

**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**

Inna 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.

Production Note:

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

Table of contents

Acknowledgements	ii
Certificate of original authorship	iii
Table of contents	iv
List of figures	viii
List of plates	xi
List of appendices	xii
Glossary and abbreviations	xiii
Abstract	xxii
Chapter 1: Introduction	1
1.1 Introduction to the research problem	1
1.1.1 Global growth of seafood and aquaculture production	1
1.1.2 Global seafood consumption, global trade and social and economic benefits	5
1.1.2.1 <i>Seafood consumption</i>	5
1.1.2.2 <i>Seafood trade</i>	5
1.1.2.3 <i>Shrimp trade from developing to developed countries</i>	6
1.1.2.4 <i>Economic and social benefits</i>	7
1.1.3 Transnational-scale producers, global trade requirements and compliance capability	8
1.2 Objectives, argument and research question	11
1.2.1 Objectives of study	11
1.2.2 Argument and research questions	11
1.3 Conceptual framework	12
1.3.1. Development as the ability to participate in global lucrative markets	12
1.3.2. The concept of the capability approach (CA)	14
1.3.2.1 <i>Livelihood capitals in the sustainable livelihood approach (SLA)</i>	15
1.3.2.2 <i>Global value chain</i>	19
1.3.3 Stylised conceptual framework for the capability to participate in lucrative export markets	26
1.4 Scope of the study	27
1.5 Contributions of the research	30
1.6 Thesis plan	31
Chapter 2: Indonesian shrimp aquaculture	36
2.1 Introduction	36
2.2 History of Indonesian shrimp farming	38
2.2.1 Pre-modernised shrimp farming (prior to 1964)	38
2.2.2 Shrimp farming industrialisation: intensification and extensification	40
2.2.3 Downfall of tiger shrimp and adoption of vannamei	48
2.3 Current practices and production	49
2.3.1 Physical structure	50
2.3.2 Water exchange	52
2.3.3 Current farmed species	53
2.3.4 Stocking density	54
2.3.5 Feeding	55

2.3.6 Production cost and productivity	56
2.4 Economic roles	58
2.5 Conclusion.....	62
Chapter 3: Methodology.....	63
3.1 Introduction.....	63
3.2 Study design.....	63
3.3 Approach to respondent selection	64
3.3.1 Shrimp producers and selection approach.....	65
3.3.2 Respondents from inputs and marketing nodes, government and non-government actors.....	67
3.4 Study location	68
3.5 Fieldwork implementation and data gathering approaches in Indonesia	69
3.5.1 Phases	69
3.5.2 Selection of study villages.....	71
3.5.3 Data collection	77
3.5.3.1 <i>Data collection for household-scale shrimp producers</i>	78
3.5.3.2 <i>Data collection for other actors</i>	80
3.6 Fieldwork in the Netherlands	81
3.7 Data analysis approach	82
3.7.1 Measuring the endowment of livelihood capitals.....	82
3.7.1.1 <i>Unit of analysis</i>	82
3.7.1.2 <i>Endowment of livelihood capitals</i>	83
3.7.2 Global value chain analysis.....	86
3.7.3 Causal relationship analysis.....	86
3.8 Ethics	87
Chapter 4: Requirements for participating in lucrative export markets.....	88
4.1 Introduction.....	88
4.2 Food safety and traceability requirements of importing states.....	88
4.3 Indonesian regulations for food safety.....	90
4.4. Eco-label certification	94
4.5. Drivers for compliance with the requirements of lucrative export markets.....	100
4.6. Conclusion.....	104
Chapter 5: Livelihood capitals of household-scale shrimp producers and complexities of endowment	105
5.1 Introduction.....	105
5.2 Human capital and complexities in human capital endowment	105
5.2.1 Human capital and geographical position (physical capital).....	109
5.2.2 Human capital and financial capital.....	111
5.3 Financial capital and factors affecting access	112
5.3.1 Type of financial capitals.....	113
5.3.2 Choices between formal and informal credit	117
5.3.3 Enhancing access to formal credit	121
5.4 Social capital and external drivers.....	123
5.5 Physical capital.....	126
5.5.1 Production facilities	127
5.5.2 Non-production facilities.....	130
5.5.2.1 <i>Houses</i>	130
5.5.2.2 <i>Sanitation facilities</i>	132
5.5.2.3 <i>Mobility</i>	134

5.6 Natural capital	137
5.7 Complexity in livelihood capitals	143
5.8 Conclusion.....	144
Chapter 6: Livelihood capitals, shrimp producer scales and capability to participate in lucrative export markets	146
6.1 Introduction.....	146
6.2 Human capitals across different groups of shrimp producers.....	147
6.2.1 Education levels for farms' owners and their children	147
6.2.2 Structure and education level of hired workforce	148
6.2.3 Access to training programs.....	155
6.2.4 Human capital and the capability to participate in lucrative export markets	157
6.3 Financial capital across different groups of shrimp producers.....	160
6.3.1 Differences in access to formal credit	162
6.3.2 Financial capital and upgrading capabilities.....	164
6.4 Social capital across different groups of shrimp producers	166
6.4.1 Social capital and factors affecting its endowment.....	166
6.4.2 Social capital and capability to participate in lucrative markets.....	167
6.5 Physical assets across different groups of shrimp producers.....	171
6.5.1 Production facilities	171
6.5.1.1 <i>Aerator, water pump and harvesting facilities</i>	171
6.5.1.2 <i>Canal and water supply</i>	172
6.5.2 Non-production facilities.....	177
6.5.3 Physical capital and capability to participate in lucrative export markets	179
6.5.3.1 <i>Production facilities and capability to participate in lucrative export markets</i>	180
6.5.3.2 <i>Non-production facilities and capability to participate in lucrative export markets</i>	181
6.6 Access to natural capital by different groups of shrimp producers	183
6.6.1 Factors affecting access to natural capital	183
6.6.2 Natural capital and capability to participate in lucrative export markets	185
6.7 Business scale, livelihood capitals, capabilities and export markets	187
6.8 Conclusion.....	191
Chapter 7: The Indonesian shrimp global value chain and capability to participate in export markets	193
7.1 Introduction.....	193
7.2 Typology of actors in Indonesian shrimp global value chains (ISGVC)	194
7.2.1 Broodstock.....	195
7.2.2 Hatchery production system.....	198
7.2.3 Shrimp feed suppliers	201
7.2.4 Shrimp wholesalers.....	201
7.2.5 Coordinators	202
7.2.6 Processors and importers	203
7.3 Indonesian shrimp global value chain (ISGVC).....	204
7.3.1 Transnational-scale shrimp producers (TSSP_GVC).....	206
7.3.2 Industrial-scale shrimp producers (ISSP_GVC).....	206
7.3.3 Household-scale shrimp producers (HSSP_GVC).....	208
7.4 Livelihood capitals and channels within the ISGVC.....	211
7.4.1 Livelihood capitals and channels for transnational-scale shrimp producers (TSSP_GVC).....	211
7.4.2 Livelihood capitals and channels for industrial-scale shrimp producers	213

7.4.3 Livelihood capitals and channel for household-scale shrimp producers (HSSP_GVC).....	214
7.4.3.1 <i>Livelihood capitals and access to seed suppliers</i>	215
7.4.3.2 <i>Livelihood capitals and access to feed suppliers</i>	217
7.4.3.3 <i>Livelihood capitals and access to shrimp buyers</i>	217
7.5 Channels and capability to participate in lucrative export markets	221
7.5.1 Quality of production inputs.....	223
7.5.2 Shrimp quality, freshness and food safety	228
7.5.3 Traceability.....	229
7.5.4 Eco-label certification.....	232
7.5.5 Strategic production: branding or adding product value	234
7.5.6 Access to technical assistance through private extension services	236
7.6 Conclusion.....	238
Chapter 8: Conclusion and recommendations	242
8.1 Introduction.....	242
8.2 The concept of integrating livelihood capitals, the ISGVC and capability to participate in lucrative export markets	242
8.3 Household-scale shrimp producers' capability to participate in lucrative export markets ..	245
8.4 Implications and further research	250
Bibliography.....	271

List of figures

Figure 1.1 Global productions of fishery products.....	2
Figure 1.2 A stylised framework of capability for participation in lucrative export markets.....	27
Figure 1.3 Flow chart presenting thesis structure used to achieve the research objective	35
Figure 2.1 Timeline of the development of Indonesian brackishwater aquaculture.....	37
Figure 2.2 Layout of an extensive shrimp pond in West Java; Indonesia	51
Figure 2.3 Layout of a farm using an intensive shrimp culture system	52
Figure 2.4: Brackishwater farmed shrimp production.....	53
Figure 2.5 Indonesian shrimp export volume, 1976–2009.....	59
Figure 2.6 Indonesian shrimp export value 1976–2009.....	60
Figure 3.1 Phases of fieldwork in Indonesia	69
Figure 3.2 Map of Indonesia and areas involved in this study	72
Figure 3.3 Approach for data analysis	85
Figure 4.1 Quality and food safety control mechanism for Indonesian fisheries	93
Figure 4.2 Export market requirements; origin of force of compliance and flow.....	101
Figure 5.1 Average schooling for husbands and wives in all studied villages.....	107
Figure 5. 2 Average schooling received by each village	108
Figure 5.3. Financial capital sources of household-scale shrimp producers in the early initial development of shrimp farms for all villages.....	114
Figure. 5.4 Source of financial capital for household-scale shrimp producers at the initial development of shrimp farms at each village.....	115
Figure 5.5 Household-scale shrimp producers' experiences of borrowing money from shrimp buyer and bank, across all villages.....	116
Figure. 5.6 Regular credit sourced from shrimp buyers and banks for household-scale shrimp producers by village.....	117
Figure 5.7 Frequency of shrimp farmers who are members of farmer groups	124
Figure 5.8 Production facilities owned by household-scale shrimp producers as a percentage of all villages	128
Figure 5.9 Household-scale shrimp producers' shrimp farming facility ownership, as a percentage, by village.....	129
Figure 5.10 Percentage of vehicle ownership among household-scale shrimp producers and type of vehicle, all villages	135
Figure 5.11 Percentage of vehicle ownership among household-scale shrimp producers and type of vehicle by village.....	136
Figure 5.12 Size of household-scale shrimp farms, all villages.....	139
Figure 5.13 Size of household-scale shrimp farms, by village	139

Figure 6.1 Common structure of workforce in an industrial-scale shrimp farm	151
Figure 6.2: Percentage of farm workers who had received certain education levels, by farm scale	154
Figure 6.3 Stylised relationships between livelihood capitals, business scale and capability to participate in lucrative export markets	189
Figure 7.1 Conceptualised argument suggested in this chapter	193
Figure 7.2: Indonesian shrimp global value chain; presenting three types of channels for export markets	205
Figure 7.3 Three routes for a simplified channel for industrial-scale shrimp producers	207
Figure 7.4 Simplified channel for HSSP_GVC, presenting 16 possible route types to access export markets	209
Figure 7.5 Conceptualised relationships between livelihood capitals, ISGVC and capability to participate in lucrative export markets	239
Figure 8.1 Livelihood capitals, GVC and capability to participate in lucrative export markets	243

List of tables

Table 1.1 The biggest ten aquaculture producing countries	4
Table 2.1 Annual fish production prior to REPELITA I, 1953–1967	41
Table 2.2 Indonesian fisheries commodities exports, 1968–1973	41
Table 2.3 Marine captured and inland fisheries productions, 1973–1977	43
Table 2.4 Characteristics of Indonesian shrimp farming for extensive, semi-intensive and intensive systems	50
Table 2.5 Stocking density for different types of shrimp in the farming system in Indonesia	55
Table 2.6 Annual productivity rates for each type of shrimp farming system in Indonesia	56
Table 2.7 Production costs per cycle for extensive, semi-intensive and intensive shrimp farming systems	58
Table 2.8 Number of households involved in Indonesian brackishwater culture.....	61
Table 2.9 Number of people working in fisheries processing and marketing 2007–2011	62
Table 3.1 Number of respondents: value chain actors and actors at input node, including feed and seed suppliers.....	65
Table 3.2 Number of respondents: stakeholders (non-value chain actors).....	65
Table 3.3 Demographic information for studied villages in NAD and North Sumatra Provinces ...	75
Table 3.4 Variables of livelihood capitals.....	79
Table 4.1 Standards and criteria for shrimp farm certification under the Aquaculture Stewardship Council	97
Table 4.2 Standards and principles for shrimp farm certification under Best Aquaculture Practice.....	98
Table 4.3 Standards and criteria for aquaculture under the GlobalGAP	99
Table 5.1 Type of houses owned by household-scale shrimp producers (%).....	130
Table 5.2 Type of toilets owned by household-scale shrimp producers.....	133
Table 6.1 Company structure of PT Central Proteinaprima Tbk	152
Table 6.2 Shareholders of CP Prima	162
Table 6.3 Land ownership and scale of operation for industrial-scale shrimp producers.....	183
Table 7.1 Summary typology of Indonesian shrimp global value chain actors.....	195
Table 7.2 Typology of Indonesian shrimp broodstocks.....	197
Table 7.3 Typology of hatcheries.....	200
Table 7.4 Typology of small and big wholesalers	202

List of plates

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	132
Plate 5.2 Geographical proximity of household-scale shrimp ponds to farmers' homes in South Sulawesi	141
Plate 6.1 Water canal and wooden water gate for household-scale shrimp farms' water access. The pictures show sedimentation of the water canal basin. Water access is dependent upon the tides.....	173
Plate 6.2 Household-scale shrimp producers' ponds with earthen lining. There are electricity pylons, but no electricity installation.....	174
Plate 6.3 Water access facilities for industrial-scale shrimp producers. 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.	174
Plate 6.4 Industrial-scale shrimp ponds with concrete lining and facilitated with production facilities; paddlewheel (a) and aerators (b).....	175
Plate 6.5 Household-scale shrimp farms within estuary ecosystems	182
Plate 7.1 Different brands and processed shrimp products by CP Prima	235

List of appendices

Appendix 1: List of respondents	255
Appendix 2: Supplementary information on technical procedures for obtaining HACCP certificate in Indonesia.....	260
Appendix 3: Supplementary information on the shrimp's biological cycle and on nursery farmers	262
Appendix 4: Questionnaire for shrimp producers	264
Appendix 5: Questionnaire for marketing actors.....	269

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; Acehese 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 spaces 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 Rakyat*s; 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

Vannamei—*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. Furthermore, 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.