multinational corporation: a radical approach*, Cambridge University Press, New York.

Coleman, J.S. 1988, 'Social capital in the creation of human capital', *American Journal of Sociology*, vol. 94, pp. S95–S120.

Collados, C. & Duane, T.P. 1999, ‘Natural capital and quality of life: a model for evaluating the sustainability of alternative regional development paths’, *Ecological Economics* vol. 30, pp. 441–460.

Cooke, A.M. 2008, ‘Branding and certification’, in S.R. Curan, A. Linton, A. Cooke & A. Schrank (eds.), *The global governance of food,* Routledge, London, pp. 63–64.

Cremer, M.C. & Duncan, B.L. 1979, *Brackishwater aquaculture development in northern Sumatra, Indonesia*, A report for USAID, International Center for Aquaculture, Auburn University, viewed 20 April 2012, http://pdf.usaid.gov/pdf_docs/pnaag560.pdf.

Creswell, J.W. 2012, *Qualitative inquiry and research design: choosing among five approaches*, Sage publications, UK.

Creswell, J.W., Plano Clark, V. & Garrett, A.L. 2008, ‘Methodological issues in conducting mixed methods research designs’, *Advances in mixed methods research,* Manfred, M. Bergman (ed), Sage publications, UK, pp. 66–83.

Dattalo, P. 2010, *Strategies to approximate random sampling and assignment*, Oxford University Press, New York.

De Schutter, O. 2010, *Report submitted by the special rapporteur on the right to food*, United Nations Human Rights Council, New York.

Dev, S.M. 2006, ‘Financial inclusion: issues and challenges’, *Economic and Political Weekly*, vol. 41, no, 41, pp. 4310–4313.

DeWitt, T., Giunipero, L.C. & Melton, H.L. 2006, ‘Clusters and supply chain management: the Amish experience’, *International Journal of Physical Distribution & Logistics Management*, vol. 36, no. 4, pp. 289–308.

Department for International Development 1999, *Sustainable livelihoods guidance sheets*, DFID, UK, viewed 20 July 2012, <http://www.eldis.org/vfile/upload/1/document/0901/section2.pdf>.

Diniz, E., Birochi, R. & Pozzebon, M. 2011, ‘Triggers and barriers to financial inclusion: the use of ICT-based branchless banking in an Amazon county’, *Electronic Commerce Research and Applications*, vol. 11, no.5, pp. 484–494.

Diop, N., Brenton, P. & Asarkaya, Y. 2005, ‘Trade costs, export development, and poverty in Rwanda’, *World Bank,* policy research working paper, no. 3784.

Divakarannair, N. 2007, ‘Livelihood assets and survival strategies in coastal communities in Kerala, India’, Ph.D thesis, University of Victoria.

Djomo, J.M.N. & Sikod, F. 2012, ‘The effects of human capital on agricultural productivity and farmer’s income in Cameroon’, *International Business Research*, vol. 5, no. 4, p. 149.

Dolan, C. & Humphrey, J. 2000, ‘Governance and trade in fresh vegetables: the impact of UK supermarkets on the African horticulture industry’, *Journal of Development Studies*, vol. 37, no. 2, pp. 147–176.

Doney, P.M. & Cannon, J.P. 1997, 'An examination of the nature of trust in buyer-seller relationships', *The Journal of Marketing*, vol. 61, no. 2, p. 35–51.

Donovan, J. & Poole, N. 2014, 'Changing asset endowments and smallholder participation in higher value markets: Evidence from certified coffee producers in Nicaragua', *Food Policy*, vol. 44, pp. 1–13.

Dowla, A. 2006, 'In credit we trust: building social capital by Grameen Bank in Bangladesh', *The Journal of Socio-Economics*, vol. 35, no. 1, pp. 102–122.

Edwards, P. 2000, Aquaculture, poverty impacts and livelihoods, *Natural Resources Perspectives,* no. 56, Overseas Development Institute, UK

Ellis, F. 1998, 'Household strategies and rural livelihood diversification', *The Journal of Development Studies,* vol. 35, no. 1, pp. 1–38.

Ellis, F. 2000a, *Rural livelihoods and diversity in developing countries*, Oxford University Press, Oxford, UK.

Ellis, F. 2000b, 'The determinants of rural livelihood: diversification in developing countries', *Journal of Agricultural Economics,* vol. 51, no. 2, pp. 289–302.

Emery, M. & Flora, C. 2006, 'Spiraling-up: mapping community transformation with community capitals framework', *Community Development*, vol. 37, no. 1, pp. 19–35.

Emran, M.S. & Shilpi, F. 2012, 'The extent of the market and stages of agricultural specialization', *Canadian Journal of Economics*, vol. 45, no. 3, pp. 1125–1153.

European Commission 2004a, *Regulation No 852/2004 of The European Parliament and the council of 29 April 2004 on the hygiene of foodstuffs*, EC, Strasbourg.

European Commission 2004b*, Regulation No 853/2004 of the European Parliament and of the council of 29 April 2004 laying down specific hygiene rules for food of animal origin*, EC, Strasbourg.

European Commission 2006, *Commission decision of 21 March 2006 on special conditions governing fishery products imported from Indonesia and intended for human consumption*, EC, Brussels, viewed, 20 June 2012, <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2006:083:0016:0017:EN:PDF>.

European Commission 2013, *Final report of an audit carried out in Indonesia from 25 February to 07 March 2013*, EC.

Fairtrade International 2011, *Certifying fairtrade*, Fairtrade International, viewed 26 July 2014, <http://www.fairtrade.net/certifying-fairtrade.html>.

Falleti, T.G. & Lynch, J.F. 2009, 'Context and causal mechanisms in political analysis', *Comparative Political Studies,* vol. 42, no. 9, pp. 1143–1166.

Farina, E.M. & Reardon, T. 2000, 'Agrifood grades and standards in the extended Mercosur: their role in the changing agrifood system', *American Journal of Agricultural Economics*, vol. 82, no. 5, pp. 1170–1176.

Feder, G., Murgai, R. & Quizon, J.B. 2004, 'The acquisition and diffusion of knowledge: the case of pest management training in farmer field schools, Indonesia', *Journal of Agricultural Economics*, vol. 55, no. 2, pp. 221–243.

Ferdouse, F. 1989, 'World shrimp market situation and outlook', S*hrimp culture industry workshop*, Food and Agriculture Organization of the United Nations (FAO), 25–28 Sep 1989, Jepara, Indonesia, viewed 16 January 2013, <http://www.fao.org/docrep/field/003/ac058e/AC058E00.htm#TOC>.

Fernández-Olmos, M., Rosell-Martínez, J. & Espitia-Escuer, M.A. 2009, 'Vertical integration in the wine industry: a transaction costs analysis on the Rioja DOCa', *Agribusines*s, vol. 25, no. 2, pp. 231–250.

Ferrol-Schulte, D., Wolff, M., Ferse, S. & Glaser, M. 2013, 'Sustainable livelihoods approach in tropical coastal and marine social-ecological systems: a review', *Marine Policy*, vol. 42, pp. 253–258.

Fieldofbusiness 2012, 'Lowongan kerja central proteinaprima', *Fieldofbusiness*, viewed 23 September 2013, <http://fieldofbusiness.blogspot.com.au/2012/09/lowongan-kerja-central-proteinaprima.html>.

Fish Quarantine and Quality Control Agency 2011, *Index regulasi,* Ministry of Marine Affairs and Fisheries, BKIPM, Jakarta, viewed 29 August 2013, <http://www.bkipm.kkp.go.id/bkipm/regulasi>.

Fish Quarantine and Quality Control Agency 2013, *Persyaratan dan tata cara penerbitan sertifikasi kesehatan hasil perikanan*, Ministry of Marine Affairs and Fisheries, BKIPM, Jakarta, viewed 21 August 2013, < http://www.bkipm.kkp.go.id/>.

Fischer, E. & Qaim, M. 2012, 'Linking smallholders to markets: determinants and impacts of farmer collective action in Kenya', *World Development*, vol. 40, no. 6, pp. 1255–1268.

Flaherty, M. & Karnjanakesorn, C. 1995, 'Marine shrimp aquaculture and natural resource degradation in Thailand', *Environmental Management*, vol. 19, no. 1, pp. 27–37.

Food and Agriculture Organization of the United Nations 2000, *The state of world fisheries and aquaculture*, FAO, Rome, Italy

Food and Agriculture Organization of the United Nations 2008, *'Fact: sheet: the international fish trade and world fisheries'*, FAO, Rome, Italy, viewed 22 Feb 2012, <http://www.fao.org/newsroom/common/ecg/1000850/en/fishtradefacts08b.pdf>.

Food and Agriculture Organization of the United Nations 2010, *The state of world fisheries and aquaculture*, FAO, Rome, Italy.

Food and Agriculture Organization of the United Nations 2012, *The state of world fisheries and aquaculture*, FAO, Rome, Italy

Food and Agriculture Organization of the United Nations 2007, *Improving Penaeus monodon hatchery practices: manual based on experience in India*, technical paper. no. 446, FAO Fisheries, Rome, Italy.

Food and Agriculture Organization of the United Nations FISHSTAT 2014, Fisheries and aquaculture software. FishStat Plus - Universal software for fishery statistical time series. In: FAO Fisheries and Aquaculture Department [online]. Rome.

Food and Drug Administration 1995, *Procedures for the safe and sanitary processing and importing of fish and fishery products 65096*, Department of Health and Human Services Public Health, FDA, Rockville, Maryland.

Food and Drug Administration 2011, *Fish and fishery products hazards and controls guidance*, Department of Health and Human Services Public Health, FDA, Rockville, Maryland, viewed 17 Feb 2012, <http://www.fda.gov/downloads/Food/GuidanceRegulation/UCM251970.pdf>.

Foster, A.D. & Rosenzweig, M.R. 2010, 'Microeconomics of technology adoption', *Annual Review of Economics*, vol. 2, no. 1, pp. 395–424.

Frediani, A.A. 2010, 'Sen's capability approach as a framework to the practice of development', *Development in Practice*, vol. 20, no. 2, pp. 173–187.

Fujinaga, M. 1969, *Methods of cultivation of penaeid shrimp,* no. Patented Nov.11, 1996, United States Patent Office, US.

Ganesan, S. & Hess, R. 1997, 'Dimensions and levels of trust: implications for commitment to a relationship', *Marketing Letters*, vol. 8, no. 4, pp. 439–448.

Ganesan, S. 1994, 'Determinants of long-term orientation in buyer-seller relationships', *The Journal of Marketing*, vol. 58, no. 2, pp. 1–19.

Gardiner, R.P. & Viswanathan, K., K. 2004, *Ecolabelling and fisheries management*, no. 1714, WorldFish Center, Penang, Malaysia.

Gereffi, G. & Lee, J. 2009, 'A global value chain approach to food safety and quality standards', *Global health diplomacy for chronic disease preventio*n, working paper series, Duke University, Durham.

Gereffi, G. 1994, 'The organization of buyer driven global commodity chains: how U.S retailers shape overseas production network', in G. Gereffi & M. Karzeniewicz (eds.), *Commodity chains and global capitalism*, Praeger Publisher, Westport.

Gereffi, G. 2001, 'Beyond the producer-driven/buyer-driven dichotomy: the evolution of global value chains in the internet era', *IDS Bulletin*, vol. 32, no. 3, pp 30-40.

Gereffi, G., Humphrey, J. & Kaplinsky, R. 2001, 'Introduction: globalisation, value chains and development', *IDS bulletin*, vol. 32, no. 3, pp. 1–8.

Gereffi, G., Humphrey, J. & Sturgeon, T. 2005, 'The governance of global value chains', *Review of International Political Economy*, vol. 12, no. 1, pp. 78–104.

Gereffi, G., Korzeniewicz, M. & Korzeniewicz, R.P. 1994, 'Introduction: global commodity chains', in G. Gereffi & M. Korzeniewicz (eds.), *Commodity chains and global capitalism*, Praegar Publishers, London.

Gibbon, P. & Ponte, S. 2008, ‘Global value chains: from governance to governmentality?’ *Economy and Society*, vol. 37, no. 3, pp. 365–392.

Gibbon, P. 2001, ‘Upgrading primary production: a global commodity chain approach’, *World Development*, vol. 29, no. 2, pp. 345–363.

Gibbon, P., Bair, J. & Ponte, S. 2008, ‘Governing global value chain: an introduction’, *Economy and Society,* vol. 37, no. 3, p. 24.

Giesbert, L. & Schindler, K. 2012, ‘Assets, shocks, and poverty traps in rural Mozambique’, *World Development*, vol. 40, no. 8, pp. 1594–1609.

Gillan, S.L. & Starks, L.T. 2000, ‘Corporate governance proposals and shareholder activism: the role of institutional investors’, *Journal of Financial Economics*, vol. 57, no. 2, pp. 275–305.

Giné, X. 2011, ‘Access to capital in rural Thailand: an estimated model of formal vs. informal credit’, *Journal of Development Economics*, vol. 96, no. 1, pp. 16–29.

Girvan, N.P. 1987, ‘Transnational corporations and non-fuel primary commodities in developing countries’, *World Development*, vol. 15, no. 5, pp. 713–740.

Global Aquaculture Alliance 2009, *Guidelines for best aquaculture practices certification standards for shrimp farms*, GAA, US, viewed 16 March 2013, <http://www.gaalliance.org/>.

Global Partnership for Good Agriculture Practice 2011, *Smallholder guide for aquaculture; based on GlobalGAP normative documents version 4.0 March 2011*, GlobalGAP, UK, viewed 19 June 2013, <http://www.globalgap.org/cms/front_content.php?idcat=9>.

Goss, J., Burch, D. & Rickson, R.E. 2000, ‘Agri-food restructuring and third world transnationals: Thailand, the CP Group and the global shrimp industry’, *World Development*, vol. 28, no. 3, pp. 513–530.

Government of Indonesia 1969, *Repelita I: Indonesia’s First Five-year Plan (1969/70–1973/73),* GOI, Bappenas, Jakarta.

Government of Indonesia 1974, *Repelita II: Indonesia’s Second Five year Plan (1974/75–1978/79),* GOI, *Bappenas, Jakarta*

Government of Indonesia 1979, *Repelita III: Indonesia’s Third Five year Plan (1979/1980–1983/1984),* GOI, Bappenas, Jakarta.

Government of Indonesia 1984, *Repelita IV: Indonesia’s Fourth Five year Plan (1984/1985–1988/1989),* GOI, Bappenas, Jakarta.

Government of Indonesia 1989, *Repelita V: Indonesia’s Fifth Five year Plan (1989/1990–1994/1995),* GOI, Bappenas, Jakarta.

Grootaert, C. 1999, ‘Social capital, household welfare, and poverty in Indonesia’, *World Bank,* policy research working paper, no. 2148.

Gulbrandsen, L.H. 2006, ‘Creating markets for eco-labelling: are consumers insignificant?’ *International Journal of Consumer Studies*, vol. 30, no. 5, pp. 477–489.

Gyau, A., Franzel, S., Chiatoh, M., Nimino, G. & Owusu, K. 2014, ‘Collective action to improve market access for smallholder producers of agroforestry products: key lessons learned with insights from Cameroon’s experience’, *Current Opinion in Environmental Sustainability*, vol. 6, pp. 68–72.

Hall, D. 2011, ‘Land grabs, land control, and Southeast Asian crop booms’, *Journal of Peasant Studies*, vol. 38, no. 4, pp. 837–857.

Hardjolukito, S. 1989, ‘Prospect for developing prawn feed industry under competition with imported feed, at decreasing situation of prawn market in Indonesia’, *Shrimp culture industry workshop*, Food and Agriculture Organization of the United Nations (FAO), 25–28 Sep 1989, Jepara, Indonesia, viewed 16 January 2013, <http://www.fao.org/docrep/field/003/ac058e/AC058E00.htm#TOC>.

Hasbi, M. 2005, ‘Analisis fungsi produksi Cobb-Doughlas pada usahatani budidaya ikan bandeng *(Chanos chanos)’*, Undergraduate thesis, Universitas Hasanuddin, Makassar.

Hatanaka, M. 2010, ‘Governing sustainability: examining audits and compliance in a third-party-certified organic shrimp farming project in rural Indonesia’, *Local Environment*, vol. 15, no. 3, pp. 233–244.

Hellin, J., Lundy, M. & Meijer, M. 2009, ‘Farmer organization, collective action and market access in Meso-America’, *Food Policy*, vol. 34, no. 1, pp. 16–22.

Helliwell, J.F. & Putnam, R.D. 1995, ‘Economic growth and social capital in Italy’, *Eastern Economic Journal*, vol. 21, no. 3, pp. 295–307.

Henderson, J., Dicken, P., Hess, M., Coe, N. & Yeung, H.W.-C. 2002, ‘Global production networks and the analysis of economic development’, *Review of International Political Economy*, vol. 9, no. 3, pp. 436–464.

Henson, S. & Loader, R. 2001, ‘Barriers to agricultural exports from developing countries: the role of sanitary and phytosanitary requirements’, *World Development*, vol. 29, no. 1, pp. 85–102.

Henson, S. & Reardon, T. 2005, ‘Private agri-food standards: Implications for food policy and the agri-food system’, *Food Policy*, vol. 30, no. 3, pp. 241–253.

Henson, S., Masakure, O. & Boselie, D. 2005, ‘Private food safety and quality standards for fresh produce exporters: the case of hortico agrisystems, Zimbabwe’, *Food Policy*, vol. 30, no. 4, pp. 371–384.

Hess, M. 2008, ‘Governance, value chains and networks: an afterword’, Economy and Society, vol. 37, no. 3, pp. 452–459.

Heyward, M. & Sopantini 2013, ‘Indonesia the challenges in quality and equity in education ‘, in L.P. Symaco (ed.), *Education in South East Asia*, Bloomsbury Academic, London, UK.

Hishamunda, N. & Subasinghe, R.P. 2003, ‘Aquaculture development in China: the role of public sector policies’, *FAO Fisheries Technical Paper 427*, FAO, Rome, Italy.

Hopper, P. 2012, *Understanding development*, Polity Press, UK.

Humphrey, J. & Schmitz, H. 2000, ‘Governance and upgrading: linking industrial cluster and global value chain research’, *IDS Working Paper 120*, Institute of Development Studies (IDS), UK.

Humphrey, J. & Schmitz, H. 2002, ‘How does insertion in global value chains affect upgrading in industrial clusters?’ *Regional Studies*, vol. 36, no. 9, pp. 1017–1027.

Humphrey, J. 2005, *Shaping value chains for development: global value chains in agribusiness*, Deutsche Gesellschaft für technische Zusammenarbeit (GTZ), Eschborn.

Hussein, K. 2002, *Livelihoods approach compared: a multi-agency review of current practice*, report for Department for International Development (DFID), UK.

Idrus, M. 2009, *Methode penelitian ilmu sosial-pendekatan kualitatif dan kuantitatif*, Erlangga, Jakarta, Indonesia.

Illenberger, J. & Flötteröd, G. 2012, ‘Estimating network properties from snowball sampled data’, *Social Networks*, vol. 34, no. 4, pp. 701–711.

Isham, J. 2002, ‘The effect of social capital on fertiliser adoption: evidence from rural Tanzania’, *Journal of African Economies*, vol. 11, no. 1, pp. 39–60.

Islam, M.S. 2008, ‘From pond to plate: towards a twin-driven commodity chain in Bangladesh shrimp aquaculture’, *Food Policy*, vol. 33, pp. 209–223.

Iversen, V. 2003, ‘Intra-household inequality: a challenge for the capability approach?’, *Feminist Economics*, vol. 9, no. 2–3, pp. 93–115.

Jacinto, E.R. & Pomeroy, R.S. 2011, ‘Developing markets for small-scale fisheries: utilizing the value chain approach’, in Pomeroy, R.S. & Andrew, N. (eds.), *Small-scale fisheries management: frameworks and approaches for the developing world*, CAB International, Oxfordshire, pp. 160–177.

Japan International Cooperation Agency 2014, *About JICA*, JICA, viewed 23 May 2014, <http://www.jica.go.jp/english/about/index.html>.

Jaw, B.-S. & Liu, W. 2004, ‘Towards an integrative framework of strategic international human resource control: the case of Taiwanese subsidiaries in the People’s Republic of China’, *The International Journal of Human Resource Management*, vol. 15, no. 4–5, pp. 705–729.

Jones, A. 2003, *Management consultancy and banking in an era of globalization*, Palgrave Macmillan Basingstoke, UK.

Josupeit, H., Lem, A. & Lupin, H. 2000, ‘Aquaculture products: quality, safety, marketing and trade’, *International Conference on Aquaculture in the Third Millennium*, Network of Aquaculture Centres in Asia-Pacific (NACA) & FAO, pp. 173–176.

Kabst, R. 2004, 'Human resource management for international joint ventures: expatriation and selective control', *The International Journal of Human Resource Management*, vol. 15, no. 1, pp. 1–16.

Kane, J. & Spizman, L.M. 1994, 'Race, financial aid awards and college attendance', *American Journal of Economics and Sociology*, vol. 53, no. 1, pp. 85–96.

Kanji, N., MacGregor, J. & Tacoli, C. 2005, *Understanding market-based livelihoods in a globalising world: combining approaches and methods*, report for the Sustainable Markets Group, International Institute for Environment and Development (IIED).

Kaplinsky, R. & Morris, M. 2001, *A handbook for value chain research*, International Development Research Centre, Otawa.

Kaplinsky, R. 2006, '14. How can agricultural commodity producers appropriate a greater share of value chain incomes?' in D.H. Alexander Sarris (ed.), *Agricultural commodity markets and trade: new approaches to analysing market structure and instability*, Edward Elgar Publishing, Massachusetts, pp.356-379.

Kautsky, N., Rönnbäck, P., Tedengren, M. & Troell, M. 2000, 'Ecosystem perspectives on management of disease in shrimp pond farming', *Aquaculture*, vol. 191, no. 1–3, pp. 145–161.

Kecamatan Peurlak Timur 2010, *Kecamatan peurlak timur dalam angka*, Kecamatan Julok, Julok.

Kelling, I. 2012, 'Knowledge is power? A market orientation approach to the global value chain analysis of aquaculture: two cases linking Southeast Asia and the EU', Ph.D thesis, University of Stirling, UK.

Key, N., Sadoulet, E. & De Janvry, A. 2000, 'Transactions costs and agricultural household supply response', *American Journal of Agricultural Economics*, vol. 82, no. 2, pp. 245–259.

Khoi, P.D., Gan, C., Nartea, G.V. & Cohen, D.A. 2013, 'Formal and informal rural credit in the Mekong River Delta of Vietnam: interaction and accessibility', *Journal of Asian Economics*, vol. 26, pp.1–13.

Kleemann, L., Abdulai, A. & Buss, M. 2014, 'Certification and access to export markets: adoption and return on investment of organic-certified pineapple farming in Ghana', *World Development*, vol. 64, pp. 79–92.

Knack, S. 2002, 'Social capital, growth and poverty: a survey of cross-country evidence', Grootaert, C. & van Bastelaer, T. (eds.), *The role of social capital in development: an empirical assessment,* Cambridge University Press, Cambridge, pp. 42–82.

Kogut, B. & Zander, U. 1992, 'Knowledge of the firm, combinative capabilities, and the replication of technology', *Organization Science*, vol. 3, no. 3, pp. 383–397.

Kongkeo, H. & Davy, F.B. 2010, 'Backyard hatcheries and small scale shrimp and prawn farming in Thailand', in S. De Silva & F.B. Davy (eds.), *Success stories in Asian aquaculture*, Springer, Netherlands, pp. 67–83.

Kongkeo, H. 1997, ‘Comparison of intensive shrimp farming systems in Indonesia, Philippines, Taiwan and Thailand’, *Aquaculture Research*, vol. 28, no. 10, pp. 789–796.

Kresna Securities 2007, *Headline news-CP Prima acquires dipasena of Rp688.1bn*, viewed 18 December 2013, <http://www.kresnasecurities.com/main/main_research.htmx?RS465654212ebf8>.

Kuklys, W. 2005, *Amartya Sen’s capability approach: theoretical insights and empirical applications*, Springer, Berlin, Germany.

Kumlu, M., Eroldogan, O. & Aktas, M. 2000, ‘Effects of temperature and salinity on larval growth, survival and development of< i> *Penaeus semisulcatus*</i>’, *Aquaculture*, vol. 188, no. 1, pp. 167–173.

Kungvankij, P. 1985, ‘Overview of penaeid shrimp culture in Asia’, *First International Conference on the Culture of Penaeid Prawns/Shrimps*, 4–7 December 1984, Iloilo City, Philippines, Aquaculture Department, Southeast Asian Fisheries Development Center, pp. 11–21.

Kurien, J. 2004, *Responsible fish trade and food security*, report of the study on the impact of international trade in fishery products on food security, jointly conducted with FAO and the Royal Norwegian Ministry of Foreign Affairs, Rome.

Kusumastanto, T. 1994, ‘An investment strategy for the development of brackishwater shrimp aquaculture in Indonesia’, Ph.D thesis, Auburn University, Alabama, US.

Kusumastanto, T., Jolly, C.M. & Bailey, C. 1998, ‘A multiperiod programming evaluation of brackishwater shrimp aquaculture development in Indonesia 1989/1990–1998/1999’, *Aquaculture*, vol. 159, no. 3, pp. 317–331.

Kydd, J. & Dorward, A. 2001, ‘The Washington consensus on poor country agriculture: analysis, prescription and institutional gaps’, *Development Policy Review*, vol. 19, no. 4, pp. 467–478.

Lanzi, D. 2007, ‘Capabilities, human capital and education’, *The Journal of Socio-Economics*, vol. 36, no. 3, pp. 424–435.

Lee, D. 2008, ‘Aquaculture certification’, in T. Ward & B. Phillips (eds.), *Seafood ecolabelling*, Wiley-Blackwell, West Sussex, UK. pp. 106–133.

Lee, D.Y. & Dawes, P.L. 2005, ‘Guanxi, trust, and long-term orientation in Chinese business markets’, *Journal of International Marketing*, pp. 28–56.

Lee, J., Gereffi, G. & Beauvais, J. 2012, ‘Global value chains and agrifood standards: challenges and possibilities for smallholders in developing countries’, *Proceedings of the National Academy of Sciences*, vol. 109, no. 31, pp. 12326–12331.

Li, X., Gan, C. & Hu, B. 2011, ‘Accessibility to microcredit by Chinese rural households’, *Journal of Asian Economics,* vol. 22, no. 3, pp. 235–246.

Lichterman, P. 2002, ‘Seeing structure happen: theory-driven participant observation’, B. Klandermans & S. Staggenborg (eds.), *Methods of social movement research*, University of Minnesota Press, Minneapolis, pp. 118–145.

Lindenberg, M. 2002, ‘Measuring household livelihood security at the family and community level in the developing world’, *World Development*, vol. 30, no. 2, pp. 301–318.

Locay, L. 1990, ‘Economic development and the division of production between households and markets’, *Journal of Political Economy*, vol. 98, no. 5, part 1 pp. 965–982.

Luo, T. & Holden, R.J. 2014, ‘Investment in higher education by race and ethnicity’, *Monthly Labor Review*., vol. 137, p. 1.

Lyons Seafoods 2012*, Farmed shrimp sustainability policy Lyons Seafoods*, UK, viewed 20 November 2012, <http://lyons-seafoods.com/>.

Madello 2011, *Profil desa*, Desa Madello.

Mäkelä, K., Björkman, I. & Ehrnrooth, M. 2009, ‘MNC subsidiary staffing architecture: building human and social capital within the organisation’, *The International Journal of Human Resource Management*, vol. 20, no. 6, pp. 1273–1290.

Manyampa 2013, *Profil desa*, Desa Manyampa.

María Angeles, S.-F., Ángel Martín, R.-D. & Oreja-Rodríguez, J.R. 2012, ‘The configuration of power in vertical relationships in the food supply chain in the Canary Islands’*, British Food Journal*, vol. 114, no. 8, pp. 1128–1156.

Markelova, H., Meinzen-Dick, R., Hellin, J. & Dohrn, S. 2009, ‘Collective action for smallholder market access’, *Food Policy*, vol. 34, no. 1, pp. 1–7.

Martosubroto, P. & Wibisono, R. 1989, ‘Towards an environmentally oriented shrimp culture industry’, *Shrimp culture industry workshop,* 25–28 Sep 1989, FAO, Jepara, Indonesia, viewed 16 January 2013, <http://www.fao.org/docrep/field/003/ac058e/AC058E00.htm#TOC>.

Ma’sum 1989, ‘Tambak intensification from the farmer’s point of view’, *Shrimp culture industry workshop,* 25–28 Sep 1989, FAO, Jepara, Indonesia , viewed 16 January 2013, <http://www.fao.org/docrep/field/003/ac058e/AC058E00.htm#TOC>.

Mattiro Tasi 2013, *Potensi desa dan permasalahan,* Data desa Mattiro Tasi, Kec Mattiro Sompe, Kab. Pinrang.

May, B., Leadbitter, D., Sutton, M. & Weber, M. 2003, ‘The Marine Stewardship Council (MSC)’, in B. Phillips; T. Ward; & C. Chaffee (eds.), *Ecolabelling in fisheries: what is it all about?* Blackwell Science, Oxford, UK. pp. 14–33.

Milligan, S., Price, A., Sommeling, E. & Struyf, G. 2011, ‘Connecting smallholders with dynamic markets: a market information service in Zambia’, *Development in Practice*, vol. 21, no. 3, pp. 357–370.

Ministerial Decrees No. PER 01/MEN/ 2007 about management for quality and food safety, Jakarta.

Ministry of Marine Affairs and Fisheries 2006, *Master plan pengembangan budidaya air payau di Indonesia*, MMAF, Jakarta.

Ministry of Marine Affairs and Fisheries 2010, *Marine and fisheries statistics 2008*, MMAF, Jakarta.

Ministry of Marine Affairs and Fisheries 2011, *Marine and Fisheries in Figures 2011*, MMAF, Jakarta.

Ministry of Marine Affairs and Fisheries 2013, *Marine and Fisheries Statistics 2011*, MMAF, Jakarta.

Ministry of Trade 2014, *Indonesia export/import*, Ministry of Trade Indonesia, Jakarta, viewed 15 May 2014, <http://www.kemendag.go.id/en/economic-profile/indonesia-export-import>.

Muluk, C. & Bailey, C. 1996, 'Social and environmental impacts of coastal aquaculture in Indonesia', C. Bailey, S. Jentoft, P. R. Sinclair (eds.), *Aquaculture development: social dimensions of an emerging industry*, Westview Press, Colorado, pp. 193–209.

Munasinghe, M.N, Stephen, C., Abeynayake, P. & Abeygunawardena, I.S. 2010, 'Shrimp arming practices in the Puttallam district of Sri Lanka: implications for disease control, industry sustainability, and rural development', *Veterinary Medicine International*, vol. 2010, pp. 1–7.

Muranto, S., 1989, 'Shrimp culture training and extension'*, Shrimp culture industry workshop,* 25–28 Sep 1989, FAO, Jepara, Indonesia , viewed 16 January 2013, <http://www.fao.org/docrep/field/003/ac058e/AC058E00.htm#TOC>.

Murphy, C. & Gardoni, P. 2012, 'The capability approach in risk analysis', in S. Roeser, R. Hillerbrand, P. Sandin & M. Peterson (eds.), *Handbook of risk theory: epistemology, decision theory, ethics, and social implications of risk*, Springer, New York, pp. 979–997

Narrod, C., Roy, D., Okello, J., Avendaño, B., Rich, K. & Thorat, A. 2009, 'Public–private partnerships and collective action in high value fruit and vegetable supply chains', *Food Policy*, vol. 34, no. 1, pp. 8–15.

Nash, C. 2011, *The history of aquaculture*, John Wiley & Sons, Iowa, US.

Neely, C., Sutherland, K. & Johnson, J. 2004, 'Do sustainable livelihoods approaches have a positive impact on the rural poor? A look at twelve case studies', *Livelihoods Support Programme working paper 16*, FAO, Rome, Italy.

Newman, I. & McNeil, K.A. 1998, *Conducting survey research in the social sciences*, University Press of America, Boston, US.

Noryadi, B.I.G., Maidie, A., Suyatna, I., Sidik, A.S. & Suripno 2006, *A study on pond productivity in Mahakam delta,* East Kalimantan, Mulawarman University, Samarinda.

Nussbaum, M. 1993, 'Justice for women! Susan Moller Okin's justice, gender and the family', *Women: a cultural review*, vol. 4, no. 3, pp. 328–340.

Nussbaum, M. 1995, 'Human capabilities, female human beings', in M. Nussbaum & J. Glover (eds.), *Women, culture and development*, Clarendon Press, Oxford, pp. 61–104.

Okello, J.J. & Swinton, S.M. 2007, 'Compliance with international food safety standards in Kenya's green bean industry: comparison of a small- and a large-scale farm producing for export', *Applied Economic Perspectives and Policy*, vol. 29, no. 2, pp. 269–285.

Okello, J.J., Narrod, C.A. & Roy, D. 2011, 'Export standards, market institutions and smallholder farmer exclusion from fresh export vegetable high value chains: experiences from Ethiopia, Kenya and Zambia', *Journal of Agricultural Science*, vol. 3, no. 4, pp. 188–195.

Oosterveer, P. & Sonnenfeld, D.A. 2012, *Food, globalization and sustainability*, Earthscan, Oxon.

Paik, Y. & Ando, N. 2011, 'MNC's competitive strategies, experiences, and staffing policies for foreign affiliates', *The International Journal of Human Resource Management*, vol. 22, no. 15, pp. 3003–3019.

Palanikumar, P., Velmurugan, S. & Citarasu, T. 2011, 'Factors influencing in success of *Panaeus vannamei* culture', *Aquaculture Asia Magazine*, vol. 15, no. 1, January–March 2011, pp. 10–15.

Pathumnakul, S., Piewthongngam, K. & Khamjan, S. 2009, 'Integrating a shrimp-growth function, farming skills information, and a supply allocation algorithm to manage the shrimp supply chain', *Computers and Electronics in Agriculture*, vol. 66, no. 1, pp. 93–105.

Paul, B.G. & Vogl, C.R. 2013, 'Organic shrimp aquaculture for sustainable household livelihoods in Bangladesh', *Ocean & Coastal Management*, vol. 71, pp. 1–12.

Paulson, A.L. & Townsend, R. 2004, 'Entrepreneurship and financial constraints in Thailand', *Journal of Corporate Finance*, vol. 10, no. 2, pp. 229–262.

Phillips, M.J. 1995, 'Shrimp culture and the environment', *Seminar-workshop on aquaculture development in Southeast Asia*, 26–28 July 1994, Iloilo City, Philippines, Aquaculture Department, Southeast Asian Fisheries Development Center (SEAFDEC/AQD), pp. 37–62.

Pigg, K., Gasteyer, S.P., Martin, K.E., Keating, K. & Apaliyah, G.P. 2013, 'The community capitals framework: an empirical examination of internal relationships', *Community Development*, vol. 44, no. 4, pp. 492–502.

Pinstrup-Andersen, P. 2002, 'Food and agricultural policy for a globalizing world: preparing for the future', *American Journal of Agricultural Economics*, vol. 84, no. 5, pp. 1201–1214.

Poernomo, A. 1989, 'The technical constraints of shrimp culture in Indonesia and how to overcome them', *Shrimp culture industry workshop*, 25–28 Sep 1989, FAO, Jepara, , Indonesia , viewed 16 January 2013, <http://www.fao.org/docrep/field/003/ac058e/AC058E00.htm#TOC>.

Poernomo, A. 1990, ‘Site selection for coastal shrimp ponds’, *Technical and economic aspects of shrimp farming,* proceedings of the Aquatec’90 conference, Kuala Lumpur, Malaysia, pp. 3–19.

Poernomo, A. 2001, ‘Sejarah budidaya udang di Indonesia’, *Pendidikan*, vol. 2013, no. 16, <http://www.kkp.go.id/stp/index.php/arsip/c/795/Sejarah-Budidaya-Udang-di-Indonesia/>.

Poernomo, A. 2008, *Jaminan keamanan hasil perikanan: sebagai pintu masuk pasar international*, Food Review Indonesia, Bogor, Indonesia, viewed 15 June 2014, <http://www.foodreview.biz/preview.php?view2&id=55755#.UhqvKaxGNfY>.

Ponce-Palafox, J., Martinez-Palacios, C.A. & Ross, L.G. 1997, ‘The effects of salinity and temperature on the growth and survival rates of juvenile white shrimp,< i> *Penaeus vannamei*</i>, Boone, 1931’, *Aquaculture*, vol. 157, no. 1, pp. 107–115.

Ponte, S. & Ewert, J. 2009, ‘Which way is “up” in upgrading? Trajectories of change in the value chain for South African wine’, *World Development*, vol. 37, no. 10, pp. 1637–1650.

Ponte, S. & Gibbon, P. 2005, ‘Quality standards, conventions and the governance of global value chains’, *Economy and Society* vol. 34, no. 1, pp. 1–31.

Ponte, S. 2008, ‘Greener than thou: the political economy of fish ecolabelling and its local manifestations in South Africa’, *World Development*, vol. 36, no. 1, pp. 159–175.

Poole, N., Alvarez, F., Penagos, N. & Vázquez, R. 2013, ‘Education for all and for what? Life-skills and livelihoods in rural communities’, *Journal of Agribusiness in Developing and Emerging Economies*, vol. 3, no. 1, pp. 64–78.

Porter, G. 2002, ‘Living in a walking world: rural mobility and social equity issues in Sub-Saharan Africa’, *World Development*, vol. 30, no. 2, pp. 285–300.

Porter, M.E. 1985, *Comparative advantage*, Free Press, New York, US.

Portes, A. 1998, ‘Social capital: its origins and applications in modern sociology’, *Annual Review of Sociology*, vol. 24, pp. 1–24.

Potts, T. & Hawards, M. 2007, ‘International trade, eco-labelling, and sustainable fisheries-recent issues, concepts and practices’, *Environment, Development and Sustainability*, vol. 9, pp. 91–106.

Pradadimara, D. 2009, ‘A political economy of shrimp: global agro-commodity production and trade in eastern Asia’, *Asian alternatives for sustainable world: transborder engagements in knowledge formation*, The Nippon Foundation, Bangkok, pp. 33–41.

Primavera, J.H. 1998, ‘Tropical shrimp farming and its sustainability’, in S.S.D. Silva (ed.), *Tropical mariculture*, Academic Press, London, pp. 257–289.

Punch, K.F. 2013, *Introduction to social research: quantitative and qualitative approaches*, Sage, London.

Purchase manual of an importing company 2008, Netherlands.

Puttnam, R., Grootaert, C. & van Bastelaer, T. 2002, *The role of social capital in development: an empirical assessment,* Cambridge University Press, Cambridge.

Raikes, P., Jensen, F.M. & Ponte, S. 2000, 'Global commodity chain analysis and the French filie're approach: comparison and critique', *Economy and Society*, vol. 29, no. 3, pp. 390–417.

Rangkuti, F.Y. 2007, *Indonesia fishery products shrimp report 2007*, USDA Foreign Agricultural Service, GAIN Report, Jakarta, Indonesia.

Rao, E.J., Brümmer, B. & Qaim, M. 2012, 'Farmer participation in supermarket channels, production technology, and efficiency: The case of vegetables in Kenya', *American Journal of Agricultural Economics*, vol. 94, no. 4, pp. 891–912.

Reardon, T. & Farina, E. 2001, 'The rise of private food quality and safety standards: illustrations from Brazil', *The International Food and Agribusiness Management Review*, vol. 4, no. 4, pp. 413–421.

Reardon, T. & Hopkins, R. 2006, 'The supermarket revolution in developing countries: policies to address emerging tensions among supermarkets, suppliers and traditional retailers', *The European Journal of Development Research*, vol. 18, no. 4, pp. 522–545.

Reardon, T. & Vosti, S.A. 1995, 'Links between rural poverty and the environment in developing countries: asset categories and investment poverty', *World Development*, vol. 23, no. 9, pp. 1495–1506.

Reddy, V.R., Chiranjeevi, T., Rout, S.K. & Reddy, M.S. 2015, 'Chapter 7 – assessing livelihood impacts of watersheds at scale: an integrated approach', in V.R.R.J. Syme (ed.), *Integrated assessment of scale impacts of watershed intervention,* Elsevier, Boston, pp. 193–1251.

Rianse, U. & Abdi 2008, *Metodologi penellitian sosial dan ekonomi, teori dan aplikasi*, Alfabeta, Bandung, Indonesia.

Rieple, A. & Singh, R. 2010, 'A value chain analysis of the organic cotton industry: the case of UK retailers and Indian suppliers', *Ecological Economics*, vol. 69, no. 11, pp. 2292–2302.

Rivera-Ferre, M. 2009, 'Can export-oriented aquaculture in developing countries be sustainable and promote sustainable development? The shrimp case', *Journal of Agricultural and Environmental Ethics*, vol. 22, no. 4, pp. 301–321.

Robeyns, I. 2003, 'Sen's capability approach and gender inequality: selecting relevant capabilities', *Feminist Economics*, vol. 9, no. 2–3, pp. 61–92.

Robeyns, I. 2005, 'The capability approach: a theoretical survey', *Journal of Human Development*, vol. 6, no. 1, pp. 93–117.

Robeyns, I. 2006, 'The capability approach in practice', *Journal of Political Philosophy*, vol. 14, no. 3, pp. 351–376.

Robinson, K. 1997, 'History, houses and regional identities', *The Australian Journal of Anthropology*, vol. 8, no. 2, pp. 71–88.

Rodrik, D. 2001, *The global governance of trade: as if development really mattered*, report for United Nations Development Programme (UNDP), Harvard University, Cambridge.

Rodrik, D. 2002, *Feasible globalizations*, National Bureau of Economic Research, Cambridge.

Roheim, C.A. 2003, 'The seafood consumers, trade, and the environment', in L.J. Anderson (ed.), *The international seafood trade*, Woodhead Publishing Limited Cambridge, England, pp. 193–203.

Roy, D. & Thorat, A. 2008, 'Success in high value horticultural export markets for the small farmers: the case of Mahagrapes in India', *World Development*, vol. 36, no. 10, pp. 1874–1890.

Salganik, M.J. & Heckathorn, D.D. 2004, 'Sampling and estimation in hidden populations using respondent-driven sampling', *Sociological Methodology*, vol. 34, no. 1, pp. 193–240.

Sammut, J. & Hanafi, A. 2002, 'Case study 10: rehabilitation and management of shrimp ponds constructed in acid sulphate Soils', in M.J.P. Macintosh D.J., R.R. Lewis III & B. Clough (eds.), *Thematic review on coastal wetland habitats and shrimp aquaculture*, FAO, the World Bank Group, World Wildlife Fund (WWF) and the Network of Aquaculture Centres in Asia-Pacific (NACA), Bangkok, pp.55–79.

Sangso 2009, *Profil Desa*, Sangso Village.

Sarma, M. & Pais, J. 2011, 'Financial inclusion and development', *Journal of International Development*, vol. 23, no. 5, pp. 613–628.

Scoones, I. 1998, *Sustainable rural livelihoods: a framework for analysis*, Institute of Development Studies (IDS) working paper no 72, IDS, UK.

Schokkaert, E. & Van Ootegem, L. 1990, 'Sen's concept of the living standard applied to the Belgian unemployed, *Recherches Économiques de Louvain/Louvain Economic Review*, Institut de Recherches Economiques et Sociales (IRES), vol. 56, no. 3/4, pp. 429–450.

Schultz, T.W. 1961, 'Investment in human capital', *The American Economic Review*, vol. 51, no 1, pp. 1–17.

Scoones, I. 2009, 'Livelihoods perspectives and rural development', *The Journal of Peasant Studies*, vol. 36, no. 1, pp. 171–196.

Sen, A. 1981, *Poverty and famines: an essay on entitlement and famines*, Oxford, Clarendon Press.

Sen, A. 1987, *Commodities and capabilities*, Oxford University Press, UK.

Sen, A. 1999, *Development as freedom*, Oxford University Press, UK.

Shang, Y.C. 1992, 'Penaid markets and economics', in A.W. Fast & L.J. Lester (eds.), *Marine shrimp culture*, Elsevier, Amsterdam, pp. 589–604.

Shang, Y.C., Leung, P. & Ling, B.-H. 1998, 'Comparative economics of shrimp farming in Asia', *Aquaculture*, vol. 164, no. 1, pp. 183–200.

Shang, Y.C., Leung, P. & Ling, B.-H. 1998, 'Comparative economics of shrimp farming in Asia', *Aquaculture*, vol. 164, no. 1, pp. 183–200.

Shoji, M., Aoyagi, K., Kasahara, R., Sawada, Y. & Ueyama, M. 2012, 'Social capital formation and credit access: evidence from Sri Lanka', *World Development*, vol. 40, no. 12, pp. 2522–36.

Sianipar, P & Genisa, S. 1987, 'Sejarah dan tipe budidaya udang', *Oseana*, vo.12, no. 1, pp. 35–41.

Silverman, D. 2011, *Interpreting qualitative data,* 4th edn, Sage, London.

Simon, J., Anand, P., Gray, A., Rugkåsa, J., Yeeles, K. & Burns, T. 2013, 'Operationalising the capability approach for outcome measurement in mental health research', *Social Science & Medicine*, vol. 98, pp. 187–196.

Smith, L.E.D., Khoa, S.N. & Lorenzen, K. 2005, 'Livelihood functions of inland fisheries: policy implications in developing countries', *Water Policy*, vol. 7, no. 4, pp. 359–383.

Soeprapto, R. 1989, 'Keynote address of the director general of fisheries' *, Shrimp culture industry workshop*, 25–28 Sep 1989*,* FAO, Jepara, Indonesia, viewed 16 January 2013, <http://www.fao.org/docrep/field/003/ac058e/AC058E00.htm#TOC>.

Southeast Asian Fisheries Development Center 2014, *About SEAFDEC*, Bangkok, Thailand, viewed 16 May 2014, <http://www.seafdec.org/contact/>.

Spanopoulos-Hernández, M., Martínez-Palacios, C.A., Vanegas-Pérez, R.C., Rosas, C. & Ross, L.G. 2005, 'The combined effects of salinity and temperature on the oxygen consumption of juvenile shrimps *Litopenaeus stylirostris*</i>(Stimpson, 1874)', *Aquaculture*, vol. 244, no. 1, pp. 341–348.

Stanford, R.J., Wiryawan, B., Bengen, D.G., Febriamansyah, R. & Haluan, J. 2014, 'Improving livelihoods in fishing communities of West Sumatra: more than just boats and machines', *Marine Policy*, vol. 45, pp. 16–25.

Stanton, J.V. & Burkink, T.J. 2008, 'Improving small farmer participation in export marketing channels: perceptions of US fresh produce importers', *Supply Chain Management: An International Journal*, vol. 13, no. 3, pp. 199–210.

Statistics Indonesia 2010a, *Consumer price of selected goods for food groups in 45 cities in Indonesia*, Statistics Indonesia, Jakarta.

Statistics Indonesia 2010b, *Population of Indonesia; result of population census 2010,* Statistics Indonesia, Jakarta.

Statistics Indonesia 2011, *Statistik perusahaan perikanan, Fishery Statistics*, Statistics Indonesia, Jakarta.

Stofferahn, C.W. 2012, ‘Community capitals and disaster recovery: northwood ND recovers from an EF 4 tornado’, *Community Development*, vol. 43, no. 5, pp. 581–598.

Streeten, P. 1994, ‘Human development: means and ends’, *The American Economic Review*, vol. 84, no. 2, pp. 232–237.

Sunarya 1989, ‘Indonesian shrimp quality problems in relation to market needs and their solutions’, *Shrimp culture industry workshop,* 25–28 Sep 1989, FAO, Jepara, Indonesia , viewed 16 January 2013, <http://www.fao.org/docrep/field/003/ac058e/AC058E00.htm#TOC>.

Sunaryanto, A. & Pahlevi, R.S. 2008, ‘Strategy for the empowerment of aquaculture fish farmers in Indonesia’, in R.M. Briones & A.G. Garcia (eds.), *Poverty reduction through sustainable fisheries: emerging policy and governance issues in Southeast Asia*, ISEAS Publishing, Singapore, pp. 189–198.

Suyanto, R. & Mujiman, A. 1995, *Budidaya udang windu*, Penebar Swadaya, Jakarta, Indonesia.

Symaco, L.P. 2013, ‘Geographies of social exclusion: education access in the Philippines’, *Comparative Education*, vol. 49, no. 3, pp. 361–373.

Tallman, E.W. & Wang, P. 1994, ‘Human capital and endogenous growth evidence from Taiwan’, *Journal of Monetary Economics*, vol. 34, no. 1, pp. 101–124.

Tang, Q., Bennett, S.J., Xu, Y. & Li, Y. 2013, ‘Agricultural practices and sustainable livelihoods: rural transformation within the Loess Plateau, China’, *Applied Geography*, vol. 41, pp. 15–23.

Tanjung Ibus 2011, *Profile desa*, Langkat District, Langkat.

Tarunamulia 2008, ‘Application of fuzzy logic, GIS, and remote sensing to the assessment of environmental factors for extensive brackishwater aquaculture in Indonesia’, MSc thesis, The University of New South Wales, Sydney.

Tarunamulia 2014, ‘Improving the utility of GIS for land suitability assessment for sustainable extensive brackishwater aquaculture in Indonesia’, Ph.D thesis, The University of New South Wales, Sydney.

Tran, N., Bailey, C., Wilson, N. & Phillips, M. 2013, ‘Governance of global value chains in response to food safety and certification standards: the case of shrimp from Vietnam’, *World Development,* vol. 45, pp. 325–336.

Tran, T.T.T. 2013, ‘Food safety and the political economy of food governance: the case of shrimp farming in Nam Dinh Province, Vietnam’, *Journal of Peasant Studies*, vol. 40, no. 4, pp. 703–719.

Traversac, J.-B., Rousset, S. & Perrier-Cornet, P. 2011, ‘Farm resources, transaction costs and forward integration in agriculture: evidence from French wine producers’, *Food Policy*, vol. 36, no. 6, pp. 839–847.

Treece, G.D. 2000, ‘Shrimp maturation and spawning’, in *Spawning and Maturation of Aquaculture Species: proceedings of the twenty-eighth US–Japan Natural Resources Aquaculture Panel*, 10–12 November 1999, report 28, Kihei, Hawaii, US, pp. 121–133.

Trienekens, J. & Willems, S. 2007, ‘Innovation and governance in international food supply chains the cases of Ghanaian pineapples and South African grapes’, *International Food and Agribusiness Management Review*, vol. 10, no. 4, pp. 42–63.

Trienekens, J. & Zuurbier, P. 2008, ‘Quality and safety standards in the food industry, developments and challenges’, *International Journal of Production Economics*, vol. 113, no. 1, pp. 107–122.

Trifković, N. 2014, ‘Food standards and vertical coordination in aquaculture: the case of pangasius from Vietnam’, *IFRO Working Paper 2014 / 01*, University of Copenhagen, Department of Food and Resource Economics (IFRO).

Trobos 2012, ‘Garap pasar udang domestic’, *Trabos aqua*, 15 December 2012–14 January 2013, Jakarta, Indonesia.

Trommlerová, S.K., Klasen, S. & Leßmann, O. 2015, ‘Determinants of empowerment in a capability-based poverty approach: evidence from The Gambia’, *World Development*, vol. 66, pp. 1–15.

Tuckett, A.G. 2005, ‘Part II. Rigour in qualitative research: complexities and solutions’, *Nurse Researcher*, vol. 13, no. 1, pp. 29–42.

UOB Kay Hian 2008, *Central Proteinaprima Indonesia; the giant in the making*, financial report of Central Proteinaprima Indonesia, UOB Kay Hian Securities, Jakarta, Indonesia, viewed 17 June 2012, <http://www.cpp.co.id/uploaded/content/File/UOB%20Kay%20Hian%20Securities%20Report.pdf>.

United States Environmental Protection Agency 2012, *Food safety,* USEPA, viewed 8 May 2013, <http://www.epa.gov/agriculture/afsy.html>.

Van Tilburg, A., Magingxa, L., Kambewa, E.V., van Schalkwyk, H.D. & Gudeta, A.Z. 2012, ‘Smallholder market access and governance in supply chains’, in J.A.G. Herman D van Schalkwyk, Gavin C.G Fraser, Ajuruchukwu Obi, Aad van Tilburg (eds.), *Unlocking markets to smallholders*, vol. 1, Wageningen Academic, Netherlands, Springer, pp. 219–241.

Valentinov, V. 2007, ‘Why are cooperatives important in agriculture? An organizational economics perspective’, *Journal of Institutional Economics*, vol. 3, no. 1, pp. 55–69.

Van Bastelaer, T. 2002, ‘Does social capital facilitate the poor’s access to credit?’ in C. Grootaert & T. van Bastelaer (eds) *Understanding and measuring social capital: a multidisciplinary tool for practitioners*, The World Bank, Washington, pp. 237–264.

Vandergeest, P. & Unno, A. 2012, ‘A new extraterritoriality? Aquaculture certification, sovereignty, and empire’, *Political Geography*, vol. 31, no. 6, pp. 358–367.

Venaik, S., Midgley, D.F. & Devinney, T.M. 2005, 'Dual paths to performance: the impact of global pressures on MNC subsidiary conduct and performance', *Journal of International Business Studies*, vol. 36, no. 6, pp. 655–675.

Vermeulen, W. 2010, 'Sustainable supply chain governance systems: conditions for effective market based governance in global trade', *Progress in Industrial Ecology, An International Journal*, vol. 7, no. 2, pp. 138–162.

Wahyono, U. 1989, 'Shrimp production status in Indonesia', *Shrimp culture industry workshop,* 25–28 Sep 1989, FAO, Jepara, Indonesia , viewed 16 January 2013, <http://www.fao.org/docrep/field/003/ac058e/AC058E00.htm#TOC>.

Weidner, D. & Rosenberry, B. 1992, 'World shrimp farming', proceedings of the Special Session on Shrimp Farming, May 1992, Orlando, Florida, *World Aquaculture Society*, Baton Rouge, Louisiana, US, pp. 1–21.

Wilkinson, S. 2004, 'Focus group research ', in D. Silverman (ed.), *Qualitative research theory, method and practice,* Sage, London, pp. 177–199.

Williamson, O.E. 2005, 'Transaction cost economics', in C. Menard & M.M. Shirley (eds.), *Handbook of new institutional economics*, Springer, Netherlands, pp. 41–65.

Womack, P.J. & Jones, D.T. 1996, *Lean thinking: banish waste and create wealth in your corporation*, Simon and Schuster, New York.

Woolcock, M. & Narayan, D. 2000, 'Social capital: implications for development theory, research, and policy', *The World Bank Research Observer*, vol. 15, no. 2, pp. 225–49.

World Bank 2014, *World Data Bank*, viewed 7 May 2014, <http://databank.worldbank.org/data/views/reports/tableview.aspx>.

Yi, D., Reardon, T., Sari, I., Harahap, H., B, A.T. & Natawidjaja, R. 2009, *Value chain key informant synthesis report: smallholder participation in Indonesia farmed-shrim'*, A report for Institute Food Policy Research Institute, Universital Padjajaran, Bandung, Indonesia.

Yusuf, D. 1995, 'Aquaculture in Indonesia' in T.U. Bagarinao & E.E.C. Flores (eds.), *Towards sustainable aquaculture in Southeast Asia and Japan*, SEAFDEC Aquaculture Department, Iloilo, Philippines, pp 109–115.

Yusuf, M. & Trondsen, T. 2013, 'A market-oriented innovative quality framework for the investigation of competitive entry opportunities into new seafood markets for producers', *International Journal of Quality and Innovation*, vol. 2, no. 2, pp. 175–192.

Yusuf, M. & Trondsen, T. 2014, 'Competitive forces and innovation strategies: a study of the Indonesian crab industries', *Journal of Agribusiness in Developing and Emerging Economies*, vol. 4, no. 1, pp. 78–96.

Zainun, I., Budidarsono, S., Rinaldi, Y. & Adek, C., Mifftachbuddin 2007, 'Socio-economic aspects of brackish water aquaculture (*tambak*) production in Nanggroe Aceh Darussalam', *World Agroforestry Centre*-ICRAF, Bogor.

Zhang, P., Zhang, X., Li, J. & Huang, G. 2007, ‘The effects of temperature and salinity on the swimming ability of whiteleg shrimp,< i> *Litopenaeus vannamei*</i>‘, *Comparative Biochemistry and Physiology-Part A: Molecular & Integrative Physiology*, vol. 147, no. 1, pp. 64–69.