2017.03.31
DISCUSSION PAPERS

Aquaculture and Rural Development in Myanmar: Pathways to Inclusion and Exclusion

Aung Hein and Ben Belton

1 Introduction

In this chapter we explore the political economy of rural development in Myanmar, with reference to a case study of fish farming (aquaculture) in Myanmar's Ayeyarwady delta. Focusing on the history of aquaculture development during the periods of 'military rule socialism' from 1962-1988, and 'market-reform military rule' from 1988-2015 (Turnell, 2009), we evaluate how successive policy regimes have shaped the development of aquaculture and, in doing so, have contributed to the production of social and economic inclusion and exclusion.

During the period of military socialism, state-managed procurement and marketing of paddy placed crippling burdens on smallholder farm households, and stifled the emergence of alternative forms of higher value agriculture, including aquaculture (Brown, 2013).

Restrictions on smallholders were partially relaxed under market-reform military rule, and industrial scale forms of agricultural development were favored (Fujita et al., 2009), leading to the rapid growth of aquaculture in areas of the Ayeyarwady Delta close to Yangon.

We use data from the largest survey of fish farms ever conducted in Myanmar to evaluate the outcomes of these policy regimes with respect to the forms and extent of social and economic inclusion and exclusion in which they resulted. This analysis reveals

a mix of outcomes.

The development of the fish farm sector has been characterized by a number of exclusionary features. Fish farms are highly concentrated geographically, and fish farm expansion has displaced many rural people from their land. Ownership of enterprises in most segments of the aquaculture value chain is also highly concentrated. However,4 we also find evidence of more inclusive growth along the aquaculture value chain. Small and medium sized fish farms and nurseries have increased quickly in number, along with small and medium enterprises in off-farm segments of the value chain, providing economic opportunities for some poorer households. These characteristics raise the question of how greater inclusivity might be achieved as Myanmar enters a new era of political and economic reform and accelerating growth.

In addressing these issues, we structure our analysis as follows: First, we set out the theoretical basis for our discussion of inclusion and exclusion with reference to four complementary perspectives, namely: 1) inclusive growth; 2) social exclusion; 3) powers of exclusion. Second, we describe the methodology and data upon which the present study is based. Third, we provide a brief history of Myanmar's political economy and the associated policy regimes that have shaped rural development. Fourth, we set out the history of aquaculture development over this period. Fifth, we evaluate resulting patterns of inclusion and exclusion in aquaculture value chains in Myanmar, with reference to the spatial (geographical location); economic (concentration of ownership); and, social (the status of those incorporated into the value chain, and the terms of their incorporation) characteristics. The final section concludes by assessing the prospects for more inclusive rural development in Myanmar.

2 Perspectives of Inclusive Growth, Social Exclusion and Value Chain Analysis

In this chapter, we draw upon several conceptual approaches to economic and social inclusion and exclusion to shed light on interactions between historical context, institutional designs and policies on one hand, and aquaculture development and its implications for welfare on the other.

First, is concerned with economic participation and sharing in the benefits of growth. In line with the World Bank, we define inclusive growth as high-paced, sustainable and broad-based growth that is driven by a mix sectors and employs a large segment of labor (Ianchovichima et al. 2009). Our view of inclusive growth also takes

into account geographies (rural-urban and core-periphery) and socio-economic groups (defined in terms of expenditure quintiles and farm and farm/enterprise size).

In addition, we pay particular attention to historical factors, market forces and policies that contribute to inequalities, both structural (e.g. occupational and spatial divides), and procedural (e.g. unequal legal provisions and protections, networks of privilege, and elite capture) that can in turn lead to economic inefficiency and poverty (Rigg, 2016). We also address inequality in circumstances, viz., access to markets, resources (specifically credit and land), and fair government institutions and regulations (Ali and Zhuang, 2007; Ianchovichima et al., 2009).

Second, addressing inequality of opportunity leads us to another critical concept for our analysis: *social exclusion*. Amartya Sen posits social exclusion in the rich tradition of capability deprivation – a concept close to inequality of opportunity – which is deprivation from participation in the worthwhile activities of community (Sen, 2000). Social exclusion can be either constitutively bad (leading directly to deprivation) or instrumentally bad (leading to deprivations in other areas of life), and can take the forms of either active or passive exclusion.

Institutional designs contribute prominently to the relational features of social exclusion (Kabeer, 2000). These can take the form of institutional bias (values, beliefs and institutional procedures that deliberately and consistently benefit one group over another), social closure (exclusive membership of a group that restricts access to resources and opportunities only to members), and unruly practices (the gap between rules and their actual implementation in practice).

Third, drawing upon the writings of Hall et al. (2011) on land in Southeast Asia, we pay special attention to '*powers of exclusion*' that structure access to land. Hall and colleagues argue that four related powers are at play in governing access to land: 1) regulations, which set physical boundaries, usage rights, type of ownership and ownership status; 2) force, either exercised or threatened; 3) the market, via its institutions and price setting mechanisms, and; 4) claims of legitimacy, including developmental discourses. All four of these exclusionary processes can be observed in the case study presented below.

3 Methodology

This chapter combines analysis of data collected during three distinct phases of research. Phase one was a systematic survey fish ponds from satellite images from Google Earth. Fish ponds are sufficiently large and distinctive in appearance that they

Table 1. Summary of interviews, by value chain segment, actor type and number of interviews conducted

Input supply	#	Farm segment	#	Post-harvest	#	Other	#
Nursery	23	Fish farm	87	Fish trader	35	Capture fish trader	4
Feed trader	19	Mechanic services	5	Transport services	10	Local official	3
Hatchery	14	Transport services	3	Market manager/worker	5	Government official	2
Seed trader	6	Worker	3	Other ancillary services	2	Landless household	1
Ice manufacturer	5	Labor broker	2	Fish processor (small)	2		
Rice mill	5	Other ancillary services	1				
Other ancillary services	4						
Ice trader	3						
Transport services	3						
Feed mill	3						
Chemical supplier	1						
Total	86		101		54		10
Grand total	251						

can be easily identified from satellite photographs such as these. In addition, fish farms in Myanmar are highly concentrated in a few key locations. This allowed us to visually identify fish farms from a manual search of satellite images and create a database of these images and their locations. This approach also allowed us to track historical changes in pond area in selected locations by comparing satellite images taken over a period of ten years.

Phase two of the research was comprised of 251 semi-structured individual interviews with actors in the farmed fish value chain. The interviews were conducted in the main fish farming areas identified by the survey of satellite images, and in the main fish wholesale market in Yangon. Interviews focused on the behavior of each actor (e.g. asset ownership and access, acquisition of production inputs, production technology, marketing behavior and sales arrangements), as well as the historical origins of aquaculture in each of the clusters visited, and the implementation of regulations relating to land tenure. Details of the interviews are summarized in Table 1.

Phase three of the research was based around a structured household survey, implemented in May 2016. The survey adopted a two stage sampling strategy. For first stage sampling, 25 village tracts estimated to hold the highest concentrations of fish ponds in the Ayeyarwady Delta were purposively selected from the digital pond database described above. For second stage sampling, 49 enumeration areas (EAs) were selected by probability proportional to size. Eight fish farming households and seven non-fish farming households were selected for interview in each EA. Households operating fish farms of 40

acres or more were selected with 100% probability, to ensure a sufficient sample of large farms to support statistically valid analysis. Respondents from a total of 1102 households (including 224 fish farming households) were interviewed.

An additional questionnaire was administered to small focus groups of knowledgeable long term residents in each of the communities covered by the household survey, to gather information on historical changes taking place within the preceding 10 years.

4 A brief history of Myanmar's political economy

We situate our analysis of aquaculture development in Myanmar in the context of the country's agricultural and financial policy regimes, anchored, in turn, in the architecture of its national political economy. In this subsection we summarize the country's political history since independence. The following two subsections describe in greater detail the character of agricultural and financial policy regimes over this period.

Myanmar's political history is summarized in Figure 1. A fledgling parliamentary democracy established following independence from Great Britain in 1948 was supplanted by a military coup in 1962. From this time, the military government of General Ne Win steadily expanded the role of state, culminating in the enactment of 1974 Constitution, which signaled the beginning of the so-called the 'Burmese Way to Socialism'. Many private enterprises were nationalized, and state organizations became dominant economic players, while the interests and needs of private individuals, businesses and society at large became subservient to those of the state. The systemic weaknesses of this regime became increasingly visible until the pent-up political and economic pressure erupted with mass popular uprisings in 1988.

The "1988 revolution" was brutally crushed, and "stability" was brought back under a military government named the State Law & Order Restoration Council (SLORC). The SLORC government enacted a series of steps towards liberalizing the economy. However, as we shall see below, terms of entry into the private sector were exclusionary—in some cases, actively and in others, passively. Limited liberalization in the economic sphere notwithstanding, the SLORC government retained a stranglehold over political and civic life.

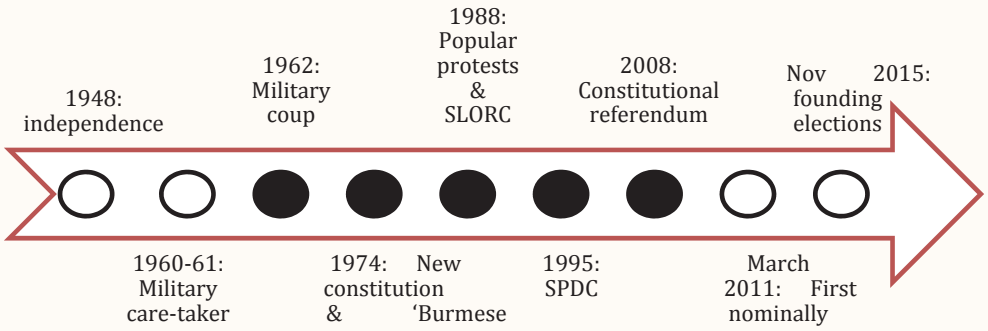


Figure 1. Timeline of major political events in Myanmar
(the period under military rule is represented by shaded circles)

In 1995, the SLORC government renamed itself into the State Peace & Development Council (SPDC). The SPDC government laid the groundwork for eventual transfer of power to civilian rule, which culminated in the transfer of power to a quasi-civilian government in March of 2011. General elections held in 2015 were won by a landslide by the main opposition party, the National League for Democracy, ushering in a civilian government for the first time since 1962.

In discussing the origins of social exclusion in Myanmar's aquaculture (and the rural sphere more widely), we focus on two formative periods in the development of aquaculture: 1) the 1962-1988 period largely under the Burmese Way to Socialism ('military rule socialism'), and 2) the 1989-2015 period under the SLORC and SPDC governments ('market-reform military rule').

4.1. Policy regimes under military-socialist rule

Under the Burmese Way to Socialism, the entire private sector became subservient to the needs of the public sector, in particular to state-owned economic enterprises (SEEs), which focused on import-substitution industrialization. Fujita et al. summarize the exclusionary, agricultural regime under the socialist government thus: "first, food prices are repressed and wages kept low in order to promote industrialization; and, second, export crops are purchased at below the international price, with the resulting revenue used to promote industrialization" (Fujita et al. 2009, p.169). An additional aim of this policy was to guarantee supplies of cheap rice for urban residents in to avoid social unrest (Okamoto, 2008). These policies reflected a systematic and consistent "mobilization of institutional bias" (Kabeer, 2000, p. 91) towards urban areas and populations and the bureaucratic industrial class, to the detriment of rural areas and populations, and agricultural producers.

Paddy farming households were subject to an onerous procurement system that

mandated them to deliver a quota of rice to the government Trade Corporation following each harvest. The quota was purchased at far below market rates. In most cases this left only a small share of the harvest to the farm household for its subsistence consumption. Any production in excess of the quota could be sold on the open market, but in practice few farms generated such a surplus. Farmers unable to meet their delivery quota were forced to purchase additional paddy in order to fulfil their commitments and faced punishment by fines, imprisonment and/or confiscation of their land if unable to do so (Thawnghmun, 2003). Many farmers became heavily indebted or had their agricultural land confiscated by the state as a result of this policy, and it was common for paddy farming households to derive farm incomes even lower than those of agricultural laborers (Saito, 1981).

Cultivation of higher value non-paddy crops by rice farmers was prohibited, excluding farmers from decisions regarding which crops to grow on their land (Thawnghmun, 2003). Paddy farmers who cultivated another crop in place of rice faced a range of punishments similar to those unable to meet their paddy quotas.

Under the Burmese Way to Socialism, much as the rest of the economy, the financial sector was brought under the strict control of the state. Private domestic and foreign banks were nationalized, leaving state-owned banks as the sole players (Kubo et al., 2009). The purpose of the state-owned banks was to finance the public sector and provide credit to SEEs. The informal financial sector, characterized by lending at extremely high rates of interest, was the only source of loans to private individuals and businesses, contributing to high levels of indebtedness and discouraging investment. In addition, demonetization - in which the currency was replaced with bills of different denominations, wiping out the value of private savings - occurred three times during this period; the last in 1987 closely preceding the collapse of the socialist government (Brown, 2013).

Together, this package of policies resulted in low productivity and economic stagnation in both agriculture and industry, and the impoverishment of rural farming populations, stymieing the possibility of inclusive growth.

4.2 Policy regimes under market-reform military rule

After the 1988 popular uprisings brought an end to socialist party rule, the State Law & Order Restoration Council (SLORC) implemented a wave of liberalization intended, in theory, to curtail the role of the public sector and spur private sector activities. However, as Fujita et al., concluded, “the genuine policy objective of the government appears to consist of the following two elements: avoiding social unrest and sustaining the regime” (Fujita et al., 2009, p.209).

For the agriculture sector this approach meant retaining a measure of control over the most politically important smallholder crop, rice, and whilst promoting large scale production of both paddy and industrial crops (e.g. rubber, oil palm, cassava).

The household rice delivery quota was reduced significantly, and then done away with in 2003, allowing farm households to sell all paddy surplus to subsistence needs to private traders at prevailing market prices. However, paddy farmers remained bound to produce rice for at least one season per year if the land cultivated was officially designated as paddy land. Thus, procedural inequalities continued to prevent paddy farmers from exercising complete agency over their production decisions.

At the same time, the government sought to ensure sufficient rice production to keep food prices low by encouraging double cropping and reclaiming 'vacant, virgin and fallow lands' and 'wastelands' (lands to which no use rights had been allocated) for use in agriculture. To achieve these ends, the state attempted to attract private capital into industrial scale paddy cultivation. This was achieved by allocating land concessions to these businesses, and providing incentives including water control infrastructure (e.g. embankments and sluice gates to allow low lying areas to be drained during rainy season), loans, subsidized fuel and tax exemption (Thawnghmun, 2003).

Similar strategies were utilized to encourage expanded production of industrial crops such as rubber, oil palm, cassava in order to increase government revenue streams and generate foreign exchange. With similar intent, the government passed an Aquaculture Law, 1989, which regularized ponds previously constructed, and allowed for "wasteland" (untitled land) to be allocated for pond construction, paving the way for agribusiness to engage in aquaculture.

This policy direction has resulted highly inequitable outcomes. According to Byerlee et al. (2014), by May 2013, a total of 377 domestic companies had been allocated 2.3 million acres of vacant, fallow, and virgin land, with an average size per concession of 2,497 ha. It is reported that just 36% and 20% of these lands have been developed and cultivated, respectively, by the companies granted concessions FSWG (2012). Untitled 'wastelands' allocated to agricultural concessions were, in many cases, confiscated from households who already worked them for decades, who subsequently became farmhands or rent-paying tenants on lands which were originally theirs (TNI 2015). Many communities also lost access to natural resources (e.g. fuel, fodder and wild foods) following the enclosure of previously common access lands for such concessions.

The state-led drive toward agricultural industrialization and agribusiness investment primarily benefitted military officials, their civilian counterparts in ministries, local officials and businessmen, while the households and communities livelihoods who lost access to land were changed forever. These tendencies similar to the outcomes of

industrial scale agricultural development observed elsewhere in Southeast Asia; involving rapid conversion of land, delocalization of ownership, land confiscation and conflict, and deployment of developmental discourse as a source of legitimacy (Hall et al., 2011).

The SLORC government also passed a gamut of legislations restricting the functioning of state-owned banks and SEEs as part of its market reform program, paving the way for private banks' re-entry into the financial sector (Kubo et al. 2009). However, private banks were established primarily by large business conglomerates, engaged in the trade, real estate and service sectors. These companies set up banks to mobilize private savings and channel them to their affiliates, and thus did little to support innovative, competitive, entrepreneurial activities, particularly in rural areas.

At the same time, military and political elites were able to control "semi-government" banks such as the Myanma Livestock and Fisheries Development Bank (MLFBD), via their political clout and shareholdings. Paradoxically, the continuing participation of bureaucrats and civil servants in the management of "semi-government" banks meant that bureaucratic procedures were either unclear or not always followed (Fujita et al. 2009), and decisions regarding credit allocation often reflected collusion between state and closely affiliated private individuals (popularly referred to as cronies).

Thus, instead of addressing existing conditions of social exclusion and thus roots of economic deprivation, financial reforms created additional layers of social exclusion through procedural inequality. These "unruly practices", were a reflection of, "the gap between rules and their implementation… [which] mediate people's ability to gain access to goods to which they are officially entitled" (Kabeer, 2010, p93).

A heavy-handed policy response to the 1997 Asian financial crisis, macroeconomic mismanagement, and the bankruptcy of general service companies ultimately contributed to a run on banks in February 2003, and the collapse of the formal banking sector, which only began to recover under the quasi-civilian government from 2011-2015.

Thus instead of paving the way for more inclusive growth, the partial market reforms enacted under the SLOCR and SPDC governments contributed to a variety of exclusionary outcomes and widening inequality.

5 The history of fish farm development in Myanmar

The development trajectory of aquaculture in Myanmar can only be understood within the context of the political economic history and policy regimes outlined in the previous subsections.

Fish farming began in Myanmar from the mid-1960s onwards, when farmers in the townships of Kayan and Twantay started to modify deep water rice fields by enclosing them with raised dikes and stocking wild fish. During the mid-1970s, the Department of Fisheries (DOF) established hatcheries to produce fish seed (juvenile fish). Early fish farmers began to purchase these, facilitating increased yields.

The first privately operated fish hatchery was established in Kayan around 1985, through informal collaboration between a fish farmer from that area and a DOF officer. Members of the extended family of the first hatchery operator subsequently established hatcheries of their own in the area. This development facilitated reliable access to fish seed, facilitating the growth of fish farming. Similar collaborations between fish farmers and DOF technicians also supported the development of private hatcheries in Twantay from 1990 onwards.

Rice bran (a byproduct of rice milling, used as a fish feed) was extremely cheap at this time while the market value of farmed fish was high, making aquaculture highly profitable for many early entrants. Some of these farmers were able to able to expand their operations rapidly by reinvesting profits and using credit provided by large fish traders from Yangon and other informal sources to buy up submerged paddy fields with low productivity. The ease with which farmers were able to acquire land this is a reflection on the unprofitable nature of paddy farming at this time, a key exclusionary outcome of socialist agricultural policy.

As area under ponds expanded during the mid- to late-1980s, aquaculture became more visible to the authorities. This resulted in a government crackdown on fish pond operators, who were in breach of tightly enforced controls mandating paddy production. Informants reported that some pond operators were arrested and detained for up to two months during this period and that in some cases their ponds were destroyed by the authorities. These rules were particularly heavily enforced in Kayan, leading the center of fish production to shift to Twantay, where rules were less strictly implemented, but the overall effect was to cause a temporary hiatus in fish farm growth.

Informants interviewed reported that the area around Twantay was earmarked as a zone for aquaculture development by a very high ranking army officer following the SLORC takeover in 1988, though this designation was never formalized. Much of the Twantay area was at that time an impenetrable swamp, a stronghold for the Karen National Union (an ethnic armed group), and the site of a long running conflict between government forces and the KNU that ended only in the early 1990s. Military support for the development of aquaculture in this area thus appears to have been part of a deliberate strategy, similar to that widely pursued by the state in former conflict zones elsewhere in the country, whereby the expansion of agricultural enterprises was encourage as part

of a strategy "to govern land and populations to produce regulated, legible, militarized territory", (Woods, 2011, p747).

As the area under fish ponds in pioneering areas such as Twantay expanded, the area of land available for conversion to ponds in these locations began to close, and the most successful farmers started to acquire land for pond construction in new areas nearby. Residents of these new 'frontier' areas also began construct ponds in increasing numbers, leading to the formation new clusters of fish farms, along with new hatcheries and nurseries producing seed. Numbers of businesses in off-farm segments of the value chain, most notably transport, and to a lesser extent traders of feed and harvested fish also began to increase in these areas.

This pattern of pond expansion through the opening up of 'new' land at the edge of a widening frontier has continued until the present day. The 'first mover' advantage conferred to successful early entrants enabled some of these individuals and their families to accumulate very large aquaculture landholdings spread across multiple sites. Our interviews suggested that they were aided in this accumulation by the development of close ties to officials in the state bureaucracy that accompanied their rise as wealthy producers.

Large government flood control and irrigation schemes constructed in the late 1990s as part of the policy agenda outlined above, were initially intended of facilitate the intensification and expansion of rice cultivation, but simultaneously improved conditions for fish farming. Informants interviewed reported that a companies and individuals with close ties to the military government acquired thousands of acres of land as concessions following completion of the scheme. The land confiscated included a mix of uncultivated "wasteland" and untitled land already worked by paddy farmers.

Most of the land awarded as concessions was not developed for intensive paddy cultivation as intended. Instead, some was leased back to its original owners or other small farmers by the companies that had acquired it, while in some concessions use rights to land were sold on to other companies. Rather than cultivate paddy, which often proved unprofitable on an industrial scale, the recipients of some concessions constructed ponds and leased them out to large fish farm operators. A number of concessions were also awarded directly to companies or individuals for the development of fish farms, in line with the provisions of the Aquaculture Act. The largest of these was reported by informants to total 7000 acres in size, and several others in the 2000-3000 acre range were also encountered during field work.

Thus, the state support for industrial scale agriculture primarily benefitted companies and influential individuals with close links to the state, while displacing large numbers of smallholder paddy farmers with weak tenure security. This latter fact is

particularly ironic, given that central pillar of state intervention in smallholder agriculture was to deny operators of paddy land the ability to convert it to other uses, including aquaculture.

In practice these regulations have been enforced only selectively. This has enabled significant numbers of small and medium scale farms and fish nurseries to establish in the vicinity of very large farms. However, these strictures increase the costs and risks of adopting aquaculture for smaller operators, discouraging its uptake, and continue to prevent it entirely in some areas outside of the main farm clusters.

Successive policy regimes have thus contributed to an un-inclusive pattern of aquaculture growth, which is concentrated in a handful of geographical areas, has privileged and benefitted powerful interests, deprived large numbers of rural households of access to land and livelihoods, and allowed small and medium scale farmers entry into the aquaculture value chain on terms less favorable than those obtained by large state sanctions operations. These aspects are explored in further detail in the following sections.

6 Research findings

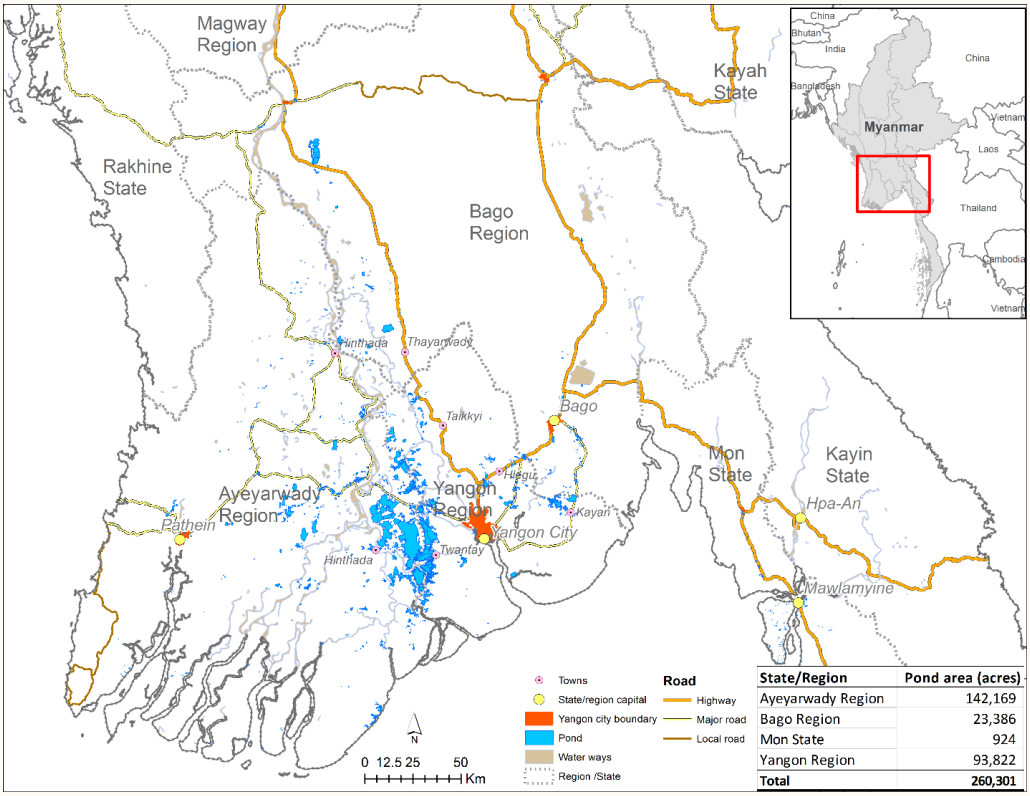
6.1. Geographical concentration in the farm sector

The aquaculture sector in Myanmar is highly concentrated geographically. Almost 80% of land in Myanmar under fish ponds is in the delta regions of Ayeyarwaddy and Yangon (Table 2). Our analysis of satellite images shows that most fish ponds lie in a zone within a 25-50 km radius from Yangon (Figure 2). Just three townships in this zone (Maubin, Twantay, Nyaungdon) account for 62% of the total estimated pond area in the delta.

Several factors account for the concentration of ponds within this zone. The zone's

Table 2. Share in total pond area by states and regions
(Source: DOF, 2014)

Region/State	Pond area	% of total pond area
Ayeyarwaddy	112,892	51
Yangon	59,864	27
Bago	26,014	12
Others	22,282	10
Total	222,027	100



State/Region	Pond area (acres)
Ayeyarwady Region	142,169
Bago Region	23,386
Mon State	924
Yangon Region	93,822
Total	**260,301**

Figure 2. Fish ponds in Lower Myanmar

proximity to Myanmar's largest city, Yangon (population approximately 5 million), plays an important role. Yangon is a major source of demand for farmed fish, and the site of Myanmar's largest farmed fish wholesale, from which fish are distributed to markets around the country.

The area in which fish farms are concentrated has a dense canal infrastructure that provides both irrigation and flood protection for ponds, and a means of transport (most farms are accessed by boat). This facilitates the flow of inputs (e.g. feeds, ice for harvesting fish) from Yangon to farms, and fish from farms to the city. Roads have also been constructed on top of flood embankments, making the area a relatively accessible in comparison to the more remote the Southern and Western delta.

These advantages notwithstanding, fish ponds been able to expand rapidly in this area, but not in others because of informal relaxation of restrictions on converting agricultural land to ponds that has accompanied the state sanctioned spread of industrial scale fish farm operations into these areas. Informants reported that in many cases, local officials in these areas had either been lenient toward individuals constructing ponds (often benefitting financially from doing so), or had actively participated in the conversion of paddy land to ponds themselves.

Thus, both geography and unruly practices have contributed to the spatially uneven development of aquaculture in Myanmar, enabling a few locations to benefit from fish farm expansion (through returns to farmers and levels of employment on- and off-farm which are both several times higher than those associated with paddy cultivation), and while other areas have been largely excluded from participation.

6.2. Economic concentration along the value chain

In addition to being spatially concentrated, aquaculture in Myanmar is also concentrated economically (in terms of ownership) in all major segments of the value chain, including seed production, feed manufacture, farms, and wholesaling. Large vertically integrated companies capture a significant share of the market across these segments, with largely negative implications for competitiveness and welfare, though small and medium enterprises have also emerged and are increasing in number.

6.2.1. Hatcheries and nurseries

Hatcheries are specialized enterprises where fish are bred under artificial conditions to produce juvenile fish (referred to as fish seed) that are an essential input for farming fish. In Myanmar, seed produced by hatcheries is usually either sold to specialized commercial nurseries, or to fish farms producing mature 'food fish' ("growout farms"). In both cases, seed is stocked in ponds and raised for up to one year until it attains a size of several inches. At this size, fish seed is referred to as "fingerlings". Specialized nurseries sell fingerlings to growout farms without nursery ponds, whereas farms with nursery ponds transfer fingerlings to their growout ponds for further rearing. The latter category of farm thus employs a degree of vertical integration in the organization of its production.

Operating a hatchery requires a high degree of technical skill and is relatively capital intensive, resulting in high barriers to entry. However, participation in the hatchery segment has also arguably been limited by uneven, informal and highly personalized delivery of public services. As noted above, informal partnerships between government technicians and farmers played a central role in facilitating the establishment of private hatcheries, and much of the subsequent transmission of hatchery technology has occurred among members of the families of the earliest operators, resulting in a concentration in the ownership of hatcheries established subsequently.

Similar types of informal consultancy and partnerships between government technicians and entrepreneurial farmers, have also been an important feature of the early stages of development of commercial hatchery sectors in Vietnam, Thailand and India (Belton 2012; Belton et al., in press a). Nonetheless, if the DOF's service delivery had

depended less on personal connections, and more on a systematic plan of service delivery with a view for inclusive aquaculture development, a larger number of enterprising individuals would likely have benefitted.

Furthermore, many hatcheries in Myanmar are vertically integrated with large farms, and there are relatively few hatcheries produce fingerlings primarily for sale to other farms and nurseries as compared to other countries in the region. Vertical integration limits how many people can benefit from this segment of the value chain. The high prevalence of vertical integration may also go some way to explaining why Myanmar's aquaculture sector is less diversity in terms of number of species than in neighboring countries, because it is easier for isolated hatcheries integrated into large farm operations to hide innovations in seed production (e.g. techniques for spawning new species), than for specialized hatcheries more fully embedded in communities. Thus, it may be hypothesized, vertical integration also limits technological spillovers.

Specialized commercial nurseries are present in virtually every village where there are clusters of growout ponds. They are especially highly concentrated in locations where there are multiple hatcheries. Specialized nurseries tend to be smaller than growout farms. The median area of land owned by nursery pond operators is just 1.7 acres (mean 3.7 acres), as compared to median 10 acres (mean 30.5) for operators of growout ponds. Nurseries also have shorter production cycles than growout farms and require less start up and operating capital.

The number of specialized nurseries in village tracts surveyed increased by more than 200% from 2006 to 2016, in response to growing demand for fingerlings from large growout farms, and they account for one third of all aqua farms in these areas. These relatively limited land and capital requirements make nursing the main point of entry into aquaculture for small landholders in Myanmar.

The growth of specialized commercial nurseries has also been accompanied by an increase in numbers of fingerling traders who act as brokers for fish seed. These traders mainly transport fingerlings from nurseries to distant farms using specially modified boats. Numbers of fingerling traders and fingerling transport boats available for hire increased by 60% and 56% respectively from 2006 to 2016 in areas covered by the community survey. Expansion of the farm segment of the value chain has thus created multiple backward linkages in the seed supply segments of the value chain, with a relatively inclusive profile in terms of the socioeconomic status of who is able to access these opportunities.

6.2.2. Feed

Feed is an extremely important input for aquaculture, accounting for more than

60% of operating costs on average among farms in our sample. The type, quantity and quality of feeds used is a key factor determining fish growth rates, yields and farm profitability. Commercially manufactured pelleted feeds, formulated to meet the nutritional requirements of the species of fish farmed, are usually more efficient than 'raw' feeds such as rice bran, and can accelerate fish growth rates. A little over 20% of farms in surveyed village tracts use formulated pelleted feeds. This level of adoption is considerably lower than that found in neighboring countries (Belton et al, in press b), and suggests that many producers are achieving suboptimal production.

The market for manufactured feed is extremely concentrated. A single domestically owned company dominates supply and distribution of pelleted feeds. Members of the family who own the company also operate several thousand acres of ponds. According to one well-placed informant, the son of a former minister of fisheries, with access to capital from the Myanma Livestock and Fisheries Development Bank was a prominent investor in the company. This may help to explain why the company how the company was able to grow during a period when access to formal credit was constrained, giving it a major advantage over potential competitors.

Three other domestically owned private companies were confirmed as producing and distributing pelleted feeds, but their market shares appear small. A further two feed mills were identified as producing feeds to order, exclusively for use by large vertically integrated farming operations. The owners of least two of these mills also own large areas of fish ponds.

Thus, formulated feeds are most accessible to large vertically integrated large farms. Smaller farms are able to procure pelleted feeds on credit from at least two feed producers, including the largest, but are required to present land title documents as collateral, placing them at risk of the loss of their land in case of a default. Farms obtaining feed on credit must also sell harvested fish back to the trading wing of the company. Thus, although these financing arrangements have facilitated the use of pelleted feed by smaller farms that would otherwise be credit constrained, the terms on which it is provided are far more restrictive than is common in neighboring countries with more competitive feed industries.

The pricing of pelleted fish feeds in Myanmar reflects the low competitiveness of the sector. Prices are among the highest in Asia, costing approximately 10-30% more than feeds of comparable quality sold in neighboring countries. In sum, the partially monopolistic nature of formulated feed manufacture – a function of the exclusionary and personalized nature of the financial sector under market reform military rule – has served to undermine the potential productivity of the sector and to disadvantage smaller producers who adopt pelleted feeds, relative to larger ones.

6.2.3. Fish farms

Structural concentration in Myanmar aquaculture is also highly pronounced at the level of the farm. The farm sector has been a key site of exclusion from access to livelihood benefits for both fish producers and non-producers; passively through procedural inequality in value chain governance, including regulatory and credit constraints that make entry into aquaculture difficult for smallholders, and actively through institutional bias toward large scale aqua-farm development that has resulted in the loss of access to agricultural and common land by previous users.

Levels of direct participation in aquaculture are low, with only 12% of households living in the areas surveyed operating a growout farm or nursery pond, even though these locations contain some of the highest concentrations of fishponds in Myanmar. This is indicative of the challenges faced by potential entrants into the sector.

Although small fish farms are more numerous than recognized in scant literature on aquaculture in Myanmar (Belton et al, in press b), land utilized for aquaculture is highly concentrated among large farms. Our community survey indicates that fish farms of less than 10 acres made up 49% of farm numbers, but accounted for a meager 4% for pond area (Figure 3). In contrast, fish farms sized 500 acres accounted for 1% of farms, but 32% of land under aquaculture, and fish farms sized 100 acres and above accounted for 60% of total pond area.

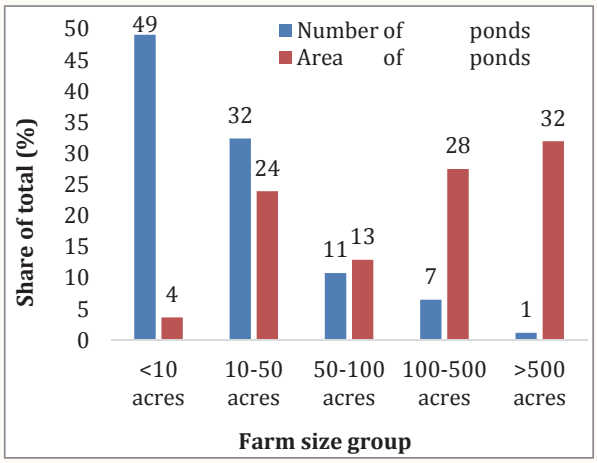


Figure 3. Share of Pond Farms (Frequency and Area), by Farm Size Category

Large farms are operated mainly by absentee owners and companies. For instance, 44% of farms larger than 500 acres were operated by absentee owners, and 48% by companies. In contrast, 95% of small farms (those sized under 10 acres) were overwhelmingly operated by residents of the village tracts where they were located (Figure 4). Absentee owners are a mix of urban residents - including, as reported by our informants, a number of senior military figures and their families - as well as some of the

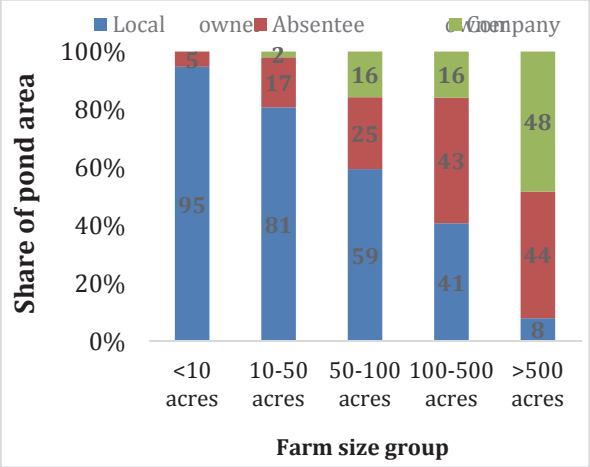


Figure 4. Share of pond area by farm size category and ownership type

most successful early pond farmers from areas such as Twantay and Kayan.

Land confiscations and the allocation of concessions has been central to the concentration land under large fish farms, and its allocation to these politically influential individuals and companies.

Households surveyed were asked whether they had sold, given away or lost a parcel of land within the last 30 years. One fifth reported having done so. Debt was the most common reason reported for the loss/disposal of a parcel of land (43% of households who disposed of a parcel had done so for this reason). High levels of rural indebtedness reflect the inequitable effects of paddy procurement quotas as well as the historically inadequate provision of formal rural credit, which forced many farmers to borrow informally at cripplingly high rates of interest in order to procure inputs (ref).

The second and third most frequently cited reasons for loss of land were confiscation by the authorities (reported by 28% of households who has lost access to land), and appropriation by private individuals (15%). Together these accounted for 43% of all land lost by households in the village tracts surveyed.

Aquaculture was the principle driver of land confiscation and appropriation in these village tracts. Thirty three percent and 18% of parcels, respectively, were lost as a result of confiscation and appropriation in village tracts with high concentrations of aquaculture, as compared to only 4% and 2% of parcels in village tracts with little aquaculture.

Local officials (35%), companies (21%), and state institutions (14%) were reported to be the top three recipients of land confiscated or appropriated, whereas 80% of the recipients of land sold or given away were relatives and private individuals residing in the same villages. The ownership of much land confiscated or appropriated was thus delocalized, whereas ownership of land sold or given away continued to circulate primarily within the communities where it was located.

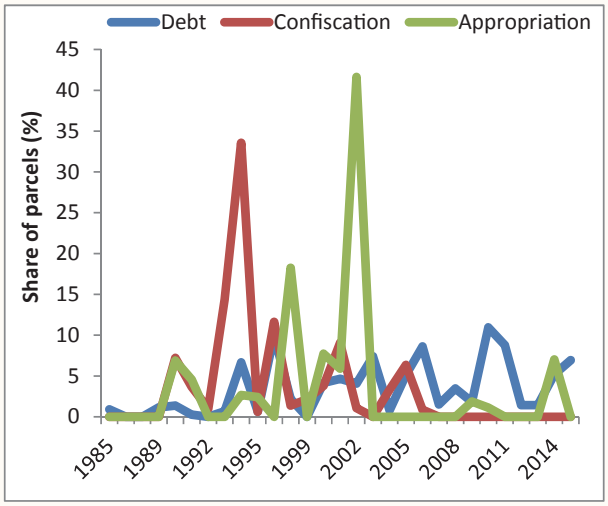


Figure 5. Land disposals due to debt, confiscation, and appropriation, 1985-2015

Most of the confiscation of land by the authorities and appropriation by private individuals occurred in two waves. Confiscations by state institutions and their representatives took place mainly in the early 1990s, peaking in 1994, while appropriation by private individuals, occurred principally during the late 1990s and early 2000s, peaking in 2002 (Figure 5).

The first wave of confiscations coincided with the SLORC-led policy shift favoring reclamation of 'wastelands' for the industrial scale cultivation of commercial crops, and the related enactment of the 1989 Aquaculture Law. The second wave of appropriations followed the completion of a water control scheme in Maubin and Nyaungdon townships in late 1990s that was intended, as noted above, to stimulate industrial scale paddy cultivation. Two major peaks in pond construction activity followed, in sequence with these events; the first in 1990 and a second in 2000-01 (Figure 6).

Interestingly, pond construction jumped steeply again in 2006, during a period

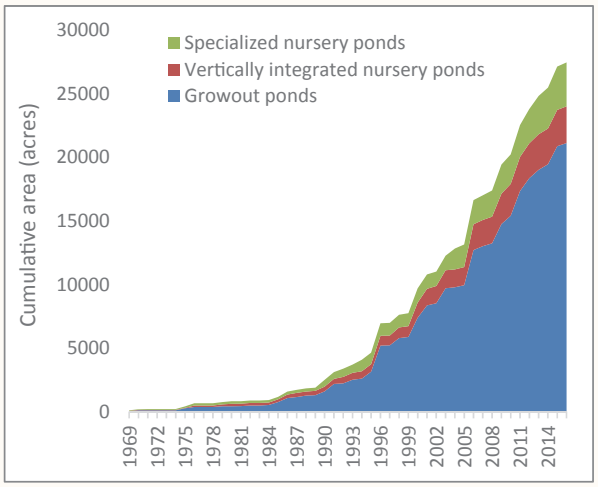


Figure 6. Cumulative area of growout ponds and nursery ponds constructed 1969-2016

when relatively little land confiscation or appropriation had taken place (Figure 6). This suggests that the market began to play a more important role in the allocation of land to aquaculture as the fish sector matured.

Weak and ambiguous land tenure of land made households vulnerable to exclusion from the resources they accessed. Virtually all of the land confiscated or appropriated had either weak tenure status (i.e. tax receipt or contract only), or no documentation at all. Less than 1% of the parcels of land confiscated or appropriated had a formal title (Form 7, Form 105, or La Na 39), as compared to 34% of parcels sold or given away.

Land confiscated or appropriated was comprised predominantly of paddy fields, the majority of which were subsequently converted into fish ponds. Eighty percent of parcels were paddy fields at the time of their confiscation or appropriation. By 2016 only 16% of these parcels remained as paddy fields, and 50% of had been converted to ponds. In contrast, 58% and 12% of parcels sold or given away were paddy fields and ponds at the time of their disposal, respectively. By 2016, 45% of these parcels remained as paddy fields, while the share of pond parcels had increased modestly to 25%.

The negative effects of these 'powers of exclusion' on the livelihoods of those affected were profound, particularly in the case of land confiscated or appropriation. Ninety eight percent of respondents who lost land due to confiscation or appropriation reported that their primary response had been to give up agriculture all together, while for 55% of households their secondary coping-strategy was to become dependent on agricultural wage labor. These responses were also common, but somewhat less acute, among households who had sold or given away land (70% and 29% households respectively).

Thus, institutional bias towards large agribusinesses, weak land tenure security, uneven application of regulations, and informal collusion between politically connected individuals and state institutions resulted in the concentration of land in the hands of these two groups and the displacement of large numbers of former farm households.

6.2.4. Wholesale

Fish wholesaling is also highly concentrated, both geographically and in terms ownership and market share. The vast majority of the households surveyed (76%) sold the farmed fish they produced directly through Yangon's main fish whole sale market San Pya. A further 5% was sold to Shwe Padauk, a smaller, more recently established wholesale market. Some of the largest farmed fish wholesale businesses in these markets, and thus in Myanmar are vertically integrated with some of the largest upstream businesses in the farmed fish value chain.

The five largest fish trading business at San Pya operate riverside landing sites

("jetties"). All the jetties at San Pya were originally state owned, but were privatized under the SLORC government in 1989. Three jetties at San Pya specialize in trading farmed fish. One of these is operated by the company that owns Myanmar's largest fish farm. Operators of other jetties were also reported to own substantial areas of fish ponds

There is only one jetty at Shwe Padauk, used exclusively for landing farmed fish. The jetty is owned by Myanmar's largest pelleted fish feed manufacturer, which is reported to have purchased a large block of the spaces allocated to traders in the market. The company also operates thousands of acres of ponds.

In addition to jetties, there are three market buildings occupied by wholesale traders at San Pya. Excluding jetties, there were 310 licensed wholesalers operating at San Pya in 2014. Many small and unlicensed wholesalers (estimated at 150) operate from around the outskirts of the market. The process of acquisition for limited license for wholesaling at San Pya market is unclear, but is likely to depend on personal connections to public officials and the paying of informal rents. Smaller unlicensed traders, are particularly dependent on these practices in order to continue their operations, and live at the mercy of policy changes and bureaucratic whims.

These observations all serve to underline the extent to which ownership and the creation of economic value within the fish value chain is concentrated across segments. This concentration is not the outcome of the efficiency of large companies on the fish value chain, but rather a reflection of inequalities in access to information and to the various interconnected forms of capital - financial, social and political - required to do business successfully in the context of Myanmar's recent political economic history. As a result, large operators with close links to the state are able to obtain advantageous positions in comparison to smaller players in all segments of the value chain, in terms of both access to formalized markets and security.

6.3. Social and economic characteristics of inclusion and exclusion in the aquaculture value chain

In this section we evaluate differences in land tenure security and access to credit (a critical but heavily constrained resource) to demonstrate scale dependent inequalities in access and their effects on security. We then explore opportunities for participation in enterprises in off-farm segments of the value chain, and evaluate opportunities for inclusion in the fish value chain created through employment.

6.3.1 Differential entitlements to tenure and credit

For agricultural land to be converted to ponds in a legally compliant manner, the

land user must apply for a change of land title – a document called La Na 39. Applications for La Na 39 must pass multiple government departments at village, township and union level. Successfully navigating the process requires time, frequent visits to government offices, and the payment of substantial "unofficial" fees.

Farms that convert paddy or other agricultural land to ponds without obtaining La Na 39 are at risk of fines, imprisonment or the confiscation of the land. This effectively weakens their tenure security, although in practice enforcement of these punishments appears to be patchy in areas with high concentrations of ponds. Conversely, informants reported that possession of La Na 39 guaranteed the owner of the titled land financial compensation in the event that it was confiscated by the state. Other informants also reported that untitled land appropriated from paddy farmers for fish pond construction was subsequently granted La Na 39, thereby precluding possible completing claims. Thus, converting agricultural land to ponds without La Na 39 potentially reduces its tenure security, while obtaining La Na 39 may increase the tenure security of land with ambiguous status.

The ability to obtain La Na 39 is mediated by both financial capacity and by access to social networks. The process is costly, averaging MMK 340,000 or $280 per acre, raising the threshold cost of investment in aquaculture. It is also complex, lengthy (averaging 17 months) and requires access to bureaucrats in state institutions at many levels. Operators of larger fish farms tend to have closer connections to the state apparatus, and more readily able to successful apply for La Na 39, and thus to gain secure tenure, than smaller farms.

Conversely, small farms struggle to navigate bureaucratic labyrinth, resulting in less secure land entitlements and more risky and uncertain investments, placing them a

Figure 7. Share of ponds with La Na 39, by farm type

relative disadvantage. This borne out by the household survey which indicates that 59% of large farms had applied for or were in possession of La Na 39, as compared to just 16% of small farms (Figure 7).

Myanmar's poorly developed financial system also favors large farms over small. Provision of formal credit for agricultural purposes other than paddy cultivation (for which the government owned Myanma Agricultural Development Bank provides crop loans), is extremely limited. Thus, if fish producers wish to utilize credit for in their operations, they are bound to obtain it primarily through informal sources.

Just over on third of small fish farms reported taking out a loan for investment in aquaculture within the previous 12 months, as compared to more than half of large farms.

The fact that only 41% of households practicing aquaculture had accessed a loan for this purpose within the past 12 months, despite having average operating costs of $2200/ acre, suggests that the cost of informal credit acts as a disincentive to investment, likely resulting in sub-optimal productivity.

Access to different sources of informal credit vary with farm size. Small farms were disproportionately dependent upon loans from private moneylenders and friends and family (41% and 40% of loans respectively), while only 2% came from fish traders. Conversely, fish traders were the primary provider of credit to large farms, accounting for 53% of the total taken, while only 3% of loans taken by large farms came from private moneylenders.

The inability of small farms to access loans from fish traders is accounted for by the fact that, in addition to earning interest to loans, traders make a commission on brokering sales of fish. The larger the volume of fish traders can secure from a single loan the higher their returns to the loan, and the lower the transaction costs involved.

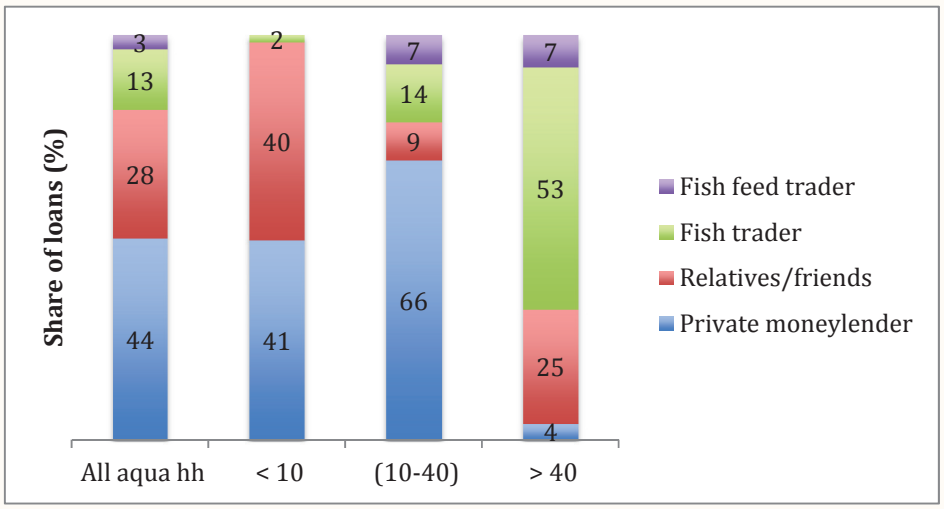


Figure 8. Composition of loans taken for aquaculture by main source and farm size

This difference is significant, because average annual rates of interest on loans from private moneylenders and friends and relatives stand at 100% and 72% respectively, as compared to 56% for loans from fish traders (Figure 8). The average cost of borrowing for small farms are thus considerably higher than for large, and the former are thus placed at a comparative disadvantaged by the failure of the formal financial system to serve their needs.

6.3.2 Participation in off-farm value chain segments

Off-segments of the value chain present a range of opportunities for households that do not operate a fish farm or nursery to derive benefits from the aquaculture sector. A wide range of inputs and services are required to facilitate fish production. These include a variety of fixed or quasi-fixed inputs (e.g. buildings, poultry houses, pumps, generators, trucks and boats), variable inputs (e.g. lime, salt, medicines, ice, seed and feed), transport (boat and truck rentals) and other specialized services (e.g. mechanical repairs, earth moving equipment rentals).

Demand for these inputs and services has grown in step with the expansion of the farm segment, resulting in the proliferation of up- and midstream value chain actors performing increasingly specialized functions. This is particularly apparent in key growth hubs located close to areas with high concentrations of ponds, most notably in the towns of Twantay and Kayan, but has also occurred within many of the communities where fish farms are located.

The number of businesses providing these goods and services in key farming locations has grown rapidly over the space of the decade from 2006 to 2016 (Table 3). Households with a mix asset and income levels are participating in these businesses: to operate a mechanical excavator rental will require substantial investment, whereas activities such as trading fingerlings or providing transport services by renting out small boats to transport inputs to farms have lower capital requirements and offer more accessible means of participation in the value chain for many households.

For households without sufficient assets to run a non-farm enterprise, the primary means of participation in the aquaculture value chain is as labor. Workers are required for a range of roles, including permanent employment on farm performing tasks such as grading and feeding fish, and temporary work in stocking and harvesting fish, and transporting fingerlings, feeds, harvested fish.

Residents of communities where fish farms are located tend to opt for the greater relative freedom and better remuneration of daily labor, whereas many permanent workers on fish farms originate outside pond clusters, mostly from remote townships in Ayeyarwaddy and Bago regions, where there were reported to be few employment

Table 3. Inventory of selected enterprises in the aquaculture value chain, 2006-2016

Business Type	Total no. businesses (2006)*	Total no. businesses (2016)*	% change (2006-2016)	Geographical area
Seed supply				
Hatchery	30	61	103	Village tract
Nursery	501	1538	207	Village tract
Fish seed trader	166	265	60	Village tract
Fingerling transport boats	66	103	56	Village tract
Feed supply				
Pelleted feed dealer	5	11	112	Nearest town
Rice bran trader	79	116	47	Nearest town
Other fish feed dealer	33	59	78	Nearest town
Farm				
Growout farm	541	815	51	Village
Fish harvesting team	53	75	42	Village
Small boats for hire	115	216	88	Village
Earth cutting team	65	34	-48	Village
Mechanical excavator hire	2	24	961	Nearest town
Trade/transport				
Fish trader	46	68	47	Nearest town
Ice factory	9	16	82	Nearest town
Large boats for hire	71	104	46	Village
Trucks for hire	1	20	1900	Village

*NOTE: For each geographical area, the total number of businesses reported is the aggregate of businesses reported operational where the survey was implemented. For the geographical area 'village' this is the total number reported in the 49 villages surveyed; for 'village tract' the total number for the 25 surveyed village tracts; and for 'nearest town', the total number reported in five nearby urban areas (Kayan, Maubin, Nyaungdon, Twantay, Hlaing Thayar).

opportunities other than occasional causal agricultural work.

Our research indicates that fish farming in Myanmar is more labor intensive than cultivation of paddy, the country's main agricultural crop and the main agricultural policy focus. Furthermore, employment opportunities linked to fish farming are less seasonal than those in agriculture. Work in all categories of employment was available for close to one month longer in village tracts with high concentrations of aquaculture than those with few fish ponds. The labor market multiplier associated with fish farming is rarely recognized.

Even a moderately sized pond requires the permanent labor of one to two people for feeding and guarding fish and performing day to day management. In contrast, labor requirements for paddy cultivation are highly seasonal and paddy farms employ few permanent workers. Similarly, harvesting fish (the most labor intensive part of the production process) was reported to require approximately 10 person days of labor per

acre; more than double the amount required for harvesting paddy manually (four person days per acre).

In sum, although aquaculture in Myanmar is characterized by multiple external and internal exclusions, it is relatively inclusive in terms of the opportunities it creates for off-farm enterprises and employment on and off-farm.

7 Conclusion:

- Broader implications for inclusion in Myanmar
- Actions for a more inclusive aqua sector: reform land governance, credit

References

Ali, I. and Juzhong Zhuang (2007). *Inclusive Growth toward a Prosperous Asia: Policy Implications*. Asian Development Bank, Economics and Research Department. Manila: Asian Development Bank.

Belton, B. 2012. Culture, Social Relations and Private Sector Development in the Thai and Vietnamese Fish Hatchery Sectors. *Asia Pacific Viewpoint*. 53(2):133-146

Belton, B., Hein, A., Htoo, K., Kham, L.S., Phyoe, S. Reardon, T. In press a. Growth and Uneven Development in Myanmar's Inland Aquaculture Value Chain. *Aquaculture*. xx xx

Belton, B., Hein, A., Htoo, K., Kham, L.S., Nischan, U., Reardon, T., Boughton, D. 2015. *Aquaculture in Transition: Value Chain Transformation, Fish and Food Security in Myanmar*. International Development Working Paper 139. Michigan State University

Belton, B., Padiyar, A.P., Godumala, R., Rao, K.G. in press b. Boom and Bust in Andhra Pradesh: Development and transformation in India's domestic aquaculture value chain. *Aquaculture*. xx xx

Brown, I. 2013. *Burma's Economy in the Twentieth Century*. Cambridge: Cambridge University Press.

Byerlee D., Kyaw, D., Thein, U.S., Kham, L.S. 2014. Agribusiness Models for Inclusive Growth in Myanmar: Diagnosis and Ways Forward. MSU International Development Working Paper 133. Michigan State University

DOF. 2014. *Fishery Statistics 2014*. Nay Pyi Taw: Department of Fisheries, Republic of the Union of Myanmar Ministry of Livestock, Fisheries and Rural Development.

FSWG. 2012. 13 *Case Studies of Land Confiscation in three Townships of Central Myanmar*, Land Core Group of Food Security Working Group.

Fujita, K., Mieno, F., Okamoto, I (eds.), *The Economic Transition in Myanmar after 1988: Market economy versus state control*. Singapore: National University of Singapore Press

Hall, D., Hirsch, P., Li, T.M. 2011. Powers of Exclusion: Land dilemmas in Southeast Asia.

Honolulu: University of Hawaii Press.

Ianchovichina, E. and Lundstrom, S. 2009. *What is Inclusive Growth?* . Note, the Diagnostic Facility for Shared Growth .

Kabeer, N. 2000. Social Exclusion, Poverty and Discrimination . *IDS Bulletin , 31* (4).

Kubo, K. 2012. Myanmar's Two Decades of Partial Transition to a Market Economy: A negative legacy for the new government. IDE Discussion Paper No. 376.

Rigg, J. 2016. *Challenging Southeast Asian Development: The shadows of success*. New York: Routledge

Saito, K. 1981. Farm househopld economy under paddy delivery system in contemporary Burma. The Developing Economies: 19(4):367-397

Sen, A. 2000. *Social Exclusion: Concept, Application, and Scrutiny* . Asian Development Bank. Asian Development Bank.

Thawnghmung, A.M. 2003. Rural perceptions of state legitimacy in Burma/Myanmar. *The Journal of Peasant Studies*. 30:2, 1-40

TNI (2015)

Turnell, S. 2009. Firey Dragons: Banks, Moneylenders and Microfinance in Burma. Copenhagen: NIAS Press.

Woods, K. 2011. Ceasefire Capitalism: Military–private partnerships, resource concessions and military–state building in the Burma–China borderlands. *The Journal of Peasant Studies*. 38(4): 747–770