

The Social Relations of Aquaculture Development in South and Southeast Asia

A thesis submitted for the degree of
Doctor of Philosophy

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2010**

Declaration

I hereby declare that this thesis has been composed entirely by myself. The work presented in this thesis has not previously been submitted for any other degree or qualification. The nature and extent of my work carried out by, or in conjunction with others, has been specifically acknowledged by reference.

Ben Belton

Abstract

This thesis contains five chapters dealing with different aspects of *the social relations of aquaculture development in South and Southeast Asia*. This analysis is presented with reference to a series of qualitative empirical studies conducted in Vietnam, Bangladesh and Thailand, and challenges conventional narratives relating to the causes, effects and significance of different forms of aquaculture development.

Chapter 1 compares the impacts associated with projects intended to promote pro-poor forms of fish culture with the impacts of commercial forms of aquaculture originating in the private sector, and examines complementarities between the two forms of development. It finds that the latter form of aquaculture development, which it terms ‘immanent’, has generally resulted in far more significant economic impacts than the former, which it terms ‘interventionist’. Impacts occur particularly through the creation of employment in associated value chains, although some caution must be exercised in equating these effects with reductions in poverty. The conditions under which immanent aquaculture development is able to take place are elaborated.

Chapter 2 provides a critical evaluation of the private sector development (PSD) discourse adopted under the post-Washington consensus. This is achieved with reference to a detailed comparative study of the establishment of hatcheries for mono-sex tilapia in Thailand and *Pangasius* catfish in Vietnam. This exercise shows the transfer of technical knowledge from public institutions to actors in the private sector to have been largely informal in both cases. The subsequent establishment of hatchery enterprises has also been shaped by culturally specific patterns of economic behaviour that go unrecognised by champions of PSD. The chapter cautions against taking the existence of causal links between increased economic activity and reductions in poverty for granted.

Chapter 3 examines patterns of development associated with the extraordinary expansion of the *Pangasius* catfish industry in Vietnam. It concludes that the ability of catfish producers to access a range of key production factors including land and credit has been mediated by relationships between individuals and the state and its associated institutions, as has access to some

markets and services. As a result, the integration of producers into global markets has tended to reinforce existing class relations rather than radically transforming the rural class structure.

Chapter 4 evaluates the likely outcomes of governance by third party certification for *Pangasius* producers in Vietnam and Bangladesh. Widespread insistence on compliance with emerging standards by Northern retailers will have little impact on Bangladeshi producers at present given their domestic orientation, but will probably involve severe consequences for smaller Vietnamese producers who will struggle to comply due to their unfavourable organisation of production and lack of integration. Although *Pangasius* production in Bangladesh appears more ecologically sustainable than its Vietnamese counterpart, the manner in which standards are formulated means that these advantages are unlikely to be recognised or rewarded. It is also concluded that standards will have limited impact on the industry's environmental performance in Vietnam.

With reference to the literature on agricultural growth and two case studies of aquaculture in Mymensingh, Bangladesh, Chapter 5 argues that commercially oriented quasi-capitalist forms of aquaculture have far greater capacity to alleviate poverty and enhance food security at the national level than the quasi-peasant forms traditionally promoted by development projects. The majority of poverty impact associated with aquaculture is demonstrated to derive from employment in associated value chains and service provision, with likely horizontal benefits also created in the rural non-farm economy via consumption linkages. By contrast, forms of aquaculture traditionally considered 'small-scale' and 'pro-poor' are shown to be beyond the reach of the majority of the rural poor, and to yield limited positive social externalities, although their role in countering the seasonal financial pressures associated with irrigated rice cultivation is shown to be significant.

The conclusion of the thesis summarises key findings presented in preceding chapters, elaborates appropriate methodologies to guide future research on aquaculture development, and sets out a research and policy agenda which identifies work in a number of key areas as priorities for further attention.

Acknowledgements

I enjoy the acknowledgements in other people's theses, partly because of the opportunity to indulge in some light reading before knuckling down to do battle with the 300 odd impenetrable pages that invariably follow, and partly because my curiosity is piqued by the window that they sometimes throw open onto the life of the otherwise faceless author. Often the more personal acknowledgements seem to hint at a long dark night of the soul endured and overcome only with the strength afforded them by their nearest and dearest. It is therefore a measure of my own extreme good fortune that, bar the occasional short-lived trials which are an inevitable feature of three-and-a-half years of any life lived, my experiences during the making of that which follows have been almost unremittingly positive. It therefore remains for me to thank of all those who have contributed to the making of this thesis, both in an academic sense and for enriching the fabric of my life during the time spent in its creation.

Thanks are due first of all to David Little, for sending me to Asia in 2005, thereby setting in motion the chain of events culminating in the writing of this thesis, and for unfailing support, friendship and wisdom ever since. I could not have wished for a better supervisor. Much appreciation is also due to Jock Stirrat for taking on the role of unofficial second supervisor, for the ever-incisive comments on my draft chapters, and for always pushing me to look further. Many thanks also to Peter Edwards for the exchange of correspondence and documents throughout the writing process which stimulated much thought and set me straight on occasion!

Although time spent at Stirling during the production of this thesis was limited, its origins stretch backward into the preceding years there. Special thanks go to Melanie Cruickshank for always finding a way to help me out with the finances, to Anton Immink for help with the housing situation when I first arrived, and to Kathleen and Susan for numerous lifts to and from Glasgow. Also in the UK, I thank my father Pete for passing on his fishing genes and helping me to nurture them, thus giving rise to one half of the fascination from whence my profession has emerged. Thanks also to my mother, Teresa, and grandmother Betty who, together with dad, have shown a keen interest in my work, passed many happy mealtimes me with on my trips home, and always

their given unconditional love, affection and support. Many thanks also to my brothers Thomas and James for great company (both), and for providing me (respectively) with a place to stay in London on numerous runs in and out of the country, and for sharing pints of Stella tops, games of pool and record shopping in Norwich. Much appreciation also goes to Tom, Hen, and the rest of my extended second Norwich family for always making my visits home highly enjoyable and slightly hazy, and to Loz, Mouse, Chris, Kara and all the rest of my Nottingham friends, and Joe, Sam, Lou, and all rest of my London ones, for all the good times. Much appreciation also to Emm, my fellow Asian doctoral student, for pointing me in the right direction to start off with

In Thailand, many thanks go to Warren and Bu Turner for kindly having me as a guest at Nam Sai, this time and all the times before, and for the very fond memories I have of my life in Ban Sang. All my many friends whose great company has made Nam Sai such a special place for me also deserve a mention, particularly Nat, A, Term, Pae, Wasan, Ta Wan, Wan Chai, Tong, Bob, and Bon. Thanks are also due to Term for help and great company during the fieldwork, especially in the Northeast. Very special thanks also to Danai Turongruang for being a both a great *adjaan* and a great companion during our long days in the field

In Vietnam I thank Dr Phuong and Dr Sinh for their generous support and guidance which was essential for me to negotiate my way through the fieldwork, and for many enjoyable dinners and other interesting dining experiences! Special thanks must also go to Nguyen Van Hien and Do Minh Chung for great company and help beyond the call of duty in An Giang and Dong Thap, and to Tran Ha Anh for both of these qualities along with fantastic interpreting skills, without which the research informing half this thesis would surely not have achieved what it did. Fond appreciation also goes to all the other friends and neighbours who made my time in Can Tho as much fun as it was, especially Thi Bay, Thu Huong, Anh Thu, Minh, Dinh, Evan, John Chen, and Jade.

In Bangladesh warmest regards go to Ripon (Dr Mahfujul Haque), and Dr Benoy Barman; my friends, teachers and colleagues. Many thanks also to Bill Collis, and Alan Brooks before him, for giving me permission to sit in the WorldFish office, and to all the WorldFish staff who have made doing so such a pleasurable experience. Thanks go to Lucy and Alex for my induction into

Dhaka nightlife, to Denis and Cesar for being great housemates, and to Pi Ting and Pi Ple for their maternal instincts.

I would also like to express my gratitude to many the farmers, workers, traders and others who were gracious enough take the time to answer my numerous and doubtless often mystifying questions in Thailand, Vietnam and Bangladesh, and for the openness and hospitality often received whilst doing so. The financial contributions of a number of organisations and schemes, without which none of this work would have been possible, are also very gratefully acknowledged. They are: the Institute of Aquaculture (University of Stirling); the British Council Connect Research and Co-operation award; the Natural Resources International scholarship; the Carnegie Trust for the Universities of Scotland, and; the EU Asia Link Aqua Internship Program.

Last but by no means least, I would like to thank Mike Skladany, for giving me my first break in the world of fish, for introducing me to Dave, and for teaching me that social science and aquaculture can, and indeed *should*, make productive bedfellows. Speaking of which, all my love and thanks go to Prisana *ja. Kop kbun, sam rap kwarm rak, sam rap kwarm suk, sam rap tam hai cheewit Ben me see san*, and for building a life and a home together with me here in Dhaka

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Glossary of terms

Term	Language	English/Scientific
<i>Aman</i>	Bengali	Rain-fed summer rice
<i>Boro</i>	Bengali	Irrigated winter rice
<i>Bunkhun</i>	Thai	Obligation, loyalty, and reciprocity in close social relationships
<i>Ca basa</i>	Vietnamese	<i>Pangasius bocourti</i>
<i>Ca tra</i>	Vietnamese	<i>Pangasianodon hypophthalmus</i>
<i>Doi moi</i>	Vietnamese	The program of economic liberalisation initiated in 1986
<i>Guanxi</i>	Chinese	Reciprocally beneficial relationship between two people
<i>Khas</i>	Bengali	Government owned land
<i>Pangas</i>	Bengali	<i>Pangasianodon hypophthalmus</i>
<i>Quan he</i>	Vietnamese	Vietnamese version of guanxi (see above)
<i>Talad nat</i>	Thai	Temporary market selling freshly prepared food and daily necessities

List of Acronyms

Acronym	Term
ACC	Aquaculture Certification Council
ADB	Asian Development Bank
AIT	Asian Institute of Technology
AOP	Aquaculture Outreach Program
APPU	AGIFISH Pure Pangasius Union
ASC	Aquaculture Stewardship Council
BAP	Best Aquaculture Practice
BFRI	Bangladesh Fisheries Research Institute
BMP	Best Management Practice
BSE	Bovine Spongiform Encephalopathy
CIDA	Canadian International Development Assistance
CIRAD	French Agricultural Research Centre for International Development
CP	Charoen Pokphand
CTU	Can Tho University
DANIDA	Danish International Development Assistance
DFID	UK Department for International Development
DOF	Department of Fisheries
DSAP	Development of Sustainable Aquaculture Project
EMS	Environmental Management Systems
EU	European Union
FAO	Food and Agriculture Organisation of the United Nations
FCR	Food Conversion Ratio
FGD	Focus Group Discussion
FPA	Floodplain Aquaculture
GDP	Gross Domestic Product
IAA	Integrated Agriculture-Aquaculture
LCA	Life Cycle Assessment
MAEP	Mymensingh Aquaculture Extension Project
MSC	Marine Stewardship Council
NACA	Network of Aquaculture Centers in Asia

Acronym	Term
NGO	Non-Governmental Organisation
PAD	Pangasius Aquaculture Dialogue
PRA	Participatory Rural Appraisal
PSD	Private Sector Development
SIDA	Swedish International Development Agency
SOE	State Owned Enterprise
SQF	Safe Quality Food
SSA	Small-Scale Aquaculture
THB	Thai Baht
TPC	Third Party Certification
UNDP	United Nations Development Program
USAID	United States Agency for International Development
VASEP	Vietnam Association of Seafood Exporters and Producers
VND	Vietnamese Dong
WTO	World Trade Organisation

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Chapter 1 - Introduction

This thesis has its origins in a fascination with fish which has been with me ever since I was a young child, and in another later fascination with the patterns of development that I observed unfolding in Asia. It was originally conceived of as a traditional monograph which would investigate entrepreneurship among fish seed producers and traders in Northwest Bangladesh and Northern Vietnam, but via a series of events and pragmatic decisions ended up as a collection of five papers (presented here as chapters) detailing what I have chosen to call *The Social Relations of Aquaculture Development in South and Southeast Asia*.

My impetus for developing these lines of enquiry over several years prior to and during my PhD was an apparent disconnect observed between oft repeated assertions about why aquaculture development¹ was desirable and how it could best be achieved or governed, and the incredible dynamism and rapidity with which forms of aquaculture largely neglected by this narrative were able to come into existence, apparently unbidden by the intentional efforts of external institutions, and the magnitude and range of the effects that these appeared to create. The intent of the research presented here is thus to understand more fully the nature of various instances of aquaculture development, to subject a number of conventional narratives pertaining to this process and its consequences to more thorough scrutiny than they have hitherto usually been exposed, and to develop more convincing alternatives. Although the focus of the thesis is on a specific activity (aquaculture) and location (South and Southeast Asia), the aim throughout is to avoid disciplinary ghettoisation as far as possible and in doing so produce a body of work which will both contribute to ongoing debates on policy and practice within the field of aquaculture itself and prove relevant to those engaged in studying the process of development in other sectors and places.

¹ I use the term aquaculture development in this thesis to denote the establishment and expansion of the interlinked technical, economic and social practices which ultimately facilitate the production of fish for human consumption.

Objectives

This thesis has three overriding objectives. The first of these is to determine which factors have catalysed the development of aquaculture in South and Southeast Asia. In attempting to tease out answers to this question I sought to compare the relative effectiveness of donor driven attempts to stimulate aquaculture with that of initiatives originating from within the private sector (most explicitly in Chapter. 2) on the basis of the disparity in scale of impacts that I observed originating from the two forms of development. In the course of doing so I also attempted to evaluate the extent to which the doctrine of private sector development almost universally espoused by multi and bi-lateral development institutions (Schulpen and Gibbon, 2002) offered a suitable framework for interpreting the form of development assumed by aquaculture in South and Southeast Asia. As part of this critical engagement I also sought (particularly in Chapter 3, but to a lesser extent in Chapters 2 and 4) to explore whether complementarities between the role of the state and that of private sector actors were evident in historical analyses of the development of aquaculture, to describe the forms that these took, and to understand how development processes are mediated by local political structures and cultures (Chapters 3 and 4)

My second objective was to explore the extent and form of the impacts of aquaculture development on human wellbeing. This involved investigation of the dynamics and consequences of the agrarian change that has accompanied inland aquaculture development in Asia (especially in Chapter 4); enquiry into the likely role of emerging forms of private governance in mediating the future form of aquaculture development in South and Southeast Asia (Chapter 5), and evaluation of the role of different forms of aquaculture in preventing or reducing poverty (Chapter 6).

The thesis' final objective is to develop a more coherent empirically grounded theoretical framework for the analysis of aquaculture development. Seeking to determine how aquaculture development could be conceived of and evaluated more effectively required engagement with a series of questions, the most fundamental of which was, 'to what extent do conventional aquaculture development discourses coincide with more fine grained empirically situated accounts of the phenomenon?' (Chapters 2, 3, 4, 5 and 6). Arriving at an answer prompted exploration of two further related questions which form the basis of Chapter 6: 'of what utility is the concept of

scale in accounting for the likely developmental impacts of different forms of aquaculture?', and 'can experience reported in literature on agriculture and other natural resource based sectors be deployed to enhance our understanding of aquaculture?'

Key concepts

Two key concepts which feature throughout the thesis require further elucidation at this juncture: these are 'social relations' and 'discourse'. The term 'social relations' is deployed in literature originating from a wide range of disciplines to connote a variety of meanings, ranging from the grand 'capitalist social relations' that govern the workings of the Marxian political economy to the 'social relations of cooperation and trust' (Jarosz, 2000, p279) that lubricate interactions between human social actors during, for instance, the course of economic transactions. In its most basic usage, the term may simply stand for 'interpersonal relationships' between people.

This thesis is concerned with gaining a clearer understanding of the processes by which aquaculture develops as a socio-technical activity, and nature and implications of the social and economic transformations that occur as result. This challenge is, I contend, best addressed by adopting a 'social relations approach', based on analysis of a variety of institutions, actors and discourses operating within and around the field of aquaculture. This is performed at a range of scales with reference to the social relations (relations of, for example, power (Chapter 4 and 5), kinship (Ch. 3), production (Ch. 6), and of a more immediately 'interpersonal' variety – (Ch. 3 and 4)) which structure, facilitate, influence or inhibit agency to establish, participate in, or gain from the activity. The term 'social relations' as deployed in this thesis therefore references the totality of the relationships which pattern the form of aquaculture development; from micro-level informal ties that ensure a farmer or would be entrepreneur is able to gain access to a loan, producer association, or piece of proprietary knowledge (Ch. 3 and 4); to the logics of global capital and private governance and their mediation by local political economies (Ch. 4 and 5); and to the constellations of institutional interests which ensure that certain representations of reality are reproduced or contested (Ch. 2 and 6).

This last observation leads to consideration of discourse, a concept which features in Chapters 2, 3 and 5, and which provides an analytical framework in the concluding chapter. In some instances I use the term discourse ‘as a synonym for what is called “register” (a style of language used in defined situations or the property of a social group, e.g. “bureaucratic register” / “bureaucratic discourse”)’ (Grillo, 1997, p11). Thus, to take an example from the conclusion, the discourse of ‘aquaculture for development’ is the property of a discreet set of individuals (researchers, practitioners and policy makers concerned with the promotion of aquaculture), and characterized by its own peculiar register or vocabulary, closely related to but distinct from other development discourses. However, the discourse ‘aquaculture for development’ can also be understood as a narrative – the essence of which may be reduced to the statement ‘aquaculture can alleviate poverty and enhance food security and must be promoted in order maximise its capacity to achieve these ends’ (see p163). It is in this second sense that I use the term ‘discourse’ most frequently; to imply a story or set of claims with an internally coherent logic which can be appealed to in order to mobilise support or resources.

My use of the term thus invokes an awareness of ‘discourse’ in the Foucauldian sense of systems of rules which produce, define the boundaries of, and legitimate certain constructions of reality, and thus naturalise and reproduce certain sets of power relations. However, the manner in which I approach discourse in this thesis is more in line with the ‘textually oriented discourse analysis’ advocated by Fairclough (1993), which recognises the constitutive functions and intertextual aspects of discursive formations theorized by Foucault, but which concentrates its analysis on spoken and written texts. In this thesis this analysis is performed in an attempt to pry apart and make visible the central logics and rhetorical devices of various discourses constitutive of aquaculture as a means of rendering it possible to hold these up to comparison against empirical data gathered in the field.

Methodology

In keeping with practicalities imposed by the fragmented nature of research funding which mandated a focus on multiple field sites within constrained budgetary conditions, it was necessary

to pursue a highly adaptive and pragmatic approach to research design and implementation. These circumstances, as well as the nature of the subject matter examined, and my experience and preferences as a researcher, all favoured the use of mixed qualitative methods deployed in an exploratory, inductive, purposive and iterative manner.

A variety of methodological approaches and tools were adopted to this end. The most basic of these was the review of secondary sources of information which functioned as a foundation for contextualising, interpreting and augmenting primary data collected in the field. In several cases (Chapters 2, 3 and 6) secondary sources were subject to ‘textually oriented discourse analysis’ as outlined above in an attempt to unpack implicit assumptions and render them susceptible to critical interrogation.

Semi-structured interviews accounted for the backbone of the field-based research effort, although the form that these assumed varied between the three field locations to some degree as a result of the specific circumstances and exigencies encountered in each. In Bangladesh lengthy interviews aimed at gaining an overview of the historical development of aquaculture in Mymensingh district were conducted with several key informants (government fisheries officers, university staff and development workers). These conversations were recorded and transcribed verbatim. However the majority of interviews were with pond operators and marketing intermediaries engaged-with on an opportunistic basis at purposively selected locations (e.g. several villages were chosen in an attempt to provide a comparison between somewhat remote rural areas and those with better connectivity to urban centres) (see Table 1). These interviews, which varied as circumstances dictated in length and the degree to which they were structured, were interpreted by my Bangladeshi research partner, recorded in note form and subsequently typed up to allow for analysis.

The approach adopted in Thailand was similar although, given the scope of enquiry, was conducted over a much wider geographical range, covering the centre and northeast of the country, with selection of interviewees based more on snowballing (i.e. the recommendations of other key informants) than in Bangladesh because the research revolved primarily around a relatively small number of monosex tilapia hatcheries and the key individuals involved in their establishment. All

key informant interviews in which interviewees gave consent were recorded digitally and subsequently transcribed, as were subsequent lengthy discussions with my extremely experienced field guide ('field assistant' is too trivial a term and does not do the dynamic of the relationship justice), in which we dissected the meaning of the patterns emerging from our enquiries. Other shorter conversations made in the field were generally recorded in note form (Table 1).

The more politically constrained research environment in Vietnam, documented in Chapter 4, meant that opportunistic approaches to interviewee selection were rather restricted since this was often (though by no means exclusively) predetermined by the officials assigned to accompany us in each location where research took place. In addition, the atmosphere of suspicion regarding the purpose of our research that pervaded many encounters, particularly with officialdom, meant that the idea of recording interviews was abandoned, and that a more structured questionnaire format than that employed in either Thailand or Bangladesh was adopted. As a result, it was necessary to attempt to 'read between the lines' to a greater degree than in the other locations, with the result that observations and informal conversations among participants in the research and our accompanying entourage of officials, which took place between interviews, acquired a special significance, the implications of which would be subsequently explored in discussions with the interpreter and other members of the field team in an attempt to triangulate and enhance breadth of understanding as far as possible.

In Bangladesh, participatory methods were also employed. These consisted principally of ranking exercises which involved a group of inhabitants of a community collectively identifying all of the households within it, assigning each one a class position based criteria which they defined themselves, and reporting on details including the occupation of the household head and pond ownership status for all the households identified (See Chapter 6). These methods were used in an attempt to contextualise more clearly the results of earlier semi-structured interviews with respect to the position occupied by pond owners in the rural class structure and were very successful in achieving this goal, not least due to the skill of my research partner in conducting participatory rural appraisal (PRA). This approach also supported the subsequent gathering of data by semi-structured interview by allowing for more purposive selection of respondents to ensure that the pond owners

interviewed were reasonably representative in terms of the class spread identified in the PRA exercises (Table 1). Animated group discussion among participants during the exercises also provided an important opportunity to elicit collectively validated responses to a variety of queries regarding the circumstances of the villages in question.

The research agenda was constantly refocused and redefined as emerging patterns were identified and as I attempted to explore these further. As Luttrell (2001, p58) states of her own work in Vietnam, 'the inductive approach led naturally to the use of a case study methodology to allow a high level of detail and thoroughness in observation, necessary for institutional analysis at the local level'. Case studies, which form the basis of each of the chapters presented here, were developed through the reading and rereading interview transcripts and field notes to identify themes which often only became apparent upon minute inspection, and by searching the literature to identify comparable themes and compatible frameworks of explanation which could be adapted to fit the material.

Table 1 presents a summary of the locations of primary research and the main research methods deployed in each chapter of the thesis, and, for each, gives a summary of the numbers and types of informants engaged with during the course of the research, of and the PRA exercises carried out. These total 182 interviews (the majority of which were semi-structured and lasted for at least 1 hour) and seven FGDs with associated PRA exercises. I directed and was present during all primary field-based data gathering activities referred to in the table, except two participatory appraisals conducted in Mymensingh, Bangladesh, which inform Chapter 5. These were conducted as part of a separate independent research effort by my research partner and co-author of Chapter 5, Dr. Mahfujul Haque, and later combined with analysis from Vietnam because of the complementary nature of the data collected in order to broaden the chapter's scope.

Chapter	Research location	Major data sources	Data gathering methods and actors engaged	Time frame	Species focus
2	Desk-based	Literature review	n/a	2009	Carps, tilapia, pangasius
3	Central & NE Thailand	Semi-structured & unstructured interviews	Interviews with 12 hatchery operators; 2 nursery operators; 14 growout farmers, 2 DOF officials; 5 academics; 2 seed traders; 1 feed distributor	April – June 2008	Tilapia
	Mekong Delta, Vietnam	Questionnaire survey & semi-structured interviews	Interviews with 29 hatchery operators; 25 nursery operators; 33 growout farmers; 11 government officials; 3 academics; 1 seed trader; 1 processing company employee. Two FGDs with hatchery, nursery and farm operators	August- November 2008	Pangasius
4	Mekong Delta, Vietnam	Questionnaire survey & semi-structured interviews	As above	August- November 2008	Pangasius
5	Mekong Delta, Vietnam	Questionnaire survey & semi-structured interviews	As above	August- November 2008	Pangasius
	Mymensingh, Bangladesh	PRA activities (conducted by co-author)	Two FGDs conducted in two villages, including village mapping, timelines, wealth ranking, activity matrix and ranking, and a seasonal activity calendar	June 2009	Pangasius
6	Mymensingh, Bangladesh	Semi-structured & unstructured interviews; PRA activities	Interviews with 31 growout farmers; 3 DOF officials; 1 fry trader, 1 seed agent, 2 fish wholesalers; 1 retailer; 1 academic; 1 NGO employee. Three FGDs including wealth ranking and inventories of assets and occupations conducted in two villages.	February 2010, May 2010	Carps, pangasius

Table 1.1 Summary of research methods

Ethnography

I consider the totality of this research endeavour to constitute a partial ethnography of aquaculture development. This statement requires some further qualification and elaboration. Herbert (2000, p551) defines ethnography thus:

‘Ethnography is generally recognized to rest upon participant observation, a methodology whereby the researcher spends considerable time observing and interacting with a social group. These observations and interactions enable the ethnographer to understand how the group develops a skein of relations and cultural constructions that tie it together’.

Whilst this definition might appear at odds with my characterisation as ethnographic of the research on which this thesis is based, Herbert (2000, p552) goes on to state that, ‘ethnographers typically enter the field more interested in generally exploring particular social phenomena than testing specific hypotheses about them. Furthermore, ‘ethnographers evince comfort with data that are unstructured (i.e., not coded) according to pre-established analytic categories. Theory is often built from the ground up by the ethnographer who allows social order to reveal itself through extended fieldwork’. Forsey (2010) also challenges the conflation of participant observation with ethnography, making the case for ‘ethnography as participant listening’; arguing that we should ‘allow engaged listening to sit alongside participant observation as an equally valid way of gaining ethnographic knowledge’ (p567).

I contend that on this basis the research that informs this thesis can be, at least in parts, be considered ethnographic. This is especially so for the research conducted in Thailand, much of which was focussed on my initial interest in entrepreneurship. This included a series of lengthy, wide ranging, largely unstructured informal discussions with the owner of a monosex tilapia hatchery (at which I lived during the course of the four months spent conducting doctoral research in Thailand and where I had previously lodged for nine months, of which three were spent working in the hatchery itself) aimed at understanding the meanings that the owner ascribed to the business

and its operation. Ch. 3, which deals with the Thai monosex tilapia hatchery sector, is where the voices of those with whom I engaged during the course of the research come through most strongly, though in Ch. 4 I also present some observations in the words of those who experienced them.

During the course of my research I also spent eight months based at Can Tho University in Vietnam, and eighteen months living in Bangladesh. During the latter period, I contributed part of my time to the monitoring and adaptive management of a technical aquaculture development intervention. Although not alluded to explicitly in the body of this thesis, my relationships, conversations and daily interactions with a wide range of actors (many of whom were not directly associated with the research) contributed directly to an understanding of development, culture and the relationship between them in each of the three countries which infuses all of the work presented.

Thus, while my immersion in ‘the field’ falls far short of that advocated Goffman (1989), and my description cannot be considered ‘thick’ in a truly Geertzian sense (Geertz, 1973), my listening was considerably more ‘engaged’ and the resultant accounts produced a good deal ‘thicker’ than the vast majority of those in which aquaculture and its development feature (see Ch. 7). My claim to partial ethnography is also supported by the ‘inductive spirit’ (Forsey, 2010) in which both the collection of data and its analysis were conducted. This involved consciously attempting to preserve as fully as possible the meaning intended by those who related it, and trying to collect from informants as much information as possible relating to any issue at all that appeared potentially relevant to the task at hand, no matter how peripherally.

Structure

The structure of the thesis is as follows: Chapter 2, *Immanent and Interventionist Inland Asian Aquaculture Development and its Outcomes*, has the broadest focus of all the papers presented here, both geographically and in terms of subject matter, and introduces some of the main themes which run through subsequent chapters; namely an interest in the mechanisms by which development is able to take place and the effects of this process on human wellbeing. This is achieved via

comparative analysis of two pathways by which aquaculture has become established in inland Asia. Borrowing a turn of phrase from Cowen and Shenton (1998), from whom Morse (2008) in turn borrows, I label these pathways immanent and interventionist; the first an ongoing, undirected process, or ‘what people are doing anyway’ (Morse, 2008, p341); the second the result of donor funded attempts to kick start or enhance aquaculture production on the behalf of a set of intended beneficiaries, and most frequently taking the form of project-based assistance.

This investigation, based on an extensive critical review of literature, concludes that immanent forms of aquaculture development have in general generated far greater levels of aggregate economic impact than interventionist ones. This owes much to the fact that the former results from concrete responses to ‘demand felt at the farm gate’ (Wiggins, 2009, p11), while the latter typically represents the outcome of responses to problems or opportunities conceived in accordance with prevailing development discourses (Bush, 2008) which often prove poorly compatible with the myriad complexities of the social and agro-ecological systems into which they are subsequently inserted. Complementarities do exist between these two modes of development in some instances however, and where technologies appropriate to prevailing immanent conditions are introduced (most notably those involving artificial reproduction), their uptake and ultimate impact can be spectacular. The chapter also highlights a severe lack of quality information relating to either form of aquaculture development, and flags a need for fine grained ethnographic treatments of the subject which can account for its effects in a more satisfactory manner than has usually been achieved to date.

The final theme explicitly addressed in Chapter 2 is the recent emergence of a private sector development (PSD) narrative within the wider discourse of aquaculture development, first and most explicitly outlined in the World Bank report ‘*Changing the Face of the Waters*’ (2006). PSD discourse has a considerably longer history outside the field of aquaculture, having assumed hegemonic status amongst donor institutions from the late 1990s onwards. Chapter 3, titled *The Social Relations of Private Sector Development: Lessons from the Southeast Asian Fish Hatchery Sector*, picks up this theme and explores it in greater depth, presenting a critical evaluation of PSD which charts the dynamics of enterprise formation in the hatchery sectors for monosex tilapia and *Pangasius* catfish

in Thailand and Vietnam respectively. This detailed historical ‘process ethnography’ (Leeuwis, 2004) is used to demonstrate; 1) that the patterns of hatchery sector development observed have resulted from specific culturally mediated patterns of interaction between individuals in public sector institutions and private entrepreneurial actors, and; 2) measuring the resultant aggregate economic impact of downstream activities is an insufficient condition for demonstrating the reductions in poverty which PSD predicts should arise from the formation of new enterprises. The chapter concludes that PSD discourse gains its legitimacy by advancing a highly decontextualised vision of reality which reifies and universalises normative assumptions about economic behaviour with specific historical and geographical roots, and lacks power as a nuanced explanatory framework for development and its outcomes.

Chapter 4, *The Social Relations of Catfish Production in Vietnam*, turns its attention to the industry which establishment of the Vietnamese hatchery sector, as recounted in Chapter 3, played a critical role in facilitating. The chapter describes the macro and micro political economy of agrarian change associated with the remarkable emergence of Vietnamese *Pangasius* as a ‘boom crop’ (Hall, 2003) of global significance during the first decade of the 21st Century. Particular attention is paid to the nature of the relationships between individuals and the state which are interwoven with other relations such as kinship to infuse Vietnamese economic life with much of its distinctive character. These relationships and the social capital that inheres in them are shown to mediate access to a range of resources which are important determinants of the success or failure of catfish growout operations. The chapter also highlights the importance of immanent conditions of development and changes in the wider political economy in facilitating the emergence of dynamic aquaculture development, and draws attention to inconsistencies inherent in the labelling of *Pangasius* farming as a small-scale given the extreme per unit area levels of investment and productivity associated with the activity.

Third party certification appears increasingly certain to govern the terms of production of an ever greater segment of internationally traded aquatic commodities (Vandergeest, 2007). The fifth chapter, *Certifying Catfish in Vietnam and Bangladesh: Who will make the grade and will it matter?*, picks up the threads of a final argument made in Chapter 4 by examining the potential of private

governance to shape the future development of *Pangasius* aquaculture in Vietnam and Bangladesh. The chapter evaluates the environmental performance and organisation of production of *Pangasius* culture in both countries with reference to the probable ability of producers to comply with three separate third party certification (TPC) schemes currently under development for *Pangasius* in Vietnam. It is concluded that widespread implementation of at least some TPC schemes is probable and will act to sharpen existing inequalities in market access among different sets of producers in Vietnam. This outcome owes much to the favourable organisation of production of large farm operations and the close professional and/or kinship ties to seafood processing companies possessed by certain sets of producers. These conditions make it feasible for them to respond to the demands placed upon them by TPC, while other (typically smaller) operators excluded from these networks face will greater difficulty in adapting, thereby hastening already ongoing processes of industrial consolidation.

For Bangladesh, where *Pangasius* production is almost exclusively for domestic consumption, standards and certification are presently of little consequence and, conversely, might offer a means for a small group of well-connected capitalist producers to leverage entry into export markets in future should sufficient incentives emerge. The study also finds that despite quite favourable environmental characteristics as compared to the Vietnamese production system, *Pangasius* produced in Bangladesh is unlikely to make the certification grade for the foreseeable future as benchmarking of standards against the Vietnamese production system and certain assumptions about the nature of negative environmental externalities encoded in certification standards work against its inclusion.

Chapter 6 continues with a focus on Bangladeshi *Pangasius* production, which Chapter 2 identifies as having developed in response to immanent conditions. The activity's impacts on human wellbeing are documented and contrasted with those associated with homestead carp culture, a form of aquaculture which has received heavy promotion by project interventions in Bangladesh, (not least in Mymensingh district where the study is based). The chapter also engages critically with another strand of aquaculture development discourse identified as problematic in Chapter 2, which privileges a somewhat ill-defined 'small-scale' aquaculture as the ideal means by

which outcomes relating to the alleviation of poverty, creation of economic growth, and mitigation of food insecurity may be leveraged. An alternative typology of aquaculture based on relations of production is advanced and shown to serve as a more empirically and theoretically robust framework for understanding the likely nature and extent of social and economic transformations associated with aquaculture. This analysis is conducted with reference to the large body of work addressing relative efficiencies in smallholder agriculture which that on aquaculture has paralleled but remained largely divorced from.

Throughout these chapters emphasis is placed on the application of qualitative research methods to generate ‘thick’ empirical data which incorporate but reach far beyond the technical and micro-economic specificities of production itself. It is argued that a variety of analytical frames of reference may be valuable in interpreting information of this nature and have the capacity to exceed the explanatory power of the mechanistic statistical analysis commonly deployed in the analysis of data generated by structured surveys of aquaculture development, whether the result of either immanent processes or deliberate interventions. This theme is returned to in the concluding section of the thesis, which attempts to define a new research agenda for a practical social science of aquaculture development in light of the work presented here, and to point the way to more effective policy alternatives.

Chapter 2 - Immanent and Interventionist Inland Asian Aquaculture Development and its Outcomes

(Submitted to Development Policy Review)

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Abstract: Aquaculture is equated with the reduction of poverty in discourse advanced by intergovernmental agencies such as FAO. This discourse demands support for the promotion small-scale aquaculture through project-based interventions. There is a lack of convincing empirical evidence to support the efficacy of development interventions of this type however. Meanwhile, huge increases in cultured freshwater fish production have occurred throughout Asia despite limited direct donor or state support, creating far larger economic impacts than aquaculture development initiatives targeting poverty reduction. The impact of commercial aquaculture development with respect to poverty also remains ambiguous however. This paper critically evaluates the developmental impacts of both immanent and interventionist forms of aquaculture and advances finely nuanced interpretations of both.

Key words: Asia, aquaculture, poverty, development, wellbeing

Acknowledgements: We thank Jock Stirrat and Peter Edwards for their incisive comments on earlier drafts of this paper, and M.C. Nandeeshha and R. Ramakrishna for their kind help in providing information on carp culture in Andhra Pradesh

Immanent and Interventionist Inland Asian Aquaculture Development and its Outcomes

1 Introduction

Aquaculture, the farming of fish and other aquatic organisms, is the world's fastest growing food production sector. Around 90% of global aquaculture output originates in Asia, and total production volumes of Asian cultured aquatic products now exceed those from Asian fisheries. Relative production gains for Asian freshwater aquaculture are even greater, and output now exceeds that from Asian inland fisheries by a factor of three or more in many of the main producing and consuming countries in the region (Figure 1). Freshwater aquaculture therefore makes a far greater contribution to aquatic food production and consumption than marine aquaculture or capture fisheries throughout inland Asia². However, despite its undeniable significance the emergence of inland aquaculture for mainly domestic markets has, with the exception of technical reportage, been relatively 'silent', and the outcomes of its development have received scant international academic attention compared to that lavished on coastal shrimp.

The figures which underpin these observations justify the specific focus of this paper on the development of, and development associated with, inland Asian aquaculture³. They are also central to a neo-Malthusian discourse advanced by intergovernmental agencies such as FAO in support of the further development of aquaculture. Appeals are expressed in terms of exhausted or stagnating capture fisheries which can no longer meet the needs of a growing, protein hungry global population. These are often coupled to mutually reinforcing statements about the capacity of aquaculture to alleviate rural poverty in developing countries. Over the course of more than 30

² At least in volume per capita terms for the region and many of the countries within it. Where prolific inland fisheries persist (e.g. Cambodia, Sri Lanka) contributions from aquaculture are generally of far lesser local significance.

³ Official fisheries statistics are notoriously unreliable, and the figures underpinning Table 1 may thus under-represent total catch from both inland fisheries and aquaculture, particularly that which services local markets or subsistence purposes, never-the-less they are clearly indicative of volume of inland culture relative to both fisheries and coastal shrimp production.

years a powerful discourse of interwoven claims concerning food security and rural development has been reproduced by bi-lateral and multi-lateral donors and agencies, underpinning support to project-based interventions and research and development intended to kick-start or enhance aquaculture production in rural areas of Asia and elsewhere in the Global South.

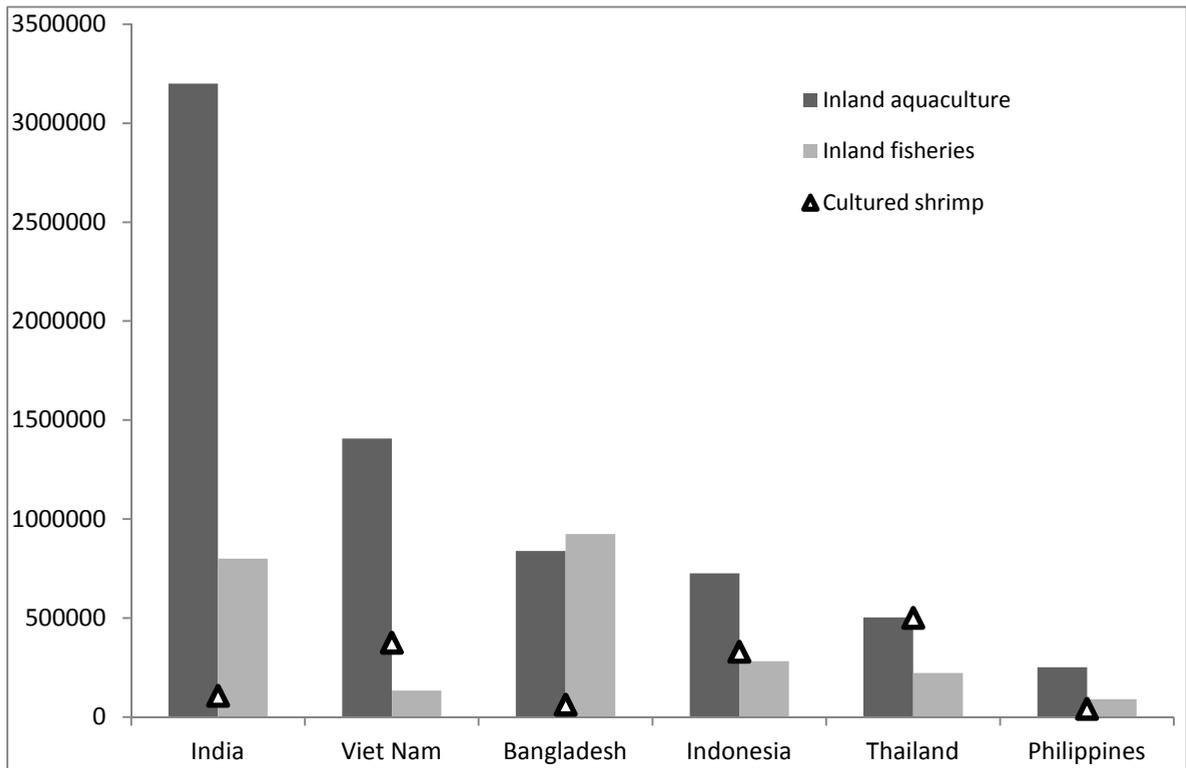


Figure 2.5 Output (t) of inland aquaculture, inland fisheries, and coastal shrimp for selected South and Southeast Asian countries in 2007 (Data from FAO, 2009a)

Several commentators (e.g. Harrison et al, 1994; Lewis, 1997; Lewis et al, 1996; Bush, 2004; Tofique & Gregory, 2008) have questioned the efficacy of such interventions with respect to their ability to reach the poorest of constituents, a tendency to elite capture of project resources, and the sustainability of impacts generated over the long term; assessments that share much in common appraisals of development interventions in other rural sub-sectors⁴. Although critiques such as these have periodically contributed to shifts in approaches to project design, service delivery, and engagement with participants that reflect wider trends in development discourse and practice, the

⁴ See, for instance, similar accounts relating livestock development (Ega and Isitor, 1991) and community development programmes (Dasgupta and Beard, 2007)

fundamental assumptions on which *interventionist*⁵ aquaculture development strategies are based remain for the most part unquestioned and continually reproduced, and published empirical evidence against which the validity of the logic underpinning them may be assessed remains surprisingly scant.

Meanwhile, huge increases in the output of commercial freshwater aquaculture have fuelled most of the production seen in Figure 1 but remain poorly documented, certainly within academic literature. This specialised commercial production of an array of fish species for urban domestic and, in some cases, commoditised export markets now accounts for a very substantial portion of inland aquaculture output by volume and value in Asia's major producing countries, but has yet to be adequately evaluated in terms of its developmental implications or clearly understood in terms of its principle drivers. This failure to address the origins and outcomes of what Cowen and Shenton (1998) term *immanent* development⁴ represents a serious omission with respect to the formulation of policies geared toward aquaculture.

The remainder of this paper offers some redress based on a comprehensive review of literature, augmented by findings from research conducted by the authors in South and Southeast Asia over a number of years. First, it sets out key claims underpinning the neo-Malthusian and rural development positions with regards to aquaculture which, taken together, represent the two major mutually reinforcing strands in interventionist discourse. Second, it examines evidence for the immediate impacts and long-term efficacy of aquaculture development interventions which proceed from this logic. Third, history and features of the concurrent *immanent* development of commercial inland aquaculture in Asia are described, and its characteristics *vis-a-vis* poverty examined. Fourth, interactions between interventions and immanent conditions are explored. The paper concludes by calling for more thorough critical evaluation of the relationship of both forms

⁵ According to Morse (2008, p341) 'development has two forms. 1. Immanent development (or what people are doing anyway): a broad process of change in human societies driven by a host of factors including advances in science, medicine, the arts, communication, governance etc. 2. Intentional (or interventionist) development: a focussed and directed process whereby government and nongovernment organizations implement projects and programmes to help develop the under-developed. Both occur in parallel, with immanent development as a canvass of change in societies and intentional development as planned interventions'. This binary definition is drawn on throughout this paper.

of aquaculture with poverty and locates these arguments in the context of wider shifts in development discourse.

2 The Interventionist Position

The first half of this section addresses what might be termed the *food security position*, whilst the second unpacks its counterpart, the *rural development position*. Together these form the base from which the interventionist programme for aquaculture development proceeds. The following paragraph, taken from an FAO document, typifies the neo-Malthusian food security position advanced in more-or-less identical terms in reams of other similar reports.

‘The world population is on the rise, as is the demand for aquatic food products. Production from capture fisheries at the global level is levelling off and most of the main fishing areas have reached their maximum potential. Sustaining fish supplies from capture fisheries will, therefore, not be able to meet the growing global demand for aquatic food... In order to maintain the current level of per capita consumption at the minimum, global aquaculture production should reach 80 million tonnes by 2050’ (FAO, 2006, iii).

Furthermore, as the World Bank (2006, p2) notes, ‘fish is often the lowest cost animal protein and the world’s growing food fish supply gap impacts disproportionately on the nutrition and health of the poor’. Thus, there is an explicit link to be made between food (fish) security and poverty. Since aquaculture is presented as having ‘great potential to meet this increasing demand for aquatic food in most regions of the world’ (FAO, 2006, iii), it is also made to appear obvious that it can ‘contribute to the alleviation of food insecurity, malnutrition and poverty’ (Halwart, et al. 2003). In this manner the concepts of aquaculture, food security and poverty become closely interwoven, and the former imbued with the capacity to enact positive change with respect to the each of the latter. The apparently commonsense nature of this relationship is reified by its perpetual production and reproduction in texts such as this paper itself and a great many of those which it cites.

Aquaculture's role with respect to poverty alleviation is not constructed only in terms of improving food security and nutritional intake, although this is an ever-present theme in assessments of its potential contributions to development. 'The poor' are also believed to gain from the expansion of aquaculture via a variety of other direct and indirect mechanisms. These are broadly, income and employment related (i.e. generation of cash incomes for producers from sales of fish, and for non-producers through employment on-farm as labourers, and elsewhere in the value chain as seed suppliers, marketing intermediaries and in a variety of other roles); and agro-ecological (e.g. stocking of fish in rice fields may reduce pesticide use, thereby contributing to increased farm sustainability and agricultural diversification) (Edwards, 1999, p8). As with the food security position, these claims possess intuitive appeal.

Establishing through a series of logical steps the unique potential of aquaculture to enhance food security and relieve poverty in developing countries provides the basis for advancing demands for interventions with which to promote its uptake and expansion. Dey et al (2005, p4) typify the tone and nature of these when they pose the questions 'what are the available options for meeting the rising demand and simultaneously improving livelihoods from fish production?', and 'what are the appropriate strategies for increasing and sustaining benefits to poor households from aquaculture?'. The normative discourse embodied in these questions unequivocally frames aquaculture as an instrument of development: a tool which can, *and should*, be deployed through targeted interventions in the fight against hunger and poverty. It is with reference to this narrative that most bi-lateral and multi-lateral donor support to aquaculture in developing countries is disbursed.

Aquaculture development discourse and practice is not static however, and has undergone a series of periodic reformulations which are depicted in Table 1 below. None of these can be considered unique to the field of aquaculture but reflect instead prevailing trends in the development establishment at large. Never-the-less, an underlying constant throughout these conceptual shifts (both within and beyond the field of aquaculture) has been the persistence of what Ellis and Biggs (2001) refer to as the 'small-farm-first narrative'. This emphasises improving small farm productivity as the key to rural poverty reduction. This paradigm remains intact as the

title of a symposium held in 2009 - *Small-scale Aquaculture for Increasing Resilience of Rural Livelihoods in Nepal* – indicates, and its logic pervades each of the interventions reviewed in the following section.

1970s	1980s	1990s	2000s
Centralised state-run hatcheries			
Research and development			
Agricultural extension			
Development of technical capacity			
	Rapid rural appraisal		
	Farming systems approaches		
		Participatory rural appraisal	
		Sustainable development	
			Sustainable livelihoods
			Millennium Development Goals
			Certification

Table 2.2 Changing concepts in aquaculture development (after Ellis and Biggs, 2001; Friend & Funge-Smith, 2002)

3 The Impacts of Interventionist Aquaculture Development

It is difficult to produce a comprehensive account of the impacts of externally funded interventions intended to promote the development of aquaculture. This is in part due to a shortfall in the volume and quality of information available, and in part due to the diversity of activities falling under this umbrella. These range from multi-million dollar pond-construction and extension components of huge integrated rural development schemes, to the experimental piloting of new ‘appropriate technologies’ implemented by doctoral students, to highly technical projects on fish genetics and health. A paucity of readily accessible information occurs because project outcomes are typically reported in internal documents circulated to a handful of individuals and effectively lost to a wider audience forever, making it difficult to ascertain the nature of any impacts. Furthermore, there is a general tendency to cast outputs in as positive, or opaque, a light as possible even in internal documents since the procurement of further funding is always at stake. Even where reasonably detailed assessments are published they are usually based on monitoring conducted just prior to project completion. As a result they may reveal little about the longevity of any innovation introduced since there is no way of knowing whether any positive effects reported

continued⁶. This uncertainty is even more pronounced where quite complex institutional arrangements involving collective access to ponds and credit represent an integral part of the intervention (see ADB, 2004, pp20-34, for an example of an intervention of this type)

This results in a dearth of detailed published information relating to outcomes of specific aquaculture development projects which stands in stark contrast to the volume of texts, as identified in the opening section of this paper, which pedal vague assertions about aquaculture's capacity to alleviate poverty. What follows is therefore necessarily partial in scope, opting for analysis of a limited number of indicative examples of extension-based intervention. Most of these relate to projects implemented in Bangladesh. This is a reflection of information available rather than a deliberate choice on the part of the authors. The size of the Bangladesh literature relative to that for other countries may reflect in part the high level of priority accorded the country by donors generally, its perceived large but as yet unmet biophysical potential for aquaculture (Karim et al, 2006), and, as a result, an unusually high number of aquaculture interventions practiced there. Whilst there may be limitations in inferring implications for other Asian societies with different structural characteristics based on the case of Bangladesh alone it is suggested that there are also generally applicable patterns to be discerned.

Broadly speaking the interventions documented for Bangladesh can be divided into two groups; those intended to promote uptake of 'improved' management practices among households already practicing fish culture in order to boost levels of production, and those intended to result in adoption of aquaculture (often in novel forms) by new market entrants. Examples of each are discussed with reference to the three main strands of critique identified in the introduction; sustainability of uptake, efficacy in reaching poorer constituents, and the possibility of creation or exacerbation of inequalities in control over resources.

⁶ See for instance Hambrey and Roy (2002), which offers what is now recognised to be an overly rosy project impact assessment based on a premature final review

3.1 Management based interventions

As Thompson et al (2006, p29) suggest, ‘published assessments of the uptake and continued practices and sustainability of aquaculture after extension projects or initiatives have been completed are rare’. An exception to this rule - an *ex-post* assessment of four major aquaculture extension projects in Bangladesh conducted by the same authors - finds that approximately 90% of project participants ‘continued to farm fish 2–6 years after receiving advice and support, had a fair understanding of good management practices, and achieved reasonable yields’. The authors also state that ‘yields and incomes of extension participants appear to reflect better practices and knowledge compared with non-participants’ (*ibid*, p28). However, this amounts to a fairly modest difference in the average cash returns of participant and non-participant (control) households in the order of US\$40-50 per annum in three of the four cases assessed.

The authors also acknowledge that although three of the four projects assessed were found to have targeted pond owners with smaller landholdings than the average for pond owners in their areas, pond-owning households in Bangladesh tend to be better-off than average rural inhabitants (*ibid*). The tendency for aquaculture interventions of this variety to select better-off participants is particularly pronounced in Bangladesh due, *de facto*, to very high levels of functional landlessness among the rural population (Lewis, 1997; Lewis et al, 1996). The necessity of access to principle production factors therefore tends to exclude the poorest social strata from initiatives aimed at increasing output among existing producers, even before relative class-mediated advantages in access to extension service providers (whether state or non-governmental) come into play.

Average land-holdings and incomes reported for households participating in another production oriented intervention in Bangladesh, the USAID funded Development of Sustainable Aquaculture Project (DSAP), also places them in upper-middle income brackets (Jahan et al, 2010). Production increases similar in magnitude and value to those reported by Thompson et al (2006) were found to occur among project farmers as a result of the adoption of improved aquaculture techniques, with fish production per unit area approximately doubling between 2002/3 and 2005/6 for project households. Labour productivity and fish consumption also increased in these households to a statistically significant degree. However, this production growth translated into

relatively modest increases in the contribution of aquaculture to total household income (rising from 7% of the total prior to the project to 10% afterward) (Jahan et al, 2010).

The Mymensingh Aquaculture Extension Project (MAEP) - a major DANIDA funded effort which offered training and support services for pond culture to 100,000 households in the Greater Mymensingh region of Bangladesh between 1989 and 2003 - is generally held to be an example of a particularly effective intervention, not least by the consultants hired to produce a post project impact evaluation study. The study states that 'MAEP is one of the most successful development programs in Bangladesh and stands as an international development achievement of the first order' (Winrock International, 2004, p59), and has 'had a profound impact in raising the incomes of the rural poor' (*ibid*, p9). This conclusion is supported by figures relating to increases in productivity of carp polycultures in Greater Mymensingh between 1989 and 2002 (from 1t to 3.3t per hectare), and extrapolated increases in the quantity and value of the region's aquaculture output (from 85,000t to 351,000t, and \$48million to \$525million).

These figures are calculated on the basis of the assumption that all increases in the productivity and output of aquaculture in Greater Mymensingh subsequent to 1989 must be treated as direct outcomes of MAEP. The assessment is almost completely devoid of any comparative or contextual information which would make it possible to judge whether or not this is a reasonable assumption to make however (there is no comparison of the performance of households trained under the project relative to that of those who received no training, no acknowledgement that improvements in productivity could have come about as a result of anything other than the diffusion of knowledge imparted by the project, and limited discussion of other critical factors such as improving access to inputs and expanding urban markets which might have contributed to this intensification).

Unfortunately these shortcomings make it difficult to take many of the report's bolder conclusions – that, for instance, 'over 418,870 greater Mymensingh households (1.8 million people) would be below the DANIDA target group poverty threshold of Tk 40,000 in income per year if they were not engaged in MAEP promoted pond aquaculture' (p9) - at face value. What the report does show more concretely however, is that among inhabitants of the region practising carp

polyculture the activity contributes a significant, though less than stellar average of 10.5% of household income, and, similarly, that based on the average pond size of households in the income group targeted by the project (those earning less than Tk. 40,000 per year), production stands at 109kg per year, or somewhat less than twice the average annual per capita fish consumption of a household with five members.

In Northeast Thailand, recommendations for improved pond management developed through on-farm trials by the Asian Institute of Technology (AIT) Aquaculture Outreach Program (AOP), 'more than doubled the income from fish' amongst users, 'increasing its share of total farm income from 2.9 to 6.5%'. The recommendations which allowed them to do so were sufficiently low cost to be accessible to poor farmers with access to a pond (ADB, 2004).

'However, with average land holdings of about 8.1 ha (50.5 rai), twice the regional average of 4.5 ha (28 rai) in 1988, the average farm income of families farming fish during the 1989 baseline survey was as much as 80% higher than the regional average gross regional product per capita for rural areas... Thus, the low-input package was not attractive to many farmers because it made only a minor contribution to their total income' (*ibid*, pp146-147).

These cases suggest that whilst the production gains generated by this sort of intervention may appear substantial on paper (incomes from fish more than doubled and so on), when placed in the context of the overall livelihood portfolio of practicing households they are generally fairly modest. Thus, whilst gains in fish production achieved under the AOP project in NE Thailand were superficially impressive, the already relatively affluent households involved subsequently abandoned techniques required to sustain them because they could not compete with alternatives such as selling labour in a buoyant non-farm economy (*ibid*). The retention by project participants in rural Bangladesh of similar techniques capable of generating similar production increases may be indicative of the generally more severe nature of rural poverty there, which is itself linked to more limited opportunities for well-remunerated diversification of economic activities beyond the farm.

Although production increases resulting from this variety of intervention may extend to poorer households fortunate enough to own or access a water body suitable for fish culture, the likelihood of possessing such resources declines with each step down the class ladder, especially where land ownership is highly stratified. This relationship also holds for the size of productive assets owned. As total volume and value of output are likely to correspond closely to the area of pond under culture, even where poorer producers can be engaged the absolute benefits they derive are likely to be smaller than those of better-off project participants with larger landholdings. These observations are supported by Cramb et al (2004) who, in a livelihoods assessment conducted in Central Vietnam as part of a project promoting the production of forage for cattle, find that although aquaculture provided a similar proportion of income (8-10%) across households in 'poor', 'average' and 'better-off' wealth categories, both pond size and frequency of pond ownership tended to increase with wealth category. The distribution of any impacts secured is therefore likely to be highly class differentiated – something which may be obscured by a tendency to present data generated from project monitoring and evaluations as mean averages. This is important to recognise since much discourse linking aquaculture with poverty alleviation represents 'the poor' as a monolithic category standing to benefit uniformly from its development.

3.2 Adoption based interventions

Interventions such as those detailed above work to enhance the productivity of existing fish producers and, for the most part, make little attempt to alter the structural conditions which form the backdrop to project implementation. Other interventions pursue a more radical agenda inasmuch as they attempt to stimulate adoption of aquaculture by new entrants. Such approaches make it theoretically possible to address the exclusion of lower income groups with limited productive assets. This is attempted either through the creation of new institutional arrangements for the purposes of securing collective access to water bodies and/or credit, or by the introduction of novel production technologies which may circumvent access or investment related 'constraints to adoption'. In Bangladesh efforts to open up new production frontiers for aquaculture have often focussed on group formation and advocacy designed to secure access to seasonal water

bodies and *kehas* (government owned) ponds, and thereby escape the problem of exclusion by functional landlessness. Schemes involving the enclosure and stocking of areas of flood plain have pursued similar strategies.

A report produced by the NGO CARE Bangladesh re-appraises three of its own interventions of this type in a refreshingly judicious manner. One of these, a *kehas* pond initiative, had earlier 'assumed show-case status' within the organisation, being exhibited to visiting dignitaries and 'written up as a case study for use in workshops and other fora'. However, the picture that emerged from thorough *ex-post* evaluation 'proved both to be more complex than had previously been imagined and to have evolved somewhat since earlier investigations, and now appeared rather less positive from CARE's point of view than had previously been supposed' (CARE, 2004, p39). This shift appeared to have resulted from a change in the administration of *kehas* ponds from one government agency to another newly formed one, coupled with a shift in the local balance of power caused by election of a new member of parliament who's interests were best served by supporting the previous lessee of the pond, from whom control had been wrested with support from the MP's predecessor. This created an impasse in which the collective activities of the co-op, formed during the project with CARE's support, stalled. As a result, in the final analysis it proved 'impossible to arrive at a definitive overall assessment of who has gained and who has lost from the intervention' (*ibid*, p44). Conclusions regarding the other two case studies presented in the CARE report are also ambiguous to greater or lesser degrees with respect to the sustainability of collective arrangements and the (re)distribution of resource access and its associated benefits, but neither describes a markedly promising nor equitable outlook (*ibid*).

Tofique and Gregory (2008) also paint a picture which describes skewed distributional impacts associated with floodplain aquaculture (FPA) projects promoted by the NGO SHISUK in Bangladesh. These schemes differ from those described in previous paragraphs in that they are highly profitable. This has resulted in the formal registration of SHISUK's project as a company and the creation of more than 90 such schemes in Daudkandi Upazila in Comilla over the course of more than a decade. In many respects flood plain aquaculture therefore represents that which has hitherto proved elusive; an aquaculture development scheme which generates substantial

enough returns to become genuinely self-sustaining, and attractive enough to stimulate uptake elsewhere without recourse to intensive promotional efforts.

The authors question however whether FPA projects have contributed to poverty focussed goals, and conclude that share ownership has become concentrated among wealthy shareholders who have been able to assume control over projects' boards of directors, enabling them to pursue agendas which further their aims and evade regulations put in place to prevent accumulation of shares originally allocated to poor and landless participants. Although there has been some localised employment creation in construction and harvesting activities, the enclosure of areas of floodplain which were formerly a common access resource during wet season has also precluded non-project households from fishing them. Whilst it is unclear from the information presented how important these privatised areas are relative to remaining unenclosed flood plains, the authors to conclude that, 'under current FPA project arrangements in Daudkandi, the poor are either marginally benefited, by-passed or are negatively affected by FPA. The extent to which these losses are offset by the production, employment and service opportunity gains would vary from one FPA to another' (*ibid*, p6).

Interventions based on the introduction of novel technologies are equally prone to malfunction due to an inability of project implementers to adequately predict the complexity of the social, economic and bio-physical context into which new innovations are inserted, as the example of an attempt to introduce scaled-down integrated duck and fish culture in Northeast Thailand illustrates. The technology, promoted following trials which suggested it was technically and economically viable, was rapidly rejected by all those involved once support for the purchase of poultry feed was withdrawn, in part because a regular cash outlay for feed became necessary and because the large numbers of eggs produced proved difficult to market locally. Thus although participants in the scheme reportedly valued the relatively large quantities of fish it produced, the high opportunity cost of unsubsidised capital and labour and a mismatch between the system and the farm resource base and local market conditions resulted in its collapse (Little and Edwards, 2003).

3.3 Interventionist Aquaculture Development and Poverty

The review presented in the previous two sub-sections, though heavily weighted toward examples from Bangladesh, suggests that the performance of externally funded aquaculture development interventions has generally been either underwhelming or difficult to divine on the basis of available information. This does not necessarily preclude the possibility that modest production gains generated by the more successful of such efforts may enhance the resilience of those targeted to seasonality and crises however. Haque et al. (2010) explain quite high levels of uptake and retention of a novel form fish culture introduced by a project (ricefield based tilapia seed production) despite low financial returns with reference to the cumulative and mutually reinforcing effect of numerous individual agro-ecological, socio-cultural and seasonal factors which appear relatively minor if considered discreetly. Lovshin et al (2000) offer a similar but converse example from Latin America involving two projects which provided assistance for pond construction for aquaculture in which most pond owners subsequently quit fish culture or continued at it very low levels but persisted in using ponds for a diverse range of other functions long after the project ended.

Unfortunately, project monitoring and evaluation focuses on standardised indicators of technical efficiency (mean gains in income and output per ‘beneficiary’), in part because this type of data is relatively straight forward to collect, and in part because project planning methods and goal setting (through instruments such as the objectively verifiable indicator component of log frames) demand its generation. As a result, interesting and potentially far more revealing variations in the utilisation of project resources by different groups are obscured, and the existence of nuanced relationships and indirect and/or non-financial outcomes such as those identified above are lost. Thus whilst, for reasons outlined above, interventions are highly unlikely to ‘eradicate’ poverty, some of their contributions toward tempering its effects may also go unrecognised.

4 Immanent Aquaculture Development

This section explores the development of specialised commercial inland aquaculture in South and Southeast Asia. The term ‘specialised’ as used here denotes at least a basic level of technical understanding on the part of the farmer, allowing for manipulation of system parameters (stocking

densities, inputs of feeds and fertilizers etc) in pursuit of desired outcomes (optimal productivity, less incidence of disease etc), whilst 'commercial' implies an exclusively market oriented production⁷. These two features are symptomatic of aquaculture in which capital investment, productivity, and production are relatively high and which, as a result, usually occupies a leading position in the livelihood portfolios of those who practice it. This is in contrast to aquaculture of the type that interventions outlined in the previous section are most commonly designed to support or promote, which would typically represent but one small component in a larger repertoire of household income generating activities.

It is not possible to offer a comprehensive account within the limitations of this article given the immense variety of aquaculture covered by this description. The following section therefore focuses on four cases: tilapia aquaculture in Central Thailand; export-oriented *Pangasius* catfish production in Vietnam's Mekong Delta; carp culture in Andhra Pradesh state, India; and *Pangasius* farming in the Mymensingh region of Bangladesh. Caution must again be exercised in drawing overly general conclusions from individual cases, but, as before, we suggest that sufficient commonalities exist to extract certain more widely applicable lessons. All cases are notable for the extent to which aquaculture has become well established as a high volume high value agrarian sector within a relatively short space of time; something that has been achieved with limited direct external support. The key features of each case are summarised in Table 2, and explored in greater detail in the text which follows. Scrutiny of the table suggests several common themes. Most important are: 1) immanent processes of agrarian change, urbanisation/industrialisation, and associated infrastructure development - all of which are embedded in ongoing processes of economic growth, and 2); technical developments, whether farmer, market, institution, or project driven, which have facilitated production increases. These are elaborated on below.

According to Belton and Little (2008, p126) growth in the production of tilapia and other species such as *Clarias* catfish in Central Thailand has occurred alongside 'industrialization and

⁷ Understanding of how to manipulate system parameters may be based on formal scientific knowledge, or as is more common, repeated observation and experimentation. Thus this definition covers systems as diverse as indigenous Chinese carp polycultures and wastewater fed aquaculture to highly intensive pellet fed systems, all of which are commercially oriented.

urbanization, and the associated growth of a class of relatively affluent urban consumers' which, 'has spurred demand for aquaculture products and provided increased levels of income with which to purchase them' (*ibid*). Reaction to changing demand patterns among urban consumers has led to the introduction of increasingly specialized agrarian enterprises, of which aquaculture is one, in the formerly rice-monoculture dominated central plain (Molle and Srijantr 1999). Growth of similarly specialised farming systems including intensive horticulture and feedlot pig and poultry production has generated large volumes of locally available, low cost resources which may be utilised as inputs in to what Edwards (1998) terms 'indirectly integrated' aquaculture⁸. Concurrent improvements in infrastructure have led to 'space-time compression', reducing travel times and dramatically speeding up communication in the region (Greenberg, 1994). This has enhanced producer access to concentrations of urban and peri-urban consumers in the provinces of the extended Bangkok metropolitan area. Downward pressure on the price of cultured fish exerted in these competitive markets has led to declines in the adjusted value of the more commonly cultured species, which has in turn stimulated greater specialisation and production efficiencies on the part of fish producers along with further increases in demand for fish amongst consumers (Belton and Little, 2008).

⁸ A host of agro-industrial byproducts are used as feeds and fertilizers for integrated aquaculture in Central Thailand. These include pig and poultry manure; chicken and fish processing wastes; rice bran; low quality maize and soy; waste bread; monosodium glutamate and noodle processing waste; animal blood, and so on.

Item	Case			
Location	Mekong Delta, Vietnam	Central Thailand	Mymensingh , Bangladesh	Andhra Pradesh, India
Species	Pangasius catfish	Nile tilapia, red tilapia	Pangasius catfish	Indian major carps
Production system	Intensive pond monoculture	Intensified pond poly/monoculture, intensive cage monoculture	Semi-intensive pond polyculture (90% Pangasius, 10% carps).	Semi-intensive pond polyculture (80% rohu, 20% catla)
Start date	1960s	1965	1989	1977
Start rapid expansion	1998	1990	2000	1985
Current production	1,200,000t	213,800t	>300,000t	800,000t
Current value	US\$1.45 billion	US\$212.9million	US\$289.4 million	US\$952million
Main market	Export	Urban domestic (regional)	Urban domestic (national)	Urban domestic (national)
Key event or technical change	Shift from wild to artificial seed ^{1,2} ; shift from <i>basa</i> to <i>tra</i> ; shift from cages to ponds ³	Monosex tilapia seed production ¹ ; contract cage culture ² ; intensified pond culture ³	Introduction of Pangasius from Thailand ¹ ; intensification ²	Government intervention ¹ ; intensification ²
Key infrastructure & processes	Transport and communications; market liberalisation; processing sector ^{4,5}	Transport & communications; industrialisation; urbanisation; rising urban incomes, growth in agro-industrial processing ^{4,5}	Transport & communications; increasing urban demand for fish ^{3,4}	Transport & communications; commercial agriculture; low profitability of paddy; increasing urban demand for fish; forward linkage development ^{3,4}

Continued on p26...

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Key actors	1: AGIFISH, CIRAD, CTU; 2: nursery & hatchery operators; 3: growout farmers; 4: state; 5: private sector	1: AIT, EU; 2: CP; 3: growout farmers & marketing intermediaries; 4: state; 5: private sector	1:BFRI; 2: growout farmers; 3: state; 4: private sector	1: State government; 2: growout farmers; 3 state; 4: private sector
Key policy	Creation of land markets; liberalisation of agricultural input & output markets; promotion of exports & FDI; 'equitisation'	Open trade & investment regimes; export-oriented agro-industrialisation	Removal of trade barriers for agricultural inputs & machinery	Land ceiling act (land under aquaculture escapes the land ceiling act); government subsidy on inorganic fertilisers
Investment/Ha	US\$ 237,475 (per crop)	US\$3800 (per year)	US\$23,790 (per year)	US\$10,900 (per year)
Net return/Ha	US\$ 45,463 (per crop)	US\$ 1675 (per year)	US\$8025 (per year)	US\$3850 (per year)
Total No. farms	9000	n/a		4-5000
Employment	>200,000	n/a	1million+	1million
Culture area	6000ha	n/a	30,000ha	80,000ha
References	Sinh & Hien (2010); Dung (2008); Belton et al (2008); Lam et al (2009)	Belton & Little (2008); Belton et al (2009a); DOF (2009)	Munir (2009) Belton et al (2011b)	Ramakrishna (2007); Roy et al (2008); Edwards (2008); Pers. Comm. Nadeesha (February 2010); Pers. Comm. Ramakrishna (February 2010)

Table 2.2 Key features of commercial aquaculture development in South and Southeast Asia

The culture of carps in Andhra Pradesh, India, and *Pangasius* catfish in Mymensingh, Bangladesh, has also developed in response to similar conditions. All three systems are driven by urban domestic demand and the use of low value agricultural by-products as feeds and fertilizers. In Andhra Pradesh feedlot chicken production provides a vital low-cost input for pond fertilization in the form of manure, and commercial rice milling generates huge quantities of cheap rice bran (a key supplementary feed), and rice husk - used to insulate fish packed in ice for dispatch by road to distant urban markets throughout the country (Roy et al, 2008). Rice bran is an important feed ingredient for *Pangasius* culture in Bangladesh, as is another agricultural processing by-product, oil cake, which also constitutes important additive in carp diets in India (Ahmed, 2007; Veerina, 1999). Urban centres in Bangladesh, particularly the capital city Dhaka, represent the main market for provincial *Pangasius* production. As in India and Thailand, improvements in transport infrastructure and communications have been crucial to the sector's development, particularly given the highly perishable nature of fresh fish which demands rapid passage from farm to plate in order for the product to retain its value.

Technical advances have played an important role in increasing levels of productivity and output in all four systems. Farmer-led adaptation and intensification of tilapia production systems has followed the introduction of large, fast growing monosex tilapia in Thailand and marketing channels and outlets have been diversified as a result, leading to an increasingly differentiated product produced in a range of culture systems for consumers with a variety profiles (Belton et al, 2009b). Innovation on the part of private nurseries, hatcheries and farmers in Vietnam has also resulted in important changes such as a shift from the production of *Pangasius bocourti* to the hardier, faster growing *P. hypophthalmus* and from cage-based to pond-based production systems, both of which have resulted in greater economic efficiencies and productivity (Belton et al, 2011a). This spontaneous and ongoing modification of culture system parameters by farmers is also noted amongst carp producers in Andhra Pradesh by Veerina (1999, p806), who finds that, 'in their pursuit of higher profit from the production systems farmers continue to modify practices, including the manipulation and substitution of species and input combinations, and their rates, often on the basis of their accumulated experience and in response to demand and market forces'.

Similar farmer-led processes also have driven evolution of the distinctive Pangasius culture system practiced in Mymensingh, Bangladesh (Munir, 2009)⁹.

4.1 Immanent Aquaculture Development and Poverty

A cursory glance at the investment costs given in Table 2 reveals that none of the commercial production systems presented can be considered likely to fall within reach of 'the poor'. Such figures obscure a great deal of diversity however and entry into the less-intensive or smaller end of the spectrum for Thai tilapia and Bangladeshi Pangasius culture is by no means beyond the reach of all middle, and perhaps even some lower-middle, income bracket households. Such systems typically provide incomes that compare favourably with alternative agrarian livelihoods. Belton et al (2009a) report for instance, that even the lowest intensity tilapia culture systems in Central Thailand provide an annual per area return approximately twice that of double-cropped high yielding variety rice cultivation. Entry into production of this type therefore offers the possibility of reducing, at a minimum, vulnerability to future downturns in fortune and, often, the chance to fund the education of children to a level where they are qualified to pursue better compensated, more stable salaried off-farm employment, thus shoring up their future prospects along with those of their parents. Conversely, astronomical investment costs resulting from the extremely high intensity of the Vietnamese system of Pangasius production now exclude all but the extremely well resourced from market entry. Here, as in Andhra Pradesh and Mymensingh the largest operations are purely capitalist agricultural enterprises which form part of the much larger multi-sectoral investment portfolios of urbanite business people.

Therefore, as Lewis et al (1996) have observed, if we are to search for an entry point from which substantial opportunities for the alleviation of poverty may be created within aquaculture we must start by looking to support services that allow for the possibility of extraction of value without the ownership of productive assets. Accurate differentiated figures for employment in ancillary services to aquaculture are hard to come by, and some of those presented in Table 2

⁹ Ahmed (2007) incorrectly attributes the introduction of Pangasius culture to the district to the Mymensingh Aquaculture Extension Project.

probably represent little more than back-of-the-envelope approximations on the part of those who estimated them. Never-the-less, their magnitude gives some indication of the volume of associated income generating opportunities that commercial aquaculture may provide. Roy et al (2008) list numerous backward and forward linked economic activities including hatchery production of fish seed, feed production, input supplies, net making, ice plants, packaging, storage, processing, and transport, which cumulatively provide employment to hundreds of thousands of individuals in Andhra Pradesh and beyond. Many of these will doubtless be poor, as measured against any criteria, but most will also be poorly compensated wage labourers rather than owners of their own means of production. This will be true not just of Andhra Pradesh, but of Central Thailand, the Mekong Delta, and Mymensingh.

It is by therefore no means obvious whether employment in ancillary services for aquaculture represents a potential way out of poverty or an indicator of inability to escape it, particularly since sale of wage labour can often represent a strategy of last resort in agrarian societies (see for example, Lawson et al 2000). In a rare study of employment in value chains associated with aquaculture in Mymensingh, Faruque (2007) paints a somewhat mixed picture. On the one hand, the growth of intensified commercial aquaculture appears to have 'had a considerable impact in the rural agricultural labour market' (p175), creating increased demand for labour in pond management and marketing activities which appeared to be linked to a mean inflation adjusted increase in wage rates for agricultural labour of 47% over the preceding 10 years. However, household incomes for 83% of actors employed by fish markets in the region were approximately two thirds of the national average. Thus, whilst commercial aquaculture can clearly leverage a large multiplier effect in terms of job creation in ancillary services and, for certain systems, on-farm employment, there is a degree of ambiguity regarding the quality of such, and questions regarding how and to what advantage wage workers and the self-employed are able to utilise these opportunities remain to be answered. The income/employment relationship between aquaculture and poverty alleviation is therefore less clear cut than most accounts would suggest.

At a more general level, the sheer scale on which aquaculture occurs in all of the cases cited means that it is a contributor to GDP, and one of increasing significance in comparison to other

agrarian activities given the rapid rate, both comparative and absolute, of its expansion. Pangasius is Vietnam's second largest export crop by volume and third by value, and approaches total global output of farmed salmon in terms of the quantities produced (FAO, 2008; 2009a). Pangasius aquaculture is thus, though geographically very concentrated, a highly significant activity within the Vietnamese economy due to its scale and export orientation. The latter makes associated processing operations subject to greater bureaucratic control than is possible for the often informal small scale enterprises which handle and distribute products such as tilapia in Thailand and elsewhere, making it easier to generate tax revenues. Under these somewhat atypical circumstances, aquaculture can be seen as a contributor to growth at the national level and thus, should one choose to accept Dollar and Kray's contention that 'growth is good for the poor' (Dollar and Kray, 2002), to the alleviation of poverty.

In general terms and despite a number of cross-sectoral complementarities described above, immanent forms of aquaculture development (driven by the agency of farmers and other actors in the value chain who seize upon or create new opportunities using the resources that become available to them as a result of other developmental processes) have created far greater impacts, in terms of output, employment and the creation of economic value, than donor funded efforts. Those who have managed to accumulate capital from aquaculture production have usually been, at least in relative terms, reasonably well capitalised prior to initiation of their activities, and thus able to bear the investment risk inherent in establishing new commercial operations. Greater potential for poorer constituents to engage fruitfully with aquaculture is therefore generally to be found within its value chains. These receive scant attention at present however in comparison to production in its various guises, and it is by no means clear how and with what effects value is distributed amongst the actors who create it.

4.2 The intersection of immanent and interventionist development

Hishamunda et al (2009) attempt to make the case that supportive government policies have been instrumental in promoting the growth of commercial aquaculture in Southeast Asia. In a related vein, Kelly et al (2003, p400) contend that subsidies were a key determinant of increased

agricultural productivity in India during its green revolution and were effective because they were preceded by public investments in infrastructure and in research and extension and were targeted at high potential areas. Conversely they argue, incentives such as input subsidies and credit are unlikely to have any lasting impact in Sub-Saharan Africa if they are not preceded by ‘serious commitment’ to providing ‘basic public goods’ such as rural infrastructure, education, and participation in WTO negotiations to secure more competitive terms of trade.

The cases examined above suggest that whilst mechanisms such as relaxation of import tariffs on feedstuffs and state provision of affordable agricultural credit are not necessarily unimportant, they are generally of limited scope and significance in comparison to the coexistence of 1) high levels of latent or effective demand for particular cultured aquatic products, 2) readily available production factors which can be combined together to supply them in large quantities, and 3) the development of appropriate physical infrastructure, networks of actors, and (in the case of exports) governance conditions, for delivering them to market. These three conditions are in turn closely related to the status of immanent economic development. The policies that really matter with respect to aquaculture are therefore typically *not* specific to the sector, but rather relate to much larger arenas of trade and investment. In fact, if anything the examples given in Table 1 tend to suggest that commercial aquaculture can thrive under rather *laissez faire*, or even hostile, conditions¹⁰ and that the (usually limited) support services provided by fisheries departments and their counterparts, whilst potentially helpful to producers, are by no stretch of the imagination necessary for successful engagement in fish production.

Whilst acknowledging this generality it is also important to take note of specific interventionist measures that have resulted in important developments. In the Thai case, the development of a system for producing monosex (all-male) tilapia fry occurred through a doctoral component of a European Union funded research project at the Asian Institute of Technology

¹⁰ Expansion of Vietnamese *Pangasius* culture has continued unabated and in breach of land zoning requirements brought in to curb its unfettered development (Belton et al, 2011a). In Andhra Pradesh, the area under carp culture in the vicinity of Lake Kolleru reached 80,000ha in 2000. This fell to 40,000ha due to the enforced destruction of ponds falling within the boundaries of a newly designated wildlife sanctuary but has since rebounded to 80,000ha through conversion of rice paddy in adjoining areas (Pers. Comm. Ramakrishna, February 2010).

during the mid 1980s. The rapid growth of monosex tilapia and large sizes they are capable of attaining has radically diversified options for the species' culture and consumption (Belton et al, 2009b). The explosion of Vietnamese Pangasius culture after 1998 can be traced even more directly (structural context notwithstanding) to a European Union project which resulted in the development of successful techniques for Pangasiid catfish seed propagation in 1995. This breakthrough (again the outcome of PhD research), was an essential precondition for the remarkable growth that has followed since it freed production from dependence on finite and declining stocks of wild caught juveniles (Belton et al, 2008).

Neither of these efforts was accorded a particularly high level of priority by the external agency that funded it relative to other interventionist activities supported at the time, nor perhaps was either technology's ultimate significance fully foreseen. Furthermore, the external investment required to achieve both these breakthroughs was relatively minor, and formal attempts by the institutions responsible to transfer the resultant seed production technology to other users were limited in scope and impact. Never-the-less, these emergent advances in bio-technical capacity represented such clear cut opportunities to entrepreneurial actors already engaged in the sector that they were very rapidly able to exploit them by establishing informal partnerships with university and government employees via which complex technical practices required to establish hatcheries privately could be transferred (Belton et al, 2009b). The rapidity with which this took place was particularly remarkable in Vietnam where, scarcely two years after the first successful artificial propagation of Pangasiid catfish had taken place under controlled conditions, tens of private hatcheries were already engaged in their own production (Belton et al, 2008).

Ramakrishna (2007) also ascribes the genesis of carp culture in the Kolleru Lake area of Andhra Pradesh to a project, implemented on the orders of the Chief Minister of the state in 1977, which led to the establishment of fish ponds under 132 cooperative societies. According to the author,

‘This was the start of commercial fish culture in the lake. But, soon, the unsuccessful cooperative societies were forced to hand over fish ponds to financially resourceful

private farmers for a specified but extendable lease period, in order to pay off their loans. The private farmers achieved successful crops with sound profits that attracted other private persons, thus, heralding an era of rapid expansion and intensification of fish culture'. (p16)

This expansion was propelled by a small number of commercially-oriented individuals and resulted in the unauthorised occupation and conversion of 'thousands of acres of government land, and land allotted by the government for purposes other than fish culture' to fish ponds of up to 200 ha in size and farms up to 1000 ha. It is ironic that this appropriation of project technologies and public resources by a small set of powerful actors led to far more wide ranging developmental impacts in terms of employment and capital formation than a development focussed project could ever have hoped to attain. This outcome is an ambiguous one however, it being a difficult act of judgement to weigh the loss of large areas of common property against very substantial creation of jobs elsewhere.

It is crucial to recognise that where interventions such as these have resulted in major impacts they have done so because of a concurrence with suitable structural conditions (markets, infrastructure, feedstuffs, export-led policies and so on). Where these conditions occur, appropriate technologies introduced by project interventions have been able to catalyse or contribute to extremely rapid growth in certain sectors of commercial aquaculture. The driving force for subsequent application of these technologies and sectoral development has been actors throughout the value chain at a range of scales from innovative individual farmers and marketing intermediaries to transnational feed suppliers and processors however, with neither additional external aid, nor, to any great extent, directed state action, playing a discernable further role.

5 Synthesis and Conclusions

This paper has sought to offer up a comparison between the outcomes of aquaculture that has occurred as a result of immanent (ongoing, undirected) and interventionist (intentional, externally inserted) processes, and has explored interactions and complementarities between the two. It has

addressed ways in which the practice of aquaculture has progressed as an economic, technical and social entity (aquaculture development), and the nature of transformations associated with this process (considered here principally in relation to poverty). As Ferguson (1994, p35) notes, there is a tendency for these distinct meanings of development relating to ‘progression’ and ‘quality of life’ to be conflated in development discourse. Aquaculture is no exception, with the result that overly simplified causal relationships (more aquaculture = less poverty) become reified as fact, forming the basis of claims through which the professional and institutional interests of those who construct them are advanced. A more thorough evaluation of interventionist and immanent forms of aquaculture reveals far greater complexity and ambiguity in relation to both however. The findings of this evaluation are summarised below and elaborated with respect to their wider theoretical and policy implications.

Preceding sections indicate that adoption-based interventions promoting novel technologies or institutional arrangements in an effort to circumvent barriers to engagement in aquaculture such as landlessness or lack of pond ownership run a higher risk of failure (outright rejection or unintended negative consequences) than those working within the context of extant farming practices and configurations of resource control. This is because the social structures and market conditions into which they are inserted inevitably prove more complex, fluid, and difficult to predict than planners anticipate. Where innovations introduced in this manner do prove viable they may stimulate considerable aquaculture development, although rarely amongst the categories of beneficiary envisaged, as the cases of flood plain aquaculture schemes (Tofique & Gregory, 2008), and carp culture in Andhra Pradesh suggest.

The review also suggests that management based interventions designed to improve the productivity and returns of ‘small-scale’ producers, tend to produce fairly unspectacular results, since whilst production gains may appear impressive on paper (the percentage contribution of fish to household income doubled, the extrapolated yield per hectare reached such and such) when placed in the context of total household income, or reported according to actual area under culture it becomes clear that these are of insufficient magnitude to facilitate the capital formation necessary to ‘lift’ any household out of poverty. The discussion does indicate however that in some instances

productivity gains resulting from interventions contribute to the maintenance of household wellbeing and are of sufficient utility to offset opportunity costs required to generate them, with the result that new culture techniques are retained recipients of project support to after assistance has been withdrawn.

In contrast, rapid growth in aquaculture displaying capitalist, and what Lighthall and Roberts, 1995 term ‘quasi-capitalist’ relations of production¹¹ appears to yield greater potential for bringing about substantial developmental impacts. The relationship between capitalist aquaculture and poverty is by no means clear cut or universal however, and is deserving of further critical examination, particularly with respect to the fortunes of those engaged in associated value chains. It also is important to note that expansion of (quasi)capitalist aquaculture has generally accompanied rapid rates of growth in other rural and urban sectors, and that it is thus viewed most accurately as a product of development rather than vice versa. Kelly et al’s conclusion (2003) that the failure of interventions intended to stimulate the intensification of staple crop production Africa is inevitable in the absence of prior development of core infrastructure and services (the presence of which is itself indicative of developmental status) can be viewed as the flipside of this observation and also explains the widely acknowledged and almost total failure of numerous interventions intended to bring aquaculture to the continent (Harrison et al, 1994; Brummet et al, 2008).

Findings by Mosley and Hulme (1998) relating to the impacts of micro-credit may be also be instructive. They conclude that ‘higher-income households experience on average higher program impact than households below the poverty line’, whilst the average income impact for borrowers below the poverty line is ‘invariably modest, much lower than for borrowers as a whole’ (p786). This relationship defines, an “‘impact frontier” which serves as a tradeoff: lenders can either focus their lending on the poorest and accept a relatively low total impact on household income, or

¹¹ Writing of North America Lighthall and Roberts (1995, p234) use the term ‘quasi-capitalist’ to refer to ‘those farm operations that have set down the path towards capitalist social relations via scale expansion and hired labor but are still predominantly family run enterprises with no reliance on outside investors. In the real world, farm operations span a continuum of social relations ranging from the quintessential family farm to the full-blown capitalist enterprise’. In contrast the forms of aquaculture promoted by development projects are essentially peasant in their relations of production.

alternatively focus on the not-so-poor and achieve higher impact' (p783). It is unclear whether such a relationship holds for provision of other non-credit forms of assistance, but evidence presented here hints that it may.

That issues such as these have not received closer attention to date relates in large part to the strictures of project design and impact measurement. In the first instance there is a mismatch between the somewhat prosaic outcomes which this review suggests are likely to be the outcome of more successful management-based interventions, and the highly aspirational rhetoric of project proposals. This results from a tendency to frame anticipated impacts in terms which are unlikely to be realised in order to comply with donor requirements and expectations and thus secure funding. In addition, attempts to produce standardised monitoring and evaluations data quickly and cheaply in order to satisfy 'objectively verifiable indicators' of performance result in production of information which is inevitably 'thin' with regards to what it reveals with about project outcomes. This information, when presented as strings of mean percentage productivity increases and extrapolated yields devoid of any comparative context, tends to give the appearance of more substantive and clear cut outcomes than it might if assessed in more comprehensive qualitative terms. Furthermore, the need to generate this data during the final phases of the intervention in order to meet with reporting requirements means that knowledge of any long term impacts, or lack thereof, are lost. As a result, the precise nature of any benefits derived, and their costs relative to the external investments required to generate them remain unclear in most instances, and require further and more thorough critical investigation. This should include *ex-post* project evaluations carried out with far greater attention to the sort of ethnographic detail that most surveys, 'participatory' or otherwise, presently fail to capture.

The level of complexity and uncertainty identified by this paper in relation to the outcomes of aquaculture represents a challenge to the simplistic discourse framed in its opening section. Although the paper is unusual in its problematisation of aquaculture development in this manner, it is not alone in according greater significance to immanent forms and drivers of aquaculture development than interventionist ones. Several other recent publications (Hishamunda et al, 2009; Brummett et al, 2008; Irz et al, 2007; World Bank, 2006) have also dealt with this issue in one way

or another, though in less critical terms than are presented here. This is suggestive of a newly emergent paradigm in aquaculture development discourse which reflects the current private sector development consensus among multi and bi-lateral development institutions¹² (Gibbon and Schulpen, 2002). Whilst this embryonic shift in understanding would appear positive to some extent, it remains to be seen whether it will be translated into policy or action any more beneficial in its effects in relation to poverty than the paradigm it may eventually replace.

¹² Central to the concept of private sector development is the understanding that economic growth (which is seen as a prerequisite for the alleviation of poverty) is best achieved through the private sector, and that 'government has a role to play in making the private sector flourish and ensuring growth contributes to poverty reduction' (Gibbon and Schulpen, 2002, p2).

Chapter 3 - The Social Relations of Private Sector Development: Lessons from the Southeast Asian Fish Hatchery Sector

(For submission to Third World Quarterly)

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Abstract: Private Sector Development (PSD) has become an increasingly pervasive concept within the new architecture of aid. Its validity is assessed here with reference to two examples of dynamic private enterprise formation from the Southeast Asian fish hatchery sector. Informal interpersonal relationships between staff of public institutions and private entrepreneurs are shown to have been of paramount importance in facilitating the transfer of technical knowledge and stimulating economic development. It is concluded that PSD provides a defective explanatory framework with regards to the process of enterprise formation, and reveals little specific about the ability of the private sector to bring about transformative outcomes with respect to poverty.

Key words: Asia, private sector development, informality, poverty, enterprise formation, aquaculture

Acknowledgements: I thank David Little, Jock Stirrat, and Peter Edwards for valuable comments on earlier drafts of this paper. Warren Turner, Danai Turongruang, and Termsac Kongsamran in Thailand, and Le Xuan Sinh, Nguyen Van Hien, Do Minh Chung, and Tran Ha Anh in Vietnam are also thanked for their generous help and companionship in the field. I would also like to acknowledge the contribution of British Council Connect Research and Co-operation award for the project *Promoting sustainable high quality river catfish seed production in Vietnam*, and EU Asia Link Aqua-Internship Program grant which facilitated the research on which this paper is based.

The Social Relations of Private Sector Development: Lessons from the Southeast Asian Fish Hatchery Sector

1 Introduction

During the late 1990s gradual recognition of the failings of both purely state-led and purely market-led development strategies resulted in a partial reorientation of priorities in donor agendas, and in the appearance of an increasingly influential concept: Private Sector Development. Private Sector Development (PSD) is a strategy which fuses two meta-discourses: 1) A neo-liberal economic ideology which positions well functioning markets (i.e. markets undistorted by state interventions such as production subsidies or protectionist tariffs for domestic producers) as the most efficient way to allocate resources in the global economy and hence, foster economic growth, and 2); the positioning of poverty alleviation (evident in the Millennium Development Goals and increasing attention to 'pro-poor growth') as the overriding objective of economic growth and development rather than simply a derived outcome. Convergence and articulation of these two positions has resulted in a partial retreat from neo-liberalism, which Fine (2002) has dubbed the 'post Washington consensus', under which debate around markets versus the state has given way to exploration of their complementary roles.

PSD is thus neither a particularly radical, nor unprecedented concept. Its significance lies in its rising prominence as an organising principle according to which development policy and assistance are structured, and its emergence as a central concern in most donor development cooperation efforts (Schulpen and Gibbon, 2002). This has culminated in almost universal adoption of the rubric of PSD among multi and, subsequently, bi-lateral development institutions; reflected in the production of PSD policy documents by, among others, ADB (2000), the World Bank (2002), UNDP (2004), CIDA (2003), SIDA (Lindahl, 2005) and DFID (HoC, 2006). This has resulted in a general consensus in development thinking and cooperation which follows a relatively simple logic:

- '(a) poverty reduction is the main objective of development (cooperation); (b) central to development is economic growth; (c) economic growth is best achieved through

the private sector; (d) government has a role to play in making the private sector flourish and ensuring growth contributes to poverty reduction' (Gibbon and Schulpen (2002, p2).

Thus, whilst the private sector continues to be recognized as the prime mover of economic activities, the appropriate role of the state has been redefined as facilitation of an environment in which the private sector can operate and flourish (Jimoh, 2002). This largely coincides with the fostering of what the World Bank (2005) refers to as a 'good investment climate'.

These principles lend PSD policies a seemingly universal applicability. As a result, the field of PSD is able to encompass 'agriculture, manufacturing and services, including trade, and increasingly also infrastructure and social services'. It also includes 'all types of market players, from the self-employed in the informal economy, and small, medium and large enterprises, to transnational companies' (Lindahl, 2005, p15). Resultant policies consequently have a tendency to be vague and idealised in scope and conception (Altenburg and von Drachenfels, 2006), refer to extremely broad cross-cutting themes with poorly defined boundaries, and encompass prescriptions across scales ranging from macro (e.g. setting international terms of trade) to micro (e.g. provision of training or other assistance for individual firms) (Gibbon and Schulpen, 2002)¹³.

The extent to which PSD discourse has infused donor agendas in all areas is illustrated by the following excerpt taken from a recent World Bank report subtitled *Meeting the Promise and Challenge of Sustainable Aquaculture*:

'In addition to being a steward and guardian, a pro-active public sector will ideally be a servant of aquaculture, creating an *enabling environment* which recognizes the role of

¹³ An abridged list of factors seen to contribute to PSD could, for example, include: 'sound' national and international macroeconomic policy; a high degree of openness to trade; good governance; securing low transaction costs for businesses (e.g. simple, fast and cheap registration procedures and appropriate levels of taxation); improved access to credit and markets (through, for example, provision of microcredit, establishment of property rights, and better transport and communications); provision of key infrastructure; investment in human capital (health and education); greater gender equality; integration of the informal sector into the formal economy; commercialization of smallholder and subsistence agriculture; introduction of new technologies; and the fostering of entrepreneurial activities. See, for example, World Bank (2005); HoC (2006); Lindahl (2005).

private sector as the engine of growth, innovation and change. In addition to setting standards and codes, public authorities can establish a progressive fiscal regime, facilitate access to credit, for example through secure aquafarm tenure, promote trade and support applied science and capacity building' (2006, p4, emphasis in original).

The field of aquaculture also forms the object of enquiry of this paper on the basis that it may offer a lens through which PSD processes can be observed to operate due to: 1) its relatively recent emergence and extremely rapid rate of growth - it is the world's fastest growing food production sector, expanding at a rate of 8.8% per annum since 1970 (FAO, 2007); 2) its increasingly significant role as a producer of domestic and global commodities (both primary and value-added and particularly in Thailand and Vietnam where this study takes place); 3) the historical context of donor and public investment in public goods, particularly research and extension, which has provided a backdrop to much of this expansion; and; 4) a large literature which links aquaculture with the potential to alleviate poverty (See Belton and Little, 2011, for an overview of these issues).

Altenburg and von Drachenfels (2006) find that empirical evidence on the effectiveness of many of the core PSD policies recommended by donors is patchy at best. Similarly, Schulpen and Gibbon (2002) note that whilst the most concrete and effective PSD policies are micro level ones, donors continue to work with concepts of PSD that are highly abstract and focus primarily on ensuring macro-level preconditions. The sum of these observations would appear to suggest that PSD warrants further critical appraisal backed by empirical research given the pervasive and hegemonic status that it has attained amongst donor institutions, and that the most appropriate and feasible scale at which do so is the micro or local level. Since dealing with all the facets of PSD catalogued above is beyond the scope of a single paper we examine how private actors and public institutions have interacted *vis-a-vis* development in two comparable historically and culturally situated cases. This is accomplished by analysis of the development of two agricultural input production sectors, the Thai monosex tilapia hatchery sector and Vietnamese Pangasius hatchery sector. It should be noted that whilst neither has emerged in response to policies implemented with the explicit intent of fostering PSD (the term having not yet appeared in the development lexicon

at the point when either one began), both are founded on donor funded research carried out by public institutions. Thus, although neither case is indicative of the success or failure of any specific PSD policies *per se*, the stories of both embody numerous themes and features common to PSD discourse.

2 Rationale and methodology

The focus here is primarily on development of hatcheries rather than on the production of food fish which hatchery-derived inputs facilitate because they represent a more tightly bounded and, hence, more immediately accessible case. Fieldwork was conducted over two 2 month periods during early and late 2008 in Thailand and Vietnam respectively. Investigations followed somewhat different strategies based on the context in which each was conducted. In Thailand rapid appraisal was felt to be the most cost and time efficient system for ensuring the collection of accurate and prescient information (Chambers, 1992), whilst in Vietnam a more formal structured survey approach was adopted in keeping with both the positivist paradigm which dominates empirical research design and practice there, and in practical deference to the limits and boundaries placed on our work by the local state bureaucracy (Scott, Miller and Lloyd, 2006).

A summary of interviews is given in Table 1. The twelve monosex hatcheries visited in Thailand represent just over half of the total recorded as operating commercially by Belton et al (2009b). The 29 *Pangasius* hatcheries visited in Vietnam account for just under a third of the 94 reported operational by Sinh and Hien (2010). Fewer nursery operators were interviewed in Thailand than in Vietnam because of their relatively low importance in the tilapia value chain. Interviews typically lasted 1-2 hours, representing partial case studies, aspects of which could be combined to produce a single instrumental case study¹⁴ (Stake, 2005), or what Leeuwis (2004, p373) refers to as process ethnography, meaning; ‘the close following (or ex-post reconstruction)

¹⁴ Stake (2005, p445) uses the term *instrumental case study* ‘if a particular case is examined mainly to provide insight into an issue or to redraw a generalisation. The case is of secondary interest, it plays a supportive role, and it facilitates our understanding of something else. The case is still looked at in depth, its contexts scrutinised and its ordinary activities detailed, but all because this helps us pursue the external interest. The case may be seen as typical of other cases or not’. This is the basis on which we sought to conduct and present our research.

of events and interactions in and around a particular innovation trajectory as well as the gathering of participants' reflections and rationalisations in connection with these'. This data provides the basis for further analysis in the paper. Before elaborating further however, it is necessary to briefly summarise the bio-technical basis for the establishment of the two hatchery sectors, and the sectors' significance with respect to subsequent development of downstream economic activities.

Location	Informant type							Total	
	Hatchery	Nursery	Growout Farm	Govt. official	Academic	Seed trader	Feed distributor		Processor
Thailand	12	2	14	2	5	2	1	-	38
Vietnam	29	25	33	11	3	1	-	1	103

Table 3.1 Summary of informants interviewed in each location

3 Hatchery Seed Production

3.1 Monosex tilapia

Tilapia have a tendency to breed prodigiously under culture conditions. This reproductive behaviour, typically results in sub-optimal growth rates and over-crowding of ponds with huge numbers of stunted low-value fish, and acted as a break on the species' transition from a primarily subsistence crop to a commercial one. As a result, there were a number of efforts during the 1970's to hormonally manipulate the sex of young fry in order to produce all-male fish which would not breed following stocking by farmers (Little, 1989), but a commercially viable system capable of consistently producing all-male fish proved elusive until research conducted at the Asian Institute of Technology (AIT) in Thailand between 1984 and 1989. The advent of all-male tilapia seed revolutionised the specie's production and consumption in Thailand. Output and value increased from 22,800t and an estimated \$12.6 million in 1990 to 213,800t and \$212.9 million in 2007. This makes it the country's most important cultured fish species, accounting for more than one third of all freshwater fish production (DOF, 2009; Piumsombun, 2001). A number of additional factors including improving transport and communications, better access to cheap feed stuffs and fertilizers, and the increasing size and affluence of urban markets played decisive roles in the expansion of tilapia production during this period (Belton and Little, 2008). Never-the-less, the availability of seed capable of quickly attaining large sizes (500g-1kg; as opposed to the 200-300g at which Thai mixed-sex tilapia are typically harvested) radically altered the species' utility to farmers

by increasing the number of ways in which it could be produced and consumed, thus expanding the geographical frontier of production into new areas, raising its potential market value, and contributing to major shifts in marketing strategies and consumer preferences¹⁵.

3.2 Pangasius

Two species of Pangasiid catfish (*ca basa* and *ca tra* in Vietnamese) have been farmed in the Mekong Delta since the 1960s. Catfish was produced exclusively for domestic markets until *doi moi* policy reforms from 1986 initiated the series of political and economic shifts that made establishment of export-oriented capitalist activities including aquaculture possible. These changes facilitated the export of Pangasius in small quantities. Production remained dependent on the harvest of wild fry from the Mekong River however until the lifecycles of both species were closed by researchers in 1995, after which time households that had traditionally nursed wild fry rapidly began producing seed by artificial propagation. This resulted in a sharp increase in the supply of Pangasius seed from private hatcheries from 1998 (Belton et al, 2008). A combination of factors including import tariffs imposed on Vietnamese Pangasius by the USA encouraged a stronger marketing orientation among Vietnamese processors from 2002 onwards, leading to rapid expansion into more diversified global markets (Belton et al, 2011a). This unprecedented growth in international markets coupled to dramatically improved availability of seed resulted in commercial output of Vietnamese Pangasius increasing 45 fold between 1998 and 2007, from 22,500t to more than 1,000,000t. Export values rose 50 times, from \$19.7 million to \$979 million over the same period. In 2008 total Vietnamese Pangasius production was estimated at 1.3million tons, with an export value of approximately \$1.45 billion (Dung, 2008). This makes Pangasius the country's second

¹⁵ It is difficult to determine exactly how much culture of mixed-sex tilapia still occurs, but informants' estimates would suggest it accounts for perhaps 20% of the total, with the vast majority of commercially oriented farmers now using all-male seed. The farmgate value of the small (200-300g) mixed-sex fish is low (in the order of \$0.37/kg in Central Thailand) whilst 600g+ tilapia from larger fully commercial systems in the same region fetch \$0.94/kg or more at the farmgate if marketed live, but require higher levels of investment and more intensive management to produce. Consumers increasingly prefer large live fish. The higher value achieved by large fish has also made it economically viable to raise them in cages, contributing to a massive expansion of production in the Northeast of the country where agroecological conditions are poorly suited to highly commercial pond culture (Belton et al, 2009)

largest export crop by volume and third by value and hence a major contributor to foreign exchange (Belton et al, 2011a). It is also a significant creator of local employment, on which more than 200,000 Vietnamese jobs are reportedly dependent (Lam et al, 2009).

4 Explaining Variations in Patterns of Development

The previous section outlined the contextual background of hatchery sector development in Vietnam and Thailand and its wider significance. In the remainder of the paper attention is turned to the significance of a number of themes relating to the manner in which this development has occurred.

4.1 Path dependency

In contrast to catfish hatcheries in Vietnam, the growth of monosex tilapia hatcheries in Thailand has occurred relatively slowly. The latter are also much more widely geographically distributed but less numerous. These differing patterns of development are related to a number of bio-economic and historical factors. There are no fundamental differences between wild and artificially propagated catfish seed, the advent of hatchery seed simply increasing volume and duration of its availability. This complete substitutability contributed to instant demand for hatchery-produced seed among farmers which was intensified by concurrent growth in *Pangasius* export markets. In Thailand demand for monosex tilapia seed (a product roughly analogous to a new hybrid cereal variety in terms of its improved performance, higher price, and somewhat different management requirements as compared to ‘traditional’ open pollinated seed) grew gradually, in line with the slower development of diversified domestic markets for tilapia and more cautious uptake by farmers. Larger numbers of *Pangasius* hatcheries were established relatively more rapidly in Vietnam as a result of these differences. Technical differences between the two hatchery systems also contributed to this pattern since the consistent production of large numbers of all-male tilapia fry is considerably more difficult to achieve than the mass spawning of *Pangasius*, and places greater demands on, capital, land, labour and time. This means that *Pangasius* hatcheries, though still fairly investment intensive, can be established as ‘backyard’ ventures, whereas most successful

monosex tilapia hatcheries in Thailand operate as medium sized enterprises with substantial on-site infrastructures.

Monosex hatcheries in Thailand are widely distributed throughout the provinces of Central and Northeast Thailand (Table 2). These are also the main regions in which tilapia farming occurs, due largely to agro-ecological and market conditions. Similarly, all catfish hatcheries are located in the provinces of Vietnam's Mekong Delta because this is where optimal climatic and agro-ecological conditions for catfish farming (and hence virtually all catfish farms) are found. Of these hatcheries, more than half are on the small Island of Phu Thuan located in the Tien branch of the Mekong River in the district of Hong Ngu. This is a legacy of the island's history as the main centre for nursing wild catfish seed which ensured that its inhabitants possessed strong economic incentives for engaging in hatchery production and a set of existing skills complementary to doing so. The close knit nature of communities in Hong Ngu (where many families are interrelated by marriage and relatively well resourced due to their prior nursing activities), when coupled to the fairly easily replicable nature of the technology and very high levels of latent demand for seed, thus contributed to the establishment of *Pangasius* hatcheries in a far more rapid and densely nucleated manner than occurred for monosex tilapia hatcheries in Thailand.

4.2 Modes of knowledge transfer

The most striking similarity in the development of both hatchery sectors has been the predominantly informal nature of the movement of knowledge and skills from the public sector in which they originated to the private actors who have sought to utilise them. This process has been embedded in the interpersonal relationships of would be adopters of the technology and a small number of key knowledge brokers in institutions that developed or were exposed to it. These individuals have been motivated to perform this role by a variety of incentives, which have in part shaped the form of resultant development.

4.2.1 Thailand

Development of a viable system for the mass production of monosex tilapia seed resulted from doctoral research completed as a component of a large European Commission funded project at the Asian Institute of Technology (AIT) concerned with using fish culture for the treatment of septage, rather than from interest in the technology's potential commercial applications. AIT publicised this breakthrough by placement of a small number of articles in the popular media but did not pursue any extension strategy aimed at encouraging fish producers in nearby Central Thailand (the heartland of Thai tilapia culture) to use monosex seed. Never-the-less this information provoked sufficient interest among commercially oriented farms and seed distributors in the region for them to begin purchasing monosex fry produced by the AIT hatchery.

The efforts of two key individuals involved in development of sex reversal technology and the operation of AIT's hatchery played a critical role in facilitating the establishment of the first four hatcheries listed in Table 2. Both individuals were instrumental in providing informal advice and training to the first of these hatcheries; an initiative built on the foundations of an interpersonal and professional relationship which pre-dated the development of monosex tilapia. Both also played central roles in establishing the second hatchery in Ayutthaya in cooperation with a customer who regularly purchased all-male fry from the AIT hatchery, and with whom both also enjoyed good interpersonal relations. Management difficulties occurred during this second venture, relating in part to enmities among various AIT staff and technicians involved in the project. This resulted in the two key knowledge brokers, one a European, the other Sino-Thai, pursuing quite different strategies independent of one another in their subsequent cooperation with the private sector, culminating in establishment of the third and fourth hatcheries listed in Table 2.

The third hatchery was established by another major customer of the AIT hatchery whose demand for all-male fry had outgrown the supply of seed available. Assistance took the form of what was essentially an informal private consultancy based on what one informant described as "regular contact, regular visits [...] and really supporting them, giving them the hormone and the feed, showing them how to do it". A Thai research assistant with experience from the earlier venture in Ayutthaya was also employed as the farm's first hatchery manager for a period of

around a year. The fourth hatchery was established as a joint-venture negotiated by two European AIT employees, one mentioned above, the other also a research assistant from the hatchery project in Ayutthaya. In contrast to the informal consultancy given to the third hatchery this collaboration was based on a contractual system under which the former research assistant would manage the operation, with most of the capital costs borne by two Chinese-Thai investors and the remainder provided by a minor subsidiary of an agro-industrial multinational. It was envisaged that this would eventually result in the establishment of franchises throughout the country, with AIT receiving a royalty for each fish produced in return for the provision of technical assistance. This arrangement proved unworkable however, ultimately prompting the corporate partner to sell its shares to the other investors.

Number	Province	Date established	Knowledge Acquisition	Monthly fry sales in 2008†
1	Ayutthaya	1990	AIT assistance	<1 million
2	Udon Thani*	1991	AIT assistance & training	2 million
3	Phetchaburi*	1993	AIT staff (personal connection)	8 million
4	Prachinburi*	1994	Ex-AIT staff	10 million
5	Khon Kaen*	1994	Ex-AIT staff	3 million
6	Ayutthaya*, Samut Sakorn, Nakorn Sawan, Kalasin, Ubon	1995	AIT training courses & alumni, independent research	30 million+
7	Chiang Mai	1998	AIT alumni	2 million+
8	Chachoengsao*	2001	DOF (personal connection)	10 million
9	Chiang Rai	2003	DOF (personal connection)	5 million
10	Kalasin	2003	DOF (personal connection)	4 million
11	Ayutthaya*	2003	Ex- staff of Hatchery 4	<2 million
12	Mukdahan*	2004	Ex-AIT staff	<100,000
13	Nakorn Pathom*	2005	Franchise of Hatchery 4	3.5 million
14	Suphanburi*	2005	DOF (personal connection)	>2 million
15	Amnatcharoen*	2006	Hatchery 4/ Hatchery 11/DOF	1 million
16	Prachinburi	2007	Ex-customer of Hatchery 4 & nursery operator for Hatchery 6	n/a
Total‡				≈80million

Notes: * Hatcheries visited during research that informs this paper; † Average monthly fry sales as reported by operators and/or estimated on the basis of comments by key informants; ‡ At least five other commercial monosex hatcheries were reported by informants as operational but are excluded here as we were unable to confirm their status.

Table 3.2 Location, date of establishment, knowledge acquisition pathway and output of private monosex tilapia hatcheries in Thailand (modified after Belton et al, 2009b)

These events are instructive in terms of what they reveal about the cultural context in which development occurs. The contractual basis for establishment of the fourth hatchery (in which nearly all the key actors were of European origin or had extensive experience of working with Western investors), designed to formally license a university invention to a new venture, is common among European and US university linked start-ups (Miner et al, 2001). In contrast, establishment of the third hatchery – a collaboration in which both the business’ owner and the knowledge broker were Thai nationals of ethnic Chinese origin – was conducted on a completely informal, and more personally involved basis which one informant explained as follows:

“[University staff in Thailand] moonlight, they earn consultancy on the side and they get great credit socially for being people who know something other people don’t. They don’t get credit for writing literature or peer reviewed journals or anything like that, they get their credit socially and professionally through that network [...] It’s the way this technology spreads in Thailand which is through, ‘I know this, I will help you do this and you will feel a lot’, you know, ‘it’s good for our relationship’. And whether or not money transacts or not is almost irrelevant because it’s about relationships”.

This observation is supported by Brimble and Doner (2007, p1023-24) who note, with respect to Thai university-industry linkages that, ‘traditionally, the principal mechanism through which transfers of educational resources to the productive sector took place was personal contacts’. ‘Most of these relationships are essentially “moonlighting”, that is, relatively informal, undertaken outside academics’ “normal” work’, and large numbers of researchers opt for personal contacts with private companies which involve individual consulting.

There have been a further four hatchery start ups facilitated with the support of DOF officials, all of which appear to have assumed similar characteristics to those described above. The details of these relationships were difficult to obtain, with both recipients and donors of assistance acknowledging the provision of informal personal support, but evasive with regards to its precise nature. One particularly well placed informant surmised however that at least one such relationship

had its origins in kinship linkages, perhaps via marriage, whilst another was born of a collegiate relationship; the consultant having graduated in the year above his client from the same university faculty. The same informant also suggested that the basis for provision of assistance in at least one of these relationships might have been a reciprocal obligation associated with involvement in previous illicit transactions. Although there is no means of verifying the accuracy of this suggestion, the general gist of these observations tends to be supported by Mulder (1996, p63) who underlines the high cultural value placed on obligation, loyalty, and reciprocity towards one's 'parents, relatives, circle of friends, and class mates', encapsulated in the concept of *bunkhun*, which is at the foundation of Thai relationships, and closely linked to the extension of power through patronage and protection.

The operation of *bunkhun* is particularly clear with respect to the establishment in 2005 of a franchised branch of the European-operated hatchery through the connections of one of its two major Sino-Thai shareholders. The franchise was set up by two brothers (also of ethnic Chinese descent), whose other brother was a long time friend of one of the investors in the parent farm, having attended high school and university with him. The youngest of the three brothers was exhorted by his elder sibling to abandon his job as a manager in the financial sector in order to operate the hatchery, a field with which he had no previous experience, because, as he was reported to have said, "my connection [with my old friend] will be destroyed if you don't do it". The strength of this obligation was important to the success of the venture since it ensured the likelihood of loyalty and honesty in business dealings for both franchisor and franchisee, and strengthened the reciprocal bonds tying each to the other.

4.2.2 Vietnam

Closure of the lifecycle of *Pangasius* catfish also resulted from European Union funded doctoral research, the success of which was also first publically announced in newspaper articles. This work was conducted by three CIRAD employees in collaboration with researchers and technicians from

the state-owned AGIFISH Company¹⁶ and Can Tho University (CTU). As in Thailand the research comprised a single component in a larger project, but one in which the development of technologies for the commercial exploitation of a variety of catfish species was an explicit aim (IRD, 2000). A somewhat different pattern of knowledge transfer is evident in Vietnam however, since those involved in the development of artificial spawning techniques for *Pangasius* were deliberately and explicitly prohibited from assisting the private sector or in engaging in business activities of their own, at least initially, as AGIFISH and CTU sought to retain control of the innovation for their own commercial benefit. The potential income that could be obtained through performing spawnings was so great however that AGIFISH technicians were motivated to disobey company rules and collaborate in secret with nursery operators, performing the difficult spawning process for them in the evenings and during weekends in return for 30-50% of the value of the larvae produced. This equated to very substantial figures of up to \$2000 from a single spawning, with at least two AGIFISH staff reportedly making in excess of \$50,000 each from their efforts.

AGIFISH employees attempted to keep spawning techniques hidden from the hatchery owners who hired their services because of their high proprietary value, but the latter were persistent in their attempts to acquire these skills, shadowing the technicians as they performed their work and seeking to imitate the procedures they observed. As hatchery operators became more proficient in these techniques they began to operate in a similar manner, spawning broodfish for newer market entrants (generally other traditional nursery operators located in the same communes) and taking a commission, and so despite deliberate efforts to prevent its transmission on the part of both the institutions and individuals involved, this knowledge diffused amongst networked actors in key seed producing locations.

Seven of the 15 nursery operators interviewed on Phu Thuan Island (where commercial hatcheries were first established) share three surnames, a fact suggestive of the importance of kinship linkages in transmission of the skills and information necessary for hatchery start ups. This

¹⁶AGIFISH is a state owned enterprise specialising in catfish processing and export. It was equitised as a separate joint stock company in 2002 and is now one of Vietnam's most prominent catfish exporters. AGIFISH also provided some matching funds during the project

channel was particularly pronounced initially although its importance has declined somewhat as knowledge has become more freely available through formal institutional channels. Prax et al's (2000) analysis of carp seed producers in a commune (Mao Dien) in Northern Vietnam is instructive in this regard. Drawing on the typology of peasant industries in the Red River Delta advanced by French colonial geographer Pierre Gourou, the authors state that

‘Gourou’s notion of the exclusivism of the village, or clan, appears to be clearly demonstrated in the case of Mao Dien. The knowledge and techniques about fish seed production have spread extensively among people of the same clan, but have been retained within the clan. It appears that there has been no leakage of information even to Thuy Mao, a geographically distinct village within Mao Dien but populated with people of a different background’ (p26).

The importance of clan or kinship as a conduit for the extension of seed production technologies is nicely illustrated by the case of a long time nursery operator living close to Phu Thuan who was finally given the encouragement, training and advice necessary for him to establish his own hatchery in 2007 by hatchery owner from the island following the marriage of their respective children.

4.3 The failure of formal transfer mechanisms

A variety of official attempts to stimulate uptake of hatchery technologies have yielded far less impressive results than informal public-private flows of information. AIT worked closely with the Thai Department of Fisheries (DOF) from 1989 onwards in an attempt to promote the institutionalisation of monosex seed production technologies and ran an international short course training program for monosex hatchery production on a regular basis between 1989 and 1999. Short courses attracted numerous participants, mainly, though not exclusively, from public institutions in Southeast and South Asia. These efforts were not generally considered successful however. As one informant explained, “we’d also run huge numbers of trainings for both private

sector and government since the late '80s, all of which seemed to be variably ineffective in their own ways; even when we did full on intensive training for a month”.

Uptake by the public sector proved slow due to the high levels of investment in capital, time and management required for successful application of the technology. Although exposure of DOF personnel to monosex hatchery technology over a period of years did ultimately result in its institutionalisation within the Department, it was not until 2001, more than ten years after the technology first was developed, that the first hatchery was established with the support of DOF staff, indicating the length of time it took for this to occur. Even then the technology's transfer from government to the private sector occurred via longstanding interpersonal relationships rather than as part of officially recognised or promoted trainings. At least four hatcheries were established in this manner (Table 2). This pattern has also been apparent in other areas of Thai aquaculture, and indeed elsewhere in Asia, with new technologies developed at DOF fisheries stations for the artificial spawning of carps and catfish spreading to households in surrounding areas via by non-official routes as well as more formal trainings (Ingthamjitr, 1997; Little, 2001).

Another partial failure of formalised knowledge to deliver impacts relates to the transfer (or rather lack thereof) of techniques for spawning *ca tra* from Thailand to Vietnam. A method for doing so was first published in Thailand in 1959 (Boonbrahm, 1959), and reports written in English containing detailed protocols for the artificial propagation of the species in Thailand were also published in an international journal in 1967 (Ling et al), and again nearly a decade later by DOF (Potaros and Sitasit, 1976). Despite the existence of this information, attempts to spawn the fish in Vietnam in the early 1980s at the DOF's second Research Institute for Aquaculture (RIA2) relied on alternative independently developed techniques which proved unreliable and were subsequently abandoned. This failure to transfer information is due in part to political enmities during this period which made it difficult for Vietnamese fisheries students trained in Thailand to acquire access to commercial operations there, and in part because at that time scholarships were

usually given for fundamental research training rather than for improvement of the local production through practical commercially oriented research¹⁷.

5 Discussion

The preceding analysis reveals the entire process and form of development in both hatchery sectors to be the product of a complex of interacting factors and heavily dependent on interpersonal social relations. In this section we evaluate whether this process and its outcomes conform to representations of PSD advanced in the literature. In order to accomplish this it is important to distinguish between private sector development as establishment and evolution of new economic institutions (in this case the two hatchery sectors under consideration), and private sector development in the sense of (positive) economic and social transformations associated with enterprise formation. Despite affirmations that government has a role to play in ensuring that growth produced by a flourishing private sector should contribute to poverty reduction (Gibbon and Schulpen, 2000), in practice this crucial distinction is absent from most PSD literature in which the underlying assumption often appears to be that presence of the former is sufficient to guarantee occurrence of the latter. Figure 1 offers a schematic of this relationship depicted in precisely these terms taken from a UNDP *'toolkit for private sector development'*. In the following we therefore divide our analysis, dealing first with the transformations associated with enterprise formation, the most important of which, in the context of PSD discourse, is poverty reduction, before exploring the process of enterprise formation itself.

¹⁷ The research effort that eventually culminated in spawning Pangasiid catfish in Vietnam in 1995 focussed primarily on another species, *ca basa*, which was considered to have greater commercial potential, but proved far more difficult to spawn than *ca tra*, new protocols for the spawning of which were developed largely for research purposes for means of comparison with *basa*. However, once spawning techniques entered the private sector it quickly became apparent that *tra* was an almost perfect substitute for *ca basa* in export markets if grown under certain conditions, and production switched almost entirely to the former given the relative ease with which its seed could be produced and its superior performance under intensive cultivation.

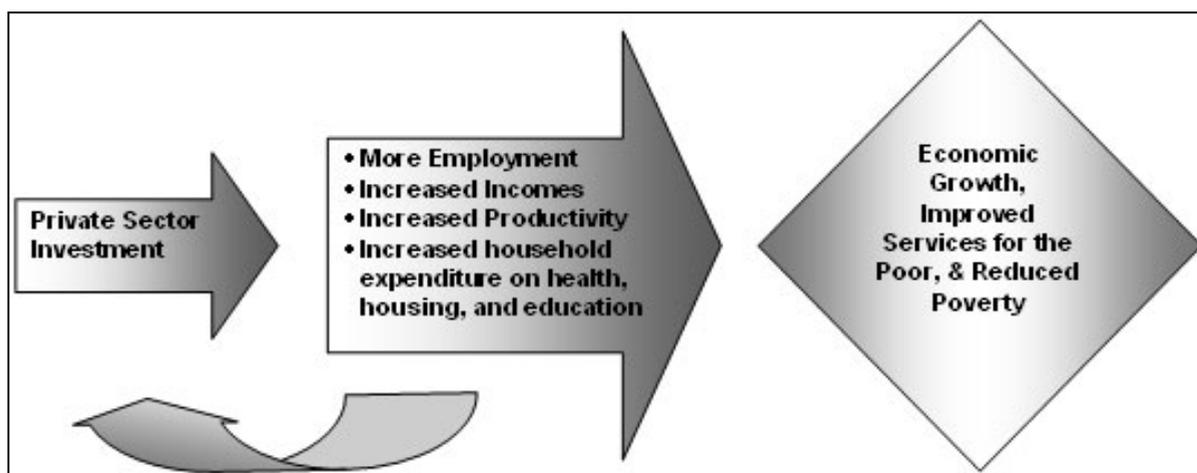


Figure 3.1 Schematic of linkages between private sector investment and poverty reduction (UNDP, 2009)

5.1 Economic and social transformations

A very rough calculation suggests the basic annual farmgate value of the Vietnamese Pangasius hatchery sector (the total value of hatchlings produced) to be in the order of \$1.85 million, while combined annual output of month old fry from Thai monosex tilapia hatcheries may be worth in the region of \$10.25 million¹⁸. When value added by nursing is considered, these totals will be considerably greater, perhaps by around an order of magnitude in the case of Pangasius, but are much more difficult to calculate with any degree of accuracy given much greater product and market value variability. As an earlier section suggests, far greater value yet is added when one considers receipts from downstream activities (i.e. growout farming, processing, and the supply of other ancillary services and other inputs).

Direct salaried employment in hatcheries is limited and unlikely to exceed 1000 for the whole Thai monosex tilapia sector, most of which is in the form of unskilled or semi-skilled labour. A similar situation prevails in Vietnam. Belton et al (2008) suggest that small-scale early nursing operations for Pangasius fry may provide a viable alternate livelihood option for low-income rice farmers and yield considerably better returns than paddy. Advanced nurseries for the production of

¹⁸ Based on an estimated annual production of 23 billion Pangasius hatchlings in 2007-2008 (Sinh and Hien, 2009) with an approximate average sales value of VND1.5 (\$0.0000806) each, and estimated annual production of 768 million 1 inch monosex Nile tilapia fry with an estimated sales value of THB0.31 (\$0.0093) each and 192 million 1 inch red tilapia fry with an estimated sales value of THB0.53 (\$0.016)

larger fingerlings are more costly to operate but may still offer opportunities to some relatively low-income households. No official figures for total numbers of *Pangasius* nursing operations exist but they are likely to number in the region of 6000-8000 (Pers. Comm. L.X. Sinh, 23-2-10), with limited levels of primary employment associated with those at the smaller (and more numerous) end of the scale. Nursing monosex tilapia is only necessary for cage-based culture systems, and is for the most part carried out either by hatcheries, by a small number of traders dealing in large volumes of seed, or by farmers themselves prior to stocking.

Operation of export-oriented *Pangasius* farms is extremely capital intensive, meaning that only the wealthy are able to participate (Mantingh and Dung, 2008). The range of tilapia farming systems (and farmers) in Thailand is much more diverse but entry costs are, for the most part, still sufficient to prevent direct engagement by very low income households. Primary employment intensity in growout is fairly low for both farming systems. Belton et al (2011a) give a figure of 2.75 fulltime workers per hectare on *Pangasius* farms, which would equate to a total of approximately 20,000 jobs. More substantial employment opportunities may exist in employment elsewhere in the value chain, particularly, in the case of Vietnamese catfish, in processing, which creates 116,000 jobs (Lam et al, 2009). The majority of these are not skilled or well remunerated however. Marketing tilapia probably also creates considerably greater employment than farming itself in Thailand and may offer some entrepreneurial opportunities with fairly low entry barriers, particularly in the form of mobile market stalls selling cooked fish, along with wage work for poorly paid migrant labour in wholesale markets and harvesting teams (Belton, 2006).

This overview would suggest that most accumulated capital is concentrated in the hands of relatively few actors at each node of the value chain (e.g. hatchery operators, large growout farmers, feed companies and, in Vietnam, processors). Most wage labour also appears to be low skilled, and remunerated at levels similar to other comparable activities, with some market space created for small and medium scale entrepreneurial activities. It is not clear on the basis of this study whether households are 'pushed' or 'pulled' into these jobs and activities, and under what circumstances (i.e. whether out of desperation or in response to apparent opportunity). These conditions may have important consequences however in as far as they might result in, variously:

the extraction of households from poverty, the maintenance of holding patterns in which one low value activity is exchanged for another, or deepening immiseration (Reardon et al, 2007). It is thus difficult to divine whether either hatchery sector, or the value chain into which it feeds, has contributed to the reductions in poverty predicted by PSD discourse - a question to which there is in any event probably no single clearly defined answer. Figures for output value are thus also opaque with regards impacts on poverty, except at the level of abstraction of Dollar and Kray's contention that 'growth is good for the poor' (2002), whatever the circumstances, and should therefore be treated with circumspection as indicators in the absence of far more detailed contextual information.

It is also difficult, perhaps impossible, to differentiate fully between development outcomes attributable to the genesis of the hatchery sector, and those linked to a variety of other ongoing processes without which sectoral development would have been unable to advance. The clearest example of this is the backdrop of *doi moi* policy reforms enacted in Vietnam after 1986 which created the preconditions necessary for intensive export-oriented aquaculture (and hence demand for hatchery produced *Pangasius* seed) to emerge: namely, creation of land and labour markets liberalisation of markets for agricultural inputs and outputs, and promotion of exports and foreign direct investment (Nghiep and Quy, 2000). Belton and Little (2008) also link Thailand's open trade and investment regimes and participation in global trade to agro-industrialisation, investment in infrastructure and the growth of urban markets, all of which have been critical factors in stimulating the development of commercial domestic aquaculture. Both these observations would appear to support PSD policy prescriptions which envisage the appropriate role of the state as creating an 'enabling environment' for the private sector through implementation of liberal macroeconomic policies.

However, other elements which do not bear the hallmarks anticipated by PSD discourse feature in both cases. Vietnam's expansion of *Pangasius* culture accelerated almost exponentially post 2003, increasing approximately eight fold from 163,000 tons to 1.3 million tons in five years (Dung, 2008). Ironically, this growth is an indirect outcome of protectionist tariffs imposed in 2002 by the United States (formerly Vietnam's main market for *Pangasius*) at the behest of a lobby of

American farmers producing another species of catfish (Davis, 2006). This action prompted Vietnamese processors to begin concerted efforts to proactively expand and diversify their markets. As a result, exports to the EU and former Eastern Bloc countries grew dramatically (Belton et al, 2011a), in part because *Pangasius* was a close substitute for traditionally consumed marine fish such as cod and haddock, stocks of which are heavily depleted (Bush et al, 2009). In a somewhat similar manner the Asian economic crisis of the late 1990s contributed positively to the growth of markets by stimulating the emergence of *talad nat* - temporary markets selling freshly prepared food and daily necessities (Yasmeen, 2001) – which are perhaps the most important sites at which large monosex tilapia retail. The crisis also coincided fortuitously with the Charoen Pokphand Company’s attempts to establish a market for cage-produced red tilapia, by offering middle class consumers with reduced spending power a relatively cheap yet acceptable substitute for expensive marine species (Belton et al, 2006).

All of this points to the difficulty in establishing clearly defined relationships between enterprise formation and pro-poor outcomes, and even between these and macroeconomic conditions, without recourse to detailed, preferably qualitative, sectoral evaluations. Such evaluations are rare however. Crude econometric extrapolations based on panel data taken to indicate the effects of whichever variable or variables are under consideration as candidates for promoting growth and alleviating poverty are by far the more common form of analysis; an approach which produces simplistic ahistorical accounts that fail to adequately integrate ‘the complex causal nature of the social world’ (Kenny and Willams, 2001, p20). The decontextualised and highly abstracted conclusions yielded by these approaches are central to PSD discourse and act to render all development devoid of the political economic context in which it is embedded. Appeals to PSD thus depoliticise and deproblematise development in much the same manner of appeals to another development trope, social capital (Fine, 2001; Harriss, 2002).

5.2 The process of enterprise formation

It is a simple matter to demonstrate that PSD generates positive outcomes in the most general sense since to seek validation of the concept with reference to the same conceptual and

methodological toolkit used in its construction is bound to be a self-fulfilling endeavour; it being far more difficult given this set of tools to imagine a situation in which PSD could deliver anything but positive outcomes for all concerned. Confirmation is less easily accomplished in a contextually situated, empirically rich, and more convincing manner without access to detailed and extensive ethnographic data of a type that has infrequently, if ever, been sought for this purpose. Furthermore, to draw broad conclusions linking PSD to reductions in poverty reveals nothing of the mechanisms by which the formation of new enterprises (the process from which this outcome is supposed to derive) occurs. In an attempt to do so the following subsection addresses the formation of businesses in both hatchery sectors and explores their implications with respect to PSD policy.

According to Granovetter;

‘In the case of the evolution of an industry, as for the development of firms and business groups, stable economic institutions begin as accretions of activity patterns around personal networks. Their structure reflects that of the networks, and even when those are no longer in place, the institutions take on a life of their own that limits the forms future ones can take; they become 'locked in'. Thus, economic problems and technology do not call forth organizational outcomes in some automatic and unconditional way. Instead, these economic conditions restrict what the possibilities are. Then, individual and collective action, channelled through existing personal networks, determine which possibility actually occurs’ (1992, p9).

This theoretical perspective is borne out and augmented by Jack et al (2008, p128) who, based on a detailed longitudinal study, find that entrepreneurs use their social networks to build the foundations for new ventures. The authors note that, ‘for our entrepreneurs, economic interaction always followed some form of social interaction’. Existing social ties influence opportunity recognition and resource mobilization, and personal affinity plays an extremely important role in the development of relationships with potential and actual business associates. Furthermore, where

new instrumental relationships occur they usually undergo subsequent deepening and ‘multiplexing’
(*ibid*)

Both sets of observations correspond well to findings presented in earlier sections; the earliest hatchery start-ups in Thailand being implemented by networked individuals who formed relationships with key knowledge brokers, either through earlier contacts in a professional capacity, by purchasing seed from the AIT hatchery, or by working there. Strong personal affinity between the main participants was evident in each case, and relationships did undergo ‘multiplexing’ (increased sociability) as they developed. In Vietnam links to technicians at the AGIFISH hatchery were also established by nursery operators from Hong Ngu who began to purchase seed there, some of whom are likely to have shared other social connections prior to this. Relationships in this instance were less complex however, being centred, at least initially, around clearly defined financial transactions involving the seeking of rents by AGIFISH technicians. This is in contrast to the more complex reciprocal partnerships founded on a range of motivations that feature in the Thai account.

Subsequent formation of the hatchery sector occurred in a far more geographically (and socially) concentrated manner in Vietnam than in Thailand due to diffusion of the technology along kinship and, later, friendship lines within the tightly knit community. Interestingly, all but one of the monosex tilapia hatcheries we visited was based on a similar design that could be traced directly to that first developed at AIT. The one exception to this rule, which incorporated high levels of automation and appeared extremely technologically sophisticated, was established by a hatchery operator who received support from a senior DOF official and appeared to incorporate elements of hatchery design from several other countries with which the official would have been familiar. Both these observations bear out Granovetter’s contention that the form of initial interpersonal relations exerts an important influence over the subsequent form of individual businesses and industries.

Material considerations also shape both the form of development and that of the relationships on which it relies however. Commercial scale Pangasiid hatchery production is a simpler, less time consuming, capital intensive and organisationally complex activity than monosex

tilapia seed production for reasons related to differences in reproductive biology. Thus, for tilapia, an involved consultancy and support process maintained over a long period of time, which the main knowledge broker was strongly committed to, offered a more appropriate model of technology transfer than a single formal training. In many ways the knowledge broker acted therefore as a business partner. Such crucial relationships (developed from origins in existing networks of contacts linked to AIT and, later, DOF) where an important element of trust was required to offset the considerable risks of investing in the major undertaking of hatchery start up, could likely not have been established on a purely instrumental basis or maintained in the absence of personal affinity. Thus it can be seen that ‘in the production process [and in the process of enterprise formation], technological systems, social relations, and natural forces interact recursively, each defining the existence and viability of the other’ (Lighthall and Roberts, 1995, p320).

The informal basis of the knowledge transfer that occurred in both cases can be seen in part as ‘a response to the inadequacies of formalization’ (Lomnitz, 1988, p42) whereby ‘the inability of the formal system’, in this case universities and extension agencies, ‘to satisfy societal needs gives rise to informal solutions’ (*ibid*, p54), although this happened for somewhat different reasons in each case. Such recourse to informality may also be what Knutsen (2003) refers to as ‘culturally embedded’. Kagawa and Bailey (2006) identify a ‘generalised morality’ which among both Thais and Vietnamese which is seen to promote business relationships based on trust, ‘where enforcement costs are minimised through informal social action designed to establish conditions in which markets are self-regulating’, with the result that informal agreements rather than formal contractual relations govern even high value export orders between the two countries and Japan.

These informal reciprocal interpersonal relations bear some of the hallmarks of Chinese *guanxi*; the connection between two independent individuals which enables a bilateral flow of personal or social transactions from which both parties derive benefits (Yeung and Tung, 1996). The same practice (*quan he*) is also evident in Vietnam, which shares China’s Confucianism (Tang et al, 2007), and is somewhat similar to the Thai concept of *bunkhun* discussed in an earlier section. This is not to invoke a kind of cultural determinism, akin to the ‘oversocialization’ of accounts of economic activity which Granovetter (1985) critiques, but rather to suggest that collective cultural

understandings may contribute to the shaping of economic strategies, goals (Knutsen, 2003) and institutional forms.

6 Synthesis and Conclusion

This paper has subjected the concept of private sector development to critical empirical analysis by comparing portrayals of PSD in the policy documents of post-Washington consensus institutions with two case studies detailing the emergence of dynamic productive enterprises catalysed by donor support to public institutions. This exercise reveals: a) the central role that culturally mediated interpersonal relationships and associated modes of non-formal knowledge transmission have played in potentiating the agency of entrepreneurial actors engaged in new enterprise formation, and; b) the manner in which this agency is mediated by the interplay of historical context and material qualities of the technologies deployed. It also suggests that the relationship between enterprise formation (development *of* the private sector) and pro-poor outcomes (development *by* the private sector) may be rather ambiguous despite the generation of high aggregate economic value, with the result that overall impacts on poverty are difficult to establish conclusively in all but the most abstract economic terms. Furthermore, it indicates that private enterprises can flourish under a range of conditions, including both those corresponding with features conventionally considered to indicate a ‘good investment climate’ and others that would typically be considered to indicate anything but.

Bordieu (2005, p10) observes that, ‘economic theory ... is never as neutral as it wishes to believe or make out, and the policies implemented in its name or legitimated through it ... are steeped in all the assumptions inherited from immersion in a particular economic world, which is a product of a singular social history’. This has crucial implications with respect to the results discussed here. Fine (2002, p144) considers the post-Washington consensus – the discourse and set of institutions from which the sub-discourse of PSD originates – ‘reductionist’, by which it is meant that, in keeping with the ‘narrow analytical principles attached to rational choice in an imperfectly formed world’, it strips away ‘the complexity and social and historical content of issues’ pertaining to development (*ibid*). Although the thrust of Fine’s critique is directed at World Bank

appropriation and deployment of the concept of social capital, it is equally applicable to PSD. Only in stripping away, 'the historical, the social and the specific' says Fine, can the theory of social capital claim 'its (false) generality'. This results in the creation of a 'chaotic' and 'ambiguous' category, 'that can be used as a notional umbrella for almost any purpose' (p184; p155). An array of other discourses propagated by the same set of multi-lateral institutions (sustainable development, participation, and good governance among them) function in a similar manner and to similar ends, conferring apparently universal applicability upon a set of historically and geographically specific values. This operation, which is most often conducted with reference to economic logic, produces constructions of reality that at once advance and conceal the interests of First World capital and hegemony (Escobar, 1995).

The level of decontextualisation required for PSD to achieve its apparent universality and consequent intuitive appeal means that it has little power as an explanatory framework other than at the generic level of macro-economic abstraction. Analysis in preceding sections reveals economic development to unfold in a manner tempered by numerous historical and cultural specificities. The translocation of values and assumptions about economic behaviour which PSD demands may therefore run counter to local practice, and fail to bring about anticipated results if translated into policy. Lomnitz (1988, p54) notes that, 'informal exchange develops within modern formal systems according to the same rules of sociability determined by a particular culture'. This is particularly evident from preceding sections, which show informal relationships linking actors from the public and private sectors to be extremely effective conduits for the transfer of productive technologies in the Southeast Asian context, both in terms of rapidity and cost of delivery, and rate and sustainability of uptake. The false generality inscribed in PSD discourse means however that the value of social relations such as these may go, at best, unrecognised or, at worst, misconstrued as corrupt, and potentially lead to their attempted suppression by policies intended to promote private sector growth.

Chapter 4 - The Social Relations of Catfish Production in Vietnam

(Submitted to Geoforum)

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Abstract: The growth of intensive export-oriented *Pangasius* catfish production in Vietnam's Mekong Delta is unparalleled in terms of rapidity and scale by any other agricultural sector, with production climbing from a low base to more than 1 million tons in a single decade. This paper examines the effects of this remarkable change on the rural class structure in locations where catfish farming has boomed, and analyses the role of local state-society relations in mediating outcomes resulting from the integration of local actors to a global value chain. We conclude that private economic activity is deeply embedded in informal relations with the state bureaucracy in Vietnam, with the result that the expansion of catfish aquaculture has generally acted to reproduce and entrench existing class relations rather leading to a radical reconfiguration of the rural class structure.

Keywords: Vietnam, aquaculture, social relations, agrarian change, development

Acknowledgements: The authors would like to acknowledge the British Council Connect Research and Co-operation award for the project *Promoting sustainable high quality river catfish seed production in Vietnam*, without which the research that informs this paper would not have been possible. We also thank Jock Stirrat for his thoughtful comments on early drafts of the manuscript.

The Social Relations of Catfish Production in Vietnam

1 Introduction

The rise of intensive export-oriented Pangasiid catfish production in Vietnam's Mekong Delta has been virtually unparalleled by any other agricultural export crop in any other location in terms of sheer rapidity and scale. Between 1997 and 2007 output of *Pangasius*, which had previously been cultured mostly for local or subsistence consumption, increased 45 fold by volume and 55 fold in export value (Dung, 2008). Production estimates for 2008 suggest that the value of Vietnamese *Pangasius* exports is likely to have matched or exceeded those for Vietnamese rice, coffee and shrimp (Dung, 2008; FAO, 2009c). Almost 90% of this expansion has occurred in just five years between 2003 and 2008. Production (which is confined to nine adjoining Delta provinces and most heavily concentrated in three - An Giang, Can Tho, and Dong Thap) now approaches the total global output of farmed salmon. Vietnam has become the third largest producer of farmed aquatic products in the world and reports the second fastest growth rate in aquaculture output of any country (FAO, 2007). *Pangasius* has been a major contributor to this growth, accounting for approximately one third of national aquaculture output, and half that of the Mekong Delta (Loc et al, 2009).

These figures appear to hint at a rapid and profound agrarian transformation taking place in provinces at the heart of the *Pangasius* boom as producers have become increasingly integrated into the global economy via the product's emergence as a major commodity. In many countries, growth in non-traditional agricultural exports 'destined for affluent capitalist markets' has caused 'rural economy and society' to become 'radically restructured' (Murray, 2001, 136). For Murray, writing of booms in the export of 'exotic' fruits and vegetables from the Pacific Islands, this has meant that 'although some material benefits are visible... smaller growers have found it difficult to survive', and has resulted in a 'concentration of leaseholds in the hands of a number of more successful growers'. In a similar vein, Gwynne (1999) finds that widespread indebtedness and proletarianisation on the part of small fruit growers has accompanied the growth in Chilean fruit

exports. This pattern is also noted by Fold and Gough (2008) for small scale pineapple growers in Ghana. Barret et al (2002), report a more mixed set of outcomes for fishing communities touched by the massive expansion of export driven Chilean salmon production however, whilst Ito (2002) and Islam (2009) record ambivalent but by no means entirely negative changes affecting the lives of smallholders and communities in areas linked into global value chains by the ‘gold rushes’ associated with production of giant freshwater prawn and black tiger shrimp in Bangladesh. Whilst this paper is not specifically couched in terms of the global value chain analysis that many of these authors employ it is never the less able to contribute to this body of work via its examination of the local level processes at play in, and results of, the remarkable development of *Pangasius* as a global commodity.

The *Pangasius* boom remained poorly documented until very recently aside from the seafood trade press and Vietnamese academic literature, and the majority of this coverage focussed on technical issues, with less attention paid to the broader political economic context that shaped the industry’s development (see Bush and Duijf, Forthcoming; Loc et al, 2009; Sinh, 2007 for recent exceptions). Empirically grounded accounts of the changes experienced by those actors engaged in or affected by the industry have been similarly lacking. Moreover, whilst there is a wealth of academic literature addressing various aspects of agrarian change in Vietnam post *doi moi* (see for example Kerkvliet & Porter, 1995; Boselie, 2002; Yamazaki, 2004) relatively little of this ventures beyond the realms of historical abstraction to address how micro level state-society relations have shaped development¹⁹. This paper therefore aims to contribute some redress of the balance, both with respect to furnishing a more comprehensive history of this extremely significant commodity production system, and unpacking its workings and implications in somewhat ‘thicker’ terms than are commonly to be found elsewhere in the literature.

The paper is divided into a further seven sections. Firstly, it details the circumstances under which the research took place and their bearing on the data generated. Secondly, it outlines a

¹⁹ Lutterell (2001) provides a notable exception to this general observation

general history of Pangasius culture in Vietnam from its origins to the present day. Thirdly, it describes material features of intensive Pangasius growout which affect its production economics and, consequently, its social characteristics. Fourthly, it examines the social and economic characteristics of those who engage in the activity based on an assessment of farm ownership disaggregated by size of landholding. A fifth section extends this analysis to unpack how the social capital inhering in various networks and relationships shapes outcomes for those engaged in catfish production. A penultimate section explores how access to resources including land, credit and extension services is mediated by these social relations. The final section synthesises the implications of findings from preceding sections.

2 Research Methodology

Primary research that informs this paper was collected over a three month period in late 2008 over five week-long field visits to the three most important catfish producing provinces in the Mekong Delta; Dong Thap, An Giang, and Can Tho. This effort was carried out as part of a research project investigating issues affecting the quality of Pangasius catfish seed (the juvenile fish used to stock growout operations). The scope of this work was primarily technical in nature, and dealt mainly with issues pertaining to hatchery, nursery and growout farm management practices, and producer and user perceptions of Pangasius seed quality. Supplementary investigations into agrarian change associated with development of the catfish industry form the basis of this paper. Thus, of the 100 interviews listed in Table 1 below, it is primarily the 33 relating to growout farms which inform this paper, although relevant information collected during interviews with the other actors listed is also drawn upon²⁰.

²⁰ The selection of growout farmers (and others) for interview was rather restricted since this was often (though certainly not always) decided by the officials assigned to accompany us in each location where research took place. Our interviewee selection was therefore, particularly in the earlier stages of the research, somewhat biased toward larger operations and to farmers well known to officials. However, wherever possible we encouraged our guides to take us to meet a heterogeneous and representative cross section of operations. Given these somewhat restricted circumstances, we made every attempt to triangulate our findings (and their validity) through discussion with other researchers and comparison with secondary material, and by making use of information gained from direct observation in the field and informal conversations among participants in the research and our accompanying entourage of officials. Thus, although constrained, we eventually arrived at what was, as best we could determine, a fairly representative sample of capitalist farms.

Scott, Miller and Lloyd (2006) reporting on their experiences as foreign researchers attempting to conduct qualitative social science fieldwork in Vietnam note that ‘despite our intentions, restrictions [imposed by local cadres] on time and the nature of our research activities in communities meant that our original research strategy and methods had to be adapted’ (p31). This observation matches closely the experience of conducting the present study, during which a highly sensitive and politicised climate encountered and the extent of state bureaucratic control extended over the research activities placed limits and boundaries, explicit and inferred, on topics of conversation which could be productively explored with respondents. This milieu generates ‘a tendency in Vietnam for the positivist paradigm to dominate empirical research design and practice, as reflected in a bias toward ‘apolitical’ quantitative methods’ (*ibid*). Complying with these expectations and constraints therefore made it necessary to adopt a somewhat more structured interview format and less flexible approach to informant selection than was initially intended. Two major surveys of the status of *Pangasius* production in the Delta were also conducted in 2008 (Sinh and Hien, 2010; Lam et al, 2009) and results from these are drawn on in subsequent sections of this paper for the depth of complimentary quantitative data that they add to the principally qualitative information generated by the study reported here.

Location		Informant Category						Total
Province	District	Hatchery	Nursery	Growout Farm	Processor	Seed Trader	Government official*	
<i>Dong Thap</i>	Cao Lanh	2	8	4	-	-	1	15
	Hong Ngu	15	3	-	-	-	1	19
<i>An Giang</i>	Tan Chau	8	4	-	-	1	3	16
	Long Xuyen	2	3	6	1	-	2	14
	Chau Thanh	-	4	7	-	-	2	13
<i>Can Tho</i>	Thot Not	1	2	16	-	-	1	20
	Vinh Thanh	1	1	-	-	-	1	3
Total		29	25	33	1	1	11	100

* District division and provincial Department of Fisheries/Department of Agriculture & Rural Development officers, Commune People’s Committee officials

Table 4.1 Location, type and number of informants

2 A Brief History of Pangasius Culture in Vietnam

The Pangasiid catfish *Pangasius bocourti* (*ca basa* in Vietnamese) and *Pangasianodon hypophthalmus* (*ca tra*) have been farmed in the Mekong Delta since the 1960's. Their culture was originally reliant on wild fry harvested during May/June in the specialised 'bagnet' fishery on the Hau and Tien branches of the Mekong River in Cambodia and in the Vietnamese provinces of An Giang and Dong Thap (Van Zalinge et al, 2002). A north to south cross-border trade in wild seed developed as inhabitants of several communes along the two rivers close to the Vietnamese side of the border developed specialised nursing techniques for rearing wild riverine seed in ponds. Successful techniques for the artificial propagation of *basa* were developed in 1996 through research carried out by a collaboration between researchers at Can Tho University, AGIFISH (a provincial state owned enterprise in An Giang), and the French Agricultural Research Centre for International Development (Phuong and Oanh, 2010). The supply of privately produced Pangasius seed became established in 1998 after existing nursery operators paid AGIFISH staff to work as unofficial consultants, allowing them to quickly adopt hatchery-based spawning techniques (Belton et al, 2008). This proved a critical factor in facilitating the expansion of catfish culture since it removed seasonal constraints on the availability of wild seed (Sinh, 2007), catches of which were already in decline due to the overexploitation of wild Pangasius stocks, and circumvented an, albeit ineffective, ban imposed by Cambodia in 1994 on the export of seed (Van Zalinge et al, 2002). The trend to hatchery production was reinforced by a Vietnamese ban on fishing wild seed implemented in 2000 (Belton et al, 2008).

Although research initially concentrated on the induced spawning of *basa* because of its perceived potential for export, *tra* proved considerably easier to spawn, more fecund, hardier, and faster growing. It also proved acceptable to export markets, resulting in an almost complete reorientation towards its production by hatcheries and growout farmers²¹. As a result, *tra* now

²¹ *P. hypophthalmus* (*tra*) was originally considered a somewhat inferior species, and was raised primarily in small latrine ponds for subsistence consumption or local sale. *Basa*, which was felt to possess superior flesh quality to *tra*, was raised in large floating wooden cages moored in the two branches of the Mekong

accounts for virtually the entire output of farmed Vietnamese Pangasius catfish. It is estimated that by 1997 Delta provinces produced 40,000t of Pangasiid catfish (FAO, 2009b) (see Figure 1). This was eaten locally and small quantities were increasingly exported, particularly to Australia (Tuan, 2003), where it is possible that initial exports catered to overseas Vietnamese already familiar with the product. Since this time the proportion of Pangasius production exported has grown year on year, from approximately 65% in 2000 to 91% in 2008. The remainder is sold either in local markets or restaurants (Loc et al, 2007; Loc et al, 2009).

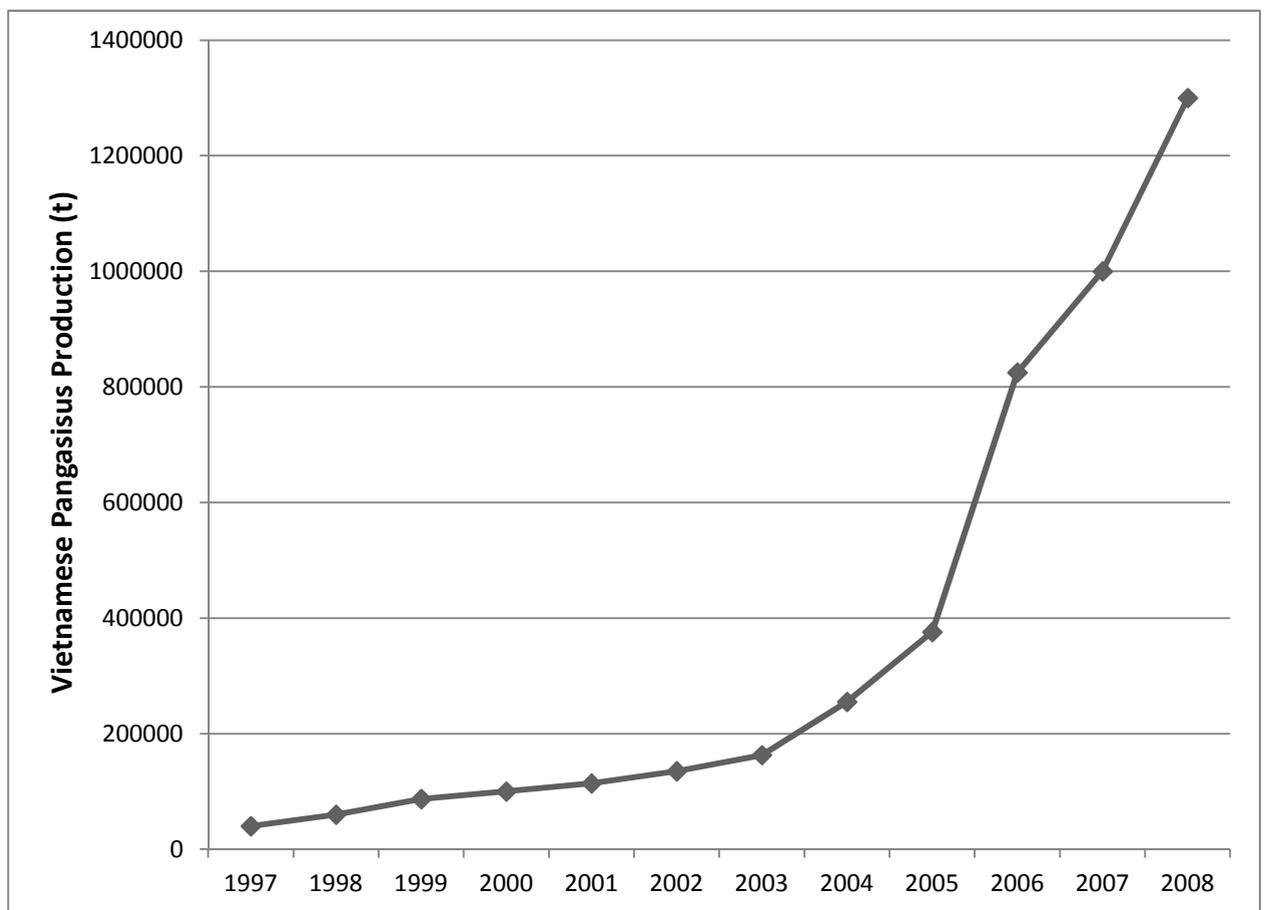


Figure 4.1 Vietnamese Pangasius Production, 1997-2008 (FAO 2009b, Dung, 2008)

In 2000 Vietnam signed a Bilateral Trade Agreement with the USA which resulted in major reductions in the tariffs imposed on imported goods by both countries (Davis, 2006). Vietnamese Pangasius proved a close product substitute for indigenous channel catfish (*Ictalurus punctatus*) farmed in the southern United States, and exports of Vietnamese product to the US jumped

sharply in response to these new trading conditions. By 2001 the USA had become the largest market for Vietnamese Pangasius exports, accounting for 71% of total market share (calculated from figures in Duc and Kinnucan, 2008). This perceived threat to US domestic producers prompted an industry body, the Catfish Farmers of America (CFA) to lobby for measures against the imported Vietnamese product. Legislation passed in 2002 as a result of this political pressure ruled it illegal to market exotic Pangasiid species as “catfish” within the US. This barrier did little to stem the tide of imports under alternative names however, and CFA rapidly launched a petition requesting anti-dumping measures to be taken against Vietnam. Although founded on the essentially baseless claim that Vietnamese fish were being exported at below production cost this unilateral action was successfully enforced. As result, a tariff of 38-64% was imposed on Vietnamese imports, with the lower rates applying to large companies which had been able to cooperate with the investigation by providing information, whilst the higher rate applied to primarily to smaller producers who had been unable to engage in the process (Davis, 2006).

The most immediate effect of the anti-dumping decision was a decline in the farmgate price of basa to below production costs, leading to the loss of an estimated 8000 jobs (Zweig et al, 2005) as the US share of Vietnamese catfish exports tumbled to just 6% in 2003 (calculated from figures in Duc and Kinnucan, 2008). This forced cost-cutting measures amongst producers and processing factories, led to the restructuring of contracts in favour the latter (Bush et al, 2009), and resulted in greater production efficiencies, the most significant of which was a comprehensive shift from production in cages to production in ponds from 2003 onwards (Figure 2). The Vietnam Association of Seafood Exporters and Producers (VASEP) - a trade association established in 1998 and comprised mostly of larger seafood processors - benefitted from the increased membership and financial contributions it gained whilst attempting to fight the anti-dumping case, and was able to bring its growing power to bear in seeking to open up new markets such as the EU, aided by the low value of the product following the collapse of the American market (Zweig et al, 2005). Publicity surrounding the so-called ‘catfish war’ may also have assisted in raising the profile of Pangasius, thus easing its entry into these markets (Sanh, Pers. Comm. 11/12/2008). As a result, exports recovered very rapidly, tripling from 10,955t to 33,304t between 2001 and 2003 (Duc and

Kinnucan, 2008). Thus, through rapid adaptive restructuring and reorientation processors (represented by the independent but state-endorsed VASEP) and some producers were able to turn the apparent crisis to their advantage.

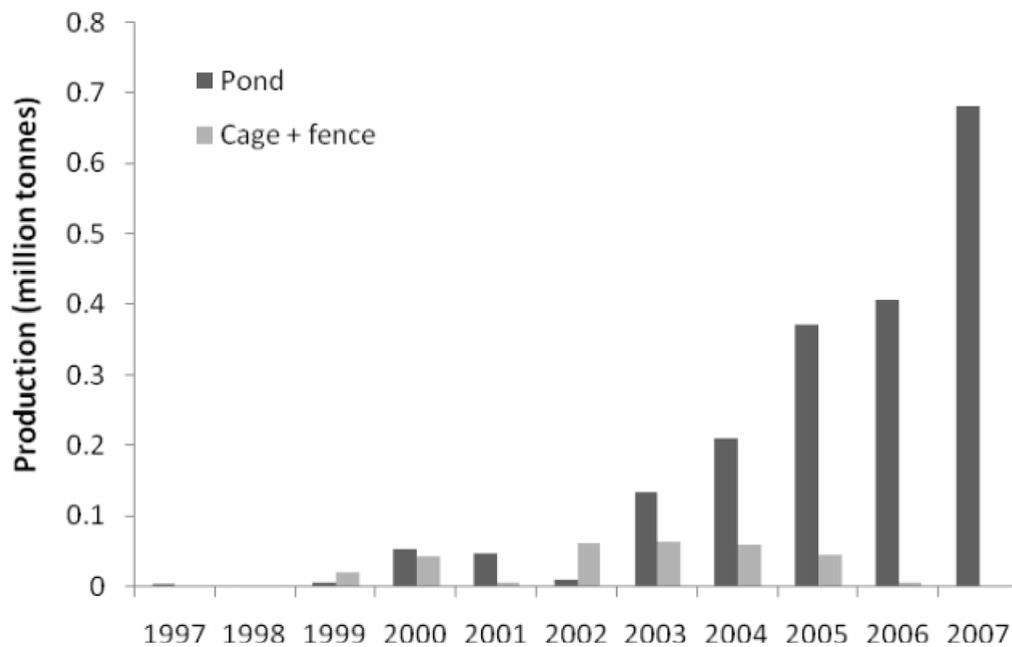


Figure 6.2 Pangasius production by source (Lam et al, 2009)

Production and export to diversifying markets has accelerated rapidly since this time, particularly to EU and former Eastern Bloc countries where demand for alternatives to traditionally consumed marine white fish such as cod and haddock has risen sharply (Figure 1). A corresponding expansion of ponds has occurred across the Delta in a spontaneous and relatively uncontrolled manner despite the imposition of elaborate land use plans, and government production targets set in an attempt to control the expansion of Pangasius production have been exceeded almost as soon as they have been established (Bush et al 2009).

Pangasius has become a significant source of export earnings as a result, worth almost \$1 billion in 2007 (Dung, 2008), and reportedly supports the livelihoods (directly and indirectly) of 105,535 individuals and provides an additional 116,000 jobs in the processing sector (Lam et al, 2009). The industry is therefore significant at the national level and is of particular importance to the Mekong Delta due to its geographical concentration there. Taussig et al, writing in 2003 when exports of Pangasius were substantial but had yet to attain anything like their current levels (see

Figure 1) noted that the three Delta provinces with the fastest growing GDP since the turn of the century had all been ‘provinces closely tied to the seafood business’. At this time shrimp exports from the Delta were worth considerably more than those of Pangasius, but the authors’ observation that, ‘a significant transition appears to be underway wherein aquaculture products are increasingly displacing rice as the country’s leading product’, and that ‘this transition has been particularly evident in the Mekong Delta’, is equally pertinent to catfish (Taussig et al, 2003, p9-10).

Such dramatic expansion has not been unproblematic for those engaged in production however. Sinh (2007) reports government estimates which suggest that 50% of Pangasius farmers suffered net financial losses on their production during 2005. Comments made by interviewees during the course of this study suggest that 2008 was even worse, with many invoking a “crisis” caused by farmgate prices well below production cost - the former resulting from oversupply of raw Pangasius caused by a large expansion of production capacity during 2007; the latter from a convergence of rising feed and other input costs linked to peaking oil and agricultural commodity prices during the first half of the year (Piesse and Thirtle, 2009). This led one farmer who had managed to brake-even on the sale of a recent crop to describe himself as “one of the luckiest people around here”, whilst another dramatically declared the industry was suffering from a “cancer”. As a result there has been a marked increase in the number of ponds left fallow, with Intrafish (2009) reporting that 30% of catfish ponds in An Giang and Dong Thap, the two provinces with the largest output, remained unstocked in March of 2009. Labrousse (2009), who conducted research at a similar time, also reported large numbers of ponds left vacant in An Giang. Reports from the Department of Agriculture and Rural Development indicate that about 70% of all Pangasius catfish farmers obtained negative profits in 2009.

4 Important Features of the Production System

Before proceeding with a more detailed examination of the implications of this development it is necessary to draw the reader’s attention to certain material facets of intensive Pangasius culture as practiced in Vietnam which affect its production economics and, consequently, its social characteristics. This is not to invoke the production system itself as the principal driver of

associated agrarian change, but rather to acknowledge that the material realities of the production system to some extent delimit the range of outcomes, social and otherwise, which may occur (Schut, 2009).

P. hypophthalmus has the ability to breathe atmospheric oxygen above the water's surface in addition to dissolved oxygen beneath it. This physiological characteristic allows it to tolerate environmental conditions which would be fatal to many other commonly cultured fish species, thus making it possible to culture at extremely high densities. Extremely high per unit area yields of *Pangasius* can thus be obtained within the six month period that it takes the fish to reach marketable size of 1kg, and the average yield per crop from farms located in inland provinces of the Mekong Delta is 369.7t/ha (Sinh and Hien, 2009). If market conditions favour the production of two crops in a year it is therefore entirely feasible for a single farmer to produce well in excess of 600t of catfish per annum from a single hectare of ponds (Wilkinson, 2008). By way of comparison, yields per hectare for carps and tilapias produced in ponds may reach an upper limit of 20t per crop if highly intensive management strategies are employed (Edwards, 2009). These exceptional yields make Vietnamese *Pangasius* culture the most intensive and productive commercial food production system on earth.

Maintaining such high standing biomasses of fish depends upon the application of correspondingly massive quantities of fish feeds, and feed accounts for 75% or more of operating costs (Lam et al, 2009). Assuming a cost per kilogram of VND7000 (\approx \$0.41) for feed, a food conversion ratio of 1.6, and a yield of 300t/ha (all figures at the conservative end of those quoted by informants) this equates to total operating cost of VND4.48 billion (\approx \$252,300) per crop. This figure is closely in line with the VND4.23 billion (\approx \$237,475) average cost per crop/ha⁻¹ in inland Delta provinces given by Sinh and Hien (2009). Margins are also extremely slim - Bush et al (2009) give a figure of VND1000/kg (\approx \$0.07), but the scale of investment is so great that even at this level it is possible to achieve net returns far in excess of those derived from alternative agrarian activities (Wilkinson, 2008). Sinh and Hien (2009) report an average of net income of VND809 million (\approx \$45,460) per crop/ha⁻¹ for producers in inland provinces in 2007-2008. Large losses also may occur in the event of a range of eventualities including, *inter alia*, depressed farmgate prices at

the time of harvest, inflationary pressure on feedstuffs, high mortality, and delays in finding a buyer for fish which have already attained a marketable size. Seventy nine percent of the producers questioned on the subject during our survey reported having made a loss on the most recent crop harvested, with losses averaging VND548 million (\approx \$31,000).

5 The Social and Economic Characteristics of Catfish Producers

The previous sections outlined the development of export-oriented Vietnamese Pangasius production from its origins to the present using broad brushstrokes and drawing largely on information from existing literature. This section examines in greater detail the social and economic characteristics of those who engage in the activity drawing primarily on information taken from the present study.

	Area (ha)						n=
	<1	1-2	2-3	3-4	4-5	>5	
Present study	48%	15%	15%	6%	6%	9%	33
Lam et al, 2009	15%	28%	19%	11%	10%	17%	89

Table 4.2 Percentage distribution of farms by total pond surface area

The mean size of Pangasius farms (pond surface only), as obtained from the survey that informs this paper, is 2.16ha. This figure is not particularly informative when considered in isolation however, since the farms surveyed ranged from 0.2ha to 18ha in size. Broken down further into size category, our sample falls somewhere between the figures given by Lam et al, 2009 (Table 2), and those of Sinh and Hien (2009), who - based on larger sample of 293 farms - find the mean area of grow-out farms surveyed to be 1ha, though distributed across a wide range. These authors report that 57% of Pangasius farmers possess a single pond, with 36% operating 2-4 ponds and only 6.5% having more than 4 ponds. Again however, there is a high degree of variability in farm size and mean figures may conceal more than they reveal. Data from the Department for Agriculture and Rural Development of An Giang province published in Loc et al. (2010) suggests that much smaller farms predominate, with 94% sized less than 0.5ha, 3% sized 0.5-1ha, and only 3% of more than 1ha. According to these figures, 34% of the total is comprised of extremely small farms of less than 0.1ha, although the number of farms in this size bracket is in quite sharp decline.

It seems probable that many of these very small farms (less than 0.1ha) produce largely or partly for domestic markets however and are subject to somewhat different production economics than the export-led operations that form the focus of this paper. Furthermore, the same data shows that farms of less than 0.5ha contribute only 10.3% of total output. Due to these differences the very numerous yet cumulatively unproductive farms of less than 0.1ha in size are therefore excluded from our analysis in the sections which follow.

Occupation	Area					
	<1ha		1-3ha		>3ha	
	Previous Occupation	Present Occupation	Previous Occupation	Present Occupation	Previous Occupation	Present Occupation
Pangasius growout	1	14	1	10	0	5
Small-scale entrepreneurial	7	2	3	2	1	1
Agriculture	9	3	2	1	0	0
Medium-scale entrepreneurial	0	0	3	3	2	3
Managerial (former SOE)	0	0	1	1	2	2
Other aquaculture	1	2	1	1	0	0
Managerial (private)	1	1	1	1	1	1
Senior Cadre	1	0	0	0	1	1
Military	0	0	2	0	0	0
Total	20	22	14	19	7	14

Table 4.3 Income generating activities of Pangasius producers before and after adopting Pangasius culture, by size of farm

Aggregating together the categories of farm into just three groups of <1ha, 1-3ha and >3ha provides a basis for further analysis which is presented in Table 3. Table 3 lists the main income generating activities or occupations of respondents operating each category of farm prior to their adoption of intensive export-oriented Pangasius culture, and at the time of interview in late 2008. Where respondents engage or engaged in more than one significant income generating activity each is listed. Income generating activities and occupations are grouped into ten sets. Distinctions between some of these are again somewhat artificial, but necessary for ordering the data. The category ‘small-scale entrepreneurial’ covers activities such as trading in rice and agricultural inputs, hiring out heavy machinery such as excavators and combine harvesters, and the ownership of veterinary stores selling pharmaceuticals and other supplies for use in aquaculture and agriculture. The term ‘medium-scale entrepreneurial’ refers to what were, as best could be determined from the

interviews, more investment intensive activities with a larger scope such as construction companies and a sand excavation business. 'Managerial' is used to denote what interviewees usually referred to as "officers", meaning staff in management positions in companies or the state bureaucracy. In most cases this meant employment in former state owned enterprises (SOEs) involved in Pangasius processing and export such as AGIFISH. 'Limited company' refers to ownership of the farm by an officially incorporated company, as opposed to an individual or individuals. Finally, 'senior cadre' indicated a former provincial People's Committee chairman in one instance and a senior provincial level policeman in the other.

A number of themes become apparent after this breakdown. Prior to taking up Pangasius culture operators of farms with a pond surface area of under 1ha were predominantly engaged in agriculture (9) or small-scale entrepreneurial activities such as trading rice bran, often linked to agriculture (7). The individual listed as practicing 'Pangasius growout' under previous occupation had formerly produced *tra* using traditional semi-intensive methods, whilst the interviewee practising 'other aquaculture' had grown carps. Only two respondents from this group had held either a managerial or a senior position in the public or private sector. The occupational pattern for owners of farms sized 1-3ha is noticeably different. A total of six respondents were engaged in small (3) and medium scale (3) entrepreneurial activities before beginning Pangasius growout. Four interviewees in this group had also held managerial level positions, in; private companies (1), SOEs (1), and the military (2). Just two had formerly been engaged in agriculture, with one other continuing to practice rice/freshwater prawn culture on a fairly large scale. No owners of farms of more than 3ha in size had practiced agriculture or aquaculture prior to taking up Pangasius growout. Three had engaged in entrepreneurial activities however (two medium-scale, one small-scale), and four had had managerial or senior positions in former SOEs or state institutions. Two of the largest farms were owned by companies rather than individuals.

This data reveals much about the class attributes of those who engage in Pangasius growout, along with the activity's place in the local political economy. In the first instance, it is clear that it would be a mistake to equate, as some have, even the apparently modest area of 'smaller' operations with what is termed 'small-scale aquaculture': a phrase usually invoked by development

institutions to denote the low input, low investment, semi-subsistence forms of fish production they often promote²². This is the case both with regards to the relative size of the areas devoted to aquaculture, (according to Zweig et al. (2005) 77% of the households practising aquaculture in Vietnam do so on an area of less than 0.1ha), and in terms of the capital investment required to sustain such high intensity production even on farms with small surface areas. This last point is underscored by considering the productivity and returns associated with rice cultivation, the most important of livelihoods in most catfish producing areas. A rice-farming household cultivating 1.2ha (the average size of landholding in the Mekong Delta) and obtaining an average yield of 6.1 tons per hectare could expect to earn just VND6.6 million (\$470) per annum, assuming a 50% gross margin (Marsh & MacAulay, 2006) – a sum insufficient to provide enough feed to maintain one hectare of intensively produced *Pangasius* catfish for a single day.

This tendency to associate *Pangasius* culture with ‘small-scale aquaculture’ (a form of production which is fundamentally peasant in nature - both materially and in terms of its relations of production) is erroneous. However, to the extent that agriculture (mainly rice or fruit production) is the most commonly given former occupation amongst owners of farms of less than 1ha, adoption of *Pangasius* culture may in some cases represent a means of class differentiation, particularly since it is often accompanied by the hiring of wage workers to supplement family labour (Bernstein, 2006), although the low employment intensity of just 2.75 workers per hectare (calculated from the present survey) means that the extent of employment is limited on smaller farms, and relatives are often hired for this purpose. However, nearly as many owners of ‘smaller’ growout operations reported small-scale entrepreneurial activities as a major source of income prior to taking up *Pangasius* culture as agriculture. This would tend to indicate that catfish production is generally treated as an opportunity for capital accumulation among households which have already transitioned beyond peasant livelihoods rather than being a major driver of this change.

²² See FAO (1996) - *Expert Consultation on Small-Scale Rural Aquaculture* - for a typical example of the term’s use in this manner. As noted above however, exceptions may apply to farms of less than 0.1ha in size which produce primarily for local markets.

Even 'smaller' operators would initially have been relatively well off at the point of market entry. On average, producers operating less than 1ha of ponds have practised catfish culture for six years. Many of them therefore entered the market at a time when production methods (and competition) were less intensive, real input costs were lower and margins were higher, making it possible to begin production on a trial basis with a very small pond and to reinvest profits from subsequent crops in expansion and intensification of operations; a path which several interviewees reported following, and which would effectively be closed to most market entrants today. Never-the-less, adopting this approach would still have required a substantial investment, particularly when one considers the low average income from rice cultivation. Many of these 'smaller' operations will fall into the category referred to by Marsh and MacAulay (2006) as 'family farms'. The authors note that the distinction between a household farm and a family farm is not clear cut, but that the former is larger and more strongly commercially oriented. Family farms were often developed spontaneously from household farms (the main economic unit of production after decollectivisation) by ex-military and ex-government officials who used pension payments to rent or acquire land. Priorities for land accumulation have often been given to farms of this type by local government (*ibid*).

In contrast, owners of 'medium' and 'larger' farms originate predominantly from one of two occupational groups; entrepreneurial and managerial/bureaucratic. Engagement in entrepreneurial activities prior to taking up *Pangasius* culture was most prevalent among owners of operations falling in the range of 1-3ha (3 small scale and 3 medium scale entrepreneurial), and slightly less so for owners of farms of more than 3ha (1 small scale, 2 medium scale). Conversely there was slightly greater tendency for owners of the 'larger' category of farm to be linked to the state through managerial positions in former SOEs or the civil service, than for owners of farms in the 'medium' category. A small number of farm owners of 'medium' sized farms had practised either agriculture (2) or aquaculture (1) prior to initiating *Pangasius* culture, whilst none of the larger farm owners had ever engaged in any activities of this nature. Two owners of medium sized farms had previously worked in the military and had focussed on catfish production following their retirement.

There is a large gap between numbers of ‘smaller’ producers engaged in agriculture and small-scale entrepreneurial activities prior to taking up *Pangasius* culture (16), and practicing this type of activity following its adoption (5). Amongst owners of ‘medium’ operations these numbers are fairly even (a total of nine engaged in agriculture, aquaculture and entrepreneurial activities before taking up catfish production, seven afterward). For owners of ‘larger’ farms there is a slight increase in entrepreneurial activities (from 3 to 4). This difference is reflected in similar disparities in total numbers of income generating activities practiced by owners of farms in each of the three size categories prior to and after taking up *Pangasius* culture. This indicates that catfish production is often an all or nothing venture for farmers at the ‘smaller’ end of the spectrum, being so capital intensive that it tends to preclude engagement in other potential income generating activities and thereby, arguably, increasing the exposure of those who practise it to market and other shocks and trends. This conclusion is supported by the comments of one of our respondents, the owner of two ponds sized 0.2ha and 0.1ha, who had lost between VND70 and 80million (\approx \$3900-4500) on his first ever crop in 2001. This, he noted, was a very large sum of money for a rice farmer at the time, and a debt of this magnitude would have taken ten years to pay off with the income generated from paddy cultivation alone so he was left with little choice but to attempt to borrow more money and continue with production in an effort to recoup his losses.

For farmers in the medium and upper regions of the production spectrum however, *Pangasius* growout tends to represent an additional activity within an existing portfolio of business interests; a tendency which becomes more pronounced as scale and investment increase. This is observation is also borne out by Table 4, which shows increasing levels of professionalisation (taking on of staff to manage the daily running of the farm) as one moves up the size scale, with all of the ‘larger’ farms managed in this way, leaving their owners free to pursue their other business or professional interests. The owners of larger operations were usually found to reside in urban centres outside of communes where their farms are located. This is in contrast to the direct hands-on involvement in daily management activities which owners of ‘smaller’ farms maintain. This pattern is also noted by Lutterell (2001) in Vietnam in relation to another investment intensive

system of non-traditional agricultural export commodity production; costal shrimp farming, as well as in Thailand, Bangladesh and elsewhere (Primavera, 1997; Ito, 2004).

	System of Farm Management		
	Self-managed	Absentee owner	Operated by company
Farm size	(%)	(%)	(%)
<1ha	79	14	7
1-3ha	50	50	0
>3ha	0	71	29

Table 4.4 System of farm management by size of farm

6 Inclusion, Exclusion and Social Capital

When the class characteristics of owners of catfish farms are considered in relation to questions of access to land and capital, the existence of certain power relations becomes apparent. The following observation by Beresford is particularly prescient in this respect:

‘State-led marketisation of the economy under *Doi Moi* has very much reflected the interests of those groups which rose to dominance during the early part of the transitions: SOE managers (often in alliance with new groups of foreign investors) as well as local and provincial kinship and political networks linked to relatively autonomous capital accumulation processes. However, within the increasingly plural Vietnamese society new groups are emerging which are not necessarily linked to the above networks. These include private domestic capitalists and may also include wealthy farmers’ (1999, p201).

The preponderance of managerial level staff of former SOE’s engaged in catfish processing and export among the ownership of ‘larger’ farms is of particular note here as their status as such provides certain advantages over other producers. In the first instance, employment in such a position is likely to furnish the holder with a level of market information in excess of that possessed by other producers, thereby arguably providing a better basis for making production decisions based on judgements of the likely nature of future demand. This also applies to the staff

of processing companies established with private capital (and our sample includes two of these), but one can speculate that knowledge of this nature may have been especially beneficial in the early phases of the industry's expansion, during which time few of these existed.

More tangibly, a number of processors, including NAM VIET, AGIFISH, and AFIEX, operate producer associations (Khoi, 2007). AGIFISH's 'Pure Pangasius Union' is perhaps the best know of these. Membership of an association entails a commitment to a production schedule on the part of the producer under which the processor will be supplied with an agreed volume of fish by an approximate date on a recurrent basis. Certain requirements such as preferred feeding and stocking practices may also be stipulated, meaning that membership effectively acts as a quality assurance standard to the processor. Processors may also offer training and supply inputs to their association members, and one company we heard of had a team dedicated to sourcing high quality fingerlings for members of its association to use. Association members do not receive preferential prices for their product, but are guaranteed to be able to dispose of it once it reaches market size. This represents a major advantage when, as during the period in which we conducted our study, demand for catfish was low relative to supply since processors will always source fish from their members before turning to non-members to make up any shortfall.

Producers who are not members of any association can exercise a greater flexibility than members in attempting to wait out slumps in farmgate value in hope of a better price since they are not tied into a production schedule. There is a limit to how long it is possible to maintain feed rations for such a large standing biomass of fish without suffering catastrophic financial losses however. Under these conditions it is apparently common for processors to extend the period of time between first assessing a farmer's crop (testing for three indicators of quality; the presence of banned antibiotic residues, flesh colour, and fish size), and agreeing to accept it. When demand is high this process reportedly takes as little as three days, whereas when demand is low it can be drawn out over a month or more as companies insist on extra checks and procedures. This can be extremely costly to the producer given the huge sums involved in feeding fish, even when rations are reduced to the minimum required to keep them from starvation, and informants viewed this as a deliberate tactic employed to coerce them into accepting low prices, or unfavourable terms such

as staggered or highly delayed payments. Khoi et al. (2008) report findings which confirm this observation.

The extent that the ability to secure a contract, coupled to good market information, represents an advantage is underlined by an employee of AGIFISH who revealed that more than 50 of the 80 members of its producer association are company staff or their close relatives. Associations are difficult to gain entry to for those outside the ‘umbrella’ of the company since membership is for the most part quite literally kept in the family (in addition to farms owned by employees of these companies we visited one operated by a director’s son and another by the husband of a senior employee). Thus, producer associations linked to processors can be seen as exclusive institutions which act to support the collective interests of their members – extending outwards inter-generationally along kinship lines - particularly when considered in comparison to the more exploitative relations exercised by many of these same processors toward non-association members.

Kinship relations also appear important to other producers. Thirty two percent of interviewees reported that a close relative of theirs also practiced some form of *Pangasius* culture. All of these respondents operated farms sized 1.5ha or less. This would seem to indicate that informal transfer of knowledge and, likely, although we did not determine whether this was the case, capital, along kinship lines plays an important role in facilitating uptake of catfish growout amongst farmers at the ‘smaller’ end of the spectrum. Similarly, Belton et al. (2008) report that 35% of *Pangasius* nursery operators cite siblings as their primary source of information at the time they adopted the activity. The same authors also find that transmission of knowledge on hatchery production has occurred primarily between relatives and close friends with strong social ties, and that such knowledge transfers act to strengthen ties between donors and recipients, thereby augmenting stocks of existing social capital associated with the relationship. These exchanges may also open up opportunities such as the ability to coordinate separate nursing and growout operations, and can thereby act to reduce input and transaction costs for both of the parties involved (*ibid*). For operators of ‘larger’ growout farms, kinship ties to other catfish producers are of arguably lesser importance since it is possible to employ well-qualified managers to oversee

production or integrate operations vertically, to some extent circumventing the need to consult, collaborate or learn from others. Furthermore, owners of large farms may acquire knowledge of farm operation through their professional roles rather than from other farmers, and kinship links to officials in the state bureaucracy may function as a more important source of support and information.

7 Access to Resources Mediated by Social Relations

There is a substantial literature dealing with land markets in Vietnam post decollectivisation - see for example; Ravallion and van der Walle (2003), Kerkvliet (2006), Hare (2008), Do and Iyer (2007). Much of this suggests that 'landlords' are, to some extent, 'taking back the land' (Akram-Lodhi, 2001, p1). Lam et al. (2009) find that only 54% of catfish growout operations are on land owned by the farmer and that an average of 30% of the fixed costs in catfish operations derive from the purchase of land, indicating the prevalence of both leasing and purchasing land use rights for *Pangasius* culture. Both Lam et al's figures and our own (Table 2) suggest that many catfish farms are in excess of the 1.2ha average landholding in the Delta, and significant numbers exceed the 3ha limit imposed on household landholdings by the state. Some farms exceed this by a great margin, with the largest of the farms we were informed of being some 50 or more hectares in size, and the largest visited covering 18ha. This might appear to suggest that the expansion of catfish culture has been associated with a degree of land accumulation, with larger farmers or companies increasing their holdings at the expense of others who have had to sell land 'out of desperation with no better prospects for making a living' (Kerkvliet, 2006, p296).

Schut (2009, p55) notes that 'small [catfish] farmers are motivated to sell their existing farms by the short term cash benefit, particularly during times of low profitability in the industry', and reports the case of one large operator who 'had purchased significant portions of his existing farm from small farmers exiting the industry during times of economic duress over the last 15 years' (*ibid*). A similar pattern was noted during our own research, although in the two cases we encountered in which failing farms had been bought up they were operations of more than 3ha in size. Schut also advances the interesting claim that land prices vary spatially, with higher prices

mostly associated with higher quality water sources, and that ‘only large investors are able to raise the money necessary to start or take over a farming operation’ in those locations where water quality is highest (*ibid*, p55). He thus draws a link between farm size (investment capacity), water quality, and farm location. Although we found no direct evidence to either support or challenge this observation it should be noted that water quality is by no means the only, or even the most critical factor at play in determining the location of different size classes of farm; there being a strong element of path dependency whereby many operators of smaller and medium farms simply excavated ponds on land they already possessed and have continued with production without expanding or moving operations.

Certainly, land values in catfish producing areas have become highly inflated however, and Sinh (2007, p338) notes that ‘within a 5 year period, the price of land for aquaculture in the freshwater areas of the Delta increased about 3-5 times’. Although this may have increased the vulnerability of poorer households who have found it difficult to purchase land for the cultivation of other crops (*ibid*), it was common practice for many of the ‘smaller’ growout farmers and an even larger proportion of the nursery owners interviewed to lease out paddy, allowing them to concentrate exclusively on fish production whilst freeing up land for others to cultivate rice. Furthermore, ‘many households give up their use rights because they have economic options more attractive than farming’ (Kerkveit, 2006), resulting in advantageous outcomes for both parties, and rents reflect land use, with informants reporting land leased for rice cultivation to be valued at approximately a third of the cost of the same land if used for catfish culture.

Schut (2009, p55) observes that ‘large wealthy investors’ possess ‘advantages in accessing new land for [Pangasius] farming expansion because they often have existing relationships with well-placed party members’. Similarly, Bush et al (2009) note that ‘anecdotal evidence suggests wealthier [Pangasius] farmers with political influence have proven more able to gain access to marginal lands, located on fluvial islands and in wetland areas, with no clear tenure’. Our interviews suggest that use rights for new land granted to some operations by local People’s Committees are often for previously uncultivated riparian wetlands, an observation also made by Labrousse (1999). Thus, although such transfers might be viewed as inequitable since they concentrate use of state

resources in the hands of powerful local actors, for the most part they appear to involve land which had not previously been utilised for productive purposes and thus formerly possessed little value. In addition, the total area occupied by Pangasius growout farms is 9000ha, of which just 6000ha is ponds (Dung, 2008). This very small area reflects the extreme intensity of the production which occurs, and is dwarfed in significance by the 1.95 million hectares of the Mekong Delta under autumn rice production (Maclean et al, 2002), meaning that any inequitable effects which may result from land accumulation are limited in overall scope, although they are likely to be geographically concentrated in those communes or hamlets where physical conditions are appropriate for catfish culture (i.e. adjacent to rivers and larger canals with high flow volumes).

As noted earlier there are central production targets for Pangasius production in the ‘master plan’ published by the Ministry of Agriculture and Rural Development (Southern Sub-Institute of Fisheries Planning, 2008). The targets contained within this report are rather general however, and each of the major producing provinces has its own master plan stipulating land use zoning intended to control piecemeal development of the industry. It was not possible to obtain copies of any of these provincial plans during the course of fieldwork, so we are unable to determine how rigidly these have been enforced. However, whilst most interviewees indicated that they had sought and gained permission for change of land use from the local People’s Committee prior to excavating catfish ponds, comments made by informants suggest that zoning requirements have not always been enforced effectively. One interviewee in an area where Pangasius nursing was common told how the demand for and price of seed was exceptionally high during 2006, leading numerous households to commence excavation of new nursery ponds. In early 2007 the authorities began enforcing the zoning requirements of the master plan, but the “fever” was such that, even after receiving visits from the police during the daylight and being instructed to cease pond excavation, local inhabitants would continue to dig at night.

A variety of intersecting and sometimes contradictory motives may temper interpretation or enforcement of regulations and thereby govern who is able to operate and where and on what terms, as the following three cases demonstrate. One interviewee talked of his “influential relationships with important figures” which had apparently made it possible for him to lease land

prime river front at well below market value, whilst another producer stated that the- local People's Committee facilitated *Pangasius* production and that farmers made "voluntary contributions" to local government funds. A third interviewee in a different commune reported that local roads had been surfaced by the People's Committee using voluntary donations of VND5-10 million (\approx \$280-560) per catfish producer during the "heyday" of peak profitability. These three examples suggest that a range of motivations may affect the manner in which official policy is implemented, ranging from mutual personal advantage on the part of farmer and official (something which may take a variety of tangible or intangible forms), to the institutional interests of local government and those of the wider community (since supportive attitudes towards catfish production have the potential both to increase Peoples Committee funds and facilitate the development of local infrastructure and services).

Luttrell (2001, p229) notes that 'an overriding theme' to emerge from her work in coastal communities in Vietnam was 'the selective application of regulations by officials and the importance of personal relations in gaining access to resources'. She goes on to state that 'access to resources is given informally. Equally, regulations can be waived if one has official or personal contacts with local officials'. She then quotes an informant as saying, "fines are different for all people, if people have a good relationship with the leader of the commune the fine will be small, if not the fine will be heavy". Although the conditions under which fieldwork was conducted made it impossible for us to explore issues of this nature in any depth, there is enough circumstantial evidence presented above to suggest the existence of similar processes at work in relation to *Pangasius* culture.

A number of other sources also point to the importance of informal social relations between individuals and officials within the state bureaucracy in settling the outcomes of decisions over land use rights. Tenev et al (2003, p94), report that the state has to sanction all transactions relating to the transfer of land-use rights: 'this power has been devolved to People's Committees at the provincial and district levels. Because administrative procedures are vague, there is ample room for bureaucratic discretion, which appears to be frequently exercised'. More specifically Goletti, quoted in Truong (2001, p7) states that '[land] titles are not easily obtained unless special relations with

local authorities are established.’ Although there is a landholding ceiling of 3ha in place, in practice, especially in the South, such limits are often ignored, and some cases of land holdings of hundreds or even thousands of hectares are known. According to Goletti such operations cannot ‘be feasible unless special connections with the local authority can be secured’ (*ibid*). It seems likely therefore that under some circumstances the ability of an individual to gain permission to convert land to catfish production, to obtain new land for the same purpose, or to avoid or mitigate censure in the event that *Pangasius* culture activities contravene any regulations, will be closely related to quality of personal relations between the individual and actors in the state bureaucracy. This is likely to favour those in positions of power; economic, political or, more likely, both.

These relationships may also affect access to credit since ability to obtain a ‘red book’ (the official paperwork required to prove land use rights) required as collateral is mediated by the same set of relations explored above (Kim, 2007). Access to credit (which is an essential prerequisite for engaging in *Pangasius* growout given the levels of investment required) may also be directly affected by the social and/or political capital possessed by the applicant. Zweig et al (2005) note this tendency with regards to shrimp cultivation in Vietnam, stating that wealthier households in the Delta province of Tra Vinh have been able to engage in shrimp production ‘because they have “connections” that allow them to gain easier access to financial capital’. This was perhaps in part what was being alluded to by one of our informants who stated that despite difficulties being experienced by the industry banks were still willing to lend to “prestigious” customers with whom they had a good relationship. In contrast, several ‘smaller’ producers complained that banks had stopped lending to them.

This pattern may also occur with respect to extension services. Belton et al’s study of *Pangasius* seed producers indicates ‘the importance of informal social relations and political capital in obtaining access to formal institutionalised knowledge’ (2008, p14). They report that a third of the nursery operators they interviewed had received formal extension on nursing from state institutions and that of these only two possessed ‘no immediately apparent professional or familial ties to institutionalised power’. This leads them to conclude that ‘personal ties to state institutions, whether strong or weak, improve opportunities to access available services, whilst a lack of these

bonds acts to passively exclude' (*ibid*, p16). This trend may be less pronounced among growout farm operators than nursery operators, since figures from Sinh and Hien (2009) and Lam et al (2009) suggest higher levels of training among the former (probably in part because they tend to be more powerful than the owners of smaller less investment intensive nurseries), but is still likely to exist.

8 Synthesis

A number of recurrent themes run through the preceding sections. Firstly, levels of investment and productivity involved mean that intensive export-oriented *Pangasius* culture as practiced in the Mekong Delta it is categorically not 'small-scale' in as much as this term implies a peasant activity, even if farms appear small when surface area alone is considered. This basic insight is necessary if the economic, social and class characteristics of the production system are to be interpreted correctly. Unfortunately this often escapes even otherwise well-informed commentators familiar with the discourse of small-scale aquaculture and poverty alleviation. Thus Schut (2009) and Labrousse (2009)²³ both refer to 'poor' small-scale *Pangasius* farmers when in fact, as one informant remarked, "No really poor household has ever done it".

There is however an evident division between 'smaller' and 'larger' operators. Both display entrepreneurial tendencies, but appear to possess different class origins. Many of the former correspond with what Marsh and MacAulay (2006) refer to as 'family farms'; strongly commercially oriented farms which emerged rapidly post *doi moi*, allowing for the accumulation of sufficient capital to subsequently invest in *Pangasius* culture on a small scale and reinvest profits in intensification and, where possible, expansion. Beresford's '[former] SOE managers' and 'local and provincial kinship and political networks' (1999, p55) form a significant faction among 'larger' operators. The following excerpt from Kim is instructive with regards their ability to seize emerging opportunities in catfish growout:

²³ This point has particular relevance since both the authors quoted in this instance have carried out research intended to contribute to the formulation of environmental and social standards for the certification of sustainably operated *Pangasius* farms

‘Political capital facilitated former cadres to become entrepreneurs and, once they became entrepreneurs, made them more successful... Despite the dismantling of the former institutional bases of political capital, ex-communist cadres could maintain their positional advantage by utilizing informal social networks’ (2004, p174).

The ability to utilise informal social networks is by no means restricted solely to former cadres however, and varying degrees of social and political capital inhere in the relations between agents of the state bureaucracy and the operators of catfish farms of all sizes, and in their kinship, professional and other ties. The process of establishing, maintaining and strengthening the relationships between farm owners, bureaucrats, and others has also entailed the associated accumulation of social capital among all the actors involved, thus entrenching their positions of relative power by increasing the total stock of actual and potential resources available to them (Bourdieu, 1986). This process of accumulation is of course generally more pronounced the further one moves toward the ‘larger’ end of the scale. Wedded to economic capital, the other capitals embodied in these complex intersecting relationships govern the ability of farm operators to access and mobilise a range of the resources required to enable catfish production; most clearly demonstrated here with respect to land use rights and perhaps also credit and technical support. The nature of these relationships and the capitals which they confer may also generate advantages or disadvantages relative to competing producers by permitting inclusion/exclusion from production contracts, enforcement of regulations, and market information. In this way they can also act to mitigate some of the risks inherent in participation in global markets.

The advent of intensive *Pangasius* production (which assumes primarily capitalist relations of production and links local actors to global value chains) has to date tended to reproduce existing class relations in a fairly stable manner whilst transferring power and resources to the local state bureaucracy in the form of taxes and rents, neither resulting in any particularly palpable form of peasant differentiation nor, conversely, dispossession. This is in contrast to some of the cases quoted in the introduction in which the advent of globalised agricultural production has clearly contributed to radical reconfigurations of the rural class structure. The difference in the

Vietnamese case may result in part from the embeddedness of private economic activity in informal relations with the state, and in part from the material characteristics of the production system itself which make the appropriation of large areas of land unnecessary and favours the development of previously unutilised riparian locations.

However, although many 'smaller' operators have been able to sustain production to date, increasing competition within the industry and ever tighter margins are evident (Loc et al, 2010). Emerging shifts toward buyer driven governance (Busch and Bain, 2004) of *Pangasius* value chains through the imposition of certification standards are likely exacerbate these pressures and constrict access to markets for smaller catfish producers (Belton et al. 2011b). If this occurs the relatively disadvantaged/advantaged positions held by smaller and larger producers may be progressively sharpened, leading to a more comprehensive restructuring in favour of the more powerful and (in all senses) capitalised in the sector, and illuminating the significance of locally embedded social relations in mediating the outcomes of integration into global value chains.

Chapter 5 - Certifying Catfish in Vietnam and Bangladesh: Who Will Make the Grade and will it Matter?

(Submitted to Food Policy)

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Abstract: Certification is an increasingly pervasive form of market governance through which retailers and NGOs are able to exert control over producers of primary products in order to secure their commercial and institutional interests. This paper assesses the likely outcomes of emerging certification standards intended to govern production of a new global commodity, Pangasius catfish. This evaluation focuses on Pangasius producers in Vietnam and Bangladesh, and one of the key areas which standards seek to regulate; the environment. We conclude that certification is likely to result in greater differentiation and polarisation between larger and smaller farm operators and will increasingly act to exclude of the latter from access to Western European and North American markets, and that any local environmental gains produced may be of relatively minor significance.

Key Words: Vietnam, Bangladesh, certification, small-scale producers, sustainability, Pangasius

Acknowledgements: The authors would like to acknowledge the British Council Connect Research and Co-operation award for the project *Promoting sustainable high quality river catfish seed production in Vietnam*, and additional financial support from the Natural Resources Institute Foundation travel fellowship 2008, and a Carnegie Trust for the Universities of Scotland research grant, without which the research that informs this paper would not have been possible. They also thank Nguyen Van Hien, Do Minh Chung, and Tran Ha Anh for their help and great company in the field.

Certifying Catfish in Vietnam and Bangladesh: Who Will Make the Grade and Will it Matter?

1 Introduction

Profound restructuring of the global agri-food system resulting from the adoption of private voluntary standards and third party certification is now well recognised and documented in a burgeoning literature (See for example Busch and Bain, 2004; Hatanaka et al, 2005; Fulponi, 2006; Higgins et al, 2008; Henson and Reardon, 2005). The most important driver of this change has been the increasingly oligopolistic nature of supermarket chains and the nature of competition between them, which has shifted from being predominantly price-based to quality centred (Busch and Bain, 2004). In the wake of various food scares over the last two decades and the neoliberal perception of the inability of the state to adequately regulate food safety, particularly as an increasing portion of produce in Northern markets originates from the Global South, major food buyers have sought to reduce risks of liability, litigation and bad publicity, and to protect their reputations for selling safe high quality produce (Fulponi, 2006). This has been achieved through an ever greater reliance on private standards, defined by (Nadvi and Wältring, 2002, quoted in Giovannucci and Ponte, 2005) as ‘agreed criteria... by which a product or a service’s performance, its technical and physical characteristics, and/or the process, and conditions, under which it has been produced or delivered, can be assessed’.

The concentration of food retailing has made supermarket chains increasingly powerful buyers, particularly in the Global North. This has enabled retailers to demand compliance with standards on the part of their suppliers as a prerequisite to accepting their goods, meaning that standards determine who will be able to supply and on what terms (Vagneron et al, 2009). Retailers are thus able obtain goods produced according to precise specifications and of a guaranteed quality whilst, at the same time, shifting many of the costs involved in achieving this to suppliers. Relying on third party certifiers (independent businesses or institutions which set standards) to implement standards and manage the auditing of compliance further reduces costs to retailers and minimizes

their responsibility for policing the safety and quality of the products they sell. Supermarkets are therefore able to enlist certification both to reduce risks to themselves, and to demonstrate quality and safety assurance to their consumers (Hatanaka et al, 2005; Fulponi, 2006). This has resulted in the governance of many global value chains for food becoming 'buyer-driven' (Ponte and Gibbon, 2005). Islam (2008) develops this characterisation further in identifying a 'twin-driven' commodity chain for Bangladeshi shrimp in which 'lead firms govern the supply network, while environmental groups and recently emerged third-party certifiers lay out and govern the regulatory aspects of the aquaculture, sometimes both working in an overlapping manner' (p217).

This emergent form of 'twin-driven' governance for certain products is an indicator that definitions of 'quality' have broadened beyond tangible organoleptic properties signifying 'wholesomeness' (such as freshness and taste) and material ones relating to public health and safety (such as freedom from contamination), to encompass a range of 'credence' attributes which cannot be directly experienced by consumers, such as environmental and ethical conditions of production. General mainstreaming of the concept of environmental sustainability and growing public consciousness of other ethical issues such as labour conditions have been driven in part by the awareness raising efforts and media campaigns of NGOs. Retailers have proven sensitive to criticism of their environmental and social performance and have thus sought to co-operate with NGOs to develop standards and certification systems for their social and environmental practices (Hatanaka et al, 2005) as a mechanism for deflecting potential criticism, and because they lack the necessary expertise to develop credible alternatives of their own. The emergence of new hybrid certifiers such as the Marine Stewardship Council (established a decade ago as collaboration between the World Wildlife Fund and Unilever) proffering 'eco-labelled' products also provides opportunities for retailers to strategically differentiate their product lines from one another and those of their competitors (Fulponi, 2006), whilst at the same time lending them social legitimacy (Giovannucci and Ponte, 2005). For NGOs, such collaboration helps to promote their agendas and

extends their spheres of influence, although it may also leave them open to accusations of co-optation (see for example Belton et al, 2010), and sensitive to damage if labels fail to deliver²⁴.

Schemes for the certification of cultured aquatic products have emerged more recently, proliferating due to the diversity of competing interests among the numerous commercial and non-governmental actors involved, and a rush on the part of retailers to source the ‘greenest’ fish around. These developments, driven by the logic outlined above, emerge partly in light of the vilification of intensive shrimp and salmon aquaculture by NGOs (based on claims relating to a range of negative environmental and social impacts), and also reflect moves to establish private regulation of ‘new’ cultured aquatic commodities such as tilapia and *Pangasius* catfish, South to North trade in which has boomed recently. The Vietnamese *Pangasius* industry has garnered increasing international interest and scrutiny recently due to its rapid ascent to global prominence (see for instance: Loc et al, 2010; Belton et al, 2011a; Bush et al, 2009), as a result of which it has become the potential subject of certification for at least six private standards. Bangladesh currently exports little or no *Pangasius* to the Northern markets targeted by certifiers, but Bangladeshi producers and academics have been vocal stakeholders and participants in the WWF initiated *Pangasius* Aquaculture Dialogue (PAD), a move intended to ensure they will not be excluded from the certification measures developed should a future shift toward more export-led production occur.

As Hatanaka et al. (2005, p355) emphasise, certification is not ‘merely an objective or impartial technical tool or institution desirable for the efficient organization and regulation of markets and trade’, but rather, ‘reorganizes, transforms and disciplines people and things throughout the supply chain, with differential social and economic implications for various participants’. Major seafood buyers and retailers including Lyons and Walmart have made commitments to purchase aquatic produce exclusively from certified sources in future

²⁴ Gulbrandsen (2009) concludes, for instance, that Marine Stewardship Council (MSC) certification is unlikely to arrest the decline of marine fisheries, whilst another WWF initiated certification project, the Round Table on Sustainable Palm Oil, has been rejected in extremely forceful terms by a consortium of 256 NGOs (Anon, 2009). Critiques of this type are arguably damaging to the credibility of NGOs associated with such eco-certification schemes.

(Vandergeest, 2007), and the use of third party certification is ‘becoming de facto mandatory’ for food suppliers more generally (Hatanaka et al, 2005, p360). In addition, Pangasius has been the subject of several food scares in major European markets in the last year (Bush and Duijf, Forthcoming). Higgins et al (2008, p1776) note that private standards are often reported in the literature as ‘enhancing the power of corporate actors to the detriment of smaller producers’, but that this ‘overlooks the complex ways in which standards are used’ by farmers ‘in the governing of farming practices’. In sum, these factors would appear to suggest that a) certification will increasingly mediate the ability of Pangasius producers to access Northern markets in coming years, and b) significant changes may occur in the structure of the supply chain as a result.

This paper addresses how these themes will play out in practice by attempting to answer two fundamental questions pertaining to the Vietnamese and Bangladeshi Pangasius industries: ‘who will make the grade?’ (i.e. which sets of producers will prove able to attain certification?); and, ‘will it matter?’ (for those affected by certification, and for the environment). This will be achieved with reference to three of the major schemes for certifying Pangasius production currently under development, and to the technical, social, and commercial realities of Vietnamese and Bangladeshi Pangasius culture revealed during fieldwork conducted in three Mekong Delta provinces during 2008 and the Mymensingh district of Bangladesh during 2009²⁵.

²⁵ Fieldwork conducted in Vietnam is described in the previous chapter. Fieldwork conducted in Bangladesh was carried out during 2008 by the chapter’s second author, Md. Mafujul Haque, with the support of two research assistants. It consisted of a structured survey of 94 farms in the three main Pangasius producing sub-districts of Mymensingh (Trishal, Mukhtagacha and Baluka) and one lengthy focus group discussion in each upazila. Each discussion involved 15-20 participants, of whom approximately half were owners of Pangasius farms of a mixture of sizes, a quarter worked in harvesting teams and the remainder were pangasius farm labourers or feed dealers. These efforts were conducted in order to evaluate farming practices and to assess stakeholder perceptions on draft WWF Pangasius Aquaculture Dialogue standards. The discussion included an initial briefing on the purpose of the research, discussion and presentation of participant’s opinions on the possibility of compliance with each of the proposed standards, and a variety of participatory exercises including mapping, a timeline, a community wellbeing ranking exercise, activity matrices and seasonal activity calendars for pangasius farmers, and ranking of food consumption preferences and perceptions of the social outcomes of pangasius farming in the localities where the discussions took place. This information was subsequently compiled and fed-back to participants in a validation workshop organised at Bangladesh Agricultural University.

2 Pangasius Culture in Vietnam and Bangladesh

Pangasius catfish (*Pangasius hypophthalmus*) was virtually unknown as a food fish outside Asia until the earlier part of this decade. However, since approximately 2001, export-oriented production of the fish in Vietnam's Mekong Delta has seen it gain growing market share in the USA, European Union, former Eastern Bloc, and elsewhere. This in part because its flaky white flesh, firm texture and neutral flavour have been widely accepted among consumers as a low cost alternative to marine staples such as cod and haddock in Europe, and the indigenous channel catfish (*Ictalurus punctatus*) in the US. The fish's rise in scarcely a decade from a low production base for local consumption, to one of Vietnam's most important export crops by volume and value has been unparalleled in rapidity and scale by any other cultured aquatic species to date (Belton et al, 2011a).

Pangasiid catfish have been cultured in the Mekong Delta since the 1960's. At this time production was exclusively for local domestic consumption, and relied upon wild fry (Van Zalinge et al, 2002). Market liberalisation from the late 1980s onwards, and the clearance of a major technical bottleneck through the development of artificial propagation techniques in the late 1990s resulted in expanding production from this time onwards. Exports were initially mainly to the USA but protectionist trade measures imposed in 2002 led the Vietnamese industry, represented by its own trade association (VASEP - the Vietnamese Association of Seafood Processors and Exporters) to seek more diversified global markets, in particular in the EU and former Eastern Bloc. As a result of these convergent factors exports have grown almost exponentially since this time. Commercial output of Vietnamese Pangasius catfish increased from 22,500t to more than 1,000,000t between 1998 and 2007 whilst export values rose from \$19.7 million to \$0.98 billion. Total Vietnamese Pangasius production in 2008 (all of which originates from just nine Mekong Delta provinces), was estimated at 1.2 million tons, with an export value of approximately \$1.45 billion (Dung, 2008; Sinh and Hien, 2010). Although growth plateaued during 2009 (Intrafish, 2009), Pangasius remains the country's second largest export crop by volume after rice, and third by value, approaching the entire global output of farmed Atlantic salmon in terms of the volumes produced (FAO, 2009b; FAO, 2009c).

In Bangladesh the expansion of Pangasius culture over a similar period has also been spectacular. Unlike Vietnam however, the entire output Bangladeshi Pangasius is absorbed by domestic markets and, since it has become one of the cheapest fish species available, is eaten mainly by consumers in lower income brackets (Little et al, 2009). Production of Pangasius, which started earlier in countries such as Thailand but later stagnated, has also climbed rapidly of late in a number of other Asian countries including India, Myanmar and China (FAO, 2009c). *P. hypophthalmus* was first introduced to Bangladesh 1990. Growout of the fish was quickly taken up in Mymensingh district where it proved attractive for its robust characteristics, rapid growth rates, and high productivity compared to other species. Production expanded rapidly from the mid 1990's causing market value to fall to a point where the fish came within reach of many lower income bracket consumers in urban and peri-urban areas. Although official figures for output of *pangas* (as it is known in Bengali) are not available, estimates, generated by the Association of Bangladeshi Pangasius Producers (*Bangladesh Mastshya Chashi Samity*) based on a census of trucks taking on water to carry live *pangas* along the main Mymensingh-Dhaka highway, put the figure at a very substantial 300,000t (Pers. Comm. M.S. Hossain). Growth in output plateaued during 2007/2008 due to record food prices which forced poorer consumers to substitute calories derived from fish with increased intake of cheaper rice, but has rebounded in 2009 and continues to grow (Haque, 2009a).

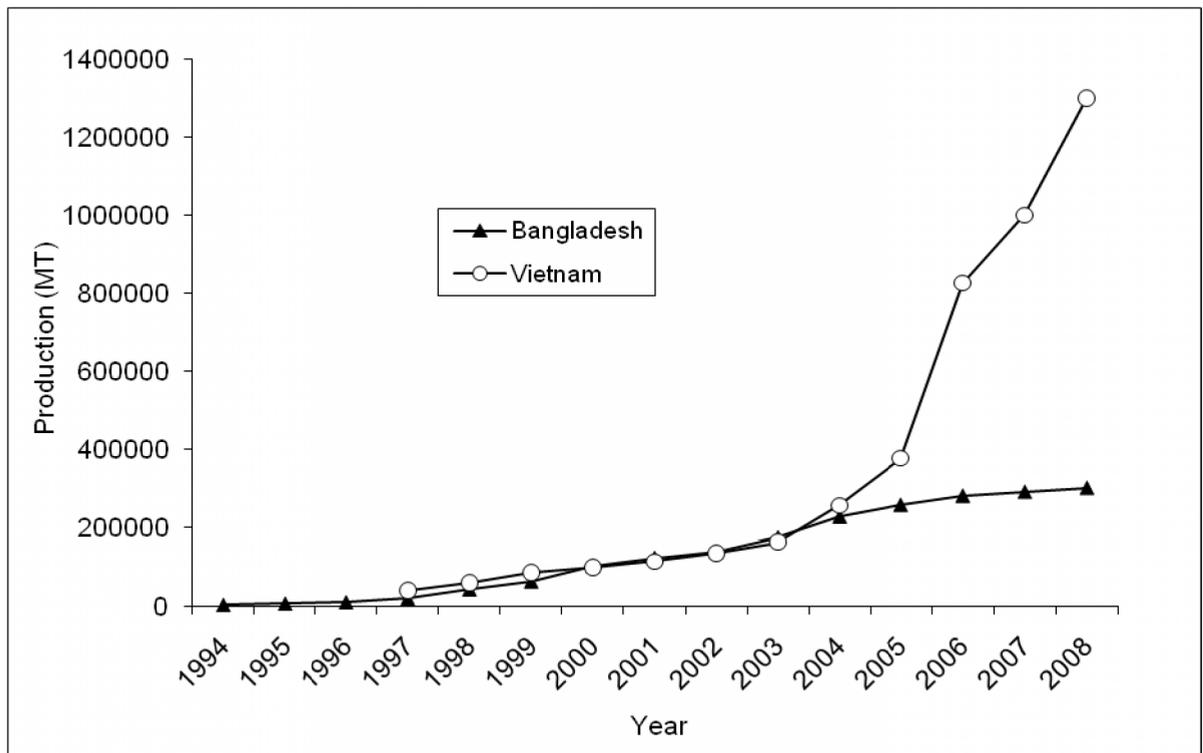


Figure 7.1 Vietnamese and Bangladeshi Pangasius Production, 1994-2008²⁶

(Source: FAO, 2009c; Dung, 2008; Haque, 2009b)

3 Certification Schemes for Pangasius

There are six standards for the certification of Pangasius production in Vietnam in existence or undergoing development, though none of these has been widely implemented to date (Schut, 2009). Given the strength of trends summarised in the introduction however, it can be surmised that at least some of these standards will eventually come to assume an important role in governing conditions under which Pangasius destined for certain markets is produced. The name of each scheme along with its certifying body, and important features are summarised in Table 1 below.

²⁶ No official figures exist for Bangladeshi output of cultured Pangasius. Instead we extrapolate these using historical data for the number of Pangasius operational farms in Trishal Upazila, Mymensingh District (a major site for Pangasius production in Bangladesh) over the period in question, working backwards from the estimated 300,000t produced in 2008 to obtain the production curve.

Scheme	Certifier	Notes
GlobalGAP	GlobalGAP	GlobalGAP is a body established by a partnership of major European retailers which certifies crops, livestock and aquaculture products
Best Aquaculture Practice (BAP)	Aquaculture Certification Council (ACC)	Established by the Global Aquaculture Alliance – an industry body for the promotion of aquaculture. ACC certified shrimp popular in the USA, ACC standards for tilapia and channel catfish also operational. Standards for Pangasius currently under public review
Pangasius Aquaculture Dialogue (PAD)	Aquaculture Stewardship Council (ASC)	One of 10 dialogues for different groups of species initiated by the World Wildlife Fund (WWF). Standards to be certified by the newly established independent ASC.
Butler's Choice	Butler's Choice	Dutch company established with the aim of guaranteeing high quality, ethically sourced foods. Shipped only 500t of Pangasius in 2007
Safe Quality Food 1000 (SQF 1000)	Food Marketing Institute	Food safety focussed standard favoured by the Vietnamese government and promoted by DOF but yet to achieve widespread uptake. SQF 2000 certification for processors has been attained by some companies
Naturland	Naturland	German organic certification body. Two Vietnamese farms currently certified

Table 5.1 Name, certifying body and key information on the six main standards applicable to Vietnamese Pangasius production (adapted from Bush et al, 2009; Schut, 2009)

Reviewing each of the standards in detail is beyond the scope of this paper however, and since certification schemes have been well documented elsewhere in the literature, both for Asian aquaculture in general (Corsin et al, 2007), and Vietnamese Pangasius production in particular (Bush et al, 2009; Schut, 2009), we direct readers to these excellent sources for more detailed accounts. As yet, only PAD has been consciously formulated with the aim of facilitating the inclusion of interested producers from countries other than Vietnam, but there does not appear to be any fundamental reason why export-oriented producers outside Vietnam would be unable to attempt to seek certification by either GlobalGAP or ACC, neither of which demand fish species be raised within their natural ranges.

We opt in this paper to examine the implications of several themes in three standards which we consider likely to have the greatest potential impacts on Pangasius producers. These are, GlobalGAP; ACC BAP; and PAD (Table 2 below). We consider these to be of potentially greater significance than other schemes because: 1) they address environmental and labour aspects of the production process and, as a result, are liable to entail more modifications on the part of producers than schemes such as SQF 1000 which are concerned predominantly to food safety; 2) they are more likely to capture a greater share of global production than niche standards such as organic (Naturland) or unilaterally implemented retailer standards (Butler’s Choice); 3) there are indications that, although there are significant differences between the three standards, all will ultimately be harmonized by benchmarking for equivalence and the addition of optional extra modules to ensure differentiation as a means to avoid duplication of effort for producers (Fiorillo, 2009; Seaman, 2009a; Seaman, 2009b). Table 2 indicates the degree emphasis placed by each of the three schemes on a number of important criteria. These are: water use and quality, biodiversity, feed ingredients, worker pay and conditions, worker health and safety, fish health and welfare, product quality, and traceability. We address each of these issues in turn the discussion which follows with respect to the respective performance of producers in Bangladesh and Vietnam.

Item	Scheme		
	GlobalGAP	ACC	PAD
Water use and quality	+	++	++
Biodiversity	+	+	++
Feed ingredients	-	-	++
Fish health & welfare	++	+	+
Worker pay & conditions	++	+	++
Worker health & safety	++	+	+
Product quality	++	+	-
Traceability	++	++	-

Key: - legal compliance only/no specific mention; + some emphasis; ++ heavy emphasis

Table 5.2 Emphasis placed on key issues by the three certification schemes

(GlobalGAP, 2009; ACC, 2008; WWF, 2009)

3.1 Water quality and use

The ability of *Pangasius* catfish to breath atmospheric oxygen makes them able to tolerate poor water quality and facilitates culture at exceptionally high densities. The Vietnamese pond-based system of *Pangasius* production has developed to take advantage of this characteristic. Deep ponds, water exchange of up to 30% or more daily and extremely high stocking densities allow for production of massive levels of standing biomass (Lam et al, 2009). As a result, Vietnamese *Pangasius* culture is probably the single most intensive high volume commercial food production system on the planet in terms of productivity per unit area (NACA, 2009), with yields exceeding 700t/ha/year⁻¹ possible (Table 3). Although considerably less intensive than the Vietnamese system, Bangladeshi *pangas* culture is highly productive as compared to most other forms of inland fish culture practised in Asia (Edwards, 2009). Whereas the Vietnamese system is a monoculture, the vast majority of farms in Bangladesh also stock around 10-20% filter-feeding carps which consume algal blooms produced in the fertile ponds. These fish require dissolved oxygen and are far less tolerant of poor water quality than *Pangasius*, indicating that water quality is maintained at relatively high levels and is never allowed to become anaerobic. This tendency is reflected in the higher levels of survival associated with the latter system (see Table 3).

	Vietnam	Bangladesh
Polyculture	No	Yes
Market size (g)	1000	700-1000
Cropping cycle (months)	6	6-8
Cropping cycles/yr ⁻¹	1-2	1
Yield/crop/ha ⁻¹ (t)	370	55
Stocking density (fish/m ²)	44	6
Pond depth (m)	4	1
Standing crop/m ³ (kg)	9.25	5.5
Survival (%)	75-80	90
Water exchange	High	Limited
Water use/t fish ⁻¹ (m ³)	3000	300

Table 5.3 Biophysical characteristics of *Pangasius* cultivation in Vietnam and Bangladesh (Sinh and Hien, 2010; Lam et al, 2009; Labrousse, 2009; Haque, 2009b)

High levels of water exchange are employed by Vietnamese Pangasius farms in order to ensure harvested fish possess the white flesh required to enter the highest value export markets. As a result, despite the extremely high standing biomass of fish stocked, water quality parameters as measured per unit volume of water can be maintained at good levels by virtue of the dilution that this practice affords. In contrast, the limited water exchange that takes place in Bangladeshi ponds means that indicators employed by the ACC and PAD schemes such as total ammonia nitrogen and phosphorous may appear relatively elevated by the end of the culture cycle, despite the total discharge of these wastes over the length of a culture cycle being far lower. ACC and PAD both place limits on water consumption per kg/fish produced. This is set at 5000m³/kg by PAD (a figure which reflects levels of water consumption in the Vietnamese system), but actual water consumption for Bangladesh compares extremely favourably at just 300m³/kg.

3.2 Feed composition and traceability

All three schemes contain prescriptions relating to the use of feeds. Traceability requirements under GAA and GlobalGAP appear to mandate the use of commercially produced feeds from accredited suppliers, whilst PAD is driven by a concern for minimising volumes of potentially polluting organic matter discharged in undigested feeds, and sets the maximum allowable food conversion ratio (FCR) at 1.75 accordingly. A PAD requirement to use fish products from fisheries independently accredited as sustainably managed will in essence also prohibit the use of locally caught marine and freshwater trash fish, which are the main sources of fish used in homemade feeds in Vietnam.

Both farm-made and commercial feeds are widely used in Bangladesh and Vietnam, although as yet very little floating feed (which is most efficiently converted to protein, but more expensive) is available in the former. Average FCRs attained by farms in Bangladesh are in the order of 2, whilst FCRs on farms in Vietnam using only commercial floating feeds generally in the order of 1.7, and those for mainly farm-made diets range from less than 2.25 to 3 or more (Lam et al, 2009; Bush et al, 2009). Although most Vietnamese farmers readily acknowledge commercial diets to offer optimal performance they are considerably more expensive than farm-made diets,

meaning that use of the latter is most common among operators of smaller farms who tend to trade off cost against efficiency, particularly during periods when margins are especially slim. Thus, prescriptions relating to both the traceability of feed and to its bio-economic performance are liable to work against both smaller Vietnamese operators and virtually all Bangladeshi ones.

Composition of feeds in Bangladesh is also somewhat different to that in Vietnam, in that little or no soy protein is used in the former, the substitute being meat and bone meal exported from Europe and perhaps Australia, often labelled as fertiliser. This practice is arguably more ecologically sustainable than dependence on soy protein, both because production of soy has been linked to severe ecological degradation in the tropics (Fearnside, 2001), and because using a by-product of another food production system instead of relying on the appropriation of ecosystem space for primary production of a feed crop results in a reduced ecological footprint (Berg et al., 1996). This practice would almost certainly be disallowed should Bangladesh enter the *Pangasius* export market however on grounds of poor traceability and due to stringent EU restrictions placed on the use of animal by-products in food production imposed in the wake of the British BSE scandal (European Commission, 2001).

3.4 Fish health and welfare

Fish health and welfare receives some attention from all three certifiers, partly on the basis that good fish health and welfare is a key indicator of good management, a goal which each of the standards aims to promote. Although survival rates of around 80% during the growout phase of production are fairly typical for the Vietnamese system and catastrophic mortalities are for the most part unusual, the lower stocking densities employed in Bangladesh are commensurate with generally higher levels of welfare and mortality rarely ever exceeds 10% during growout (Table 3). This would indicate a clear advantage of the latter system in this regard. Generally better levels of fish welfare in Bangladesh also translate as a lower propensity to use antibiotics and other therapeutants for disease treatment.

3.5 Working conditions

Informal remuneration, exchange and payments in kind which supplement the basic wages of Pangasius farm workers are common in Bangladesh and Vietnam. Examples include provision of daily meals, festival and production bonuses, free housing, financial and other assistance for medical care, marriages and other important events, and consent to consume fish and other crops grown on site at will. These arrangements, which reflect local practicalities, are frequently considered fair and acceptable by workers and farm owners alike. Attempts to formulate formalised standards relating to employment conditions are thus at odds with the realities of employment of permanent farm labour in both countries, and reflect a normative set of Northern preconceptions which favour implementation by farms with a well developed bureaucratic structure and large formally registered permanent workforce. In the event that smaller operators attain certification, prescriptions such as these may lead to counterproductive tradeoffs. Labrousse (2009, p28), for instance reports a focus group of smaller-scale Vietnamese producers stating that ‘they could not pay for health and accident insurance. If they paid for it, they would have to reduce the workers’ salary’, and it seems likely that existing customary benefits might be revoked in a similar manner should more stringent labour standards be required.

Considerably greater employment opportunities are created upstream and downstream in the value chain than in permanent on-farm employment in both Vietnam and Bangladesh. This encompasses a range of independent entrepreneurial and subcontracted labouring activities including, but not restricted to, seed production, nursing and trading, feed manufacture and distribution, and growout pond harvesting. There is a tendency for levels of ancillary employment in Bangladesh to exceed those in Vietnam, in part because the system of multiple stocking and harvesting throughout the culture cycle requires high levels of maintenance by itinerant harvesting teams, and Haque (2009a) lists 20 income generating activities related to catfish culture practised in a single village. Lower densities at which fish are stocked in Bangladesh also equate to a greater labour demand per unit fish stocked compared to Vietnam. Marketing chains are extremely direct in Vietnam; product passing from farm to processor without the intervention of marketing intermediaries. This is in contrast to Bangladesh, where multiple intermediaries are involved in

complicated systems of sale and distribution which provides numerous livelihood niches. However, whereas according to the Lam et al (2009) catfish processing employs 116,000 people in Vietnam, 90% of whom are female, little if any Bangladeshi product undergoes any significant post harvest processing.

3.6 Will standards enhance sustainability?

The previous section suggests that the less intensive nature of *Pangasius* culture practised in Bangladesh may equate, broadly speaking, to better environmental performance than Vietnam given its lower demand on ecosystem services, as well as to higher levels of animal welfare. However, the formulation of environmental standards through *de facto* benchmarking against the existing Vietnamese system means that the generally less resource intensive nature of Bangladeshi farms will likely go unacknowledged or be penalised if audited for standard compliance. This points to inherent difficulties in setting standards with an environmental performance component capable of effectively regulating more than one production system simultaneously (although only PAD explicitly sets out to do this it is still effectively constrained to operating within parameters dictated by the Vietnamese system). It also suggests the environmental standard setting process to be a somewhat arbitrary one, based less on a detailed understanding of the resilience of receiving ecosystems than on certifiers' experience with standard development for other forms of intensive aquaculture²⁷, lessons from which may not necessarily be directly applicable to the peculiarities of *Pangasius* production.

Significant local declines in water quality in the vicinity of clusters of *Pangasius* ponds are reported by residents who cite increased turbidity and inability to use it for domestic purposes as they did in the past (Labrousse, 2009; Schut, 2009), and by nursery operators who blame poor water quality for the reduced performance of seed (Belton et al, 2008), suggesting that standards may have a role to play in minimising pollution from farms. Lam et al (2009) report however that

²⁷ Cherry (2006) reports that early drafts standards for *Pangasius* produced on behalf of EUREPGAP and ACC 'looking at stocking density, food safety, water quality and social elements' were 'based on elements from both EUREPGAP's salmon standards and ACC's shrimp standards'

despite its scale and intensity, the Vietnamese *Pangasius* industry's total estimated annual discharges of nitrogen (one of the key indicators used to assess water quality in the ACC and PAD standards) into the Mekong River amount to only a very small fraction of total discharge from other agricultural activities and human waste. Bosma et al. (2009) also find nitrogen discharge from catfish farming accounts for only 2% of the total in the river, that water quality in the lower Mekong River was hardly modified between 2005 and 2008 despite the massive expansion of the sector which occurred during this period, and that withdrawal of water from the river for catfish production is approximately 2%, most of which is restored as reusable water. This would appear to suggest that an emphasis on controlling the environmental impacts of *Pangasius* aquaculture on water quality is, at least in part, founded on assumptions which exaggerate likely levels of impact.

A focus on the farm as the primary source of ecological degradation also appears misplaced (Belton et al, 2009a), particularly in light of recent life cycle assessment of Vietnamese *Pangasius* culture systems which finds the production and transport of feed ingredients to be responsible for 90% of environmental impact in six out of eight impact categories (Bosma et al, 2009). The origin of feed ingredients and the transport and energy consumption associated with their production were found to be particularly important factors in producing these outcomes, possibly hinting that commercial feeds are not inevitably 'cleaner' than farm-made alternatives based on local ingredients and by-products such as meat and bone meal. There is however a tendency for standards to underestimate very substantially, and make little if any attempt to control, the impacts of pre-farm linkages in the production process, in part because their diffuse nature does not make them readily amenable to application of an environmental management systems approach. Making the farm the focal point of governance also produces a similar effect with respect to labour, since permanent on-farm employment rates tend to be far lower than work in itinerant or casual labour linked to the provision of a variety of services and, in Vietnam, in the processing sector. These actors remain beyond the reach of standards as formulated at present however, meaning that the scope of any potentially positive impacts generated in relation to working conditions is substantially curtailed.

4 Who Will Make the Grade?

The analysis presented above suggests that an ability to achieve certification may not prove a reliable indicator of environmental performance considered in the round. This section reveals that there are additional and perhaps more fundamental non-technical reasons why certain sets of producers will be able to attain certification and the market access it facilitates, whilst others are liable to face exclusion. Much of the literature on global value chains supports Busch and Bain's observation that private standards pose particular challenges for small producers, especially from developing countries because 'these producers often do not have the institutional, technological, or infrastructural capabilities to easily make the necessary changes' (2004, p341). In a comprehensive review of certification standards pertaining to Asian aquaculture Corsin et al (2007, p38) also find that 'the requirements of most schemes... are well beyond the possibilities of most producers, especially small-scale farmers in the Asia-Pacific region'. As Mantingh and Dung (2008, p18) correctly note however, '[Vietnamese] Pangasius farmers cannot be considered as poor smallholders', due to the high levels of investment required to partake in the activity and the returns which can be derived.

This is confirmed by examination of Table 4, which also indicates that, despite average operating costs roughly an order of magnitude less than those found in Vietnam, direct engagement in Pangasius culture remains beyond the means of most rural inhabitants of Bangladesh. This point is nicely illustrated by comparing the production costs involved (approximately \$250,000 and \$24,000/crop/ha⁻¹ for Vietnam and Bangladesh respectively) against average annual incomes from rice cultivation, which is the dominant agrarian activity in both locations. Marsh and MacAulay (2006) report average net returns of \$470 per annum for rice-farming households in the Mekong Delta, whilst for Bangladesh, net annual incomes from double cropped rice are in the order of \$400 per household (Haque, 2008). It should therefore come as no surprise that farm owners in both countries come predominantly from upper income brackets and (particularly owners of larger operations) engage in a variety of other business or other non-agricultural activities (Tables 5 and 6). Table 4 also shows that profit margins are generally extremely slim in Vietnam meaning that producers are highly exposed to changes in the cost of

inputs and farmgate value. Margins in the Bangladeshi system are somewhat more comfortable, and cushioned to a degree by the extra production of carps which require no outlay on additional feed. The interplay between slim margins and massive productivity mean that financial returns have the potential to be very substantial but that, conversely, losses are also easily incurred in the face of adverse circumstances. Belton et al (2011a), for instance, give a figure of \$31,000/ha⁻¹ as the average loss incurred on unsuccessful *Pangasius* crops in Vietnam.

	Vietnam	Bangladesh
Mean farm area (ha)	1-2	1.0
Farm size range (ha)	0.1-50	0.1-30
Farmgate value/kg	\$0.82	\$0.84
Production cost/kg	\$0.75	\$0.66
Margin/kg	\$0.07	\$0.18
Production cost/crop/ha ⁻¹	\$250,000	\$23,790
Net return/crop/ha ⁻¹	\$45,000	\$8025

Table 5.4 Financial characteristics of *Pangasius* cultivation in Vietnam and Bangladesh
(Belton et al, 2011a; Haque, 2009a)

Previous Occupation	Farm size		
	<1ha	1-3ha	>3ha
Aquaculture	2	2	0
Agriculture	9	2	0
Small-scale entrepreneurial	7	3	1
Medium-scale entrepreneurial	0	3	2
Managerial	2	2	5
State institutions	1	2	1

Table 5.5 Prior occupations of *Pangasius* farm operators in the Mekong Delta
(Adapted from Belton et al. 2011a)

Wellbeing status	No. households	No. Pangasius farmers	% of wellbeing group farming Pangasius
Better-off	7	6	86
Medium	17	14	82
Marginal	27	11	41
Poor	43	4	9
Poorest	116	0	0
Total	210	35	17

Table 5.6 Well-being status of households in Moddhovati village, Mymensingh, Bangladesh (Adapted from Haque, 2009a)

All of this renders the term ‘small-scale’ somewhat misleading in this context, particularly given popular connotations which link ‘small-scale aquaculture’ with poverty. Never-the-less, there is an undeniable gap between the family-run operations at the smaller-scale end of the spectrum and the larger ones maintained as business concerns by absentee urban investors and corporate entities, which translates as a greater degree of vulnerability to risk for small producers who often function on a financial knife edge with little if any reserve capital (Belton et al, 2011a). Differences in the characteristics of Vietnamese producers of various sizes are shown in Table 7 below. Although in reality category boundaries are porous, farms referred to as ‘small’ in the discussion here fall will primarily into categories 1 and 2, whilst those in categories 4 and 5 can be considered ‘large’.

There are several reasons to believe that Corsin et al.’s observations (*ibid*) will apply to each of the standards discussed here. Studies from Bangladesh (Haque, 2009a) and Vietnam (Labrousse, 2009) both report that, although generally positive in their outlook toward seeking to comply with PAD certification requirements, producers at the smaller-scale end of the spectrum struggle to comprehend the details, particularly with respect to highly technical standards relating to water quality, and would thus require training and support if they were to be able to do so. Schut (2009, p75) makes a similar point with respect to the planning documents and recording procedures required by GlobalGAP, stating that, ‘a large percentage of Pangasius farmers in Vietnam lack the expertise to write these kinds of plans, or the financial capacity to hire someone with that skill set.

These... [standards] will not exclude larger farming operations that can afford to pay for testing and hiring professionals with the required expertise but does severely limit the percentage of farmers who can participate in the system’.

Item	Farm category				
	1	2	3	4	5
Size (ha)	<0.05-0.1	0.1-0.5	0.5-1.5	1.5-5	>5
Market Orientation	Mainly local	Export	Export	Export	Export
Intensity	Low/moderate/high	High	High	High	High
Ownership and labour	Family owned & operated	Family owned & operated	Family owned & operated/ absentee owner	Absentee owner	Absentee owner/ corporate ownership
			Permanent labour	Permanent labour	Permanent labour
				Some technical & clerical staff	Professionalised technical & clerical staff
Organisation of production	One of several livelihood options	Primary livelihood activity	Primary livelihood activity/ entrepreneurial investment activity	Primary livelihood activity/ entrepreneurial investment activity	Entrepreneurial investment activity or large business
				Possible partial or complete vertical integration	Likely partial or complete vertical integration

Table 5.7 Characteristics of Vietnamese Pangasius farms by size category

This conclusion parallels findings of a study on banana growers in Ecuador by Melo and Wolf (2007), who report that ensuring compliance with standards from Rainforest Alliance (an eco-certification scheme) and EUREPGAP (the predecessor to GlobalGAP) required large injections of capital from the Commonwealth Development Corporation and the International Finance Corporation. They go on to note that ‘clearly certification was and remains a large project supported by the commitments and capital of industrialized nations’ (p269), and that, ‘credible certification systems are currently relevant only for the top segment of the relevant populations. Voluntary [eco]certification systems do not reach firms that lack the resources to improve their production practices... Most producers and acreage will remain uncertified’ (p273).

Umesh et al (2010, p41) do report success in organising small-scale shrimp farmers in India 'through a cluster based approach' in order to implement best management practices (BMPs). This effort apparently resulted in significantly improved shrimp yields, lower incidences of disease and higher profitability among group members. BMPs are understood to be considerably less demanding in terms of compliance than all of the standards discussed here however, and it appears that achieving these outcomes required a considerable long term financial and institutional commitment, including the formation of a new federal institution, the National Centre for Sustainable Aquaculture, to carry out project activities in this area. A pilot project in Vietnam aimed at facilitating SQF1000 certification among a cooperative of category 1 and 2 Pangasius farmers (Table 7) experienced substantial problems in ensuring cooperation and collective action on the part of members, suggesting that this type of arrangement might not prove to be a panacea for certification among smaller producers (Kheim, 2010)

Whilst it is unclear exactly how great an additional financial burden ensuring compliance would impose on Pangasius producers in terms of auditing fees and costs of making physical alterations to the farm there are additional and, arguably, more pressing reasons why certification will fall more readily within the grasp of the largest farms. One of these is the organisational structure of large operations, particularly those which are run by processing companies or are independently operated but substantially vertically integrated to include feed mills, nurseries, and in some cases hatcheries (Table 7). Farms of this type are inherently better placed to meet with traceability requirements because of the ease with which they can demonstrate the origin of inputs and, by virtue of their size and level of capitalisation, tend to be highly professionalised; possessing a bureaucratised structure in which detailed record keeping already occurs, and a dedicated qualified technical and administrative staff to whom responsibility for ensuring compliance can be delegated. Importantly in this regard, Higgins et al (2008) find that Australian cattle farmers have been able to adopt environmental management systems (EMS) successfully but that, crucially, they had considerable previous exposure to record-keeping, auditing and reporting procedures which allowed them to incorporate the EMS process as part of existing practices with relatively little difficulty

In Vietnam, associations of producers affiliated to processing companies, of which there are a considerable number, may offer an alternative means of ensuring improved traceability, training delivery and greater levels of vertical co-ordination within the value chain to facilitate certification. The AGIFISH Company's Pure Pangasius Union (APPU) is perhaps the best known of these. Members receive technical support and training from AGIFISH intended to culminate in attaining SQF1000 certification, and must purchase seed and feed from accredited sources. Whilst members do not receive a premium price for their output, they benefit considerably from privileged market access since the company always prioritises its membership when sourcing fish for processing. APPU membership is restricted however, and composed predominantly of company employees or shareholders (Bush and Belton, in press), and it is likely that other such associations are also dominated by powerful farm operators well-connected to the co-ordinating companies, and hence offer little scope for entry by large numbers of small producers.

Evidence presented in this section suggests therefore that despite omission of any explicit requirements regarding scale of operations from all of the standards reviewed (PAD is at pains to point out that anyone can be certified regardless of scale provided they can find ways to ensure compliance), Vietnamese producers at the smaller-scale end of the spectrum will be at a disadvantage in attempting to attain certification for a variety of reasons and are thus less likely to 'make the grade' than their larger corporately owned and vertically integrated or organised counterparts. For the immediate future most Bangladeshi producers are also likely to be excluded from the certification schemes assessed here for reasons similar to those that apply to smaller Vietnamese producers, and because standards for Pangasius culture are effectively benchmarked against the Vietnamese culture system.

5 ... and Will it Matter?

5.1 For producers in Bangladesh

Despite practising a less resource consumptive culture system than Vietnam, at present it appears unlikely that producers in Bangladesh would attain certification under any of the schemes reviewed here. This is in part because current feeding practices would fail to meet traceability and feed

conversion efficiency requirements demanded by the various schemes, and in part because water quality standards are set with reference to the Vietnamese production system and would appear to disqualify Bangladeshi producers even though it seems likely that they would achieve superior results if measured by differently weighted criteria.

The feed issue is by no means insoluble since if sufficient demand for higher grade commercial feeds were to emerge as a result of producers seeking to attain certification one of the many feed businesses operating in Bangladesh would almost certainly move to meet it. *Pangasius* production in Bangladesh is as yet only very partially linked into global value chains however, and the scale on which production occurs is on average considerably smaller than in Vietnam in terms of investment and productivity. This makes barriers to the inclusion of smaller producers from Bangladesh proportionately greater than those applicable to smaller producers in Vietnam. Nevertheless, large well-financed operations run by powerful entrepreneurs do exist in Bangladesh, and actors of this type have already signalled interest in attempting to move toward export-orientated production (perhaps in tandem with certification) via their active participation in the PAD and other international fora.

There are likely to be issues to do with product quality and consistency should Bangladesh choose this path however, particularly with respect to the highest value markets, since the flesh of *Pangasius* produced in static ponds tends to take on an off-white colouration which renders it unsalable in many Western markets where demand is for pure white fillets²⁸. This tendency, which is circumvented in Vietnam by high rates of water exchange made possible by the location of farms in close proximity to the Mekong, would at present appear to represent the most critical barrier to entry into mainstream markets in developed countries for Bangladeshi producers, and would need to be addressed before it would make sense to seriously pursue certification.

Furthermore, there is presently little incentive for Bangladeshi producers to look overseas given that average farmgate prices are virtually identical to those in Vietnam, whilst profit margins

²⁸ Vietnamese processors differentiate between grades of meat based on colour. Grade 1: is white and light pink colour and is in highest demand in Europe and USA. Grade 2 is cream or light yellow and sells mainly in Eastern Europe and the Middle East. Grade 3 is yellow and is sold predominantly within Asia. Product value declines from grades 1-3 (Khoi et al, 2008).

are considerably higher. Entry into international markets would also bring with it greater competition along with a variety of potential unforeseen risks, as the Vietnamese ‘catfish wars’ episode demonstrates. The benefits derived from serving a large domestic market are also more equitably distributed through the supply of relatively affordable high quality fish protein than they would be by its export to Northern consumers. Thus for the vast majority of Bangladeshi Pangasius producers a likely failure to make the certification grade will be of little practical consequence in the short to medium term. Never-the-less, if domestic markets eventually reach saturation point and unforeseen eventualities (emergence of a virulent new pathogen for example) affect Vietnamese output, this balance may shift.

The participation of a number of prominent Bangladeshi Pangasius farm owners in PAD with a view to possible future re-orientation toward export therefore raises the interesting possibility that attempts to achieve compliance with third party certification could serve as a future point of entry from which to leverage reconfiguration of the production process to facilitate entry into global markets however. Such an eventuality would lend weight to Higgins et al.’s observation that ‘while farmers – particularly in developing nations – are largely “standards takers”, they may seek to use standards and [third party certification] strategically’ (2008, p1778) as a means of advancing their own interests and thus may be able to increase rather than diminish their agency (though for Pangasius it is primarily only the well-connected and capitalised owners of large operations able to proactively engage certifiers, government, processors and other key actors who are liable to do so)

5.2 For producers in Vietnam

Given the apparently inexorable logic of value chain governance by private standard it is probable that emerging third party schemes for certification of Pangasius destined for markets in the Global North represent the leading edge of phenomenon that will assume ever-greater ubiquity and significance. Retailers may be particularly keen to introduce systems that serve to inject greater traceability and accountability into the commodity chain given the prevalence of anti-biotic use on Vietnamese farms, and hygiene concerns which have recently prompted a number of food scares in

Europe and temporary bans on Pangasius imports by Russia and Egypt (Bush and Duijf, Forthcoming; Eurofish, 2009). Question marks raised over the safety of Vietnamese product may also serve as an important incentive for exporters to demand certification from the producers who supply them in the interests of preserving reputation and avoiding the imposition of trade barriers²⁹. Certification is thus increasingly likely to become a key determinant of market access for producers and as a result may ultimately come to matter a great deal to Vietnamese producers.

According to Higgins et al (2008, p1779) ‘market signals for environmental assurance are currently weak’. Experiences from the certification of other products such as MSC certified South African hake which ‘is sold at the same price as “regular” fish at the retail level’ (Ponte, 2006, p41), and shade grown and eco-friendly coffee certifications for which there are no price premiums (Giovannucci and Ponte, 2005) support this assertion, and give no reason to believe that adherence to any of the main schemes addressed here will result in a better price for producers. The (non)existence of price incentives will ultimately have little if any bearing on producers’ decisions to adopt standards however since, as growing numbers of major retailers request certification, ‘[it] may become less about gaining a competitive edge and more about simply remaining in the marketplace’ (Hatanaka et al, 2005, p361). As a result, those who do not meet standards will be ‘excluded from markets in the short run and may eventually be forced to exit the sector’ (Fulponi, 2006, p11). This process is likely to unfold fairly slowly to begin with because few producers will be willing to make the changes required of them, particularly where those suppliers in a position to upgrade possess export market alternatives. As a result, some chains initially take a position somewhere between non-application of private standards and full implementation and enforcement (Henson and Reardon, 2005). Never-the-less, once a critical mass is reached compliance will become imperative for those wishing to export high grade white meat Pangasius, particularly since an estimated 80% of total output originates from just 20% of the farms in operation (Loc et al. 2009).

²⁹ Imports of shrimp and other seafood from countries including Bangladesh and Vietnam have at times been banned by the EU and other major markets on the basis of objections about quality which are sometimes enacted to serve as non-tariff trade barriers (Cato & Lima Dos Santos, 1998; Mansfield, 2003).

Following a decade of rapid growth the Vietnamese Pangasius industry now appears to be undergoing what Fold and Gough (2008, p1688) refer to as a ‘maturation phase’, during which concentration and centralisation takes place among suppliers, with the result that competition will ‘wipe out’ weaker ones. This observation is borne out by data from Loc et al (2010) which suggests a 61% reduction in the number of farms under 0.1ha in size between 2006 and 2008, and a 247% increase in those over 2ha for the same period in An Giang province. Given that private standards will increasingly govern the ability of producers to access major markets in the EU and elsewhere, certification therefore seems liable to hasten an already ongoing process of consolidation in Vietnam, and to make it more acute. This conclusion is supported by Dolan and Humphrey (2000), who find that stronger governance of commodity chains for fresh African vegetables by buyers in developed countries through the imposition of quality standards has meant that ‘market share of smallholder production and small export firms has declined and the industry is dominated by a few large exporters sourcing predominantly from large-scale production units’ (p161).

Never-the-less, it would be wrong to envisage some sort of widespread proletarianisation resulting from this process since, as indicated in the previous section, all but the very smallest of producers (those in category 1 of Table 7) are, despite exposure to high levels of risk, wealthy operators engaged in an essentially capitalist form of production. Exclusion of category 1 producers from export markets is not necessarily problematic since it is relatively easy for them to ‘out-grade’, to other forms of aquaculture or ‘down-grade’ into activities such as nursing and because they frequently possess diversified livelihood portfolios (Bush and Belton, in press). More significant impacts are likely for category 2 and some category 3 producers (those with farms sized 0.1-0.5 and 0.5-1.5ha) however, since levels of capital investment and potential indebtedness are great and no alternative agrarian activities are capable of generating anything like the same level of return (Belton et al, 2011a)

Certification will not necessarily signal the end for category 2 and 3 producers however, at least for the time being. Former Eastern Bloc countries are now major importers of Vietnamese Pangasius, whilst the Middle East and Latin America represent important emerging markets with lower quality requirements and lesser consumer demand for intangible qualities. Thus, what may

occur in the medium term is a division in which larger professionalised or corporate operations service those markets demanding certified product, whilst smaller operators continue as best they can to cater for markets with lower entry requirements but face increased vulnerability due to shrinking market share and downward price pressures (Ellis, 2006), thereby deepening existing inequalities in market access (Belton et al, 2009).

Furthermore, as Hatanaka et al (2005, p366) note, as standards become more pervasive, 'non-certified growers may be pushed into less profitable internal markets'. Raw material rejected by processors, which is already disposed of in these markets (Loc et al., 2009), may also increase in volume as regulation becomes more stringent. Given that the Vietnamese domestic market for *Pangasius* is already well supplied and of finite capacity, these trends may ultimately negatively affect domestic producers of other species such as grass carp and tilapia. Such developments may also spur the development of greater intraregional trade in *Pangasius*.

6 Conclusion

Certification is an increasingly pervasive form of market governance through which retailers and NGOs located in the Global North are able to exert control over producers of primary products in order to secure their interests. This paper has sought to evaluate the likely results of emerging standards intended to govern production of a new global commodity, *Pangasius* catfish. This evaluation has focussed on implications for *Pangasius* producers in Vietnam and Bangladesh, and one of the key areas which standards seek to regulate; the environment. Although they are not yet firmly established, the simultaneous emergence of several certification schemes suggests that patterns of governance already well established for other commodities are on the brink of happening to *Pangasius*, and will therefore increasingly come to regulate producer access to Western European and North American markets. Henson and Reardon (2005) also indicate that this reconfiguration of value chains is increasingly evident in countries of the Global South as supermarkets advance globally.

The evaluation presented here suggests that larger Vietnamese operations are most likely to achieve certification since they tend to possess organisational structures and characteristics

amenable to the adaptation which will be needed to meet standard requirements and the requisite capitals required to facilitate proactive engagement with certifiers. Technical requirements such as those pertaining to feed use will also generally work in favour of larger producers. The case of Ecuadorean Bananas noted above also suggests that, even for larger businesses, external support and investment may be required if certification criteria are to be met (Melo and Wolf, 2007). Thus it seems likely that in Vietnam the growing reach of certification will intensify the level of relative vulnerability experienced by smaller producers by further reducing their already somewhat constrained ability to dispose of product. This is likely to reinforce pre-existing market inequalities and, over time, lead to progressively more rigid market segmentation and greater consolidation and concentration among larger suppliers. These conclusions are broadly in line with much of the literature on standards and global value chains, and add nuance to the general observation that their spread is likely to result in growing marginalisation for smaller producers.

For Bangladesh, achieving certification raises the interesting prospect of opening up a gateway to global commodity chains for a select group of large entrepreneurial producers, suggesting that, at least for those with the resources to mobilise proactively, standards may also result in increased agency with which to forge new market opportunities. However, despite culture practices which in many respects are arguably preferable from an environmental standpoint, Bangladeshi producers will, at least for the time being, fail to make the grade. This leads us to conclude that all third party certification schemes adopted by major retailers (even those with a primary agenda that is avowedly environmentally or socially motivated) must be understood as instruments that function, first and foremost, to order and lubricate value chains to the advantage of buyers and, second, (in light of Islam's conception of a 'twin-driven chain'), to extend the institutional interests of certifiers. In doing so they reduce risk by instituting traceability and greater surveillance, create strategic advantage in the market place through the creation of credence attributes linked to the production of public environmental and social goods, and expand the coverage of certification brands. The process of standard setting will therefore come to define which public goods matter and how they are to be attained, based largely on what is most conveniently quantified and regulated, and on the congruence of these aims with maintenance of

control over product safety. Credence attributes embedded in certified products will therefore always reflect a construction of sustainability more reflective of the interests of retailers than of the material realities of production.

Chapter 6 - Does size matter? Reassessing the Relationship between 'Small-Scale' Aquaculture and Poverty

(Submitted to the Journal of Development Studies)

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Abstract: 'Small-scale' aquaculture has been promoted by development institutions on the understanding that it can alleviate poverty. This commonly held view is challenged here based on empirical data on fish culture collected in Mymensingh district, Bangladesh. Drawing on concepts from the literature on agricultural growth and elaborating a typology of aquaculture based on relations of production rather than scale, it is demonstrated that quasi-capitalist forms of aquaculture possess far greater potential to leverage a range of desirable development outcomes than the quasi-peasant forms of production widely assumed to do so. The policy implications of this conclusion are explored.

Key words: Bangladesh, poverty, small-scale aquaculture, entrepreneurial smallholder, peasant

Acknowledgements: The authors thank Peter Edwards for the exchange of correspondence during the writing of this paper which contributed greatly to the formation of the ideas within it, to Jock Stirrat for his incisive comments, and to Hazrat Ali for his generous assistance during parts of the field work which inform it.

Does Size Matter? Reassessing the Relationship between ‘Small-Scale’ Aquaculture and Poverty

1 Introduction

Publication of the *World Development Report 2008* (World Bank, 2007) signalled renewed interest in the capacity of agriculture to deliver economic development and reduce poverty in the Global South. The report emphasises the deeper integration of competitive commercially-oriented entrepreneurial smallholders into the global economy, expanded opportunities for rural waged labour and outmigration from the rural economy as fundamental solutions to rural poverty in a variety of settings (Akram-Lodhi, 2008). Despite this call the long dominant narrative of smallholder efficiency (Ellis and Biggs, 2001) remains popular, and has gained in prominence in some quarters in the wake of the 2008 world food crisis (see for example Guillou’s comments in Butler, 2010).

‘Small-scale aquaculture’ has long been championed by development institutions based on its perceived potential to alleviate poverty, enhance food security and promote economic development (see for instance Bondad-Reantaso and Prein, 2010). Research and promotional efforts have spawned a substantial literature, but this remains largely dislocated from the much larger body of work on ‘smallholder’ agriculture. Whilst similarities between the two are evident, that which addresses agriculture is far more theoretically advanced than that dealing with aquaculture³⁰, and the received wisdom that direct participation of low-income households in ‘small-scale aquaculture’ affords greater potential to alleviate poverty than more capital intensive forms of fish production is increasingly being challenged (Brummet et al, 2008; Belton and Little, 2011).

³⁰ There are also numerous similarities evident between the literature on aquaculture and development and that dealing with development related aspects of livestock husbandry (see Delgado et al (1999) as an example of the latter). This is reflective of fundamental similarities between terrestrial and aquatic animal husbandry, and of the similar institutional contexts in which research on each is conducted which leads to closely matching discursive formations. Despite this considerable overlap there are virtually no comparative treatments of the two. Such an analysis is not attempted here however since the intent of this paper is to apply the theoretical foundations of the agricultural growth literature to the field of aquaculture.

The opening sections of this paper review key themes in the literature on agricultural growth and small-scale aquaculture. A typology of aquaculture is then proposed which adopts relations of production rather than scale as its central heuristic. A case study of two contrasting forms of aquaculture in Mymensingh district, Bangladesh is presented to test the utility of this new typology. This is analysed with reference to both the ‘small-scale aquaculture’ narrative and relations of production. Finally it is argued that, when coupled to the concept of ‘rural growth linkages’ adopted from the agricultural growth literature, relations of production offers a more effective means of understanding the capacity of aquaculture to mitigate poverty, enhance food security and bring about growth at the aggregate national level than the explanations which emphasise scale alone.

2 Agricultural Growth and Rural Development

Explicit links have long been drawn between growth in agricultural productivity and both rural and national economic growth. Early development economists posited ‘modern’ large-scale agriculture as the most efficient option for securing increases in farm productivity needed to hold down urban food prices and free up surplus rural labour for work in industry, thus driving economic growth (Byerlee et al, 2009). ‘Traditional’ or ‘subsistence’ agriculture was seen as lacking the capacity to deliver these outcomes (Ellis and Biggs, 2001), and was considered doomed to be subsumed by its modern capitalist counterpart. This logic shifted following the Green Revolution experience in Asia which appeared to show that, contrary to previous expectations, newly developed technologies (high yielding varieties and packages of intensive inputs) were scale neutral, making small farmers capable of successful adoption. In fact, it came to be argued, there were diseconomies of scale operating in agriculture as a result of high transaction costs associated with hired farm labour, and due to a superior knowledge of soils, topography, drainage, and the like which allowed small farmers to work their lands at optimal levels of efficiency (Wiggins, 2009).

Numerous studies conducted since appear to confirm the so called ‘inverse relationship’ between farm size and per unit area productivity (Hazell et al, 2007). In addition, it came to be understood that rising agricultural output in the small-farm sector resulted in ‘rural growth

linkages' which spurred the growth of labour-intensive non-farm activities in rural areas, and that linkages associated with small-holder dominated agriculture were more numerous and dense than those associated with large farms alone due to the favourable spending patterns of small-farm households (Ellis and Biggs, 2001; Hazell et al, 2007). Thus, agriculture came to be seen not just as an adjunct to urban manufacturing, but as an important driver of growth in its own right, and one in which small farms (and, by implication, poor farmers) possessed the greatest capacity for leveraging growth. This school of thought, which Ellis and Biggs (2001) dub the 'small-farm-first' paradigm has, in various forms, dominated rural development thinking throughout the last half-century.

Irz et al (2001) summarise the theoretical consequences of agricultural growth (i.e. increases in farm productivity and area under cultivation) at the level of the farm economy, rural economy, and national economy. At the farm level these include higher incomes for farmers, greater on-farm employment opportunities and corresponding demand-linked rises in wage rates for farm labour. The most important effects within the rural economy are created by growth linkages, both in upstream and downstream in agricultural value chains and throughout the rural non-farm economy through 'consumption linkages' which occur due to the expenditure of additional incomes by farmers and farm workers (Ellis, 1998). At the level of the national economy some of the most important effects derive from reductions in the price of food and raw materials which effectively raise real wages among urban populations and allow operational costs in manufacturing and other sectors to remain low, and from the generation of savings and tax revenues which may be reinvested in non-farm businesses, education, infrastructure and other key areas, thereby stimulating further growth. Increased exports of agricultural commodities may also increase foreign exchange (Irz et al, 2001).

A number of qualifications are due. In the first instance much rests on the assumption that the bulk of the rural poor are small farmers, when in fact very high levels of landlessness prevail in many areas³¹, although many landless rural inhabitants still stand to gain from employment in a

³¹ Bangladesh is a case in point, with over 50 percent of the rural population owning less than 0.2ha of land – the threshold considered to signify functional landlessness there (Rahman and Manprasert, 2006)

buoyant market if the logic of small-farm efficiency is correct (Ellis and Biggs, 2001). Perhaps more important is the observation that distribution is often highly skewed even in areas where there is relatively little concentration of land ownership with the result that most marketed output comes from a minority of small farms. This leads Wiggins (2009, p2) to the conclusion that, 'smallholder development will benefit directly probably no more than the uppermost quartile of small farmers'. The term small-scale is also poorly defined, 'small' being a relative and geographically contingent concept (Ashley and Maxwell, 2001). Wiggins also finds that unstated assumptions about precisely what is being discussed are obscured by use of the term. In the debate, he asks, 'about farms with the equivalent of two or three hectares of reasonable arable land, or is it about the land hungry who have access to plots of one hectare or less?' (2009, p13). Despite these issues the extent of this body of work and the diversity of narratives within it signals how thoroughly researched and theorised the areas of agricultural growth and small-holder productivity are. This stands in sharp contrast to the field of aquaculture and the 'small-scale' sub-set of the activity on which most development hopes have been pinned, which, as the following section shows, is far more weakly conceived.

3 Small-Scale Aquaculture

Aquaculture has received attention and support from development agencies since the 1950s. Early efforts focused predominantly on the development and transfer of productive technologies. Coastal shrimp farming in particular received major multilateral development bank support (Bailey and Skladany, 1988), although efforts such as the USAID funded Village Fisheries Demonstration Program in Northeast Thailand during the 1970s and 1980s also pursued a broader rural development agenda (Bush, 2008). Nash, writing for FAO in 1986 cites increased trade and foreign exchange, increased producer incomes, and increased employment as the main three objectives which promotion of aquaculture can fulfill (Nash, 1986). Reductions in poverty are a potential derived outcome of the activity's development, but are by no means prioritized or even inferred. This is in contrast to the situation at the end of the 1990s, by which time aquaculture practitioners had begun to draw unequivocal links between promotion of aquaculture and reductions in

poverty³². This shift from productionist to poverty-centered narratives was the result not of a dawning realization of the positive social externalities of aquaculture, but a response to changing donor agendas in line with wider shifts in development discourse taking place at that time. Articles by Edwards (1999; 2000) which represent some of the best known work on aquaculture and poverty, started life as a response to the question “to what extent is aquaculture a poverty reducing technology?”, issued as a challenge by the then UK Fisheries Adviser, the answer to which would either justify or forego continued DFID funding of aquaculture research and development activities in Southeast Asia (Pers. Comm. Edwards 2010).

Because continued donor support for aquaculture rested on the notion that it was a ‘poverty reducing technology’, and because the activity in its commercial forms is usually investment intensive to a degree where it could not credibly be considered to fall within reach of the poor, low-input ‘rural aquaculture’ and its more recent synonym ‘small-scale’ aquaculture (hereafter SSA) came to be emphasised as the key means of linking aquaculture to development goals. Thus, unlike agriculture, in which the doctrine of small-farm-first originates from a large body of empirically grounded theory (albeit one which is not immune to criticism or occasional modification in line with shifting discursive currents), the reification of SSA as a poverty reducing mechanism results largely from the need of a particular set of institutions to align with donor priorities in order to ensure their continued support. To paraphrase Bauin (1982), small-scale aquaculture should therefore be seen as ‘a field by bureaucratic fiat’.

Various authors, starting with Martinez-Espinoza (1995), have attempted to define SSA³³ or have written about its characteristics. These include; the poverty of its practitioners (Martinez-Espinoza, 1995; Edwards, 2000; Edwards et al., 2002; Friend and Funge-Smith, 2002); its subsistence or semi-subsistence nature (Martinez-Espinoza, 1995; Edwards and Demaine, 1997;

³² This discursive shift followed a period during which seed from commercial hatcheries had become widely available in large quantities throughout much of Asia. This was a precondition necessary for aquaculture to assume the mantle of a technology which could, at least in theory, be adopted by large numbers of poor households.

³³ The term ‘rural aquaculture’ as used by Martinez-Espinoza is analogous to ‘small-scale aquaculture’, juxtaposed as it is by with ‘industrial’ aquaculture. This is also true of its later usage by Edwards et al (2002)

Prein, 2002); its potential as a means of agricultural diversification (e.g. Martinez-Espinoza, 1995; Friend and Funge-Smith, 2002; Prein, 2002); family ownership and operation of production (e.g. De Silva and Davy, 2010); a reliance on predominantly family labour (Subasinghe and Phillips, 2008) and, logically given the name, utilization of small areas of land and/or water (Subasinghe and Phillips, 2008; Bondad-Reantaso and Prein, 2010). Most recently, an FAO workshop reworked Martinez-Espinoza's original typology, concluding that small-scale aquaculture is a continuum from, 'Type 1' systems 'involving limited investment in assets, some small investment in operational costs, including largely family labour and in which aquaculture is just one of several enterprises', to 'Type 2' systems 'in which aquaculture is the principal source of livelihood, in which the operator has invested substantial livelihood assets in terms of time, labour, infrastructure and capital' (Bondad-Reantaso and Prein, 2010, p8).

Despite having absorbed some of the sustainable livelihoods flavour of the preceding decade this definition remains problematic in two respects. First, unlike in the small farm narrative, which is justified on the basis of an inverse ratio of farm size to efficiency, it lacks a clear theoretical basis which would explain precisely why aquaculture within this continuum should offer developmental outcomes exceeding those of the 'industrial' aquaculture against which it remains implicitly opposed. Second, because the definition is potentially applicable to such a wide range of aquatic farming systems it lacks precision as an analytical category and thus, strength as a basis for practical decision making. In the following section we therefore introduce an alternative framework which we suggest to be of greater categorical utility.

4 From Scale to Relations of Production

Attempts to define aquaculture according to scale are necessarily somewhat arbitrary and owe much to the bureaucratic impetus to create categories with 'political' value. This section introduces an alternative framework for understanding aquaculture (and its potential to ameliorate poverty),

based on the material and social nature of its relations of production. A typology of aquaculture based on relations of production is presented in Table 1 below³⁴.

Table 1's central heuristic is its location of aquaculture on continuum running from what we label 'quasi-peasant', through 'quasi-capitalist', to fully capitalist relations of production. The term quasi-peasant is used to refer to farming systems in which the household controls the means of production (most importantly ponds) and organises the labour necessary to utilise them productively based on kinship (as opposed to market) relations. The household owns the final product (fish) and may dispose some or all of it in the market. Consumption of fish, or of the cash incomes derived from sales of fish, is used to guarantee the continuation of the process by which the household sustains its productive activities and thus itself (Friedman, 1978). This definition encapsulates producers ranging from those producing for wholly subsistence purposes (often identified with peasant producers) to those who produce entirely for the market, all of whom are united by a single aim (reproduction) and are unable to create surplus value from the production process. We borrow the term 'quasi-capitalist' from Lighthall and Roberts (1995) who, use it to refer to 'those farm operations that have set down the path towards capitalist social relations via scale expansion and hired labor but are still predominantly family run enterprises with no reliance on outside investors' (p234). Capitalist aquaculture, as the quote implies, tends to result in substantial or complete delinking of farm operations from the household economic unit, with increasing levels of professionalisation and corporatisation prevalent.

³⁴ This characterization is developed with specific reference to the pond-based culture of food-fish which dominates Asian aquaculture. Other systems such as cage-based culture, culture-based fisheries, shrimp culture, nursery operations, and mollusk and seaweed farming may be exceptional in some respects. The framework has its origins in a table which features in Belton et al (2011b), later modified in Edwards (Forthcoming), and modified further here with inspiration from Johnson (2006)

	Characteristics					
	Quasi-Peasant		Quasi-capitalist		Capitalist	
Relations of production	Quasi-Peasant		Quasi-capitalist		Capitalist	
Production intensity	Low	Low/moderate	Moderate	Moderate/intensive	Moderate/intensive	Highly intensive
Capital & operating costs	Limited	Moderate		Substantial	High	Very high
Ownership & labour	Family owned & operated	Family owned & operated	Family owned & operated	Family owned & operated or absentee owner	Family owned & operated or absentee owner	Absentee owner or corporate ownership
				Part-time &/or permanent labour	Permanent labour	Permanent labour
					Managerial staff	Professionalised managerial, technical & clerical staff
Organisation of production	Minor activity in a portfolio of livelihood options	One of a portfolio of livelihood options	Primary livelihood activity	Primary livelihood activity or entrepreneurial investment activity	Primary livelihood activity or entrepreneurial investment activity	Entrepreneurial investment activity or large business
					Possible or partial or complete vertical integration	Likely partial or complete vertical integration
Market orientation	Subsistence/local/district		District/urban/national		National/export	

Table 6.1 Typology of pond based finfish culture and its characteristics

The typology thus extends certain elements present in earlier formulations of small-scale aquaculture to their logical conclusion (e.g. concerns with family labour and operation), whilst moving away from associations with physical size that the term ‘small-scale’ evokes. The reason for emphasising this latter point is to avoid both the arbitrariness involved in judgements relating to size (how small does a farm have to be before it can be considered small-scale? and small relative to what?), and because per unit area productivity can vary massively according to the species stocked and the ways in which they are managed.

This point leads us to the second level of the table which indicates a close correlation between production relations and system intensity. Intensity in aquaculture is defined in relation to feeding practice, with extensive systems using no artificially introduced feed whatever. Semi-intensive systems are reliant on application of fertiliser to produce natural feed (plankton) in the pond and, frequently, inputs of supplementary feedstuffs. Intensively managed systems are entirely dependent on artificially introduced feeds; most commonly complete pelleted diets that contain a number of processed ingredients formulated to optimise growth rates (Edwards 2009). As feed-related intensity increases there is also a requirement for more intensive management in order to maintain artificial conditions within optimum biological parameters for the increasingly valuable crops produced and, consequently, a need for greater skills, expertise, technological inputs (drugs, water pumps, aerators and so on) and, frequently, labour. Thus, as intensity rises and production becomes more capitalised fixed costs, operating costs (comprised predominantly of feed) and demand for labour all grow, marking a shift from quasi-peasant to quasi-capitalist relations of production.

Increasing investment costs and potential returns see aquaculture playing a more significant role in livelihood portfolios as intensification occurs and relations of production move from quasi-peasant toward quasi-capitalist. As ever-more intensive forms of production and capitalist relations of production are encountered aquaculture becomes increasingly de-linked from agrarian livelihoods, and begins to feature market entry by entrepreneurial (often absentee) investors and, in some instances, vertically integrated agri-businesses. Production volumes and commoditisation also increase and the geographical boundaries of output markets tend to expand correspondingly,

shifting from the immediate locality of the farm to district, national, international and, in some cases, global scales as output becomes increasingly integrated into ever wider circuits of exchange. This trend is mirrored by outwards expansion of the geographical boundaries of input markets which accompanies intensification and associated penetration by capital.

5 Aquaculture, Poverty and Rural Growth Linkages in Mymensingh

This section aims to test the suitability of ‘relations of production’ as a framework for understanding the poverty alleviation potential of aquaculture with reference to a case study of aquaculture in Mymensingh, Bangladesh. The two predominant forms of aquaculture in the district – homestead carp culture and intensive *Pangasius* catfish (*Pangasianodon hypophthalmus*) culture – are described, and then comparatively analysed with reference both to the ‘small-scale aquaculture’ narrative and relations of production framework³⁵.

5.1 Aquaculture in Mymensingh: a case study

The remainder of the section is based on data collected through interviews and participatory appraisal (PRA) exercises conducted in three Upazilas (sub-districts) of Mymensingh. Several sites were visited during the first half of 2010 in areas with high concentrations of homestead carp ponds and *Pangasius* farms, and interviews and discussions were held with pond owners, fish farm employees, hatchery operators, marketing intermediaries, local inhabitants and staff of the Department of Fisheries. The most intensive fieldwork was conducted in two villages. The first, in Phulpur Upazila, is located in a rural area several kilometres from the main road where aquaculture consists almost exclusively of homestead carp production. The second location in Trishal Upazila is close to a small town just off the main Dhaka-Mymensingh highway where fish culture is dominated by production of *Pangasius*.

³⁵ Mymensingh is among the major freshwater fish producing districts in Bangladesh. Aquaculture is dominated by production of carp in small ponds for semi-subsistence purposes and commercial *Pangasius* catfish farming. Some carp culture for completely commercial purposes is also practised but to a comparatively limited degree. The term ‘homestead carp culture’ is used here to differentiate partially subsistence carp production, which is the principal concern of the paper, from the more commercial form of the activity.

Informal participatory exercises lasting for several hours were conducted with groups of inhabitants in the two study villages during which every household in the community for whom those present could recall information was named and assigned a socioeconomic class, the boundaries of which were defined by the participants. Information on a range of indicators including size of landholding and ownership of other productive assets, primary and secondary occupation of household head and, where applicable, details of pond ownership and pond area, were also recorded for as many households as possible. The extensive and largely unstructured group discussions which took place as part of this process helped to clarify and triangulate the information gathered and allowed for the exploration of topics that emerged during the course of the conversation. This approach not only proved instructive in its own right but was also extremely useful in contextualising the information generated by earlier semi-structured interviews, and facilitated the selection of pond owners for further interviews on a purposively stratified basis according to class criteria defined during the PRA.

Extensive fish culture is a traditional activity in Mymensingh. Ponds were originally constructed close to homesteads for multiple purposes including raising houses above the level of flood waters and providing water for drinking, bathing and watering livestock (Karim, 2006). Declining availability of wild fish coincided with increasing availability of hatchery produced seed, improving transport links and market access, and promotional efforts by a number of institutions and projects during the 1980s and 1990s. All of these factors have contributed to a general increase in the numbers of such ponds brought under fish culture, and in their deliberate management for this purpose. The uptake of 'improved' management strategies such as regular application of fertilizers and feeds, and the stocking of fish species in combinations and densities suitable for boosting productivity remains somewhat patchy however, as Department of Fisheries (DOF) statistics which identify three categories of 'non-commercial farm' - 'extensive', 'improved extensive' and 'semi-intensive' – suggest (Table 2).

The median area of ponds devoted to homestead carp culture in our main study site in Phulpur is 0.08ha. Approximate budgets for farms operating at each level of intensity recorded by DOF are given in Table 2. There are no labour costs other than the commission extracted by harvesting teams on the day of sale. Other operating costs are limited primarily to fingerlings

(exclusively in the case of extensively managed ponds), small quantities of inorganic fertilisers, and 'raw' (i.e. unformulated) feeds purchased off-farm, most commonly rice bran and mustard oil cake. Rent is rarely incurred since ponds are normally borrow pits dug on land immediately adjacent to the homestead.

Item	Extensive	Improved-extensive	Semi-intensive
Extrapolated yield (kg/ha)	527	1860	2890
Actual yield (kg/household)	42	149	231
Per unit farmgate value (\$/kg)	1.44	1.44	1.44
Operating costs (\$/household)	58	163	216
Actual cash equivalent gross income (\$/household)	66	215	337
Net cash income (\$/household)	0	52	121
Net fish consumption (kg/household)	42	75	116

Note: Based on unpublished DOF statistics for yields in Phulpur Upazila and representative values from field interviews; it is assumed that pond size is 0.08ha and that 50% of fish produced is utilised for household consumption with the remainder sold, except extensive for which it is assumed that no fish is sold.

Table 6.2 Approximate budgets for homestead pond carp culture, Phulpur Upazila, Mymensingh

Commercial production of non-native *Pangasius* catfish began in Mymensingh in 1993, and expanded rapidly to reaching an estimated 300,000t nationally by 2008 (Belton et al, 2011b). This has caused the fish's value to decline to its present level approximately 40-50% lower than that typically obtained by traditionally popular Indian major carps, and makes it the cheapest widely available fish species in Bangladesh (Little et al, 2009). Unlike the carps which dominate production in homestead ponds *Pangasius* are fed artificial diets comprised of compound pelleted feed in order to optimise their performance under culture, but can thrive at high stocking densities. This means that high per unit production costs and quite low margins can be compensated for by productivity of 35-50t/ha. The average area under *Pangasius* ponds of 1.37ha is far larger than that under homestead carp production, and more than double Mymensingh's mean agricultural holding size of 0.63ha (BBS, 2002).

A very substantial majority of homestead carp pond operators practice rice cultivation as their primary livelihood activity, with fish culture nearly always second or third in terms of cash incomes generated. In contrast, fish culture almost always represents the first or second most important income stream for *Pangasius* farmers, with agricultural activities often absent from, or comprising a minor component of livelihood portfolios. The relatively large areas under *Pangasius*

culture and the labour intensive nature of the management and husbandry that they require³⁶ stands in sharp contrast to homestead carp culture, which can be handled by a single household member in little more than an hour per day. As a result, Pangasius farms create approximately two permanent jobs per hectare, whereas the homestead carp production generates no direct employment whatever. The high input demands of Pangasius culture are reflected in average production costs of \$23,790/ha and net profits of \$8025/ha (Haque, 2009a). To put this in perspective, based on figures given by our interviewees, the average cash equivalent net annual income from 1ha of double cropped rice would be in the order of just \$400.

These factors indicate that Pangasius farm operators cannot in general be considered to belong to the ranks of the poor. In our study community in Trishal only two of 130 households in the two poorest classes were found to farm Pangasius, and these two exceptions held only partial shares in ponds belonging to others (Figure 1). In contrast, 75% of households in the two wealthiest classes operated Pangasius ponds, and the activity was considered one of the defining characteristics of households categorized as rich (see Table 4). Results of our appraisal in rural Phulpur reveal a somewhat similar pattern with 63% and 64% of households in the two highest classes having access to ponds with potential for homestead carp culture, as compared to just 8 among the poorest 145 households (Figure 2). This gives a clear indication that even low input carp culture practiced in small homestead ponds remains beyond the reach of the majority of the rural poor.

³⁶ Involving a variety of tasks including the purchase or manufacture of feeds which must be applied in large quantities across several ponds twice a day; stocking, nursing, and grading of fish; regular harvesting of carps and occasional harvesting of Pangasius; draining, drying and re-excavating ponds; exchanging water and applying chemicals; and guarding fish from theft overnight.

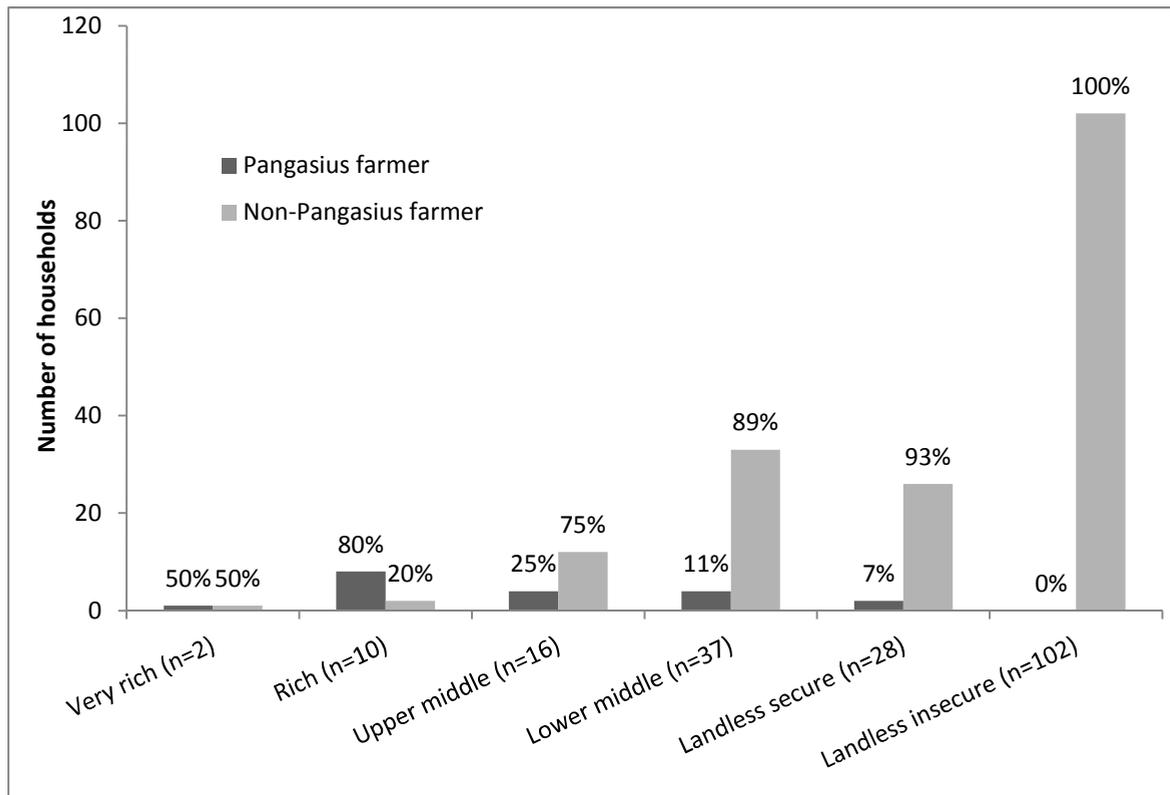


Figure 6.1 Distribution of households farming Pangasius in Trishal study village by class (n=195)

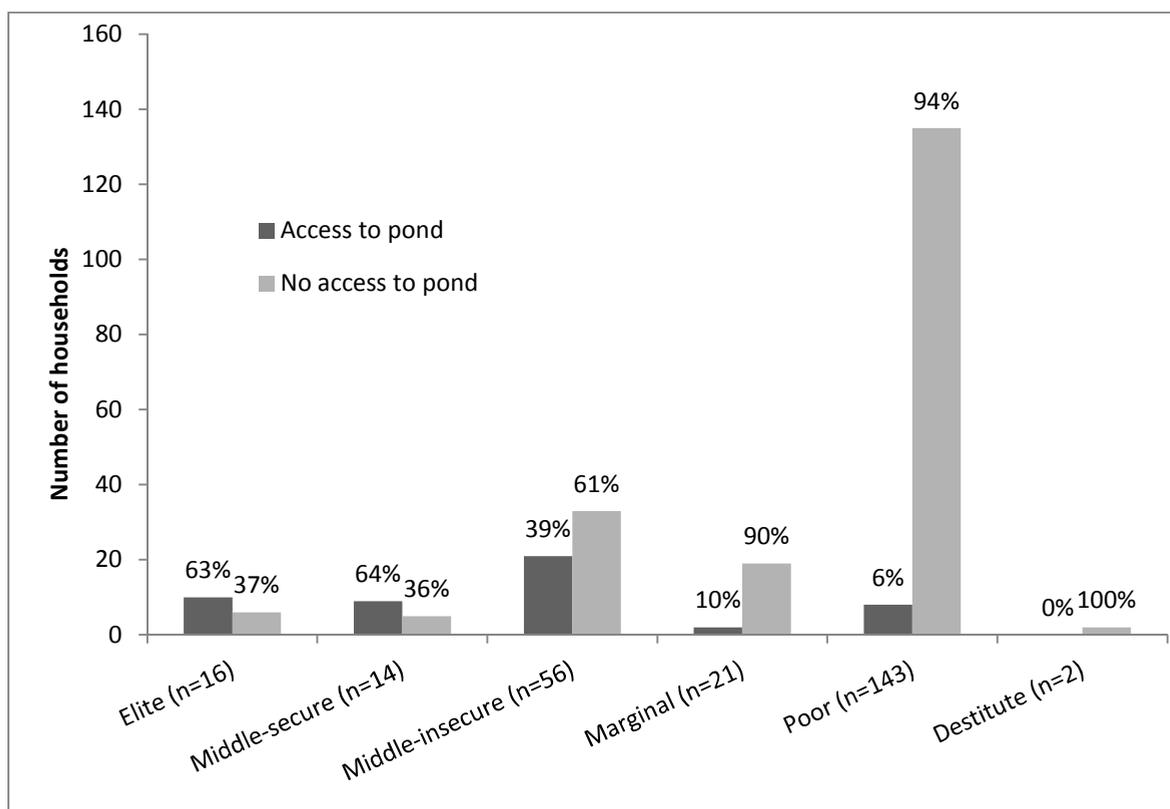


Figure 6.2 Distribution of households with access to a pond in Phulpur study site by class (n=252)

5.2 Does aquaculture in Mymensingh conform to the SSA narrative?

The preceding descriptive analysis shows homestead carp culture and Pangasius culture to exhibit a number of features noted in the literature on SSA, whilst being strongly divergent in other respects. Homestead carp culture in Mymensingh ticks all anticipated boxes with regards to ownership and operation by the household economic unit, a complete reliance on household labour, the subsistence or semi-subsistence orientation of producers, and its capacity to diversify the agricultural asset base. It also utilises what are in absolute terms only small physical areas of land, although only households possessing considerably larger than average total landholdings are able to deliberately construct or expand ponds for the purpose of fish culture given the extreme scarcity of both land and capital. This observation is closely related to a final point of divergence from SSA discourse concerning the relative poverty of its practitioners, since as Figure 2 clearly illustrates, aquaculture even of this variety remains by-and-large the preserve of the *relatively* well resource endowed. Thus whilst the most recent FAO definition of ‘Type 1’ aquaculture accurately encapsulates many features of homestead carp culture, the phrase ‘limited investment in assets’ cannot be considered applicable in the context of Bangladesh if considered in terms of the tiny asset base available to most citizens.

Ownership and management oversight of Pangasius farms is also dominated by households (or, more accurately, male household heads). In some cases Pangasius culture has also offered a means of diversification away from paddy cultivation by conversion of rice fields to ponds. However, given that wealth and poverty are defined by participants in our case studies in large part with reference to the area of land required to sustain self-sufficiency in household rice consumption, such behaviour should be read as the actions of land-endowed and income secure households diversifying for purposes of accumulation rather than survival (Ellis, 1998). The significant labour requirements of Pangasius culture and the high likelihood that male household members of farm operators are educated to a level at which they are able to secure better employment opportunities than unremunerated farm labour renders the contribution of household labour a minor part of total labour requirement, and only the three smallest farms out of eighteen in the village where our study was conducted relied on household labour alone.

The median area under Pangasius ponds of just under 1ha is large by local standards (see Table 4 for confirmation of just how large), and yields of standing biomass produced per hectare are up to eight times greater than those from irrigated rice, rendering the issue of physical area utilised a relative one. Production is entirely market oriented, with home consumption of fish produced playing no role in the motivation for engaging in production. Finally, as should be clear from the farm ownership pattern indicated in Figure 1 and the levels of investment required to sustain production, Pangasius culture is not an activity in which the poor may participate directly except under exceptional circumstances (see also Figure 4 below).

Despite its divergence from most of the characteristics of SSA traditionally identified in the literature Pangasius culture as practiced in Mymensingh conforms well to the revised FAO definition of ‘Type 2’ aquaculture (systems in which aquaculture is the principal source of livelihood, and in which the operator has invested substantial livelihood assets in terms of time, labour, infrastructure and capital). This is indicative of a recent change under which the definition of ‘small scale’ has broadened to include a range of systems displaying features not previously consistent with the traditional view of what rural aquaculture entailed. De Silva and Davy’s (2010) definition of small-scale aquaculture as ‘family owned, managed and operated’ is consistent with this discursive shift in that it subsumes under the label ‘small scale’ almost everything except corporate agribusiness (Table 3).

Although by virtue of their generality these recent definitions are reasonably technically accurate they do not refer to mechanisms by which SSA is supposed to contribute to human development. This is in contrast to earlier literature which emphasised household food consumption, agricultural diversification, the small size of physical assets exploited, and the relative poverty of their owners (all indicators which would exclude the vast majority of Pangasius culture practised in Mymensingh from inclusion in the small-scale category). However as the case study presented above shows, the economic status of even most homestead carp producers is relatively elevated. This suggests that alternative interpretations of the relationship between aquaculture and poverty may be due. With this in mind, the following subsection addresses this relationship with reference to the ‘relations of production’ framework set out earlier.

Feature	Homestead carp	Pangasius
Family ownership and operation	+++	++
Reliance on predominantly family labour	+++	--
Subsistence or semi-subsistence activity	+++	---
Means of agricultural diversification	+++	+
Utilization of small areas of land and water	++	-
Relative poverty of practitioners	--	---
Type 1	++	---
Type 2	-	+++

Key: Scale from +++ to --- The former indicates a high degree of compatibility with characteristics of SSA identified in the literature, the latter a high degree of divergence

Table 6.3 Comparison of Pangasius and homestead carp culture with features of SSA

5.3 Relations of production, rural growth linkages and poverty

Homestead carp culture is somewhat poorly integrated into the capitalist economy since it utilises few manufactured inputs and deploys only unwaged household labour. It can thus be considered a 'quasi-peasant' activity. Our study reveals a variety overlapping strategies adopted by pond owners falling under this category. If, as is usually the case, ponds have not been constructed specifically for the purpose of fish culture, cash outlays are limited to the purchase of juvenile fish (seed) and, depending on the inclination of the pond owner, possibly also small quantities of lime, inorganic fertilizer, rice bran and oil cake. Even these relatively minor operating costs can prevent poorer pond owners from utilizing their resources productively however, and we encountered several households with homestead borrow pits sized 0.01-0.04ha which remained unstocked, and several more with similar resources into which they stocked only seed, harvesting small quantities of fish several times a month exclusively for purposes of home consumption. For these poor households, reliant largely on intermittent agricultural day labour (Phulpur classes 4 and 5, Table 4), even mustering \$10 or less for the purpose of rehabilitating ponds or buying seed could prove prohibitively difficult, and limited and inconsistent incomes prevented regular outlay on even small quantities of low cost inputs. This tendency is compounded by the high risk of flood in many areas which acts as a disincentive to those unable to afford to raise pond dykes to intensify their

production to levels at which a commercial surplus might be produced, and perhaps also by the propensity for members of this income group to work off-farm.

Better-off pond owners with somewhat more water and capital at their disposal (Phulpur classes 1, 2 and 3, Table 4) pursue a variety of different strategies regarding intensification. Our interviews reveal that pond owners in these classes usually value production of carp first and foremost for home consumption and, second, for the cash incomes generated, despite the economic value of fish consumed and fish disposed of in the market often being approximately equal. This is because for households above a certain asset threshold fish represents a crop which can be obtained at relatively little opportunity cost to labour and capital (being, in its most extensive form, effectively completely free bar a small outlay on seed once or twice a year), and because carp possesses high affective value as a culturally preferred food item. Its production thus contributes to household wellbeing via emotional satisfaction as well as through purely monetary or calorific gains (see, for example White, 2009).

The economic aspect of production should not be underestimated however. Carp produced in this manner returns high margins (as much as 100% for fish receiving feed on a regular basis), and numerous interviewees in higher wellbeing groups stated explicitly that they used sales of fish left over after household consumption for the purposes of covering expenses related to irrigated rice (*boro*) production. Many of these deliberately timed sales of fish to coincide with periods when market value was high and saved the money raised to avert or lessen the need take informal credit with high rates of interest for the purchase of inputs and labour during *boro* plantation and/or harvest. Béné's (2009) analogy of a 'bank in the water' is therefore particularly apt in this instance, the pond acting as a high interest savings account from which withdrawals can be made in order to smooth seasonal cash shortages. This insight underscores the continued importance of the role of rice plays in livelihoods in rural areas, with the outputs of fish culture deployed in sustaining the reproduction of the rice-based household economy.

High margins mean that significantly increasing levels of fish production, whether by raising input levels to existing ponds or horizontal expansion by construction of new ponds, has the potential to bring attractive returns to households in these wellbeing categories. Despite this

apparent incentive, the very limited opportunity costs and risks associated with low intensity fish culture, its close counter-seasonal fit with rice-based livelihoods, constrained household resource bases, and practicalities such as the scarcity of suitable land for expansion and the high cost of flood proofing ponds mean that in practice it is quite rare for members of this type of farming household to opt to do so. Homestead carp culture is therefore best understood as a quasi-peasant activity, both in terms of the orientation of those who practice it (risk averse and interested primarily in reproduction rather than accumulation of capital), and in its relations of production (since utilises only household labour and is poorly integrated with input markets, and because producer surpluses quite are small in terms of both quantities of fish disposed of in the market and the cash incomes that these generate).

Pangasius aquaculture is far more comprehensively integrated into a variety of markets via diverse forward, backward and horizontal linkages. The large volumes of feed required to sustain production are manufactured either in commercial feed mills or by farmers using purchased machinery, and contain numerous raw and processed ingredients sourced from local, national, and international markets. A huge range of ancillary services are present in areas with large concentrations of Pangasius farms. Some of these are held in common with carp culture (e.g. nursery operations and certain aspects of marketing), but as there is also demand created for farm labour and services including for feed production, sale and distribution, pond excavation, mechanical services, and the harvesting and transportation of fish to market.

Phulpur		Trishal	
Class	Criteria	Class	Criteria
Class 1 Elite (n=16)	Large landholdings; Produce more than 8t rice/year; Own deep tube wells or agricultural machinery; Culture fish (gross income \$580)	Class 1 Very rich (n=2)	Well paid formal employment and/or very large landholdings; Own land or a house in Dhaka; Have family living abroad (non-migrant labour)
Class 2 Middle-secure (n=14)	Own 0.1-0.4ha land; produce 2-4t rice/year; Rice cultivation is main livelihood activity; Members of this group are completely self sufficient with regards rice consumption	Class 2 Rich (n=10)	A combination of: Land ownership (0.12-0.48ha); off-farm activities (SME owner or formal employment); Culture Pangasius
Class 3 Middle-insecure (n=56)	Own 0.14-0.16ha land; Produce 2.0-3.2t rice/year; Sometimes have insufficient rice for home consumption and have to take credit to buy in; Culture fish (gross income,\$290)	Class 3 Upper middle (n=16)	Own 0.1-0.2ha land; Own business or employment providing a constant income stream
Class 4 Marginal (n=21)	Own 0.1ha land and sharecrop in extra land; local petty businesses such as selling vegetables, rickshaw pulling; have to purchase rice for home consumption	Class 4 Lower middle (n=37)	Own 0.1-0.2ha land; Own business but providing lower level earnings than for Class 3
Class 5 Poor (n=143)	Homestead land only; agricultural day labour; catch wild fish; Migrate to sell labour (e.g. to Dhaka)	Class 5 Landless secure (n=28)	Homestead land only; Have permanent off-farm employment or petty trade yielding consistent/regular earnings
Class 6 Destitute (n=2)	No homestead or assets of any kind; completely dependent on labouring for other families fulltime	Class 6 Landless insecure (n=102)	Homestead land only; temporary (day) labour or seasonal/infrequent business activities; Less income secure than Class 5

Table 6.4 Class attributes in Phulpur and Trishal (PRA data)

Figure 3 indicates the extent to which clusters of Pangasius farms can impact on the local economy. Three categories of employment (fish culture, aquaculture employee, and aquaculture ancillary services) are almost absent as primary occupations in our study site in Phulpur but, combined, represent one third of all primary occupations in the Trishal location. The significance of this effect is particularly pronounced for members of Trishal Class 5 and 6, for whom activities associated with Pangasius aquaculture make a significant contribution to 29% and 40% of employment respectively³⁷ (Figure 4). Employment on Pangasius farms is particularly sought after as it provides a steady monthly wage totaling approximately \$850 per annum. This is significant because it substantially exceeds the \$350 which an agricultural day labourer might expect to make in a year, but also because of the dependable nature of the income; the temporal consistency and predictability of cash flows being the key feature used by respondents to distinguish between members of Trishal Classes 5 and 6.

According to informants at our Trishal site, daily wage rates in agricultural laboring had more than doubled to \$2.90 over the previous six to seven years, with the result that agricultural workers migrated to the area from neighboring districts at key times of year; a phenomenon they attributed to increased demand resulting from the expansion of Pangasius farming in the union³⁸. Some caution must be attached to this interpretation as interviewees in rural Phulpur reported agricultural daily wage increases of a similar magnitude over a similar time frame, citing inflation as the cause. The hypothetical link between agricultural productivity growth and wage rates in the wider rural economy (e.g. Hazell et al, 2007) is thus difficult to substantiate conclusively on this basis.

³⁷ The category 'aquaculture ancillary services' includes fish harvesting teams, fish feed mill employees, a fish broker, soil cutters, and a large number of trishaw pullers whom interviewees reported to derive an estimated 80% their work from transporting fish feed. Other occupational groups reportedly also benefit peripherally (for instance wood cutters who fell trees planted on Pangasius pond dykes) but are excluded from these calculations.

³⁸ A union is the smallest administrative unit in Bangladesh.

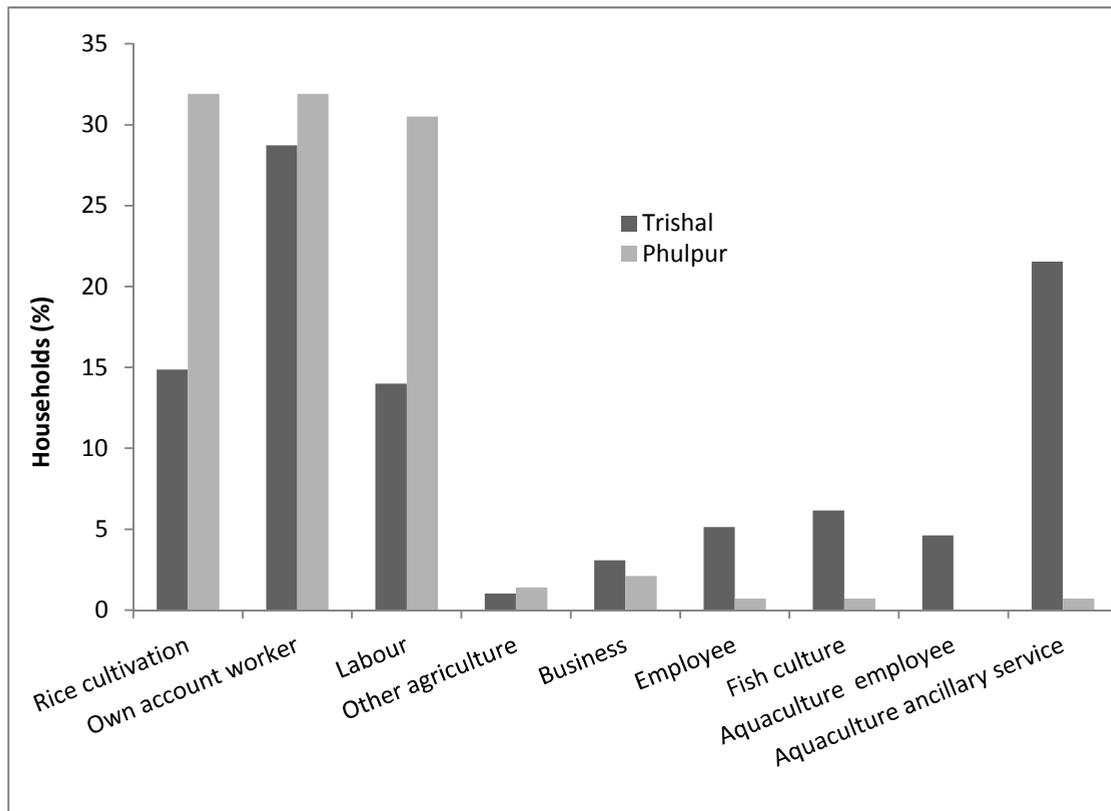


Figure 8.3 Primary occupation of all household heads in Phulpur and Trishal study sites

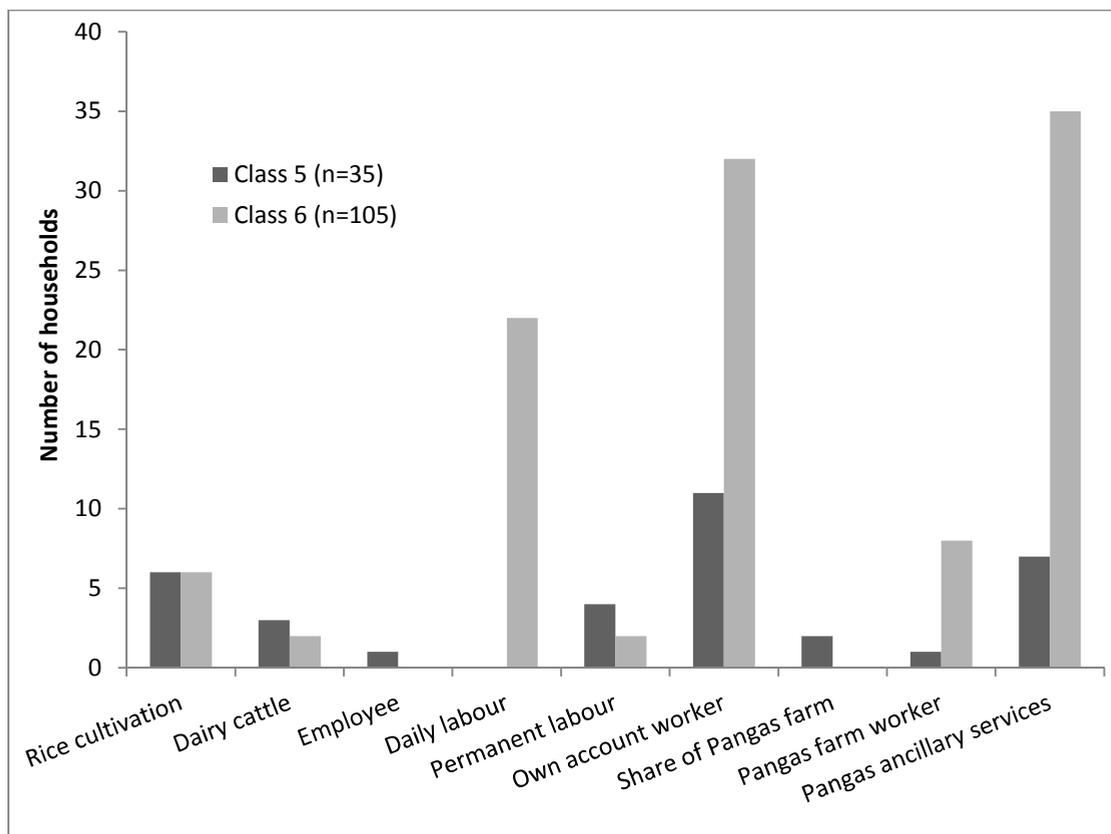


Figure 6.4 Primary and secondary occupations of Class 5 and Class 6 household heads in Trishal study site

However, Faruque (2007) demonstrates daily wage rates among casual agricultural labourers selling occasional labour for commercial aquaculture in Mymensingh to have increased by 48% in real terms over the period 1995 to 2005, albeit from a low base. According to the same study, inflation adjusted daily wages also increased from \$1.12 to \$1.77 over the same period for fishers involved in harvesting ponds, while the average number of days per week worked in the activity rose from 1.7 to 4.4. Ninety percent of fishers reported improvements in household food consumption over the period, with 85%, 60% and 65% respectively reporting improvements in conditions relating to clothing, housing and health care (Faruque, 2007). Pangasius farm workers interviewed in Trishal also expressed satisfaction at similar progressive improvements in their standard of living which they considered directly attributable to their employment status. A study by Munir (2009) which indicates rising wages among labourers on Pangasius farms in Trishal and a variety of other actors involved in input supply and marketing also supports this conclusion. These points are particularly important given that functional landlessness and a dependence on sales of labour characterises the poorest two thirds of the inhabitants of both our study areas

Land markets are particularly competitive in unions where large concentrations of Pangasius farms are found and land values are correspondingly several times higher than in more remote rural unions. Several sources confirmed that this stems in part from the high value of catfish culture, but more fundamentally from underlying levels urbanisation, connectivity and long term economic development. In some places land owners have sold off a portion of their property in order to free up capital to invest in pond construction and feed and facilitate market entry into catfish farming. The potential for high earnings from Pangasius culture has also encouraged conversion to ponds of land formerly sharecropped out, as have high rental values paid on land leased out for catfish farming as compared to rice. The advent of a burgeoning (quasi)capitalist aquaculture can therefore be seen to have resulted in a reallocation of production factors in a more economically efficient manner and has created dense agglomerations of rural growth linkages through demand for labour, goods and services in upstream, downstream and horizontally linked portions of the value chain, and (most importantly of all if certain assumptions in the literature are correct) through

consumption linkages as rising wage rates and surplus value contribute to increased expenditure and reinvestment in other sectors of the rural economy (Mellor, 2010).

A final point concerns the characteristics of those culturing *Pangasius*. Less than one third of *Pangasius* farmers surveyed in Mymensingh by Haque (2009a) had previously counted agricultural activities as their main occupation, with a somewhat larger portion being engaged in some form of business and significant numbers being salaried employees in high status positions or recent university graduates. This would seem to suggest an entrepreneurial orientation among most farm operators who appear to have entered into the activity on the basis of its potential for capital accumulation rather than through a linear progression from agriculture or lower intensity aquaculture.

6 Discussion

The previous section analyzed characteristics of fish culture in Mymensingh with reference to two interpretive frameworks; scale and relations of production. This exercise shows that explanations of fish culture and poverty which emphasise scale as the key variable reveal little concrete about the relationship between the two, and are in fact potentially misleading in this regard. In contrast, by adopting relations of production as an analytical framework and incorporating established theoretical links between agricultural and economic growth it is possible to establish a far more complete and persuasive vision of mechanisms by which aquaculture may leverage reductions in poverty. Thus, though perhaps counter intuitive, it is abundantly clear from both a theoretical and an empirical standpoint that the greatest potential for generating aquaculture-related economic growth in rural areas (and thereby alleviating poverty) derives *not* from the quasi-peasant varieties of fish culture so often promoted by development agencies, but from clusters of (quasi)capitalist aquaculture connected to longer value chains and wider networks of exchange. Having established this as a fundamental point of departure from the conventional SSA discourse, the remainder of the paper explores a number of associated observations relating to poverty dynamics among quasi-peasant producers, food security, and the implications of this study for current policy discourses on agriculture and poverty.

6.1 Poverty dynamics

Previous sections demonstrate clear connections between quasi-capitalist *Pangasius* aquaculture and the creation of opportunities for regular employment in a context where severe seasonal underemployment among the landless is very strongly associated with poverty (Wood, 1994), but also cast doubt on whether quasi-peasant homestead carp production can achieve positive impacts. This question therefore forms the focus of enquiry for the remainder of the sub-section.

Poverty is a dynamic state with both chronic and transient forms from which households and individuals may descend or graduate for a variety of reasons and on multiple occasions over the period of a lifetime (Wood, 2003). In a particularly insightful piece of work conducted in 35 villages in Rajasthan, India, Krishna (2004) finds a combination of health and health-related expenses, high-interest private debt, and social and customary expenses to constitute the major reasons for a decline into poverty in 85% of all cases. In contrast, diversification of income sources is the principal factor associated with households' escape from poverty in 70% of cases. In Bangladesh, Sen (2003) finds that 31% of rural households surveyed over a period of 12 years were 'always poor' and 25% 'never poor', while 26% 'escaped' from poverty and 18% descended into it. The causes of ascent and descent described by Sen are extremely similar to those identified by Krishna (i.e. livelihood diversification and idiosyncratic shocks respectively), although Sen adds changing household demographics - specifically shifting ratios of dependents and income providers, with potentially both positive and negative outcomes - as another key variable.

Land distribution in Bangladesh is extremely polarized (Rahman and Manprasert, 2006). This is reflected in our PRA exercises in Phulpur which reveal homestead pond ownership rates to be well below 10% among the poorest two thirds of the population. In contrast, rates of pond ownership exceed 60% among the top 10% of households. These results are remarkably similar findings from the Mekong Delta in Vietnam which showed that just 6% of households categorized as poor had integrated aquaculture into their farming systems, as compared to 60% of those considered rich (Nhan, 2007). The results also underscore the continuing validity of the observation made almost 15 years ago that pond owners in Bangladesh tend to enjoy a higher socioeconomic status than other community members in terms of land ownership, farm size and

household income (Lewis, 1997; Lewis et al, 1996). However, our Phulpur PRA also identifies a group of pond owners falling between these two poles (Class 3) who account for 40% of all pond ownership. Members of this class constitute the upper portion of the segment of the population formally considered functionally landless, owning 0.14-0.16ha, but are able to share or lease in sufficient land to allow them to continue to pursue livelihoods characterised predominantly by rice cultivation (Table 4). We classify this group 'middle-insecure' in reference to the observation of participants in our appraisal exercises who noted that its members sometimes have insufficient rice for home consumption and must take credit in order to buy in supplies.

Many of our interviewees attested that carps raised in homestead ponds represented a readily fungible asset which could be liquidated strategically to reduce or avoid high interest debt burdens associated with *boro* cultivation and, where necessary, purchase of rice for home consumption. Strategies such as these may therefore function as a buffer against the threat of transient poverty. This may be an important even for Class 1 and 2 households since, as Krishna notes in relation to his sample villages, 'even quite well-to-do households have become desperately poor over the past 25 years. If only these numbers had been smaller... the net reduction in poverty would have been much better overall' (2004, p127). It is not possible to answer definitively on the basis of the research presented here whether levels of income generated by homestead carp culture are sufficient to allow households to compensate for or quickly rebound from more serious stochastic shocks such as the protracted ill-health of the household head, and such outcomes would probably be highly contingent on the specific circumstances of the individual case. Nor did we encounter a clear cut instance in which homestead carp culture had exceeded its 'defensive' role and facilitated accumulation of sufficient capital to facilitate graduation from entrenched chronic poverty. However, Sen's data (2003) shows the share of non-crop agriculture (including livestock and fish production) in the incomes of households 'ascending' out of poverty in Bangladesh to have grown at a faster rate than for those remaining behind. This would suggest that there is a generally positive (though not necessarily causal) relationship between homestead carp culture and upward mobility, albeit much less dramatic and far reaching than that observed for quasi-capitalist *Pangasius* culture.

6.2 Food Security

Another key strand in the SSA narrative is the activity's capacity to contribute to food security (Prein, 2002). This seems particularly prescient in the wake of the 2007/2008 global spike in food prices. This relationship is often conceived of first and foremost in terms of increasing consumption of fish among producing households (e.g. Ahmed and Lorica, 2002). However our research shows most homestead carp producers to be in upper income brackets, with members of Phulpur Class 1 and 2 never faced with a situation in which they were unable to consume three meals a day, and members of Class 3 being forced to reduce food consumption to two meals a day for short periods only in the event of total loss of the *aman* (rain-fed) rice crop due to unusually heavy flooding. It is thus unclear to what extent homestead carp production can be said to reduce food insecurity *per se* since most of those practicing it are already relatively secure by virtue of their pre-existing socio-economic status, and in some cases are also capable of purchasing of fish in the market should the need arise. Furthermore, with the exception of the non-native silver carp which, according to Little et al (2009) is valued at slightly less than half the more highly prized native rohu, most of the carp species produced in homestead ponds are too expensive for poor consumers to afford (Lewis, 1997). Wider societal impacts on food security are therefore somewhat limited in scope despite the very large aggregate volumes produced because most carps disposed of in the market are destined to be consumed by the relatively wealthy, and because fish produced in homestead ponds are sold predominantly in local markets.

In contrast, *Pangasius* is exported from Mymensingh to markets throughout the country, particularly those in Dhaka, and is now widely considered the fish of the urban poor in Bangladesh. Huge increases in production have driven down the fish's retail value to an average of \$0.85/kg, as opposed to \$1.20-1.70 for the three Indian major carps, making it the cheapest and perhaps also the single most widely available fish species in Bangladesh (Little et al, 2009). Production of *Pangasius* fell sharply during and after the spike in food prices from late 2007 and early 2008 in response to reduced demand, but has since rebounded. This phenomenon has been attributed to low-income consumers substituting consumption of *Pangasius* for rice in the face of reduced real incomes as the cost of the latter rose (Haque, 2009a). Whilst this event demonstrates the high

income elasticity of even cheap fish in Bangladesh (Dey et al, 2008), it is also clearly indicative of the relative poverty of the portion of the population among which *Pangasius* is most widely consumed and thus, under normal circumstances, the importance of its contribution to national food security. This facet is particularly important given that the capital city Dhaka is one of the fastest growing cities in the world (Hossain, 2006) and that the proportion of Bangladesh's population living in urban areas is set to reach 39% by 2030 (UNdata database, 2010). *Pangasius* aquaculture therefore has an important role to play in increasing the availability and accessibility of high quality protein to urban consumers and, hence, improving food security at a nationally significant level.

7 Conclusion

This paper has sought to challenge conventional wisdom on the relationships between aquaculture, poverty, growth and food security. It has argued that small-scale aquaculture is a political construct which possesses little value as an analytical category, and that addressing aquaculture in terms of its relations of production offers far greater scope for predicting its likely potential to contribute towards these desirable goals. Tripp (2001, p485) notes that 'general categories (such as "small farmers") are of decreasing utility for policy formulation', and this paper confirms the validity of this observation with respect to the field of aquaculture also. This is underlined by the work of Purcell and Brown (2005) who, with reference to a detailed ethnographic study of Brazilian beekeepers' cooperatives, argue powerfully that 'scales should be seen not as things in themselves with inherent qualities' (p280).

In contrast to representations of aquaculture which emphasise scale, the relations of production framework advanced here is both empirically and theoretically grounded, and thus offers a significant step forward in understanding the capacity of aquaculture to leverage development gains. The preceding analysis also suggests that there may be some entry points for enhancing poverty outcomes within existing systems, or at least that certain areas deserve further enquiry in this regard. One of these is the category of quasi-peasant producer toward the lower end of the wellbeing spectrum (Phulpur Classes 3 to 5). Given that homestead carp culture appears to

offer a buffer against seasonality and other transient causes of poverty among a potentially vulnerable group, one might ask how assistance or support could be channeled in a more focused and effective manner than it is at present, and do so with more realistic expectations of the rather unspectacular but none-the-less valuable outcomes which may result. Optimism needs to be tempered by consideration of the transaction costs involved in carefully tailored and targeted service provision which pond owners in this group might require however, and recognition of the diversity of strategies deployed by pond owners and their fit with other elements of the household economy which mean that increasing fish production to technically optimal levels may not be a priority.

Another issue worthy of further examination is whether quasi-capitalist farming operations create rural growth linkages of a higher or lower intensity than fully capitalist ones, and whether the diseconomies of scale reported in so much of the literature on agricultural growth also apply to *Pangasius* farming and other comparable systems of fish culture. Finding answers to these questions is particularly timely considering the relatively early stage of development of aquaculture compared to agriculture and hence, perhaps, greater opportunities for designing policy-based interventions that steer it towards socially optimal goals in future.

It is noteworthy that the current domestic demand driven system of *Pangasius* production in Mymensingh appears both economically and ecologically robust (Belton et al, 2011b). This is in contrast to export-oriented *Pangasius* aquaculture in Vietnam which has recently experienced a dramatic exit of smaller producers unable to compete in an increasingly competitive and demanding global market (Loc et al, 2010). Findings from Central Thailand which demonstrate tilapia production for a buoyant domestic market to be more ecologically and economically sustainable than export-oriented shrimp aquaculture and to support more secure and resilient livelihoods are also pertinent in this regard (Belton and Little, 2008). Assessing the relative sustainability of production for domestic markets is particularly relevant in this context given that a small elite of capitalist catfish farmers in Mymensingh already have their sights set on entering international export markets; a move with potentially significant consequences for the organisation of production (Belton et al, 2011b). This question also has wider implications in light of the new

status of former domestic staples such as tilapia and Pangasius as global commodities where, as throughout much of Asia, inland aquaculture production predominantly serves large internal markets. Thus, although Bangladeshi Pangasius producers appear to offer a good fit with the commercially-oriented entrepreneurial smallholders who the *World Development Report 2008* endorses as leaders of 'the emerging new agriculture' (World Bank, 2007, p8), the Bank's vision of their role as producing for global markets should be treated with caution given that domestic alternatives may prove preferable for a variety of interlinked reasons.

One final point is pertinent. Ellis (1998) observes that as the major increases in agricultural yield and output growth experienced in Asia during the 1970s and 1980s look ever less likely to be repeated, so the rural growth linkage view of development, upon which much of this paper rests, seems increasingly dated. Whilst this may well be the case with regard to cereal-based terrestrial agriculture, the picture presented here seems to suggest that the much vaunted 'blue revolution' in aquacultural growth has finally arrived, and that many of the fundamental lessons of the green revolution rural development narrative remain equally applicable in this new context where, as in certain sub-districts of Mymensingh, dense clusters of (quasi)capitalist aquaculture are to be found.

Chapter 7 - Conclusion: Toward a New Research and Policy Agenda for Aquaculture Development

1 Discourses and empirical findings

This concluding chapter reflects upon and develops some of the most important themes to emerge from the five preceding papers. The first section briefly reviews the main discourses drawn upon or engaged with in the thesis in relation to the key findings each of the papers presented. The second section explores the disciplinary characteristics of aquaculture and their methodological consequences and, in light of this analysis, identifies research priorities and argues the need for more qualitative approaches to the investigation of aquaculture development. The final section elaborates on some of the most fundamental conclusions drawn from the thesis and, based on these, advances a research and policy agenda for aquaculture development in South and Southeast Asia and beyond. The various discourses informing research on which this thesis is based are summarised in Table 1. These are considered in more detail below with respect to their ability to account for the findings presented in preceding chapters. The table also indicates where each discourse features in the thesis.

Aquaculture for development and small-scale aquaculture

The phrase ‘aquaculture for development’ is borrowed from Friend and Funge-Smith (2002, p2) who argue that;

‘Rather than thinking in terms of aquaculture development, the emphasis now is on *aquaculture for development*. In order to effectively address poverty alleviation, poverty and poor people’s livelihoods need to be placed as the starting point for intervention, with small-scale aquaculture and aquatic resource management one of a number of strategic tools for achieving this objective’ [emphasis in original].

Discourse	Summary	Chapter
Aquaculture for development	Aquaculture can alleviate poverty and enhance food security and must be promoted in order to maximise its capacity to achieve these ends	2
Small-scale aquaculture	Aquaculture which utilises small areas of land/water and is predominantly family-owned and dependent on family labour possesses greater inherent potential to alleviate poverty than other forms of the activity	2, 4, 6
Private Sector Development	Growth is the key to alleviating poverty. The private sector is the primary engine of growth. The role of government in promoting development is to create an environment which enables the private sector to flourish	2, 3, 6
Agricultural growth	Small farms are more efficient and create more favourable patterns of employment, consumption and rural growth than large farms	6
Private governance	The terms of access to global value chains are increasingly dictated by oligopolistic retailers and, to a lesser extent, civil society. This is leading to the restructuring of value chains in ways which favour larger producers	5
Best Management Practice	Problems associated with aquaculture relate mainly to biophysical sustainability and originate from individual farms. They are best solved by adherence to technical prescriptions laid out in standards	5
Political economy of agrarian change	Rural class differentiation leads to the formation of a capitalist class and a landless proletariat from which the capitalist class extracts surplus value	4

Table 7.1 Summary of discourses of development drawn upon in the thesis and the chapters in which they feature

This formulation is highly normative in that it tends to suggest a moral imperative to promote the use of interventions to stimulate adoption of aquaculture among poor households as a means of improving nutrition and incomes and ameliorating poverty. As the quote indicates, this discourse overlaps considerably with that of ‘small-scale aquaculture’ (e.g. Bondad-Reantaso and Prein, 2010) addressed in the final paper, the latter being essentially a sub-set of the former. Chapters 2 and 6 demonstrate that whilst both discourses are founded on an intuitively appealing logic, the objects they privilege (aquaculture established as a result of development interventions, and small-scale forms of aquaculture respectively) are generally far less effective in delivering the outcomes claimed of them (poverty alleviation, growth, food security) than larger commercial operations established in response to favourable immanent conditions with little or no external support. This insight represents the single most important finding of the thesis, and its implications are returned to in

more detail later. This general observation notwithstanding, there are also examples in which interventions, particularly the development of technologies for the artificial reproduction, have coincided with conditions of immanent development ripe for their exploitation, and have contributed to very substantial downstream impacts³⁹.

Private Sector Development

Private sector development (PSD) has assumed hegemonic status as a development strategy and discourse among the post-Washington Consensus institutions. Its fundamental logic is as follows:

- (a) Poverty reduction is the main objective of development (cooperation);
- (b) central to development is economic growth;
- (c) economic growth is best achieved through the private sector;
- (d) government has a role to play in making the private sector flourish and ensuring growth contributes to poverty reduction (Gibbon and Schulpen, 2002, p2).

The second chapter in the thesis examines the validity of this narrative with reference to detailed case studies of hatchery sector development in Vietnam and Thailand. PSD themes also pervade the first and final papers in the thesis, although, with the exception of a brief mention at the end of the first paper, discussion is not couched in expressly these terms.

Chapter 3 shows the manner in which enterprise formation occurs to be highly contingent on local cultural and political conditions that are completely absent from the idealised and mechanistic chains of causation implied in PSD narratives. The character of the informal relationships and interactions between actors in the public and private sectors, which the Thai and Vietnamese cases show to facilitate the process of enterprise formation, is at odds with representations of economic behaviour in PSD discourse. The paper also cautions against taking abstractions about the relationship between private sector expansion and reductions in poverty at

³⁹ Although only the seed sectors for Pangasius and tilapia are dealt with in detail in this thesis it should be noted that the closure of the lifecycle for Chinese and Indian major carps is of even greater significance, and has supported the development of both household and commercial production systems throughout Asia

face value, on the basis that, for instance, creation of more jobs cannot necessarily be taken to signify progress if they are an option of last resort for those who engage in them, or if economic surplus is concentrated at only a small number of nodes and among a small number of actors in the value chain, as appears to be the case for Vietnamese catfish. This leads to the conclusion that it is necessary to establish these contextual details on a case by case basis when assessing the impacts of the growth of private enterprise rather assuming their existence *a priori*. Never-the-less, whilst the discourse clearly serves the interests of its architects and may offer little in the way of specifics to guide micro level policies it cannot be dismissed out of hand since it remains difficult to escape the conclusion that economic growth usually results in aggregate declines in absolute poverty and that the bulk of growth originates from market based economic activity (Ravillon, 2001). This is reflected in Chapters 2 and 6 which find the immanent expansion of mainly quasi-capitalist forms of aquaculture across Asia to have resulted in generally favourable impacts with respect to poverty and growth.

Distinctions need to be drawn between specific locations and production systems however. Mellor (2001) contends that the poor, having little capital or land, depend primarily on labour for their income as a result of which increased employment is *the* critical factor in reducing income poverty. Whereas under-employment and landlessness are evident in the Mekong Delta they are less severe in extent and depth than in Bangladesh (Ravillon and van de Walle, 2008; Rahman, 2009). Furthermore, labour productivity per unit output is much higher for *Pangasius* culture in Vietnam than in Bangladesh and a great many of the functions performed by human labour in the latter are mechanised in the former (e.g. pond excavation and transport of feed). Whilst not ignoring the very large contribution that Vietnamese *Pangasius* makes to GDP, tax receipts and the balance of trade, this suggests that, at least within the local rural economy, the Bangladeshi system may have inherently stronger poverty reducing characteristics. Although it is not possible to establish this conclusively on the basis of the evidence available here these observations indicate that the specific conditions of the local political economy and mode of production may have important implications for the ability of PSD to deliver equitable growth, and may determine the

character of the mechanisms which facilitate poverty amelioration. This is not fully acknowledged in the PSD literature, which retains only superficial explanatory power at present.

Agricultural growth

The discourse summarised here as ‘agricultural growth’ emphasises the unique capacity of increases in farm productivity to reduce rural poverty. The most extreme formulation of the rural growth hypothesis is asserted thus: ‘Rural growth and agricultural growth have a major effect on poverty reduction; urban growth and manufacturing growth do not’ (Mellor, 2001, p371). Whilst others are somewhat more circumspect (e.g. Ellis, 1998), there is a general consensus that agricultural growth possesses the capacity to stimulate demand for agricultural labour and, consequently, rising agricultural wage rates, resulting in corresponding increases in demand for locally produced ‘non-tradable’ goods and services. The majority of gains resulting from agricultural growth are therefore less a direct result of the increased value of agricultural output, than of the ‘rural growth linkages’ which the expenditure of agricultural incomes and wages create. Central to this discourse is the finding that there is an inverse relationship between farm size and productivity, in addition to which small-farm households are found to have the most favourable expenditure patterns for promoting growth of the local nonfarm economy, since they spend higher shares of incremental income on rural non-tradables than large farms.

This narrative was deployed in Chapter 6 as a framework for evaluating the contribution of aquaculture to poverty alleviation on the assumption that comparison of the large but almost entirely separate literatures on small-scale aquaculture and agriculture held the potential to yield useful insights. In addition, the under-theorised nature of small-scale aquaculture discourse, which proceeds from a series of common-sense assertions rather than rigorous analysis of empirical data, made it necessary to seek an alternative framework with which to explain the implications of aquaculture *vis a vis* poverty. ‘Agricultural growth’ appeared to offer just this.

Although it was not possible to establish the extent and value of consumption linkages associated with *Pangasius* aquaculture in Mymensingh these may be inferred to exist based on very significant generation of employment opportunities in ancillary services and likely agricultural wage

increases. This seems to suggest similarities between aquaculture occurring in sufficiently dense clusters and green revolution agriculture, certainly in terms of effects, if not origins. However, whereas growth in the production of the main cereal crops has slowed markedly following the advances made during the 1970s and 1980s, leading Ellis (1998) to question the continued relevance of the agricultural growth narrative, commercially oriented aquaculture continues to expand rapidly in many of the same high potential agricultural areas that experienced green revolution growth two to three decades previously, and may thus presently possess greater capacity to stimulate rural employment, albeit in much more localised patterns.

As a point of clarification it should be noted that the term ‘small-scale’ aquaculture, which Chapter 6 finds to be unhelpful, does not equate directly with the kind of ‘small-holder’ enterprise which the agricultural growth narrative concerns itself. This is because, at least in its ‘Type 1’ form, ‘small-scale’ aquaculture represents a minor portion of total farm area and income, as opposed to cereal dominated small-holder agriculture which often occupies the majority of farm area and generates most farm income. Thus, it is fish producers for whom aquaculture represents the main agricultural activity (and would have been excluded from older definitions of small-scale aquaculture) to whom the discourse of agricultural growth is most applicable.

Private governance and Best Management Practice

Two partly opposing discourses form the basis of Chapter 5. The first of these I call ‘private governance’ after the large and rapidly growing literature which documents the emergence of third-party certification (TPC) ‘as a significant regulatory mechanism in the global agrifood system’. This;

‘reflects a broader shift from public to private governance. Traditionally, government agencies were responsible for monitoring food safety and quality standards. However, the globalization of the agrifood system, the consolidation of the food retail industry, and the rise in private retailer standards have precipitated a shift in responsibility for this task to third-party certifiers’ (Hatanaka et al, 2005, p354).

This discourse is descriptive with respect to shifting governance regimes, and is often critical of their outcomes. These are frequently seen to include the marginalisation of smaller producers from global value chains due to their inability to comply with the demands imposed by standards. The private governance narrative is thus in partial opposition to what Béné (2005), writing with reference to standards for shrimp aquaculture, calls ‘best management practice’ (BMP) discourse. BMP discourse represents standards as the only appropriate means of ensuring the technical improvements required to solve issues of environmental sustainability associated with production processes. Although two of the three standards discussed in this thesis with reference to *Pangasius* are broader in scope than those discussed by Béné, since they include concerns with food safety and product traceability, all of those examined include prescriptions for governing environmental performance constructed in exactly the manner Béné describes.

The results presented in Chapter 5 concur with much of the literature on private governance in concluding that the imposition of private standards and TPC for *Pangasius* culture are likely to restrict access to high value export markets for smaller producers. In Vietnam this is a result of both the more favourable organisational structures and capacities of large enterprises, and the social relations governing entry to the farmers’ associations operated by processing companies; access to or exclusion from which may prove a prerequisite for attaining certification among moderately sized operations. The paper’s key finding is that the environmental element of all three standards discussed (which represents the core of BMP discourse) is likely to have limited discernable positive impacts, in large part because conceptualising the farm as the locus of environmental degradation, which is necessary to render it manageable, also results in a concomitant exclusion of feed provision as a source of negative externalities. Ironically this failure to account for externalities beyond the immediate vicinity of the farm means that in practice *Pangasius* production in Bangladesh, which appears more ecologically sustainable than its Vietnamese counterpart, will likely be excluded from certification. Whilst numerous life cycle assessments suggest that feed accounts for the majority of the environmental impacts associated with fish production (Pelletier and Tyedmers, 2008), this observation has so far yet to receive significant recognition in the literature on environmental standards and the paper therefore makes

an important contribution to the literature on private governance. The intersection of PSD and TPC is also noteworthy, with several bilateral donors having provided support for efforts to operationalise the implementation of certification for Pangasius and shrimp as part of interventions based on a rationale that conforms to PSD discourse.

Political economy of agrarian change

A final discourse which features in Chapter 4 and, less explicitly, in Chapter 6 might be termed ‘the political economy of agrarian change’. Broadly speaking this deals with processes of peasant class differentiation, and has been the subject of a body of work and thought far larger, older and more diverse than the others referred to here. This diversity in part reflects the myriad forms which agrarian transitions take on at different times and in different places (see, for instance, Friedman, 1978). The work presented in Chapter 4 shows a tendency for the expansion of catfish aquaculture in the Mekong Delta, resulting from Vietnam’s integration into the global economy, to reproduce existing power relations along political and kinship lines. These relations carry over into and become embedded within the market economy, thereby mediating access to the institutions and key factors of production required to successfully engage in this risky operation. The accumulation of land and dispossession of former landholders is limited however. This is due in part to the form of production itself, particularly its exceptionally high intensity, which generates an output equivalent to 70% of European aquaculture production from just 6000 hectares of ponds (De Silva et al, 2010), and the fact that the best farm sites are found largely on otherwise economically unproductive riverside land.

2 From discourse to practice

This section explores why some of the narratives examined in the preceding section appear to possess good explanatory power with respect to the nature of aquaculture development, while others, *especially those which originate within the field of aquaculture itself*, perform poorly. This is achieved with reference to the sets of interests entrenched in each and the methodological approaches

mobilised. A critical discussion of methods and priorities for research on aquaculture development is then advanced.

One of the more striking observations to emerge from the preceding analysis is that those discourses rooted in the field of aquaculture itself (aquaculture for development; small-scale aquaculture; best management practice) are the least adequate of all those engaged with in this thesis in terms of their ability to account for the causes and effects of, and solutions to, in the first two instances, aquaculture development and, in the third, the activity's negative environmental externalities. Discourses originating outside the field of aquaculture (i.e. private governance; the political economy of agrarian change; agricultural growth; and, to a somewhat lesser extent, private sector development), and forged in a variety of different institutional and disciplinary environments appear better equipped to provide frameworks of explanation which can capture the nature of social and economic change associated with the process and to predict its likely impacts.

The challenge then is to account for this finding and identify ways in which to strengthen analytical capacity within the discipline. In order to do this it is first necessary to identify the sets of interests encoded in each of the narratives drawn on here. This is most easily achieved for BMP discourse, which is critiqued by Belton et al (2009) in relation to standards for tilapia production, and by Béné (2005) for shrimp standards on the basis that:

‘The large majority of the scientists who advocate the BMP approach have also strong professional interests in supporting the further development of the sector – because they have based their scientific careers (i.e. reputation and publication) on shrimp farming research, and some also have financial interests because they also act as independent consultants for private or public clients (industry, funding agencies, etc.)’ (p608).

A similar process is also evident in the construction of aquaculture for development and small-scale aquaculture discourses. With respect to the latter, Purcell and Brown's observation that ‘scale is not an external entity to which actors respond; it is rather a *strategy* that they mobilize to realize their interests’ (2005, p281, emphasis in original) is particularly prescient. As elaborated in Chapter

6, the first half of this statement implies that there is nothing inherent about aquaculture practiced on a 'small-scale' that lends it an intrinsically greater capacity to deliver development than the 'large', 'industrial', or 'commercial' forms of production against which it is implicitly juxtaposed. More importantly however in the context of the present analysis, the statement's second clause reveals recent attempts by certain institutions to redefine ever greater swathes of aquaculture as 'small-scale' to be part of a strategy to shore up continued support and legitimate their activities in the face of the seemingly inexorable rise of increasingly capitalist forms of the activity and the declining significance of old-style 'rural aquaculture'.

At the expense of stating the obvious, all discourses are produced, whether consciously or unconsciously, in a manner which serves the interests of those groups controlling their production. Each of the other discourses referenced here is therefore susceptible to critiques similar to those advanced with respect to the aquaculture discourses above. 'Agricultural growth' is just as much a construct as 'small-scale aquaculture' and also serves the interests of the set of institutions and professionals from whence it originates, both shaping and shaped by the prevailing global policy environment. As Chapter 3 demonstrates, PSD discourse and the institutions that produce it are equally (perhaps more deeply) implicated in this regard, 'giving rise to constructions of reality that at once advance and conceal the interests of First World capital and hegemony' (p68) embodied in the post-Washington consensus. Nor are the discourses of private governance and the political economy of agrarian change value neutral. Both, though more so the latter, tend to advance a populist political agenda which favours its subjects (Bernstein, 2009), be they peasants under assault from the forces of global capital or, (much the same but in slightly different terminology) smallholders excluded from global value chains by the quality demands of Northern retail giants, and both also serve to advance the professional interests of the academics who produce them.

That said, the evidence presented above suggests that some narratives pertaining to aquaculture and associated developmental processes 'hold more water' and are of greater analytical value and pertinence than others. The remainder of the section therefore explores methodological practices associated with these discourses since these are partially responsible for determining their utility in interpreting aquaculture development and the social relations on which this depends.

The field of aquaculture is overwhelmingly dominated by professionals trained in biology, or more specifically zoology (Edwards, 1998), along with a small number of agricultural economists. This tends to result in positivist world views and attitudes toward the creation of knowledge, even among those who over the course of their careers have become involved in the field of development (whether through administering projects or frontline extension activities) and who have been exposed to modes of thought and action beyond the boundaries of their original disciplines as a result. The dominance of these epistemic communities over the construction of knowledge relating to aquaculture thus shapes the character of discourses of aquaculture development and results in the production of texts which are frequently unreflexive and unsophisticated in any attempts they make to integrate what are almost ubiquitously referred to as 'social issues'⁴⁰. Aquaculture therefore remains something of a disciplinary island; somewhat detached from and resistant to the influence of other fields of knowledge even where (as is most immediately obvious in the cases of agriculture and livestock) there is a high degree of overlap in terms of institutions and research agendas, and in the locations and the material and social characteristics of the systems studied. Although some exceptions do exist, this general separation represents a missed opportunity on both sides of the divide in terms of mutual lessons foregone, and means that the penetration by ideas and practice from other areas is often limited or occurs only following a considerable time lag. This state of affairs is particularly unfortunate given that, as Lewis et al (1996) note, fish culture is 'the perfect case for interdisciplinary treatment: the growth and habits of such fish are determined through biological investigation, but they can only prosper when humans intervene, and this requires social investigation' (p30).

⁴⁰ Béné (2005) argues that BMP discourse effectively denies the existence of the activity's social dimensions, whereas Belton et al (2009, p842) note that in the case of standards for tilapia 'social issues' are co-opted as a 'minor, nebulously defined component' of standards in a way which 'implicitly reinforces an understanding that technical biophysical criteria assume primacy over social ones as determinants of sustainability'. It is ironic that standards themselves are one of the most important 'social issues' currently impinging on the production of Pangasius, shrimp and other aquatic export commodities; a state of affairs which standard-setters invariably fail to recognise. Although BMP discourse represents an extreme example of this tendency, the identification of 'social issues' in the other aquaculture discourses surveyed here frequently remains muddled or tacked-on, and analysis often somewhat naïve.

Conversely, fora such as mainstream development journals often seem reluctant to embrace aquaculture as a subject worthy of exploration despite numerous parallels with areas which routinely receive exposure (agriculture again prominent among them), and appear to view it as too technical or specialised to warrant coverage. With a small number of exceptions (principally journals with a strongly maritime flavour carrying articles relating to the political ecology and economy of shrimp culture), it is difficult to locate a single social science publication containing more than three or four papers on aquaculture, and a great many contain none at all. This is in contrast to articles on fisheries, which feature frequently; colourful fishing communities with strong collective identities, and institutional aspects of natural resource management evidently proving more romantic or fashionable subjects than the proprietors of ‘fish-filled holes-in-the-ground’ to both researchers and editors. Social scientific research on aquaculture has thus failed to form a cohesive body with a clearly defined agenda. This is perhaps reflective of the type of scholars carrying out work in the field, who are most frequently either academics from outside the sector who engage in research on a pragmatic basis through consultancies or temporary involvement in projects, or technically orientated individuals attempting to frame the biological aspects of the systems they study within a wider social context. Researchers with a foot in both camps remain rare.

Much research on non-biological aspects of aquaculture takes the form of structured questionnaire surveys designed to yield ‘socio-economic’ data destined for statistical analysis, most commonly by form of linear regression. Such methods are often favoured because their treatment of large numbers of cases and the use of ‘statistically valid’ methods of sampling and analysis is seen to lend them a veneer of ‘objectivity’. In the right hands such approaches may yield interesting results, and may provide a useful source of benchmark figures to support more descriptive analyses. Never-the-less, there is a tendency to generate information devoid of context which, as a result, often reads as little more than strings of mean averages and standard deviations. Quantitative data generated or presented without appropriate contextualisation can easily be misinterpreted even when subjected to more sophisticated economic analysis, as a study by Dey et al. (2010) demonstrates. This emphasises that Malawian farmers integrating ‘small-scale’

aquaculture into their operations are significantly more efficient than non-adopters, have significantly higher total factor productivity, significantly higher farm income per hectare, and significantly higher returns to family labour. These ‘efficiencies’, which the authors take to ‘illustrate the potential of IAA⁴¹ to contribute to poverty reduction and improvements in livelihoods’ (p77) are rendered effectively meaningless however, when one considers the finding that fish culture directly contributed an average of only US\$21 to the annual farm incomes of adopting farmers; a fact, the significance of which, the paper’s authors evidently fail to recognise.

An overreliance on quantitative methods and statistical analysis may also mean that even where interesting or convincing relationships appear it is impossible to infer anything concrete about the nature of causality, or may lead to gross oversimplification. This latter point is nicely illustrated by Haque et al. (2010) who, in a comparative exercise, are able to show that whereas regression analysis identifies two variables as predicting 57% of the adoption or rejection of a new fish production technology introduced by a project, a far more complex set of mutually reinforcing agro-ecological and socio-cultural factors uncovered through supplementary qualitative investigation are in fact responsible.

As discussed in Chapter 2, structured surveys are widely deployed as project monitoring tools due to the relatively high speed and low cost with which they can generate large quantities of the sort of standardised data needed to comply with impact evaluation requirements and demonstrate the achievement of outputs specified in project logframes. As Chapter 2 also indicates, there is a tendency for this data to be presented as aggregate means which may conceal as much as they elucidate in terms of variation in the extent, causes and implications of uptake of whichever technologies or arrangements are being promoted. Chapter 2 also notes that post-project sustainability assessments are rare, making judgements of their long term efficacy difficult. The Mymensingh Aquaculture Extension Project is one of the few aquaculture development projects to have received significant *ex-post* attention. Three different efforts to assess its long term impacts have resulted in: 1) gushing praise, based on dubious extrapolations about increases in the

⁴¹ Integrated agriculture aquaculture

volume and value of fish production resulting from the project, and some bolted on PRA exercises (Winrock International, 2004); 2) an even handed treatment employing on a carefully designed mix of qualitative and quantitative methods and indicating generally positive income effects but accruing mainly to better-off households (Hallman et al, 2003), and; 3) economic analysis based on a purely quantitative survey indicating positive short run impacts on pond productivity and the value of fish production per capita among participants but no similar long term effect (Rand and Tarp, 2010). Unfortunately the latter part of this a conclusion is explained by invoking a decline in the world market price of fish ‘transmitted to local level’ (p143) – a deduction which would surely have been revised given even a basic contextual understanding of the situation on the ground on the part of the authors, and so far-fetched that it makes one question the remainder of the paper’s findings. The variability in the design of these efforts and resultant quality of the conclusions reached are interesting in their own right, and point to the desirability of building carefully conceived long term impact assessments into the fabric of project design and appraisal. Given the three year cycle under which most funding is delivered at present this would probably require a significant shift in donor thinking however.

For much of the last decade ‘participatory’ forms of appraisal have commonly been deployed in research on aquaculture (much of it associated with projects), either in addition to the standard surveys or separately, but have been used mainly to assess the status of the various ‘capitals’ of the livelihood pentagon, resulting in analysis which is not always particularly illuminating. Participatory methods certainly can be put to good use however, and may provide rich data in both qualitative and quantitative forms (Chambers and Mayoux, 2003), as their deployment in the research informing Chapter 6 indicates. Their application in an excellent study by Brooks et al (2008) is also indicative of this dual potential. Participatory methods may prove counterproductive when used badly however, in part because of their connection with the inception of development projects. This association may lead ‘participants’ to manipulate responses by, for instance, downplaying their incomes, land holdings or social status if they believe that access to project resources is likely to depend on their replies. It should also be recognised that participatory appraisals place significant demands upon participants’ time and powers of

concentration, and may prove more extractive than empowering (Cornwall and Pratt, 2010), perhaps even more so than alternative research methods including the administration of lengthy interviews.

The fieldwork which informs this thesis is based predominantly on interviews, structured to greater or lesser degrees depending on the circumstances and demands of each field situation, and backed by observations and the collection of secondary data. This formed part of a purposive, inductive approach to information gathering, in which research questions were constantly refined and refocused in order to allow the data space to tell their own story as new patterns emerged. This proved effective in producing detailed empirically grounded case studies which, particularly in Chapters 3 and 4, illuminate the micro social relations ‘oiling the wheels’ of development at the local level. This approach is less fully realised in Chapter 6, the last of the three main fieldwork-based papers, as a result of which it reveals less than the others about the dynamics of local social relations which may affect the ability of actors to mobilise the resources necessary to enter into aquaculture and the terms on which they do so. Such work would be valuable given the importance of the informal power relations which, as vividly described by Wood (2001), structure rural Bangladeshi society and, in doing so, define the boundaries of individual agency.

The methods adopted during the research that informed this thesis are similar to those often deployed in studies of agrarian change and private governance. This in part explains the greater degree of convergence between work in these traditions and the research presented here than with most work in the ‘aquaculture for development’ lineage. However, despite the depth of insight which qualitative case-based approaches provide, they may suffer to some extent from a lack of ‘breadth’ (Davis and Baulch, 2010). Béné et al (2010, p936) also note that whilst macro analyses of panel data may lack precision, a reliance on case study data alone can severely limit the potential to generalise arguments made, and result in ‘difficulty in gaining wider acceptance amongst development researchers and policy analysts’. Thus, whilst every effort was made to ensure diversity and representativeness in all the case studies that inform this thesis, wider geographical coverage and the generation of more detailed standardised numerical data from larger numbers of respondents on, for example, household income and expenditure, production economics, or

employment patterns, would have enhanced the robustness of the analysis presented. The work of Davis and Baulch (2010) which systematically combines ‘medium-N’ qualitative and ‘large-N’ quantitative methods in the evaluation of poverty in Bangladesh is interesting in this regard and shows some promise as a model for future multi-dimensional studies on the poverty impacts of aquaculture development in both immanent and interventionist forms.

To date only a relatively limited number of ethnographic accounts have addressed issues associated with aquaculture development interventions; e.g. Wood (1994); Lewis et al (1996); Lewis (1998); Crewe and Harrison (1998). Although a larger number of studies have engaged critically with the consequences of immanent aquaculture development (see *inter alia*, Ito, 2002; Barrett et al, 2002; Stonich and Bailey, 2000; Kelly, 1996), these deal almost exclusively with production of the globally traded aquatic commodities of most interest to Northern academic audiences. Recent additions to the literature have also begun to chart the political economy of another ascendant global commodity; Vietnamese Pangasius (Loc et al, 2010; Bush and Belton, in press), but the absence of attention paid to commercial culture of the carps which dominate production in the world’s two aquaculture superpowers, China and India, represents a gaping omission in the literature. Carps account for three quarters of all Asian cultured freshwater fish by volume (FAO, 2010), making them by far the most significant species group in terms of global production and consumption, dwarfing output of catfish, tilapia, salmon and shrimp. Although there are doubtless important issues to be explored regarding the contributions of commercial cyprinid aquaculture to food security and poverty in domestic and emerging intra-regional Asian markets, for now these remain almost entirely unbroached, certainly in international peer-reviewed publications, as, by-and-large, do the implications of the production of catfish, tilapia and other species groups for these domestic markets.

An article by Bebbington (2003) which attempts to set an agenda for research in development geography is of particular relevance with regards future research on aquaculture development. Building on Cowen and Shenton’s (1998) definition of immanent and interventionist

development⁴², which Chapter 2 of this thesis also adopts as a framework for analysis, Bebbington suggests that ‘comparative case study work exploring the ways in which the development of capitalism and processes of intervention are both linked and vary across space still offers fruitful terrain for theory’ (2003, p287). He goes on to argue that, with some exceptions, the tendency has been to treat the geographies of capitalism as a more global phenomenon, while development intervention is treated as a more local, subnational phenomenon. By the same token, work on the former has had more of a structural focus in which actors are often treated at the level of organisations and companies, while work on development as intervention has had more of an actor-oriented focus (*ibid.* p300).

He then highlights ‘the importance of studying development interventions and the development of capitalisms simultaneously and in relation to each other’ and calls for more studies, ‘conducted in a way that traces the relationships between places and transnational development processes (related to both types of development) and constantly seeks a more comparative view in order to tease out far more strategic lessons for theory and practice’ (*ibid.* p306). It might be argued that this thesis inadvertently adopts such an approach, dealing as it does with aquaculture development of both immanent and interventionist varieties, on a comparative case-based basis, and across a range of scales. This conceptualisation of the research agenda also appears to serve as a useful guide to future attempts to study aquaculture development, in both its forms and in their relation to one another, in a more purposefully structured manner.

With hindsight, although the methodological tools employed in the research that forms the basis of this thesis were appropriate to the task at hand, they could have been strengthened by the integration of more rigorously pre-planned mixed methods. The complementarity between participatory and semi-structured interview methods made apparent by work informing Chapter. 6 might, for instance, have had potentially useful applications in Vietnam to help locate the position of catfish producers within their local social structure in a more precise manner. Similarly,

⁴² According to Bebbington’s reformulation of Cowen and Shenton’s definition, ‘development can have two (often confused) meanings: 1. Development as the expansion and extension of (generally capitalist) systems of production, exchange and regulation. 2. Development as organised interventions with explicit and implicit goals’ (2003, p299).

research in Bangladesh would have benefitted from closer scrutiny of the social relations governing entry into and maintenance of fish production such as those determining, for instance, access to credit and land, and would also have benefitted from more detailed scrutiny of possible negative social externalities such as exclusion of former sharecroppers or inequitable gendered outcomes of new patterns of resource use. The somewhat superficial and, almost by definition, rapid nature of PRA, means that some of these nuances, which could have been captured by longer, or even medium-term immersion in the communities where our research took place, were missed.

In retrospect, most of the studies would also have been enriched, and produced narratives with greater traction with respect to policy had they been based on more carefully designed integrated qualitative-quantitative strategies capable of generating more definitive values with respect to growth linkages, employment multipliers, real wages and the like, in preference to the usually rather indicative figures usually derived in practice. Given the resource limitations under which the research was conducted (and other practical difficulties, including the limitations of my own skill set), this would have been difficult to render effectively. Never-the-less, it should remain an important priority for future research along these lines. A more fully-fledged ethnography of the workings of an aquaculture development intervention, the intent of which was to furnish a more complete analysis of some of the shortcomings of project performance identified in Chapter 2, was also originally envisaged as a key component of the thesis and, had it been successfully executed, might have provided valuable insight in this area. However, for much the same set of reasons acutely described by Lewis (1998) this attempt quickly ran into difficulties and was not subsequently able to reach fruition.

3 Implications for a new research and policy agenda

The preceding sections and the papers that inform them indicate serious shortcomings in the way processes giving rise to aquaculture development and the social dimensions and implications thereof are understood and represented within the discipline of aquaculture itself. Exploration of these issues by researchers from other disciplines has hitherto been limited in quantity and scope, being dominated by work on the socio-ecological impacts shrimp development. This has left

considerable knowledge gaps which, it might be argued, inhibit the capacity of those charged with designing policy on aquaculture to implement meaningful and effective measures. This thesis has therefore made a small, and long overdue, contribution towards redressing this balance.

Another more fundamental conclusion is that, in polar opposition to its representation by the discourse of ‘aquaculture for development’, aquacultural growth is first and foremost a product of development rather than a driver, albeit one which may have the capacity to promote growth and employment wherever sufficiently dense clusters of enterprises are to be found. As elaborated in Chapter 2, aquaculture is therefore most accurately understood as the outcome of immanent conditions of development (economic, infrastructural, demographic) intersecting with increasing demand for fish⁴³. The existence of these conditions creates a space for agency within which certain entrepreneurial actors become capable of accessing and recombining factors of production in a manner which allows them to respond to this need (see also Belton and Little, 2008). The ability of actors to exercise this behaviour is, in addition, tempered by the nature of local social relations, as shown in Chapters 3 and 4. This reversal of causation is sufficient to explain a great deal of the failure by interventions conceived in line with conventional aquaculture development discourses to establish the activity in sub-Saharan Africa since, simply put, they place the aquaculture cart before the development horse.

This chain of insights represent this thesis’s most important overall contribution to the body of knowledge on aquaculture development, working as it does in almost diametrical opposition to the conventional wisdom propounded in the dominant discourse of ‘aquaculture for development’. As such, it has (potentially) profound implications for how aquaculture development is conceived by those professionally engaged in the field, particularly with respect to the direction of policy decisions involving the allocation of scarce public resources to aquaculture, perhaps not only in South and Southeast Asian countries but in Africa too. Read in conjunction with many of the other findings presented earlier this insight suggests the need for a new research and policy

⁴³ Demand for fish, which is frequently though by no means exclusively urban in origin, is itself a product of immanent conditions (rising incomes and aquatic habitat degradation among them). Throughout much of Asia its roots are to be found in the co-evolution of rice cultivation and fish consumption, resulting in closely overlapping cultural and agroecological geographies of aquaculture development.

agenda for aquaculture. As appropriate methodologies and approaches to research in this field are presented above the remainder of this final section restricts itself to highlighting a number of areas deserving of further systematic exploration and policy attention.

The relative importance of contributions to food security made by the emerging quasi-capitalist aquaculture and ‘traditional’ semi-subsistence forms of the activity in terms of both quantity and access remain unclear. Data collected at the national level has a tendency to be woefully inadequate except where it relates to production of commodities for global export which pass through formal regulated channels on their way out of the country. This leads to severe underrepresentation of production volumes, and what data exist are often aggregated to a point where useful distinctions between the origins of production in systems with differing characteristics cannot be teased out. Access to more accurate and detailed information on the composition of the sector at national and district levels would seem to be a prerequisite for the formulation of meaningful strategies with respect aquaculture, making this an important issue both for research, which can help to fill in knowledge gaps, and policy.

As Chapter 6 suggests, there is ample scope to fruitfully apply lessons and approaches derived from the green revolution experience to aquaculture. Other types of agriculture may also yield useful comparisons; the emergence of a new breed of entrepreneurial ‘middle class horticultural farmers’ in Kenya, whose heavy reliance on hired workers has stimulated local demand for labour, providing one obvious example (Neven et al., 2009). These comparative efforts should include detailed economic analysis of growth linkages, employment multipliers, and indirect consumption effects associated with different forms of aquaculture (e.g. homestead versus quasi-capitalist⁴⁴) backed by contextual qualitative evaluation. Other concepts drawn from the agricultural

⁴⁴ A point of clarification is necessary here. Chapter 5 indicates the vast majority of *Pangasius* culture in Mymensingh to be quasi-capitalist in nature with a small number of fully capitalist operations, and a similar situation prevails in Vietnam. This should not be taken to indicate all productive commercially oriented forms of aquaculture to be quasi-capitalist/capitalist however. Different fish species have different biological characteristics and requirements which establish bio-economic parameters for their production. In Marxian terms, cultured species with markedly different biological characteristics represent different *forces of production*. These characteristics (e.g. carnivorous feeding habits, or an ability to survive high stocking densities) are reflected in differing demands on capital and labour, and therefore place some limits on associated *relations of production* by, for example, dictating the extent of the need to employ farm labour. As a concrete example,

growth literature such as the inverse relationship between farm size and productivity are also worthy of exploration with respect to aquaculture, again particularly in light of their policy implications. Comparisons with development in other natural resource based sectors, in particular poultry and livestock, also merit further empirical evaluation from a variety of perspectives including the dynamics of their co-development with aquaculture, and convergent discursive representation (livestock production in the Global South is also referred to as undergoing a revolution, and small ruminants, poultry, cattle fattening and milk cows are all prescribed as tools for rural poverty and food security focussed interventions). Similar questions of certification, resource use, ecological impacts and disease all cut across animal husbandry and aquaculture, also suggesting fertile ground for further exploration.

The combination of environmental assessment techniques, in particular life cycle assessment (LCA) with economic and social analysis also appears to be a particularly fruitful area for further investigation and theoretical development, particularly given current inadequacies inherent in environmental standards (Chapter 5). The need to look beyond the boundaries of the farm itself to comprehend the extent and nature of environmental impacts associated with production processes, which is the basis of LCA, also has implications for social and economic research. As Chapter 6 suggests, the old paradigm in which poverty and nutritional impact is seen to begin and end with fish-producing households and perhaps a small number of farm employees and local consumers is insufficiently sophisticated to account for multiple interlinked effects on actors located at multiple

tilapia must be stocked at much lower densities than *Pangasius*. Per unit area productivity and demands on labour are consequently also much lower for the former. As a result, while the household head and/or household members usually contribute their own labour to both types of enterprise it is rare for tilapia farms in Central Thailand sized less than 15ha to employ permanent labour (Belton, Forthcoming), whereas in Bangladesh even farms of less than half a hectare do so. This means that despite the owners of Thai tilapia farms of less than 15ha and the owners of Bangladeshi *Pangasius* farms sized 0.5ha both producing for fish exclusively for the market and in a specialised manner which exceeds the capital investment and yields of 'traditional' polyculture, the former group do so under quasi-peasant relations of production (more specifically, they are simple commodity producers) since they employ no labour and consequently create no surplus value, whereas the latter group do and are therefore (quasi)capitalists (Roseberry, 1980). It is therefore necessary to exercise care in ensuring that these terms are correctly deployed in analysis.

geographical scales along extended value chains in the non-farm, urban, national and global economies.

In sum, this indicates the farm itself can no longer be considered the only, nor even most important, site of production of ecological, social and economic effects. Obtaining a clearer understanding of the nature and distribution of the economic and social impacts of aquaculture along value chains in both vertical and horizontal directions must therefore represent a priority as a guide to policy and, if deemed appropriate, intervention. Bolwig et al's observation (2010, p174) that 'little attention has been paid to how participation in value chains exposes poor people to risks, as opposed to how it affects income opportunities' also sounds an important note of caution however, and these authors' conceptual framework for integrating poverty and environmental concerns into value chain analysis appears to offer a useful starting point for future work in this area.

As highlighted above, while global aquatic export commodities have attracted the attention of social scientists, systems of production for Asian domestic consumption have remained largely untouched except where research explores their introduction through projects. Without suggesting a case for either/or, particularly since the two may prove complementary, a closer understanding of the relative advantages offered by domestic and export-led production in terms of associated patterns of growth and externalities (both positive and negative) is required. This need is particularly pressing in light of the *World Development Report 2008* call for more comprehensive integration of entrepreneurial smallholders into global value chains as a key strategy for reducing rural poverty, and the emphasis placed by many other contemporary development policy prescriptions on the potential for closer integration of poor people or areas with global markets (Bolwig et al, 2010). Differences in the social and perhaps also ecological resilience of Pangasius culture in Vietnam and Bangladesh, at which the papers presented here hint, are deserving of further exploration in this regard, particularly in light of the massive exit of quasi-peasant producers in Vietnam and their increasing replacement by capitalist enterprises suggested by recent studies (Kheim et al, 2010; Loc et al, 2010); a process which will doubtless be accelerated by the looming imposition of private standards.

This tendency highlights the mixed blessing that export-oriented production may represent, and suggests a role for more action oriented research on how to manage or mitigate exclusion from or ‘adverse incorporation’ into value chains, or for policy actions to reduce inherent risks and market unpredictability. A number of projects have already explored or are exploring some of these issues, although with varying degrees of reported success (Umesh et al, 2010; Khiem et al, 2010). A recent study on the effects of fish trade in sub-Saharan Africa (Béné et al, 2010) is also potentially instructive regarding the relative desirability of production for export, finding no demonstrable correlations, either positive or negative, between fish trade and economic or human development in sub-Saharan Africa. Despite the very different political economic context found in Asia this observation is sufficient to serve a warning against assuming trickle down effects from foreign exchange earnings or revenues associated with the export of aquatic products. The authors’ conclusion that intra-regional trade in fish among African countries bears potentially greater promise with regards reducing poverty and improving food security than that from South to North is also worthy of further exploration in the Asian context given the existence of important but as yet poorly researched transboundary flows of cultured and wild fish in both South and Southeast Asia.

With respect to more conventional interventions, given that Chapter 2 suggests projects which aim to boost the productivity of existing quasi-peasant aquaculture have a better track record than those introducing it afresh, it may make sense to prioritise the former. However, in most high potential areas⁴⁵ the basic technologies and management strategies of semi-intensive polyculture are sufficiently well known after years of promotion that it is a fairly simple matter for anyone able to muster the necessary resources to move toward more technically optimal production of their own volition should they wish to do so. Moreover, as Chapter 6 indicates, individuals possessing the capability to do so also tend to belong to relatively more affluent segments of the community. Poorer pond owning households do exist however and Chapter 6 also raises the question of whether the variety of interlinked factors which often render them unable to

⁴⁵ Predominantly Asian lowland rice-dominated agro-ecosystems

utilise these resources effectively can be overcome by specifically designed and carefully targeted interventions. This question demands thorough evaluation of the transaction costs involved in implementing such measures and the likelihood of their sustainability before endorsing them as appropriate actions however. It should also be recognised that a failure on the part of ‘non-adopters’ to use techniques already in common circulation in the public domain may represent the outcome of calculated decisions, albeit founded on a rationality severely bounded by the circumstances of their poverty.

The introduction of novel technologies or systems of social organisation may therefore represent potentially more effective forms of intervention *if* they can be designed and disseminated in a manner appropriate to ensuring sustained uptake. It must be recognised that interventions of this type run a higher risk of abandonment than those working with existing producers however and, especially for those involving the formation of new institutions for collective action, a higher propensity to result in unintended negative consequences. In contrast, immanent aquaculture development continues to expand and evolve in high potential areas and, to a lesser extent, in more diverse rainfed systems, largely unaided by the intentional efforts of external agents, and will do so for the foreseeable future.

While, unlike cereals, significant yield gains for fish are probably still possible in many cases using existing technologies, past history shows that most productivity increases are likely to come from within the sector itself in response to shifting demand patterns and incentives. Historically, by far the most important technological developments originating in the public sector or from donor funded initiatives involve closure of the lifecycle on key culture species and in a much smaller number of cases, improvements to their performance⁴⁶. Such breakthroughs have required relatively little capital investment and, as Chapter 3 shows, once effective techniques which answer a particular demand are established, they are easily replicated along immanent lines with little need for further promotion. Interventions of this variety are thus highly cost effective and extremely

⁴⁶ With respect to tropical freshwater aquaculture, these have to date mainly been limited to the development of techniques for the sex-reversal of tilapia fry and the hybridisation of Asian and African walking catfish species. Other improvements such as attractive red coloured strains of tilapia have resulted from research and development conducted in both the public and private sectors.

significant. Whether there are still many un or underexploited fishes meeting the requirements for good culture species remains to be seen however, and the limited number of terrestrial animals used in agriculture suggest there may be a contraction rather than an expansion in the number of domesticated species over the long term – in other words, the most important work in this area may already have been done. Applied technical research which can support more economically productive forms of aquaculture is therefore of potentially greater benefit but, certainly in the case of the emergent global commodities Pangasius and tilapia, this is already taking place in the private sector, as seen for instance in the ongoing development of new vaccines for the most common and economically destructive diseases and moves toward the production of pathogen-free seed stock for the latter.

It is also important not to underestimate farmers' capacity for experimentation and adaptation, particularly among (quasi)capitalist type enterprises. These are generally better placed than homestead type operations to take risks or innovate, whether out of curiosity or in response to economic signals, and in some cases may find it imperative to do so given that their significant investments may be at stake. This tendency is plainly illustrated by the rapid emergence of the two distinctive forms of Pangasius aquaculture found in Vietnam and Bangladesh which rest almost entirely on a constant process of adaptation, driven by and resulting in business failures and successes. Indeed, the rapidly changing form of quasi-capitalist aquaculture is perhaps one of its most notable features.

This might appear to suggest that, for the most part, policy regarding the activity's promotion can afford to be quite *laissez faire*. One of the areas this thesis has failed to fully address is the long term effect of repeated waves of intervention such as those experienced in Bangladesh, as opposed to the discreet outcomes of individual efforts. It may be that, at least in certain contexts, the cumulative outcome of intervention is greater than the sum of its project parts and that, as the papers in this thesis consistently indicate in other related contexts, effects are less direct, obvious or linear than prevailing discourses would suggest. This implies both a need for judicious consideration of how impact is constituted and assessed and, perhaps, caution against

throwing the intervention baby out with the immanent bath water (or, to use a more appropriate aquatic metaphor, pumping the fingerlings out with the pond water!).

As the papers here show clearly however, immanent conditions provide the backdrop which will determine the longer run aggregate successes or failures of any intentionally inserted efforts at national or even continental scales. This observation has two final implications for policy and practice: 1) that some of the best aquaculture policies may not necessarily be related to aquaculture at all, and; 2) that pinpointing areas with favourable geographies of immanent development where aquaculture has yet to become firmly established (most likely the provinces or districts surrounding major cities where materials and services are readily available and where large markets are directly accessible), and targeting specifically tailored responsive support services there to initiate or accelerate the emergence of systems with potential to produce large volumes of fish at low cost and stimulate employment in associated value chains, may represent a more promising model for leveraging significant impacts than those conventionally espoused.

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