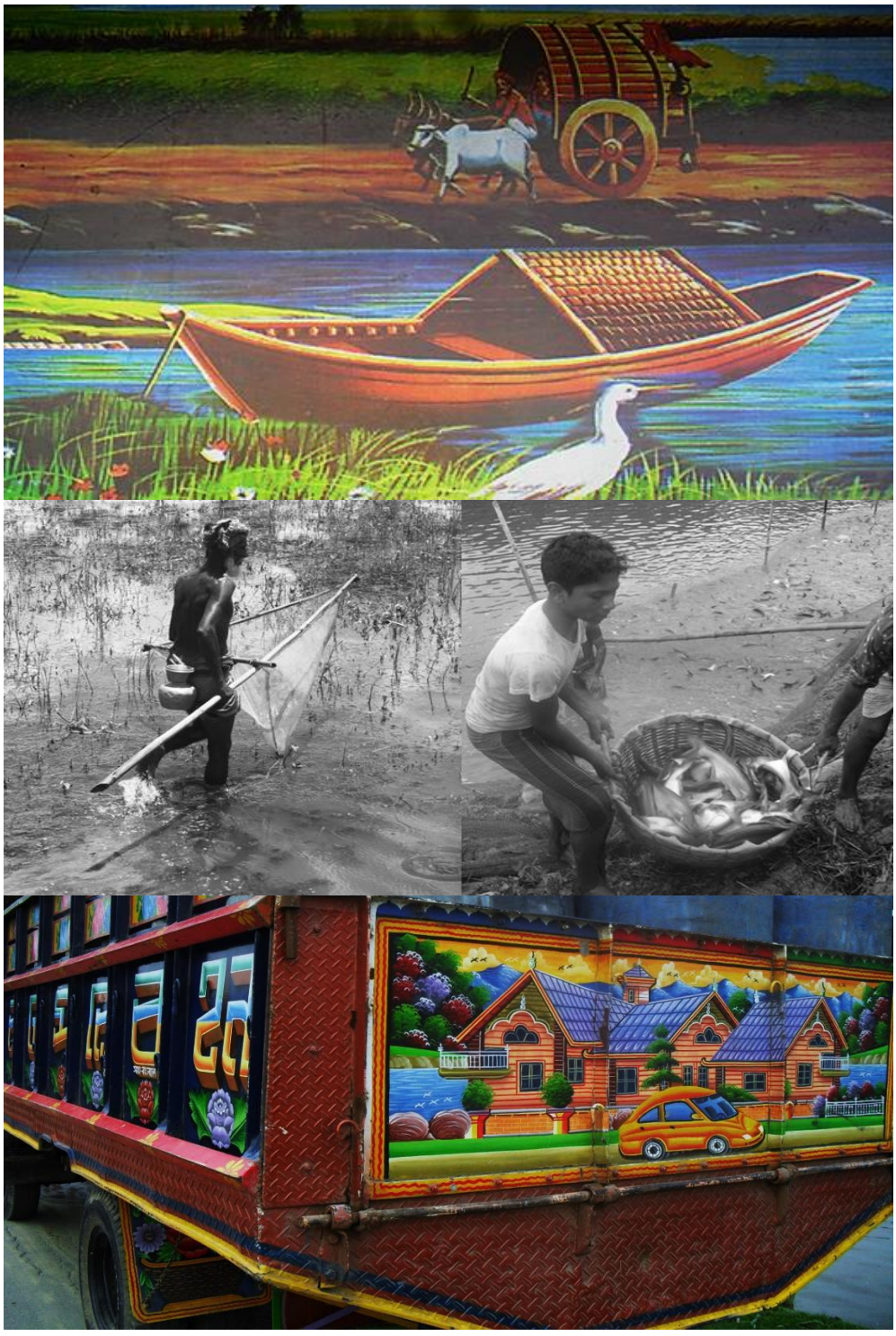
Agrarian transition: Evolving livelihood pathways in the context of the pangasius boom crop in Bangladesh.

A comparative case study of two villages in Mymensingh district.



I.J.M van Asseldonk

The photos on the front cover are from the personal collection of the author.

The top photo shows a painting on the back of a rickshaw, a common means of transportation in Bangladesh. It shows a traditional Bangladeshi landscape containing natural wetlands and cultivated rice fields. It also portrays two traditional forms of transportation, a cart pulled by oxes and a simple fishing boat. The photo at the bottom shows a picture of a completely different and modernized world, painted on the back of a truck transporting pangasius. The photo in the middle left shows a fishermen fishing in shallow water with a push net, while the photo to the right shows the harvesting of a commercial pangasius pond. With this combination of old and new images the front cover shows the transition in rural Bangladesh and the visions of prosperity that go with it.

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A comparative case study of two villages in Mymensingh district.

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Abstract

Over the last couple of decades South Asia has been the stage of a variety of agrarian transitions, often causing dramatic changes in the lives of rural households. The move away from subsistence farming, followed by the introduction of new production methods or completely new crops subsequently led to a greater importance of the market economy. These transitions often go hand in hand with challenges ranging from local environmental degradation to changing migration patterns. Agrarian transitions therefore have a profound impact on rural livelihoods. Since most of the literature is focused on agricultural commodities, this thesis looks into a transition based on the aquacultural commodity, *Pangasianodon hypophthalmus,* commonly known as pangasius.

To analyse the effect of an agrarian transition on rural livelihoods and the role of aquaculture in it, two rural villages that were part of the pangasius boom crop in Mymensingh district, Bangladesh, were researched. The comparative study between these villages is based on their application of different production systems, i.e. pond cultivation in Bawalia and *beel* cultivation in Medila. By using the grounded theory approach three driving forces of livelihood pathways were identified: geographical conditions, class relations and land relations. These drivers proved to be instrumental in shaping the livelihood pathways of households throughout the development of pangasius aquaculture. Further investigation of the livelihood pathway drivers showed a decreasing importance of geographical conditions throughout the lifespan of the boom crop. The importance of class mobility on the other hand increased over time. Land relations have developed continuously and remain important as a driving force to livelihood pathways.

Following this discussion, some observations are made regarding the role of aquaculture in agrarian transition. Commercial aquaculture appears to be more likely to develop in a 'booming' manner. The shift from land-based agriculture to water-based aquaculture seems to be more permanent in nature compared to an agricultural transition. The shift from land to water also increases the complexity of the existing but ever evolving land relations.

Keywords: agrarian transition, livelihood pathways, boom crops, aquaculture, Bangladesh

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1. Introduction

1.1 Agrarian societies in transition

Over the last decades many Asian countries went through a rapid economic development, that in many occasions went hand in hand with a massive growth of the population in a relative short time period. Countries that were previously predominantly agricultural, shifted towards a more and more industrialized nation with increasing rates of urbanization. In the countryside many changes to the lives of rural households can be seen, where traditional subsistence farming shifted to a farming system with increasing intensification and a greater linkage to urban markets. Extensive farming methods, often practiced for many years by small-scale farmers made place for the introduction of 'cash crops' aiming for greater intensification of the land and commercialization of agricultural commodities. Agrarian transitions such as these are accompanied by dramatic changes in both the natural and social environment of rural villages. An increasing pressure on the land, intensified migration flows, environmental degradation, rural economic diversification, depeasantization and de-agrarianization of the rural countryside are just a small selection of changes related to agrarian transitions (Zhang and Donaldson, 2010, Kelly, 2011, Borras, 2009, Rigg, 2006, Deb, 1998). Bangladesh' countryside currently forms the stage of such an agrarian transition. Regardless of its average GDP of 6% between 2000-2010 (Gimenez et al., 2013), Bangladesh remains among the poorest countries of Asia[1]. The importance of the rural economy is presented by the fact that in 2012, 71% of the total population (154.7 million) lived in rural areas (World Bank Group, n.d). Even though a clear reduction in both urban and rural poverty is demonstrated (Sen, 2003), 35% of the rural population (equalling 38 million) still lives below the rural poverty line[2] (World Bank Group, n.d). The on-going economic development of Bangladesh goes together with nationwide trends as rapid urbanization, increasing rural-urban migration and population growth (Afsar, 2003), all having a profound impact on the rural society and its landscape.

As the world's largest delta formed by the rivers Ganges and Brahmaputra, Bangladesh faces many challenges regarding water. Around 20% of the surface area is flooded every year as a result of its geographical position as a delta, and by being part of the tropical region of Asia in which average yearly rainfall is among the highest of the world. Bangladesh' geographical setting creates the presence of various types of seasonal and perennial water bodies, that provide the rural population with highly productive floodplains in which agriculture (primarily rice cultivation) and to a lesser extent fisheries, either professional, seasonal or subsistence, are the main land uses (Craig et al., 2004) (see Figure 1.1). Apart from inland fisheries, traditional subsistence aquaculture has been customary for many years, with household income derived from homestead pond culture ranging between 2.8% to 15% (Belton and Azad, 2012). Over the last decade, aquaculture in Bangladesh has undergone fundamental changes that led to a rapid expansion in the production of farmed fish. The traditional low intensity (semi-)subsistence aquaculture gave way to the introduction of commercial aquaculture in which greater intensification and specialization are the standard (Belton and Azad,

[1] Bangladesh has a GNI of 780,- US $, well below the average of South Asia, 1.312,- US $ (World Bank Group, n.d).

[2] World Bank data based on HIES 2010 from Bangladesh Bureau of Statistics (BBS).

2012). These commercial aquaculture operations are often found in clusters, two of which will form the locus of this thesis.

Figure 1.1 Traditional fisherman with his catch existing of small indigenous species. In the background the seasonal floodplain in July.

The most known and widely documented development related to aquaculture in Bangladesh is that of shrimp culture, that started in the Southern coastal areas and expanded into the mangrove and polder areas in the early '70s (Deb, 1998). While the effects of shrimp culture on livelihoods and the natural environment of rural households has been discussed in length (Ito, 2002, Islam, 2008), the more recent development of pangasius (*P. hypophthalmus*, see Figure 1.2) fish farming is only now starting to draw attention (Belton and Azad, 2012). For this reason, this thesis focuses on the rapid expansion of pangasius production, which originated in Mymensingh district in the early 1990s (Ali et al., 2012, Belton et al., 2011a). Because of pangasius' characteristics as a fish species able to breath atmospheric oxygen, it can be held in high stocking densities (Belton et al., 2011a). Together with its fast growth and good survival rates this makes pangasius a suitable and popular fish for commercial aquaculture (Ali et al., 2012). Pangasius production in Bangladesh was estimated at 300,000 t in 2008 and continued to grow ever since (Belton et al., 2011a).

The introduction and subsequent rise of pangasius production in Bangladesh has many characteristics of a *boom crop*, a term coined by Hall (2004). What characterizes boom crops and differentiates them from other agricultural developments is primarily their rapid increase of the production of one crop, that often goes hand in hand with large scale conversions of land to suit the newly emerging crop. Some of the most known examples of boom crops include the development of palm oil, rubber and coffee plantations in Malaysia and Indonesia, for which large stretches of natural forest, formerly only used for traditional swidden agriculture, were converted (Hall et al., 2011, Ziegler et al., 2009). Apart from shrimp cultivation, the development of aquacultural commodities are largely underrepresented in studies of boom crops, that are part of the wider agrarian transition literature. Therefore, via the case of the newly developing pangasius cultivation in Bangladesh, this thesis aims to get a wider insight into the role of aquaculture in boom crops and agrarian transition.

Because of the characteristics of a boom crop and its rapid nature of development, the implications on rural livelihoods are often accelerated and comprehensive in comparison to agrarian transition outside the scope of a boom crop. Whereas the understanding of the scale of pangasius aquaculture in Bangladesh and its production process is emerging, far less is known about the ecological and socioeconomic processes affecting rural livelihoods. Within the case presented this thesis thus focusses on understanding the effects of the pangasius boom crop on rural livelihoods.

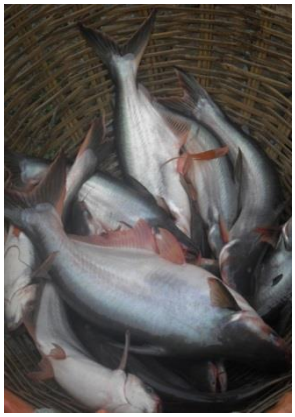


Figure 1.2 Pangasius (*Pangasianodon hypophthalmus)*

1.2 Research questions

This thesis employs the grounded theory approach. In this approach, researchers "develop analytic interpretations of their data to focus further data collection, which they use in turn to inform and refine their developing theoretical analyses" (Charmaz, 2003: 250). The approach thus starts with data being analysed during the research process in order to construct theories that are 'grounded' in the data. An advantage of grounded theory is its flexibility, since it allows researchers to modify their emerging or established analyses as conditions change or further data are gathered (Charmaz, 2003). Important is that the approach provides the tools for understanding empirical worlds, but its goal transcends that of a descriptive analysis.

This thesis aims to gain insight into the role of aquaculture in agrarian transition by analysing the pangasius boom crop in Bangladesh and its effect on livelihood pathways. The main research question, arising out of the problem statement defined in the previous section, then is as follows:

- **How did the pangasius boom crop in Mymensingh develop over time and in what way does this case provide insight into the role of aquaculture in agrarian transition?**

While the first part of the main research question is descriptive in nature, its overall goal is to generate concepts that provide new insight into the literature concerning agrarian transition. The main question being asked here is if there is a significant difference in the effects on the rural society with an agrarian transition based on an agricultural commodity in comparison to an aquacultural commodity? In order to discuss aquaculture's role in agrarian transition, which will be done in the

final chapter, a greater understanding is required of pangasius' booming production in Mymensingh, and its effect on households. With this in mind the following three sub-questions are defined.

1) How do livelihood pathways develop in light of the pangasius boom crop, and how do they differ between pond cultivation in Bawalia and *beel* cultivation in Medila?

This sub-question explores the different livelihood pathways that arose after pangasius cultivation started in early 2000 and how they have changed ever since. It discusses the changes in people their lives and how these changes are related to pangasius production in their village. Since pangasius production in Bangladesh can be found in two very different production systems, i.e. pond culture and *beel* culture (natural wetlands), this thesis contains a comparative study of two villages in Mymensingh district that produce pangasius predominantly in either ponds or beels. The importance of the comparative study arises from the question whether the boom crop results in different outcomes for rural households, that is related to the two production systems? And what are these outcomes? Did the introduction of pangasius production provide for new opportunities or did it limit the ability of households to obtain a livelihood? This directly leads to the question of who were able to participate in the boom crop directly and who were not? The following sub-question goes deeper into this by looking into the how and why of this differentiation.

2) What are the driving forces behind the development of the livelihood pathways?

This sub-question discusses the driving forces that led to the changes in livelihood pathways as described by the previous sub-question. To get insight into which drivers are responsible for changing livelihood pathways, thus to fully understand the extensiveness of a boom crop, a holistic approach was found to be appropriate. This included looking into a wide range of ecological and socioeconomic processes that were central to the agrarian transition of Bawalia and Medila. Throughout the research it became apparent that the geographical conditions of the villages, its class relations and land relations were crucial drivers to the development of livelihood pathways. The early identification of these three pathway drivers, in line with the grounded theory approach, paved the way for a more in depth investigation of each driver, that leads to the following and final sub-question.

3) What role do livelihood pathway drivers have in shaping the boom crop and does this role change over time?

This sub-question takes a critical look at the role of each driver in shaping livelihood pathways that in turn affect the course of a boom crop. Thus in what way do the geographical characteristics of each village influence the livelihood pathways? And how does the dramatic transformation of the landscape, as a result of the boom crop, consequently further the development of the boom crop? A big concern in boom crops and their effects on livelihoods is often related to whether or not they lead to farmers losing (access to) their land. And in what way do changing interactions between people affect the social classes that are in place? As these questions show, an important element in this research question is the temporal analysis of the livelihood pathway drivers. Thus, did the influence of certain pathway drivers increase or decrease during the course of the boom crop?

These three sub-questions leave the reader with a cohesive overview of the socioeconomic and biophysical processes related to the development of pangasius in Medila and Bawalia, and how this

influences the development of livelihood pathways and consequently the boom crop. The following section provides a reader's guide to the thesis, explaining the incorporation of the research questions into the empirical chapters.

1.3 Thesis outline

The following chapter will explain the theoretical concepts introduced in this chapter. It starts by elaborating on some of the core concepts in agrarian transition research, followed by an in-depth description of the literature concerned with boom crops. The sections following this theoretical overview discuss the theory concerning the three driving forces of livelihood pathways, which form the basis of the analytical framework used in this thesis. The concepts discussed include: agro-ecology, class differentiation, access to- and exclusion from- land. The final section shows the operationalization of these concepts to form the analytical framework.

Chapter three elaborates on the methodology used for this research, i.e. it discusses the overall approach to the research conducted, the manner of data collection and the case study sites. Its final section includes a discussion regarding the limitations to the research. The following chapters, four and five, form the core of this thesis and discuss its empirical findings. As mentioned above, this thesis includes two villages that cultivate pangasius in a different manner. Each of the two empirical chapters discusses one village, starting with pond cultivation in Bawalia. First, a historical overview of the village is given, followed by a description of how pangasius cultivation became of such importance in the village. This section includes a presentation of the effect of changing land usage on the landscape and discusses the changes to land relations caused by the boom crop. Central to the second part of the chapter are the newly evolving livelihood pathways. The second village included in this thesis is Medila, where pangasius cultivation is carried out in beels. It follows the same chapter outline as chapter four. The final chapter returns to the research questions posed in the Introduction. The livelihood driving forces, the forces that drive (different) livelihoods, are discussed separately. This is then followed by a discussion regarding the changes that occurred to the livelihood pathways in the context of the pangasius boom crop. A comparison between the two villages is made throughout the text. The next section addresses the main research question. It discusses the aquarian character of the pangasius boom crop and thus draws on the case study presented in this thesis in order to obtain wider insights regarding the role of aquaculture in agrarian transition literature. Finally, the implication of this research on existing literature is explored and suggestions for further research are given.

2. Theoretical framework

2.1 Introduction

This chapter aims to develop an analytical framework that forms the basis of the analysis of evolving livelihood pathways, in light of the pangasius development in rural Mymensingh, Bangladesh. This thesis will focus on livelihood pathways as an approach to better understand the implications of the boom crop on rural households. Livelihood pathways provide a holistic approach that incorporates both social and ecological drivers in its analysis, and thereby does not take the risk of limiting its scope that might result in a too narrow understanding of agrarian change.

The chapter starts by a discussion of agrarian transition and some of its general outcomes concerning the affected households. This places the case study discussed in this thesis into the wider context of agrarian transition. Following this, section 2.3 elaborates on a particular form of agrarian transition, that of boom crops. By doing so the chapter narrows down the scope of analysis. An explanation and elaboration on the definition and the characteristics of boom crops will be given by drawing on literature concerning some of the most documented examples of boom crops. Together, section 2.2 and 2.3 provide sufficient background to understand the phenomena of agrarian transition. In order to understand the effects of the agrarian transition occurring in Mymensingh, and to identify livelihood pathways, a closer look on its driving forces is needed. The following three sections explore the concepts central to the analytical framework, that provide the basis for a detailed analysis of livelihood pathways at the household level. First, the concept of agro-ecology is explained, an approach that provides insight in the role of both social and geographical (and biophysical) factors determining the workings of an agro-ecosystem, i.e. an ecological system transformed by human action to produce food, fibre or other agricultural products (Conway, 1987). This is then followed by a discussion of class transformation, a process often related to agrarian transition. The next section explores a process both social and ecological in nature, namely that of changing access to and exclusion from land as a result of altering land usage. The chapters final section provides a summary of the analytical framework and its usage in the empirical chapters.

2.2 Agrarian transitions

Throughout history scholars remain interested in processes related to agrarian changes at rural areas, placed in the wider context of developing capitalist societies. Examples of these processes are; changing relations of production, class struggles, disappearing peasantries and household mobility. The interest lies on the interface between rural peasant agriculture and the capitalist industry. The processes that contribute to or constrain the emergence of agrarian capital and rural capitalism are the core of what is collectively known as the agrarian question. Kautsky defines the agrarian questions by asking ‘is capital, and in what ways is capital, taking hold of agriculture, revolutionising it, smashing the old forms of production and of poverty and establishing the new forum which must succeed?’ (Akram-Lodhi and Kay, 2012). On a household level the emergence of capitalist relations of production is the shift from the peasant economy in which production is based on subsistence needs, to production based on making a profit. It also entails the shift of peasants into wage labour.

Marx is considered to be one of the first scholars concerned with agrarian issues, addressing the emergence of capitalist relations of production at England's countryside throughout the 18th and 19th century (Akram-Lodhi and Kay, 2012). As pointed out by Kelly (2011) most of this scholarly work is deeply embedded in their historical and geographical context, with forces such as colonialism, urban migration and emerging globalisation shaping agrarian transitions. Time and place are thus two important notions in agrarian transition research and one should be careful in treating the "writings of Lenin, Kautsky and Chayanov ... as universal statements" (Kelly, 2011: 482), since these were mainly related to the industrialization of the Soviet Union. Since these first writings, a tremendous amount of research has been done on agrarian change, resulting in many scholars identifying rural transformations shaped by so-called 'pathways'. Most often these development pathways indicate the de-agrarianization of the countryside and a disappearance of peasantries, with Hobsbawm going as far as proclaiming the "death of the peasantry" (Akram-Lodhi and Kay, 2012: 4). Processes interconnected with these pathways are identified on numerous occasions by scholars and include the rising level of diversification in livelihoods at the countryside, greater occupational multiplicity, heightened spatial- but also class mobility, a greater dependence on market relations, growing rural-urban interpenetration, fragmentation of the classes of labour and the de-linking of rural livelihoods from land (and from farming in general) (Bryceson et al., 2000, Kelly, 2011, Rigg, 2006). Practically these processes include e.g. the rising average age of farmers, a decline in swidden agriculture, increasing importance of remittances, and a growing rural-urban (temporary) migration (Dressler and Fabinyi, 2011, Kelly, 2011, Rigg, 2006). As said, many 'pathways' have been identified in literature. However, even though patterns exist, clear pathways are often a strictly conceptual idea. Rigg and Vandergeest (2012: 1) show a "mosaic of possibilities", with agrarian development often occurring differently than expected. They show that a detailed analysis might reveal more diversity and complexity to pathways identified.

So what are the outcomes on rural livelihoods of the above described development pathways? Breman (2000) discusses the effects of capitalist penetration in rural areas on the landless 'underclass'. Whereas Breman foresees increasing inequality and an extreme vulnerability in the rural proletariat, Rigg (2006) has a more positive view on the effects that de-agrarianization has on rural communities and presents examples showing the development of rural economies going hand in hand with de-agrarianization. Rigg (2006: 189) also highlights social and cultural changes and states the existence of a "disjuncture between how some elites view farming and agriculture (often from afar), and how rural people view the occupation". "It is undoubtedly the case that modernity and capitalism are (unequally) infiltrating Southeast Asian social and geographical space. But how rural people encounter and respond to the possibilities offered by such processes are varied..." (Rigg and Vandergeest, 2012: 7). It is thus evident that agrarian transitions rework rural livelihoods and that class structures in rural areas are not fixed. Understanding that livelihoods and class structures are not fixed also leads to recognizing that people don't simply undergo agrarian transitions, but play an active role in responding to changes by negotiating social relations in order to adjust (Dressler and Fabinyi, 2011). As Scoones and Wolmer (2002: 27) state; "livelihoods emerge out of past actions and decisions are made within specific historical and agro-ecological conditions, and are constantly shaped by institutions and social arrangements". The process under which livelihoods emerge are also known as *livelihood pathways*, defined as "a pattern of livelihood activities which emerges from a co-ordination process among actors, arising from individual strategic behaviour embedded both in a historical repertoire and in social differentiation, including power relations and institutional

processes, both of which play a role in subsequent decision-making" (De Haan and Zoomers, 2005: 45). This definition acknowledges both the agency of actors shaping livelihoods and their constraints. Actors from different starting positions, often defined by social class, can embark on similar livelihood pathways, whereas people with similar starting points might develop different pathways. By looking at livelihoods as pathways one recognizes the short lived nature and changeability of livelihoods, that is important in the analyses of rural livelihoods in agrarian transition, and how these transitions provide outcomes that differ among households.

2.3 Boom crops

In his reflection of agrarian change and peasant studies Borras (2009) refers to Weis, who examines the world food system and states that "revolutionary changes, which once took shape over the course of millennia, then over centuries, and which are now compressed into mere decades" (Weis, 2007: 5). This bring us to the concept of *boom crops*, that is considered to be a specific form of an agrarian transition. Boom crops are defined by Hall (2011a: 840) as "taking place when there is a rapid increase in a given area in the amount of land devoted to a given crop as a monocrop or near-monocrop, and when that crop involves investment decisions that span multiple growing seasons". Some crops that witnessed such a boom since the mid-1980s include palm oil, rubber, fast-growing trees, cocoa, coffee and shrimp. However, boom crops are not exclusive to recent years, as shown by Schnurr (2011) in his historical overview of the cotton boom (and bust) in the Union of South Africa, lasting from 1910s to 1930s. An extensive amount of literature has been written on boom crops, of which a small overview can be found in Figure 2.1. It also shows the 10 variables inherent to many boom crops, which are discussed below. The focus of study varies among the literature and includes land rights, migration patterns, environmental degradation etc.

1. Investment decisions span multiple years.
2. Rapid increase in land devoted to one crop (mono- or near monocrop).
3. Booms are driven by market demand, often from the exporting market. Creation of new markets also occur.
4. Highly lucrative crop. Rising crop prices.
5. Booms frequently go bust. Insecure growth associated with high risk for farmers.
6. Various degrees in the role of the state, international donors, NGOs and national and international agribusinesses.
7. Technical innovation Introduction of new growing techniques.
8. Occurrence of environmental problems associated with the boom crop.
9. Increasing migration.
10. Actors involved in boom, e.g participation of small scale farmers vs. large plantations by urban or foreign investors.

10 variables of boom crops

Boom crop literature overview

Boom crop	Countries	Focus of study	Variables addressed	Authors
Palm oil Shrimp Coffee	Malaysia (Thailand, Indonesia) Thailand Vietnam (Indonesia, Philippines)	Land rights, exclusion to land	1-10	Hall et al. (2011)
Shrimp	Philippines Indonesia Thailand	Explaining diversity of boom crops between and within countries	1-10	Hall (2004)
Coffee Palm oil Shrimp Fast-growing trees Cocoa Rubber	Southeast Asia	Land control	1-10	Hall (2011a)
	Southeast Asia	Migration	9	Hall (2011b)
Pangasius	Vietnam	Global markets, Sustainability claims and standards	3, 5, 8, 10	Bush and Belton (2011)
Rubber	China and Southeast Asia	Environmental degradation	8	Ziegler et al. (2009)
Palm oil	Indonesia Malaysia Papua New Guinea	Social and ecological impacts of palm oil plantations	2, 6, 8, 10	Wakker (2005)
Cotton	South Africa	Explaining the boom and bust of the cotton boom	1-10	Schnurr (2011)

Figure 2.1 Boom crop variables and its coverage in scientific literature

As mentioned, boom crops are characterized by a rapid increase in the production of one crop that often goes hand in hand with large scale conversions of land to suit the newly emerging crop. This varies from cutting forests to make place for crops such as coffee and palm oil, to digging ponds for inland aquaculture. Hall states that boom crops are primarily, though not exclusively, driven by export demand (Hall, 2011a). While market demand is a main driver of boom crops, other factors can be of importance too. These include: a rising crop price, the introduction of new growing techniques and various kinds of state support (Hall et al., 2011). The rising crop prices make boom crops highly lucrative, but as Hall (2011a) points out "booms frequently go bust"(Hall, 2011a: 840), indicating a high risk for participants. This is clearly displayed by Szuster et al. (2003: 188) who state that "it is no wonder that rice farmers [were] tempted to gamble and try to earn in two or three years what would otherwise be a lifetime income". In the case of the coffee boom in Vietnam, rising world coffee prices were the main initiator for the coffee boom that started in 1993 (Hall et al., 2011). As stated, technical innovation that lift the constraints previously present in production systems can also cause a boom in production of a certain crop. The development of artificial propagation techniques in pangasius farming that partly initiated the boom in Vietnam is an example of this (Belton et al., 2011a), since it decreased the reliance on wild fry making production on a greater scale possible. In the case of palm oil it was the creation of new markets that played an important role in the initial stages of the boom. Palm oil, the second-most consumed edible oil in the world, is used in the production of many food products but recently also became an important source of biofuel (Hall et al., 2011). Pye (2010) states that EU plans to introduce a mandatory target for renewable energy resulted in a huge increase in investment and expansion in the palm oil sector in Southeast Asia.

In numerous occasions boom crops have led to an increase in the value of the land (Hall, 2011a), which then often result in an increased competition for land. In places with unclear or a lack of land rights, this can result in user conflicts. Wealthier farmers with political influence tend to be more able to gain access to land with unclear tenure rights (Bush et al., 2009). Another issue related to access to land are small scale farmers selling their high value land to newcomers and buy land in less favourable areas, e.g. deeper in the forest or further away from rivers, and thereby accumulating enough capital to enter the boom crop. Another common feature is the tendency of boom crops to stimulate migration (Hall, 2011b). Migration can occur in different forms, e.g. by households or individuals looking to set up a farm, or by individuals taking part in *transmigration*, a state supported organized farming scheme and migration with the aim to work as waged labourers (Hall, 2011b). For example, in order to take part in the highly lucrative coffee boom crop in Vietnam and shrimp farming across Southeast Asia, non-agricultural urban residents entered the boom.

The role and the importance of the state, but also of international donors, non-governmental organisations (NGOs) and national and international agribusinesses, varies greatly in boom crops and has a potential effect on the development of the boom. State actors can regulate production by structuring policy and regulations, providing loans and giving out land leases, but in some occasions also directly organize the production of the boom (Hall, 2011a). In the case of shrimp farming in Thailand promotion and support via subsidies and technologies by state agencies, academics and technicians, national and international aid agencies and corporate interests is considered to have been of great

importance to the boom (Hall et al., 2011). The boom crops described by Hall et al. (2011: 89) (palm oil, shrimp and coffee) are all associated with "visions of prosperity and modernity", indicating a motive for states to be involved in its development. In line with these motives states create smallholder schemes aiming for the "development of isolated rural areas, accumulation of property for landless farmers, better development and use of natural resources, creation of jobs, ensuring national food security, diversification of exports, stemming rural exodus", settling indigenous nomadic people and relocate people from densely populated areas (Wakker, 2005: 33).

However, conflicting interests within the state and between the state and actors involved in the boom crop also exist. A common feature of boom crops is the association it often has with environmental degradation of the land or water on which it is situated. Some of these environmental issues are (1) the large-scale conversion of (mangrove) forests for shrimp, palm oil or rubber farming, (2) deterioration of the water-quality such as salinization of freshwater sources, nutrient pollution and decreasing oxygen level associated with shrimp and fish farming, and (3) the risks that are related to monoculture and the use of pharmaceuticals, e.g. diseases in shrimp farming. Thus, as well as promoting boom crops, state agencies are also known to oppose certain boom crops on the basis of the concerns described. This indicates a conflict between environmental conservation measures undertaken to combat the degradation caused by the boom crop, and the promotion of the same crop via regulation, subsidies and loans.

Another factor that varies among boom crops is the level of participation of small scale farmers. In the Vietnamese coffee boom "limited farm-level involvement of the state and of large-scale agribusiness" can be seen (Giovannucci et al., 2004: 106). Compared to the coffee boom, independent smallholders weren't much involved in the palm oil boom in Malaysia and Indonesia and is therfore considered to have been driven much more from the top-down (Hall, 2011a).

The definition of boom crops provided by Hall (2004) at the start of this section includes investment decisions that span multiple growing seasons. Whereas this statement holds for tree crops, which need some years to mature, at first notice this does not seem like the case for shrimp and pangasius farming. Pangasius production only needs six to eight months before adults are harvested, showing that investment returns become visible within the year. There are, however, two related reasons that explain how the investment of pangasius span multiple seasons. Hall et al. (2011) explain that converting ponds back to a state that suits the previous land crop will be difficult, therefore making the transformation in land use an investment that spans multiple years. Secondly, the level of investment for pangasius farmers is very high, making it a necessity for farmers to continue pangasius cultivation for at least several years. A farmer thus cannot easily return to growing rice when he invested in digging a pond that suits commercial pangasius production.

2.4 Agroecology

The feature most evident to a boom crop are the physical alterations made in the landscape and the rapid nature in which this takes place. As mentioned in the previous section, boom crops come with

large scale land conversions that are often devoted to one crop only. This thesis will pay sufficient attention to the physical changes in the landscape. The geographical analysis, however, goes beyond a mere description of the physical changes in the environment and includes the human-environmental interaction. Nature is not solely the space in which the agrarian transition occurs. Or as Vandergeest and Rigg (2012: 21) put it "...farming and other agrarian activities are understood as a co-production *with* nature, where the focus is not on the environment as an enabling or constraining 'context', but on the interactions between human agents and active nature". This interaction is highlighted in agro-ecology literature. An agro-ecosystem is defined as an ecological system transformed by human action to produce food, fibre or other agricultural products (Conway, 1987). The performance of an agro-ecosystem is determined by its social value, of which the properties – productivity, stability, sustainability and equitability - are assessed (Conway, 1987). In the case of productivity, often measured in yield per hectare, both social and physical factors play a role. That is to say, yield is influenced by physical factors such as flooding, but also by social factors such as the number of household members able to help out on the land. This example shows both the ecological and socio-economic dimensions of an agro-ecosystem and provides insight into the human-environmental interactions that are central to its functioning.

As mentioned, farming is being understood as a co-production between humans and active nature. This interaction between the socio-economic and biophysical factors of an agro-ecosystem is also recognized by Fougères (2008: 70), who uses the term *territory* in capitalist production "to signify any ecological zone demarcated by people and imbued with specific political and productive relations". An important element of these spaces are the property relations, which he views as continuously ambiguous and contested. Co-production is thus viewed as intrinsically dynamic, with the socio-economic relations of farming being regarded as continuously ambiguous and contested, and the nature embodied in farming constantly being changed and reconstructed (Douwe van der Ploeg, 2010).

Fougères (2008) deliberately uses territory rather than land as the geographical space of production, for he addresses *aquarian* capitalism that is based in the water. He states that production taking place on land compared to that on wetland are significantly different from each other. The restructuring of naturally flowing wetlands into controlled production systems requires a high initial investment and is considered more radical compared to changes made in land uses in agricultural development (Fougères, 2008). This thesis aims to get more insight into the capitalist processes specifically related to aquacultural development. It hopes to contribute to the debate concerning the theoretical recognition of aquarian questions, as put forward by Fougères (2008).

2.5 Class relations in rural agrarian transition

2.5.1 Introduction

The impacts of agrarian transitions have far reaching effects on livelihoods of rural households as is discussed above. This section deals with changes in class relations seen within villages that go through an agrarian transition. By focussing on the effect of livelihood pathways on class relations this part of the

thesis takes on a more holistic view regarding the effects of agrarian transition. Class transformation is often observed by scholars of agrarian change and occurs in diverse ways (Li, 2012, Kelly, 2012). The first section will start out by presenting a typology of rural socio-economic classes that is commonly used in agrarian studies. Since agrarian transitions often lead to a shift in socio-economic class structures, some of the broader trends identified in this respect will be discussed in section 2.5.3. Together the two sections will form the basis for discussing possible changes in class relations in light of the pangasius boom crop in Bangladesh.

2.5.2 Typology of rural socio-economic classes

The feature most defining in rural class structures is that of controlling the means of production. This differentiates the rural society between farmers and non-farmers. The latter include those who sell their labour as a commodity, whereas the former own the commodities that are produced (Roseberry, 1978). Another important nuance regarding the distinction of classes has to be made, involving the different organization of production between farmers. Where the capitalist farmer employs wage labour, thereby extracting profit from their labour, the peasant farmer works on the land himself and does not use any labourers. The latter is involved in what is known as *simple commodity production*, in which the ownership of the enterprise and the provision of labour are combined in the household (Friedmann, 1978). It is important to recognize that the boundaries of the three socio-economic classes presented here are not that strictly defined in reality, since for example many subsistence farmers complement their income with labour.

Belton et al. (2012) created a typology of farmers that is closely related to the classes presented above. This typology represents the farmers' different forms of aquaculture production, and is based upon their social relations of production. A more detailed picture is presented in Table 2.1, showing the differences between the two organizations of production that are fundamental to the two distinct farmer classes[3]. Belton et al. (2012) argue that pangasius farmers share most characteristics with the quasi-capitalist mode of agriculture. These farmers focus their production on the market rather than on subsistence of the household. For them capital dominates the production process, whereas this is of little importance to a peasant farmer that depends on reciprocal labour often based on kinship. An aspect often used in defining class structures is landholding, and is therefore included in Table 2.1. The labour class that is sometimes considered as the underclass, is characterized by households being landless or land-poor, a distinction that is often so small that one should not make a sharp divide between the two (Breman, 2000, Clark, 1978). Households owning some land often belong to higher socio-economic classes, with large differences between small and large landholders.

[3] While the text speaks of two distinct farmer classes only, Table 2.1 adopts another distinction, namely that between quasi-capitalist and capitalist farmers.

Table 2.1 Class differentiation in rural society (modified from Belton et al., 2012)

	Class characteristics	Socio-economic class					
		Labourer	**Quasi-Peasant farmer**		**Quasi-capitalist farmer**	**Capitalist farmer**	
		Seller of labour power	Controlling the means of production				
	Organization of production	Capitalist production.	Simple commodity production Working on own land for themselves		Capitalist production Employing wage labour and thereby extracting profit from labour		
	Landholding	None (or small control over land as tenant)	Small (either owned or as tenant)		Medium	Large (predominantly owned)	Very large
Relations of production	**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 Part-time &/or permanent labour	Family owned & operated or absentee owner Permanent labour Managerial staff	Absentee owner or corporate ownership Permanent labour 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 Possible or partial or complete vertical integration	Entrepreneurial investment activity or large business Likely partial or complete vertical integration
	Market orientation		Subsistence/local/district		District/urban/national		National/export	

2.5.3 Trends in class transformation

Following the emergence of capitalist dynamics in rural areas, Breman (2000) discusses changes in the social relations of production, with a focus on landless non-farmers. He identifies three interconnected processes that represent these changes: 1) the diversification of the rural economy, 2) increased mobility of labour and 3) the casualization of employment. The first process describes the trend away from agriculture as the main source of labour in rural areas, towards the inclusion of off-farm rural employment such as transport, infrastructural work or service. Secondly Breman (2000) reflects on the (often temporary) migration of labourers to urban areas where they often work in the informal sector. As Hall (2011b) points out, in the case of boom crops a reversed migration pattern into rural areas is also common. Thirdly, the casualization of employment is related to the increasing occurrence of short-term labour contracts and daily wage earners. Rural societies operating in a (quasi-) peasant mode of agriculture often work with reciprocal labour exchange (Rigg and Vandergeest, 2012) whereas in (quasi-) capitalist societies the creation of rural labour markets can be witnessed showing a shift towards the use of waged labour. This shift is related to the change in the relations of production that also represents the emergence of a different lifestyle in which hired and often outside labour is preferred (others might speak of a decline in community solidarity). Breman (2000: 240) concludes that the capitalist penetration in rural agriculture increased the vulnerability of "life at the bottom of rural economy" and that agricultural employment doesn't outweigh the immense population growth in rural Asia. However, Rigg and Vandergeest (2012) revisited previous rural research sites and many of the case studies discussed show the increasing importance of non-agricultural activities in rural peoples livelihoods, such as small handicrafts or semi-industrial businesses, indicating that agricultural employment is often only one of the income-generating activities of the rural (near-) landless.

Another interesting point of discussion is the reproduction of class, concerning the way households in specific class positions are reproduced from one generation to the next. Kelly (2012) assesses local processes of class reproduction in a rural Philippian village in transition and observes many changes in class positions involving the process of upward class mobility of the new generation. Because of new opportunities it isn't necessarily the case that the son of a tenant farmer also becomes a tenant farmer, which is a process that resulted out of the creation of a dramatically different context including "a growing local economy; an enormous expansion of industrial employment; improving transportation, communications and educational infrastructure; and increasing numbers of residents going overseas" (Kelly, 2012: 238). Li (2012) shows an example of an agrarian transition in which the introduction of cacoa and clove trees resulted in the emergence of agrarian classes previously non-existent. Differential access to newly enclosed land that was previously both abundant and communally owned, was key to the process of class formation, that created a large difference between those households that became successful and those that lost out on the transition taking place (Li, 2012). While this paragraph discusses very specific cases, its purpose was to show the influence of agrarian transitions on the reproduction and transformation of rural class structures.

2.6 Land relations in rural agrarian transition

2.6.1 Introduction

Even though rural livelihoods are increasingly being characterized with non-farm activities there remains to be a dominant view among scholars and development agencies that consider

"land/farming as a core ingredient in the essential recipe for rural development" (Rigg, 2006: 180). Rural poverty is seen as inversely related to the size of landholding (Ali and Penia, 2003). With rural poverty being considered as related to a lack of land, many pro-market scholars and important development agencies like the World Bank support the claim for (pro-poor) land reform policies. Whereas land reform can mean many things, the focus of development organizations is mainly on formalizing land rights. A common suggestion is the creation of private property rights in order for land to contribute to capitalist accumulation (Borras and Franco, 2010). This market-oriented discourse in land policy and governance is dominant in the development agencies that wish to address the issue of poverty and inequality in rural areas, and assume that capitalist development will lead to a reduction of poverty (Borras and Franco, 2010). As argued by Ribot and Peluso (2003) as well as Borras and Franco (2010) this discourse ignores the fact that in reality land entitlements are not confined to a property right and an official document of it, but entail the social relations between people that in turn determine the ability to gain access to land. As mentioned by Fox (2008: 335), "rights and empowerment do not necessarily go together. Institutions may nominally recognize rights that actors, because of imbalances in power relation, are not able to exercise in practice". In line with Ribot and Peluso (2003) and Borras and Franco (2010) this thesis argues that studying land rights should be extended to analysing the social dimensions that form the basis of access to or exclusion from a resource, in this case land. This framework draws on the theory of access developed by Ribot and Peluso (2003) and the powers of exclusion formulated by Hall et al. (2011).

2.6.2 Access

Ribot and Peluso (2003) define access as the 'ability to benefit from things' and distinguish it from property, that they consider as the 'right to benefit from things'. Even though scholars don't necessarily limit property to solely a formal ownership defined by law, custom or convention, Ribot and Peluso (2003: 156) go further beyond this notion by stating that "access is about *all* possible means by which a person is able to benefit from things". They provide a framework in order to analyse who and under what circumstances people can benefit from access to certain resources. An important distinction they make is that of *controlling* access and *maintaining* access. "Access control is the ability to mediate others' access", whereas "maintenance requires expending resources or powers to keep a particular sort of resource access open" (Ribot and Peluso, 2003: 158-159). Apart from control and maintenance, *gaining* access is essential in order to establish access to a resource. In order to gain, control and maintain access actors can draw on multiple mechanisms categorized as rights-based access (i.e., legal and illegal) and structural and relational access mechanisms (i.e. technology, capital, market, labour, knowledge, authority, identity and social relations) (Ribot and Peluso, 2003).

The ability to access a resource can be achieved through "bundles" of power that are composed of combinations of mechanisms described above. An example of a bundle of power is when a landlord maintains his access to land by using his extensive knowledge on existing regulation, his well-established status that constitutes his social identity or simply his capital. On some occasions a single mechanism can be enough to achieve access, whereas in others one might need to draw upon several (a bundle of powers). These bundles of power are always subject to change for example when previous indigenous land rights become formalized or when market dynamics change causing land prices to rise leading to the exclusion of the smallholders. These bundles of power are located

within 'webs of power' (Ribot and Peluso, 2003) (see Figure 2.2), that are made up by the mechanisms determining access (the strands in the web). Being able to draw on multiple mechanisms makes the web more stable and the road to access easier. However, this stability can be undone by excluding others, which equals the control of access described above as the ability to mediate others' access as compared one owns access. The notion of exclusion and the powers associated with it will be explained more in detail in the following section. Whereas the mechanisms of access build up the web, the powers of exclusion can destroy the web.

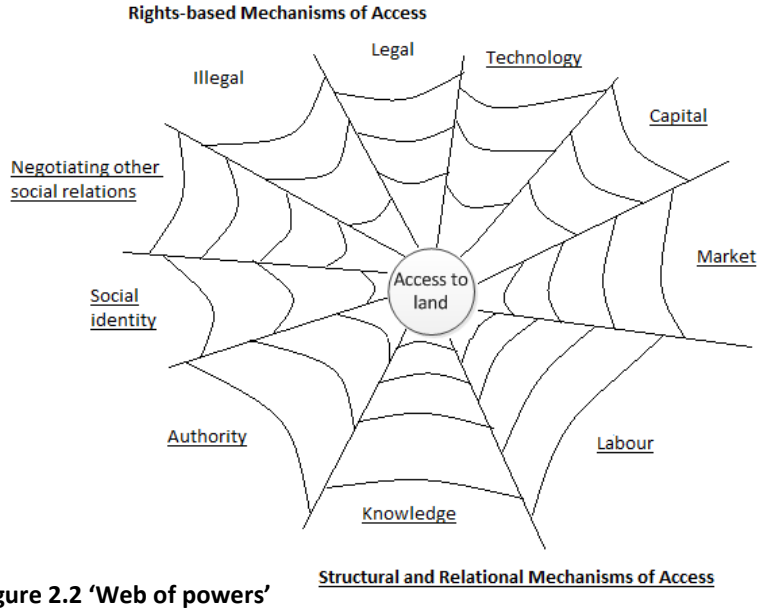


Figure 2.2 'Web of powers'

2.6.3 Exclusion

Building on Ribot and Peluso's (2003) theory of access, Hall et al. (2011: 7) define exclusion as "the ways people are *prevented* from benefiting from things" and thus consider access as the opposite of exclusion instead of the more common notion of *inclusion*. Hall et al. (2011) state that while they recognize that exclusion isn't a new phenomenon they identify certain processes, including boom crops, that drive changes in rural land relations. In their analysis of exclusion from land, they introduce four powers that shape exclusion, namely 1) regulation, 2) the market, 3) force and 4) legitimation. Regulation refers to formal and informal rules that govern both access and exclusion. They determine *boundaries* between plots of land, prescribe acceptable *land uses* and determine kind of *ownership* and *usufruct* claim (Hall et al., 2011). This is interconnected with the rights-based mechanisms of access showing that regulation can be used both for gaining access to land and for excluding others from it. The second power of exclusion is related to the market. Market forces are important in rural land dynamics since they affect the price of land and that of key commodities. The market is in varying degrees subject to government regulations and market forces thus do not occur in the abstract space of supply and demand (Hall et al., 2011). Thirdly, force as a power of exclusion include both outright violence to implicit (or explicit) efforts at intimidation (Hall et al., 2011). It can be used in a legitimate way by the state (thus combined with regulation) but also illegitimately. As pointed out by Hall et al. (2011), force is not a power or mechanism that is limited to the powerful actors in society. Force is also used by smallholders at varying scales, for example between neighbours or against state agencies and outside corporate businesses. Finally, legitimation are the justifications of what is or what should be and which appeals to moral values. People support their

claim on land by addressing discourses that suit their claim. Previous common land of which landless people are excluded by outside investors are claimed back on indigenous grounds. Another example is the claim of land for the greater good of rural development, where people lose their access to land to make place for the construction of a dam that will provide the country with larger benefits. As these examples show, discourses are often conflicting. None of these powers is limited to a certain class of people, a variety of actors can mobilize the four powers of exclusion in varying ways at different scales. Large scale 'land grab' occurring in developing countries throughout the world has been given considerable scholarly and media attention in recent years. This phenomenon also takes place in the so-called *boom crops* in which participants shift from smallholders to foreign agribusinesses. However, this thesis' case study of Bangladesh will also pay attention to what Hall et al. (2011: 145) calls 'Intimate Exclusion', a "process of accumulation and dispossession ... among neighbours and kin who share common histories and social interaction" and are considered as 'everyday processes'.

To conclude this section, a final note on what Hall et al. (2011) call exclusion's double edge, the tension that arises when access to a resource for one means exclusion to it for others, indicating that both access and exclusion are concepts with positive and negative outcomes. Exclusion can occur as a result of 'land grab' by transnational cooperations, but also when, for example, environmental NGOs aim to establish a nature conservation reserve. Though the interest of the actors involved differs greatly, both situations result in exclusion for some. Exclusion thus should be considered as inherent to land relations. Since gaining access to land for some will without exception lead to a form of exclusion for others, this thesis incorporates both concepts. By discussing and recognizing exclusion's double edge this thesis will avoid going along with the popular notion in which exclusion is simplified as solely a negative concept.

2.7 Framework for analysis

This thesis' objective is to contribute to the theoretical understanding of agrarian transitions and the role of aquacultural commodities in it. It aims to gain insight into the effects on rural livelihood pathways and whether these are inherently different between agrarian transitions and aquacultural transitions. This chapter discussed the existing theory regarding this thesis' main concepts, that provided for the creation of an analytical framework to gain understanding in evolving livelihood pathways in agrarian transitions. The changing nature of livelihood pathways is best understood by analysing its driving forces, identified during the field research as: geography, class mobility and land access.

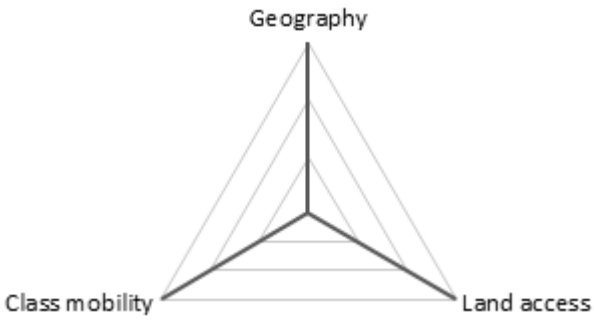


Figure 2.3 Conceptual diagram to indicate the role of livelihood pathway drivers in boom crops

Figure 2.3 shows the main concepts that form the basis of the analysis focussed on livelihood pathways and their development over time. The two empirical chapters applying the analytical framework have the same outline and thus both start their analysis by exploring the village characteristics prior to the introduction of pangasius. The geographical conditions in the village and the changes in land usage as a result of the increased pangasius production are discussed. This is followed by an analysis concerning the changes in land access and land relations. This analysis, together with the description of the development of pangasius production in the village, paves the way for defining and exploring each specific livelihood pathway.

The analytical framework will be applied to the two cases of the pangasius boom crop presented in this thesis. It will determine and explain the livelihood pathways developed in light of the boom crop. These results form the basis of a discussion, using the diagram of Figure 2.3, concerning the changing role of each driver in shaping livelihood pathways and thereby influencing the development of the boom crop. This analysis provides an elaborate overview of the pangasius boom crop that then leads to a final discussion concerning the role of aquaculture in agrarian transitions. It explores the idea of whether aquaculture leads to different outcomes for rural villages and its households compared to that of agrarian transitions discussed in the beginning of this chapter. The following chapter will provide an explanation of the methodology used in order to apply this analytical framework to the two cases that will be discussed in the empirical chapters four and five.

3. Methodology

3.1 Research approach

This thesis is a comparative case study between two villages. It entails a detailed and intensive analysis of the effects of the increase in pangasius aquaculture on rural livelihoods and land access. The comparative analysis is based on the hypothesis that the adoption of different production systems result in different outcomes for households. Therefore, two comparable cases part of the rural phenomenon of the pangasius development are discussed. A case study is an in-depth approach in which the researcher often places themself within the context being studied, in order to achieve new insights and reach an advanced understanding of the local complexities and problems often missed in quantitative large sample research (Flyvbjerg, 2006). Case studies provide context specific data that proves to be difficult to generalize to larger populations. However, this does not mean that this specific knowledge isn't valuable. Universal ideas and predictive theory cannot be found in the social sciences as they can be in some of the natural sciences. The greatest understanding of human affairs therefore originates from learning from individual cases, that provides concrete and context-dependent knowledge. "That knowledge cannot be formally generalized does not mean that it cannot enter into the collective process of knowledge accumulation in a given field or in a society. A purely descriptive, phenomenological case study without any attempt to generalize can certainly be of value in this process and has often helped cut a path toward scientific innovation" (Flyvbjerg, 2006: 227). This indicates the aim of this thesis in elaborating on existing theory concerning agrarian transitions, and specifically to that of livelihood pathways in the context of boom crops. Data found in the case studies can thus confirm or contradict the theory but can also create new hypothesis, adding detail and specifying theory more fully (Vaughan, 1992).

The combination of qualitative and quantitative research methods strengthens livelihood research, especially in an investigation into livelihood diversity (Marschke, 2005). This shows that the research approach most appropriate for this thesis, that is dealing with a variety of livelihoods in two different villages, is data collection incorporating both quantitative and qualitative methods. Shaffer (2013) also states that acknowledging the strengths and weaknesses of each approach to data collection (i.e. either quantitative or qualitative) opens the way for a more systematic integration of quantitative and qualitative methodology, that is known mixed method research or as the Q squared approach. The research for this thesis was a combined effort between the author and WorldFish Bangladesh and consisted of a quantitative survey, qualitative interviews and participatory mapping exercises. While the priority in this analysis was given to qualitative data, all three methods are essential elements of the research, complementing to each other so that a detailed overview could be given about the start and development of the pangasius boom and its far reaching effects on households.

WorldFish aimed to get insight into the effects of commercial aquaculture (pangasius, tilapia and shrimp) on livelihoods and poverty in rural areas. This thesis focuses solely on pangasius aquaculture in Mymensingh district in northern Bangladesh, for this development characterizes that of a boom crop, an important concept in this thesis explained in chapter two. The combination of a literature review on agrarian transitions and boom crops and the empirical data collected at the two cases provide sufficient theoretical insight in agrarian transitions, that will be discussed in chapter six. This

chapter will continue by discussing the selection of the two case studies and the methods used in collecting data. Finally, some of the challenges to the research will be discussed.

3.2 Site selection

Research has been conducted in Bangladesh, a country located in South Asia surrounded by Burma (Myanmar) and the Indian states West Bengal, Meghalaya, Assam, Tripura and Mizoram (see Figure 3.1). Pangasius production in Bangladesh was first introduced in Mymensingh district in the '90s. As mentioned above, production increased to an estimated number of 300,000 t in 2008 (Belton et al., 2011a). While pangasius has spread throughout the country, Mymensingh district is known for having a high concentration of pangasius aquaculture, making this a suitable location for fieldwork regarding the pangasius boom crop. Mymensingh district is part of the larger Dhaka Division. The city Mymensingh has a direct highway connection with Dhaka city, with a travelling time varying between three to five hours.

Pangasius in Bangladesh is known to be cultivated in either ponds or so-called beels, low-lying natural depressions that are enclosed to prevent the fish from escaping. To get a complete insight of

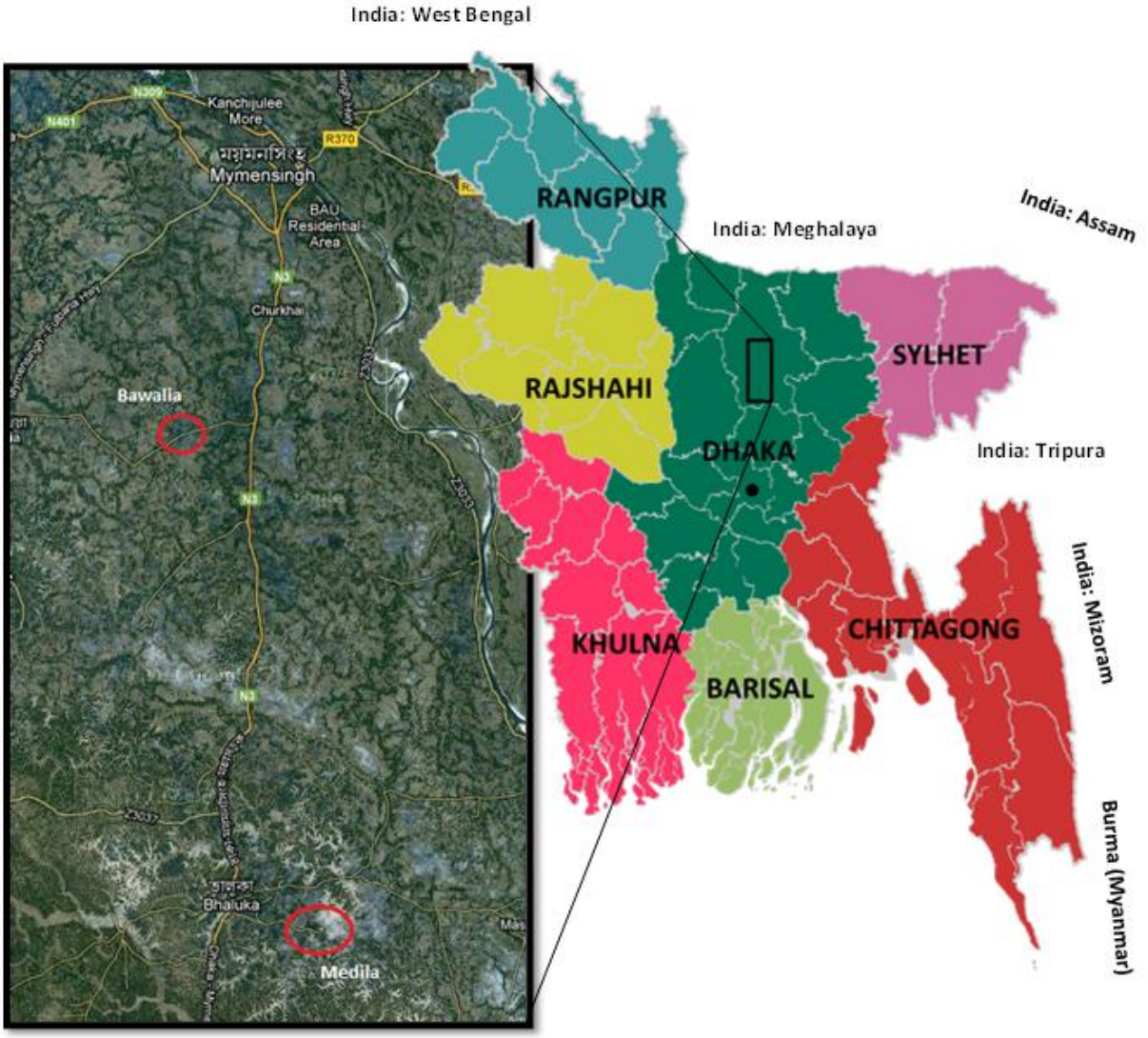


Figure 3.1 Research site

the different production systems and the way this impacts livelihoods, this research uses a comparative case study including pond and beel culture. The two production systems are quite distinct from each other in terms of size, production intensity and the investment required to undertake production. This makes for an interesting comparative case study regarding the different outcomes of the boom crop on livelihood pathways, between the two production systems. To be able to cross-reference data among studies the two villages that were selected were part of an earlier conducted production economics survey. The main selection criteria for the villages was a high concentration of pangasius farming operations. Research for this thesis has thus been conducted in the two villages named Bawalia and Medila, initially estimated to contain between 400-600 households. The village Bawalia, in which pangasius is solely produced in ponds, is located in Trishal Upazila, situated 3.8 kilometers West of the Dhaka-Mymensingh Highway. Medila village is located further south towards the capital Dhaka, in Bhaluka Upazila. It lies 4.5 kilometres East of the Dhaka-Mymensingh Highway and consists pre-dominantly of pangasius beel culture.

3.3 Data collection

Initial research included an in depth literature review on boom crops in general and that of pangasius in Bangladesh. A total of 7 months was spend in Bangladesh, in which field work took place in the months June, July and early August. Fieldwork existed out of a combination of quantitative and qualitative research methods including numerous interviews, FGDs, participatory mapping exercises and an extensive survey. At the start of the field work a considerable amount of time was invested in training the enumerators, after which they were divided among three different places characterized by a high density of either commercial pangasius, tilapia or shrimp aquaculture. As mentioned, research for this thesis focuses on pangasius in Mymensingh district solely. The WorldFish research was centred around the survey, but was complemented with qualitative data. This thesis emphasis is more located towards qualitative research. However, a combination of methods are employed in the analysis, which will be described in detail in the following two sections.

3.3.1 Quantitative research methods

For both villages an initial household census was made for those *para's* that were to be included in the survey. A *para* is a territorial and social unit within a village. Para's selected for the study were similar in size regarding population and pangasius farming operations. The census provided data regarding the land area owned, main occupation, aquaculture resource type and the area operated for pangasius. The census revealed 167 households in the two eastern para's in Bawalia and 216 households in two para's in Medila. This formed the basis for establishing the sample for the survey that was to be conducted by the field staff of WorldFish. The survey contained questions regarding a range of livelihood indicators such as, income (from e.g. occupation, remittances, land lease, pension etc.), education level, household expenditure, possession and sale of household and agricultural assets, land ownership, food consumption and security, savings and loans etc. The data most useful for this study is related to occupations and employment, taken for all household members aged 8 years or above. This showed their involvement in activities related to aquaculture. For pangasius farmers, specific attention was paid to the labour they used and where they came from. The survey data related to land ownership provided insight into the current operational status of each plot of land and pond owned or leased. For those ponds leased out the yearly lease value per hectare was

determined where possible. Other important data taken from the survey include; household size, remittances from inside or outside Bangladesh and household rice production.

Substantial amount of time has been invested in training the field staff, field trials of the survey, and revising it based on comments from the field staff and own observation. The field staff existed out of six Bangladeshis MSc students and graduates, mainly from aquacultural sciences. Data for the survey has been collected during the month June in Bawalia and throughout July in Medila. The months June and July represent the beginning of the raining season and the low season for agriculture, for it is after *boro* rice harvesting and before *amon* planting. The timing of the survey during low season might suggest a limitation regarding occupational status for those persons involved in seasonal labour jobs that are currently unavailable. The survey however takes this into account by including the number of months worked in the last year, instead of solely focussing on the last month or week. Conducting the survey during low season actually provided respondents with time to participate in the research, which could have been a challenge otherwise.

In order to get a representative sample of the population, households where stratified in five categories, used by the Bangladesh Bureau of Statistics, according to their land ownership, < 0.19, 0.20-0.60, 0.61-1.21, 1.22-2.02 and > 2.03 hectare, to ensure representative distribution of respondents in the survey. In practise this means a higher number of respondents that are landless or small landholders, in comparison to a small number of large landowners of which both villages only have a few. The final selection of households was done by the field staff in the village. For the purpose of this study, the following definition of a household was taken; 'a household is a group of people who live together and take food "from the same pot" '. This ensured the exclusion of family members that have (temporarily) migrated elsewhere and do not participate in daily household consumption. Income generated by these family members to the village household has been included in the survey as remittances. The survey respondents were identified based on their complete knowledge of their households' assets, savings, loans etc. Most often this was the household head, but in some occasions the survey respondent was the wife of the household head, or one of his older sons. A total of 100 households in Medila and 101 in Bawalia were surveyed, allowing for generalization to the village level. Because the survey took a minimum of around one and a half hour, a small fixed financial compensation was given to each respondent upon completion of the interview, regardless of their income level.

On top of the large survey conducted by WorldFish, a small questionnaire was done. This included a small number of pangasius farmers and aimed to get insight into the market price variations of pangasius and some of its input costs over the years. Since Medila is home to only a handful of pangasius farmers this questionnaire was only conducted in Bawalia. And finally, an online open source area measuring tool utilizing Google Earth satellite images was used to determine the size of the village in km^2.

3.3.2 Qualitative research methods

Complementing to the quantitative survey, and core to this thesis is data collected with use of qualitative research methods. A series of Focus Group Discussions (FGDs) and interviews have been conducted over a time span of 15 full days in Bawalia and 10 days in Medila[4]. The interviews and FGDs were not limited to the two villages representing the two cases, but were also extended to

[4] A complete overview of the interviews and FGDs conducted can be found in appendix I.

include nearby villages. These sites were visited because they represented a link to Bawalia and Medila in providing aquacultural services such as transportation, labourers and feed and fingerling markets. They also gave insight into the differences between those villages in which pangasius 'boomed' and the villages in which there is hardly any commercial aquaculture.

Respondents for personal interviews or FGDs were found by conducting purposive sampling in which the census household data served as a starting point. Since the field staff visited both villages on a daily basis for a time period of around three weeks they managed to establish a good relationship with the local community. By knowing some key (often older) people who knew a great amount of the villagers, they assisted greatly in locating respondents for interviews. The willingness of residents to participate can be seen in the many spontaneous interviews that were held during walks through the village, often transforming into a larger FGD including many more people. Careful attention has been given not to over-represent certain groups, since it were often the richer farmers (and exclusively male) that were to be found at the foreground. Respondents were sought-after based on multiple characteristics such as occupation, land arrangements and gender. To ensure inclusion of a large variety of pangasius farmers, they were contacted based on the total area operated, their reliance on leasing land or the year in which they first started producing pangasius. Since this thesis aims to understand the effect on farmers and non-farmers' livelihoods as a result of the pangasius boom crop, the objective was to get a large variety of respondents in terms of occupation. Other respondents interviewed were agricultural farmers, people that lease out land to pangasius farmers, sharecroppers, fishermen, labourers (agricultural labour, fish harvesters, earth work labourers and van-pullers) and women (specifically wives of pangasius farmers). The interviews took the form of informal conversations and data was recorded in a notebook. On some occasions a wellbeing ranking was conducted that asked about changes in a person's wellbeing before and after the introduction of pangasius. This was done in order to get a better understanding in the categories that were either positively or negatively affected by the pangasius boom crop. The core questions and topics included in the interviews and FGDs are presented in appendix II. During all interviews a translator was used. When the interview contained sensitive information, for example regarding power relations concerning land access, care was taken to keep the interview as private as the situation permitted it. To ensure inclusion of women and to make them feel at ease, interviews and FGDs with women where always held inside the homestead.

Several FGDs were conducted to obtain a general historic overview of the village and its surrounding. Also important events affecting the village, such as political or geographical changes, were recorded. In order to get insight into the introduction and spreading of pangasius aquaculture over time, a combination of methods have been used including several participatory mapping exercises. In the form of an FGDs a map was drawn showing general land usage before the introduction of pangasius. Following this an A1 printed version of Google Earth satellite images of each village was used in order to create a map of the current land usage. During transect walks new ponds and enclosed beels were added to the map, in addition to the outdated images from Google Earth. The satellite images from Bawalia dated back to November 2006. Those of Medila originated from both November 2009 and March 2010. Via personal accounts of many village inhabitants, the map was extended to include the year of construction for every pond and beel present in the village. While it was difficult to obtain the exact year for each pond/beel, respondents often knew whether a pond/beel, or a group of ponds,

were created before or after the adjacent ponds. By working our way through the village like this an elaborate spatial and temporal overview of the boom crop was created.

3.4 Critical reflection on the methodology

Some limitations and challenges that possibly interfere with the research' outcome, have been experienced throughout the research period. First of all, conducting sociological research in a country a person is unknown to provides some challenges, mainly related to the language and social norms specific to Bangladesh. However, having spent some months in the country prior to the fieldwork increased my knowledge regarding basic social norms and values common in Bangladesh. The researchers lack of proficiency in the language Bengali made it essential to use a translator. Regardless of the high educational level of the translator (MSc graduate) and of the other field staff members, it is likely some detail has been lost in translation. On the other hand, the translator did possess previous experience with FGDs and sociological research and was educated in aquacultural studies, providing great assistance in explaining the local aquacultural practises.

The research for this thesis was done in cooperation with WorldFish in Dhaka, Bangladesh. Receiving data from the survey undertaken by them proved to be very helpful in obtaining a larger scope of the research, that would otherwise not have been reached. Spending only 15 and 10 days in Bawalia and Medila respectively, for conducting FGDs and interviews might not be enough in order to fully grasp the effects of the boom crop on the different households from multiple social classes. However, the field staff that carried out the survey subsequently in the two villages, stayed a longer time in the area in which they visited the villages on a daily basis. This helped greatly in speeding up the process of finding key informants, and it assisted in gaining trust and cooperation from local people, essential to sociological research based on individual interviews and FGDs. The short term nature of the research inhibits the creation of a strong trusting relationship between the researcher and the respondent, making it difficult to obtain in depth insight in the local power relations among the villagers. While caution was paid to having private interviews, this didn't always prove to be feasible. The most common reason for this was that the presence of a foreigner always attracted a lot people. It is therefore possible that this thesis did not obtain the complete story regarding power struggles in relation to the pangasius boom crop.

Another limitation is regarding the selection of respondents for the survey, that was based on a census of people living in the village. In Medila, many pangasius beel farmers are outside investors that do not live in the village and therefore are not included in the survey. While the qualitative interviews partly compensate for this, quantitative data on pangasius farming as found in Bawalia is lacking for Medila. A comparative analysis between pond and beel production methods based on quantitative data was therefore not possible. While the survey does not give such a comprehensive picture of the pangasius boom crop as that of Bawalia, it does provide the necessary data to gain insight into the effects of the boom crop on households within the village.

The next challenge in the fieldwork involved gaining access to women for interviews or FGDs. As a women myself conducting interviews or FGDs with local women (in the company of a male translator) seemed to be easier in comparison to the times when my (male) supervisor from WorldFish joined me in the field. Nevertheless, in most cases interviews with women were conducted with the supervision (and sometimes interruptions) of local men, which very likely

interfered with what the women would tell. This made it harder to obtain a complete understanding of the experiences of women with pangasius production in their village.

A final, more technical challenge is related to determining village borders. Substantial effort has been put in clarifying the borders of both villages. Whereas Medila's borders are mainly based on natural formations and thus forming no difficulty in mapping the village, defining Bawalia's borders resulted in continuous debate. Many different thoughts of respondents regarding this topic made that no absolute certainty can be given about the borders drawn in Figure 4.5 to 4.8.

Regardless of these limitations and challenges, this thesis is based on a large amount of data obtained from a combination of qualitative and quantitative research methods. Data saturation was achieved for the topics most important in this thesis, and a wide range of village inhabitants have been included to ensure all perspectives are taken into account. This provides for the empirical data needed to form a clear picture of the development of livelihood pathways in light of the pangasius boom. The following two chapters present the empirical data collected in the two case studies. In chapter four the development of pangasius will be described in Bawalia, the village producing pangasius in small ponds. This is followed by chapter five, covering the production of pangasius in large beels in the village of Medila.

4. Pond culture – Bawalia village

4.1 Introduction

The socio-economic and biophysical effects of the boom crop on the village as a whole but more specifically on its households, are best understood by looking at the effects on livelihood pathways. Objective of this and the following chapter is therefore to investigate the main drivers, i.e. geographical characteristics, changing class- and land relations, in order to gain a greater understanding of the creation of new livelihood pathways in light of the pangasius boom crop. The specific role of each driver and how this changes over time will then be discussed in chapter 6.

This chapter discusses pangasius cultivation in Bawalia, adopting pond cultivation as its main production system. Bawalia is a small village which centre lies 4.5 kilometres west of the Dhaka-Mymensingh highway. The village has an estimated 1764 inhabitants[5] and is part of Trishal Upazila, a subsection of Mymensingh district. As many parts of Bangladesh, Bawalia witnessed a lot of changes over the last 15-20 years. The most dramatic change in the landscape can be seen in figures 4.4 to 4.7 that clearly shows the increase in the number of ponds since 2000. This increase in ponds can be solely linked to the introduction of pangasius fish culture in the village. The chapter starts by providing a brief historical overview of the changes that occurred and shows the general way of living for most of its inhabitants before pangasius became of any importance. This section is followed by a description of how pangasius aquaculture established itself in the village and how it developed ever since. It describes the land use changes and its effect on the landscape. The chapter continuous by a study on the changes in land relations occurring after the introduction of pangasius. While section 4.2 discusses the effects of pangasius on village level the next section, 4.3, draws the attention to the effects on specific groups within the village. It identifies a variety of livelihood pathways that evolved throughout the boom crop and discusses the drivers most responsible for this. Finally, a conclusion is given of pangasius cultivation in Bawalia.

4.2 Pangasius culture in Bawalia

4.2.1 Historical overview of the village

Changes that are occurring throughout Bangladesh over the last decades also had a profound impact on Bawalia. The most profound change has been the tremendous increase in population over a very short time span. Whereas Bawalia had around 200 households 15 years ago, nowadays this number is thought by many locals to have doubled. However, it was the introduction of pangasius production, that originated in Mymensingh and remained home to the highest concentration of pangasius production nationwide, that changed the village in a most significant way.

The satellite image of Figure 4.5 represents Bawalia before 2000. Cultivating rice was the main occupation in the village and almost all households had access to some land, in the form of private or shared ownership or by sharecropping[6]. While Bangladesh' agriculture is dominated by rice

[5] BBS National Census revealed a total of 377 households in the village. The WorldFish survey showed an average household size of 4,68 people. This suggests 1764 inhabitants in Bawalia village (see also Table 5.1).

[6] Sharecropping is a system in which the land owner shares out his land to a farmer that cultivates a crop of which he provides 50% of the yield to the land owner and keeps the other 50% himself. In some occasions the share is paid in cash. The agreement lasts generally for one crop, or for one year.

monoculture, many variations in cropping patterns exist, depending on the local agro-ecological conditions (Alauddin and Hossain, 2001). Seasonal changes in rainfall and the altitude of the land thus have a profound impact on the cropping patterns of different rice varieties, as is also presented in Figure 4.1. In the case of Bawalia, the lower areas that are more flood prone could only be cultivated during the dry months of the winter. This winter rice is commonly known as *boro.* Land at a higher altitude produces either two or three seasons of rice, known as *aus* and *amon* rice. Figure 4.5 demonstrates the variation in land elevation within Bawalia and the associated number of rice crops produced on it. There is thus great variation in the quality of agricultural land. The residual products from rice production were used for cattle feeding and thus many households had some cattle, which was used for ploughing the field. Cattle was also kept for its milk and is a high value asset that could be sold when needed. During the raining season (end June-Sept) the low-lying areas, so-called *beels*, turned into vast water bodies that sometimes could extend many kilometres. These

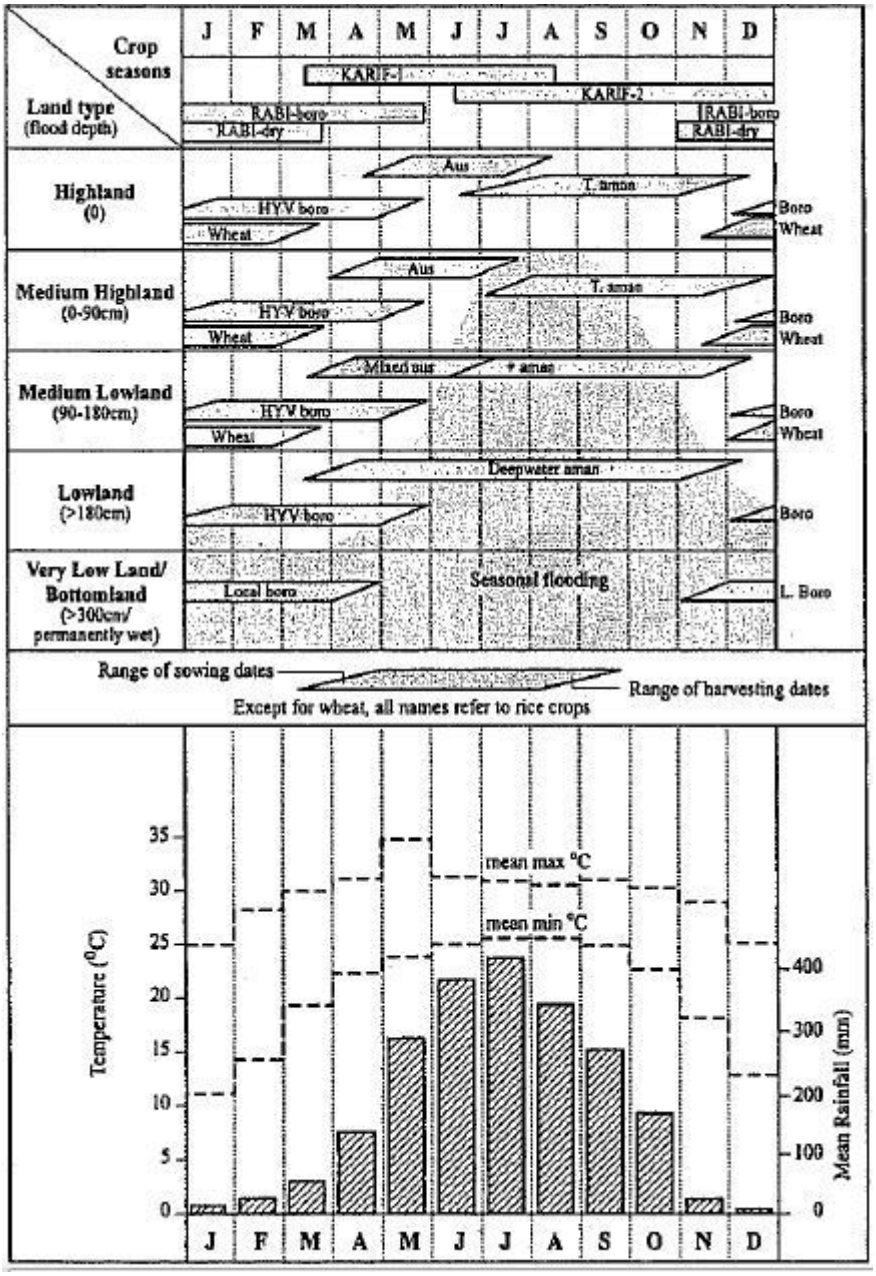


Figure 4.1 Cropping patterns in relation to climate and seasonal flooding (Alauddin and Hossain, 2001)

water bodies contained many indigenous fish species, that was caught on a regular basis by villagers for their own household consumption. As shown by the satellite images Bawalia had several beels, of which only the one in the South is partially left. The village its main road is paved and was constructed around 10-15 years ago. Before this the road flooded every rain season, inhibiting any easy transportation. In these days people used to make rafts out of banana trees and bamboo in order to travel to nearby villages. In essence Bawalia was almost completely isolated during some months of the rain season each year. Thus even though the colours in the figures below show a clear distinction between areas of rice cultivation and beels, in reality this difference is less strict and highly variable between months. This means that when a person would visit the village in February, he would find himself surrounded by green rice fields. On returning to the village in July, a large share of it would have changed into a blue landscape and one would be surrounded by water and marshland.

Before the introduction of pangasius the village had around 15 ponds, which were all solely used for household purposes such as bathing, washing, watering livestock and cultivating carp for household consumption. In earlier times these ponds were also used for providing drinking water. This changed with the introduction of shallow tube wells, which usage expanded exponentially in Bangladesh throughout the '80s (Hossain, 2009). Most of the ponds that existed before the year 2000 were created several decades ago. When asked about the biggest changes that occurred in their village, people mentioned the introduction of deep tube wells around 1985 that enabled the cultivation of *boro* rice and the introduction of pangasius around the year 2000.

4.2.2 Introduction and development of pangasius culture

The production of pangasius in Bangladesh expanded rapidly from the mid-1990s. This growth in production led to a decline in the market value to a point where the fish came within reach of many lower income bracket consumers in urban and peri-urban areas (Belton et al., 2011a). The creation of this new group of consumers paved the way for further expansion, coinciding with the introduction of pangasius in Bawalia. The first farmer to cultivate pangasius inside Bawalia started in 2001. He started in partnership and continued on his own one year later. This farmer still is by far the biggest pangasius farmer of the village and currently cultivates 26 ponds on 8.9 ha. He was inspired by a nearby pangasius farmer from which he also received technical advice regarding pangasius cultivation. This farmer, a local Union Parishad Council member, had started pangasius in Hapania, the adjacent village west of Bawalia, one year before. In 2001 he started a pangasius farm for which he dug 16 ponds (6.5 ha) at once, a number that didn't increase since. This farm is located on the east side of Bawalia (see Figure 4.6) and is known as Pankuri farm. One year later a second large pangasius farm near Bawalia started cultivation. This farm is known as Reza Ali farm, owned by a former local Awami League MP. It started with 60.7 ha, increased to 80.9 ha and still continues to expand. Nowadays this large farm lies partly within Bawalia's borders (see Figure 4.7 and 4.8). Both Pankuri and Reza Ali farms are owned by people that are originally not from the local area and are managed on a daily basis by a permanent manager. The role of these two farms, but primarily that of Reza Ali farm, on the further development of pangasius in Bawalia will be addressed in the following section.

Apart from one farmer that started commercial carp cultivation a few years before the introduction of pangasius, none of Bawalia's pangasius farmers had any previous experience with commercial aquaculture. Figure 4.5 to 4.8 show the development of pangasius since its introduction in Bawalia in 2001. As can be seen the increase in the number of ponds occurred at a slow pace in the first couple of years. However, around the year 2005 the pangasius boom crop really took off. Farmers throughout Bawalia observed the success gained by the pangasius farmers and took the plunge as well. This snowball effect led to the inclusion of lower income households in the pangasius boom. Whereas the very first pangasius farmers were all relatively better off households, the increase in ponds after 2005 includes also the small land owners and even landless households.

In the first years of the pangasius boom in Bawalia the new crop was very profitable, with many farmers enjoying a substantial increase in their income. The market price of pangasius was still very high and feeding costs low (see figure 4.2 and 4.3). The pangasius market price curve in Figure 4.2 follows the national pattern of steady decline as observed by Belton et al., during its first years. In 2008 a dramatic drop in the market value can be observed. This corresponds to the worldwide food crisis of 2008, which strongly affected Bangladesh' agricultural sector. Many poorer consumers limited their intake of fish and resorted to consuming rice, a cheaper source of nutrition (Haque, 2009). This had a profound impact on the pangasius farmers of Bawalia. The price of pangasius dropped about 40% compared to 2007, to 0,43-0,56 US $/kg, resulting in many farmers obtaining a large loss. Only farmers financially able to delay their harvest until the prices rose again, meaning they continued the grow out season throughout the winter, didn't obtain a loss. The year 2008 thus had varying outcomes on the pangasius farmers, with some able to continue their cultivation

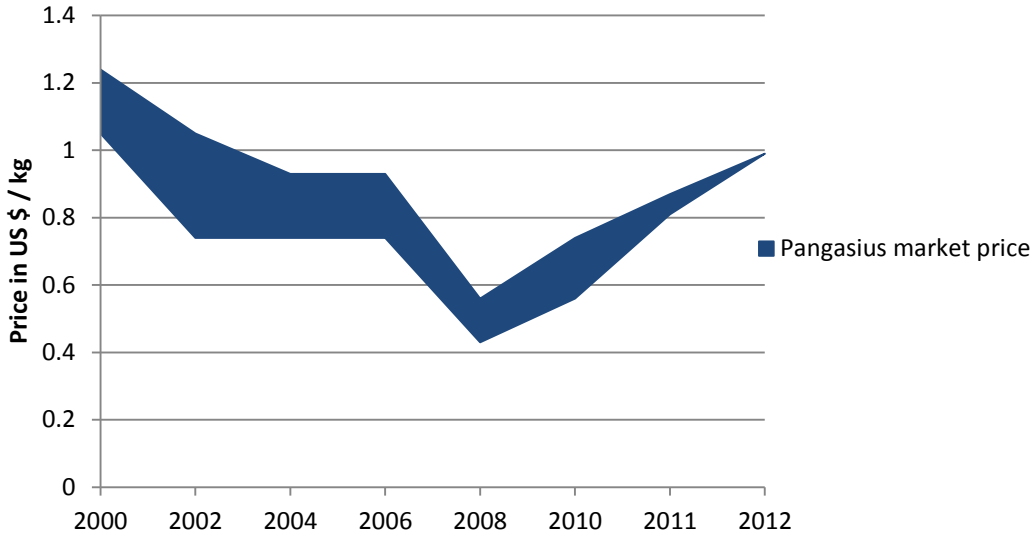


Figure 4.2 Nominal pangasius market prices in Bawalia between 2000-2012

Source: pangasius farmers questionnaire

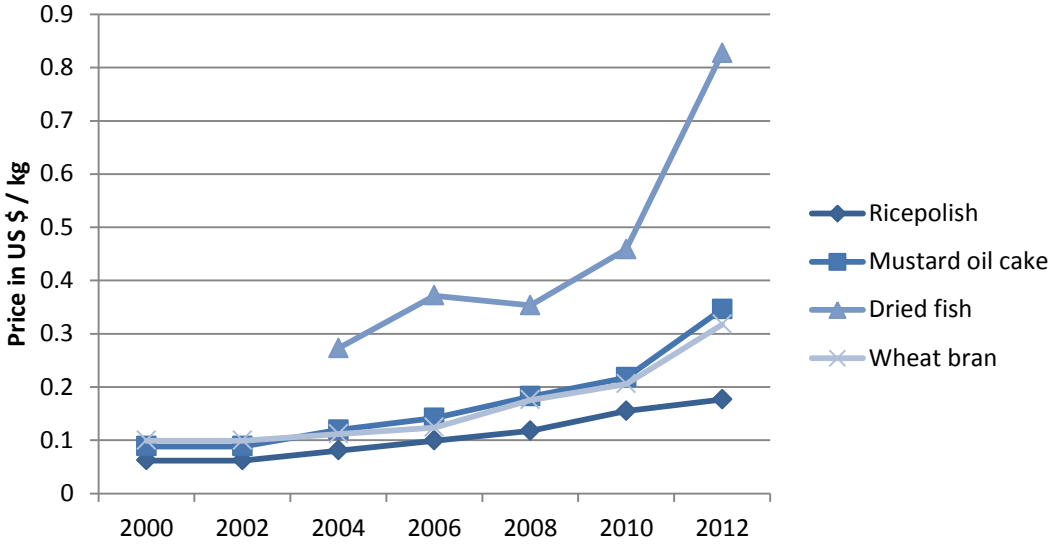


Figure 4.3 Nominal pangasius input costs in Bawalia between 2000-2012

Source: pangasius farmers questionnaire

throughout the winter or again the next year, whereas others had to lease out or even sell their ponds. Selling land is widely considered a last resort. The crisis had shown that farming pangasius was an investment that could result in big losses instead of the continuous profit of the previous years. Together the satellite images of Bawalia's land usage and the market price curve presented in Figure 4.2 clearly illustrate the agrarian transition in the village occurring as a boom crop. A boom crop that started out with low input costs and a high market price that gradually dropped, creating a strong incentive for many farmers to start pangasius production. Next a downfall in the market price occurred, temporarily stopping the growth in number of ponds and the subsequent recovery. Nevertheless, while the production growth throughout Bangladesh, including in Bawalia and Medila, plateaued during 2007/2008 it has rebounded in 2009 and continues to grow (Haque, 2009). Thus while many farmers in Bawalia occurred a loss, the pangasius development wasn't put to a stop and the increase in ponds continued assiduously, as can be seen in Figure 4.8. As will be shown below over 20% of the current pangasius farmers do not own their ponds nor any other cultivable land. This indicates that while the food crisis had an immediate impact on some of the less capital rich farmers it didn't result in the total exclusion of the smaller landowners or landless farmers in pangasius farming. Ahmed et al. (2010) do however point out that the increasing production costs, as also observed in Bawalia (see Figure 4.3), potentially contributes to the vulnerability of poor farmers.

The pangasius boom crop provided not only opportunities for farmers, but also for landless labourers. The most common labour jobs include fish harvesting, excavation worker (earth worker) and feed mill operator (see also Table 5.3). The first feed mill was made a few years after the introduction of pangasius in Bawalia. Data from the census suggest there are currently more than 25 feed mills in the village. These mills are small scale feed mills producing for local farmers only, instead of large commercial fish feed manufacturers. In general, pangasius farmers buy feed ingredients at nearby markets and make their own feed instead of buying industrially made feed. Stocking density of ponds depend mainly on the amount of feed a farmer can afford. This thus can vary between years. Farmers tend to stock pangasius at densities much higher than recommended by the Upazila Fisheries Office (local office of the Department of Fisheries). Bawalia's biggest pangasius farmer mentioned on this topic that "the practise is very different from theory", stating that no pangasius farmer would be able to make a profit if he follows the Upazila Fisheries Office recommendations. Indicative for the lack of influence of established institutions on Bawalia's pangasius development is also the fact that while Bawalia houses a scientist from the Bangladesh Fisheries Research Institute he never was involved in providing pangasius farmers with any technical advice. While not residing often in Bawalia, one could expect him to play some role in the pangasius boom. For many rural-urban migrants the connection to their native village remains of importance, based on the livelihood, the culture and the identity it provided them (Kuhn, 2003). Nevertheless, for technical advice most farmers go to neighbouring pangasius farmers or relatives instead of to a governmental authority.

Bangladesh' pangasius culture is characterized as polyculture, since the vast majority of pangasius farmers also stock Indian major carps or Chinese carps and/or monosex Nile tilapia (Belton et al., 2011a, Ali et al., 2012). This also holds for Bawalia's pangasius farmers, stocking both carp and tilapia in their pangasius ponds. They are harvested and sold (and/or consumed) at a regular basis to cover the feeding costs of pangasius. The income of carp and tilapia is not considered to be important on its own, but to support pangasius culture. For many smaller pangasius farmers the carp and tilapia production also contributes highly to their diet. Another specific characteristic of Bawalia's pond

cultivation is its intensive but small scale production. Pond size varies from 0,01 to 0,53 ha, with more than half (56%) of the ponds being smaller than 0,10 ha. Also the number of ponds cultivated per farm is very small, with most farmers cultivating only one pond (see Figure 4.4) This makes farm size similarly small, with survey data showing that 82% of the farms are sized <0.51 ha. This is a much larger share of the total number of farmers compared to the 21.1% found by Ali et al. (2012). Belton et al. (2011b) show a higher number with small farms of <1 ha representing 50-74% of all pangasius farms.

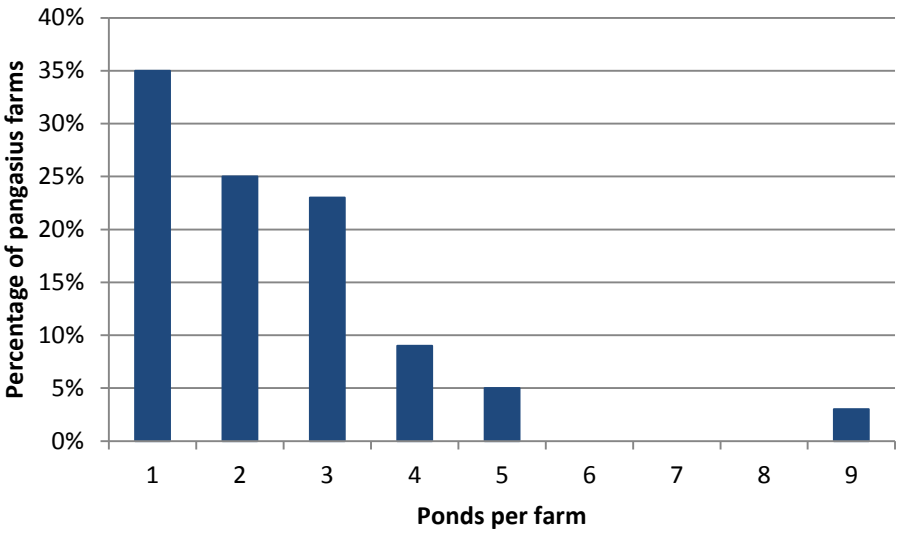
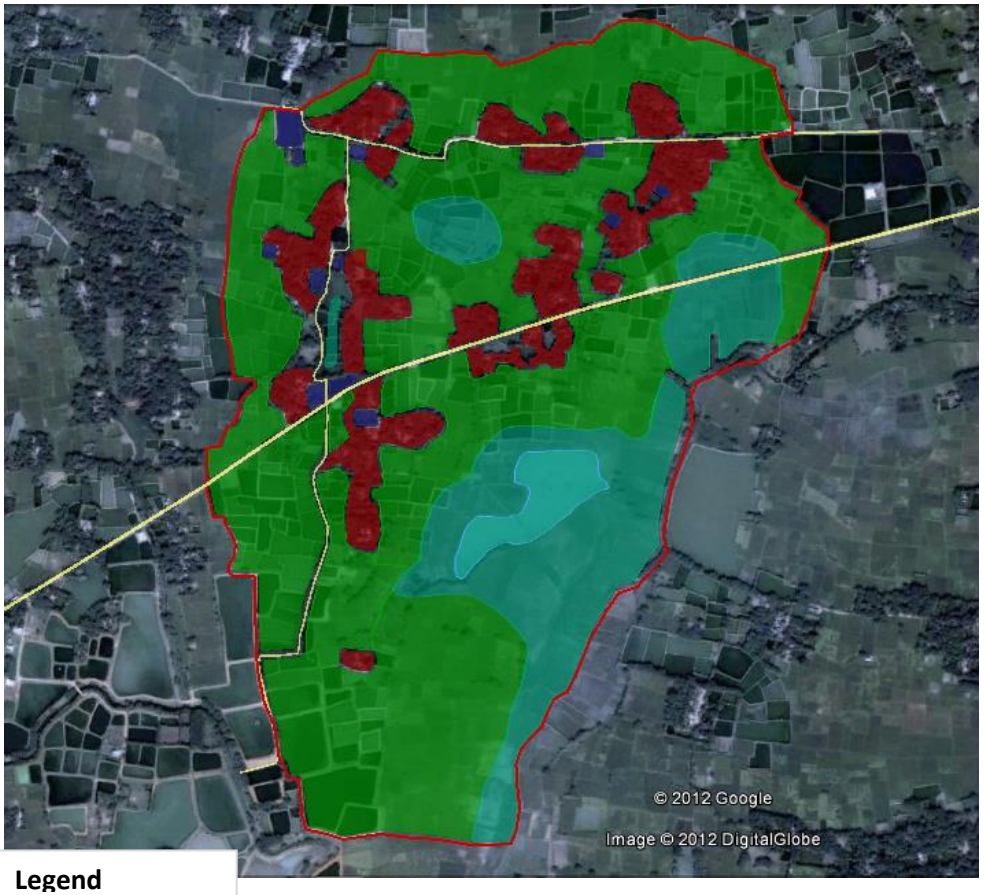


Figure 4.4 Number of ponds cultivated per pangasius farm
Source: WorldFish survey

Throughout the years ponds started to arise everywhere in the village. In later years ponds were also excavated closer to the beel. These ponds are on low lying areas and thus need higher dikes to prevent them from flooding. This is the main reason why the south eastern area of the village has the fewest ponds. The villagers prediction of the near future is that more ponds, mostly closer to the beel, will be created. There has however, already been an example of a pond that was filled up again to create space for homestead construction. This clearly shows the squeeze on land caused by pangasius culture. This will be discussed more in detail in the following sub-section.



Legend

- Pond
- 3 rice crops per year
- Beel: 1 rice crop per year
- Beel: 2 rice crops per year
- Feed mill
- Homestead area
- Large pangasius farm
- Paved road
- Small dirt road

Figure 4.5 Bawalia land use before 2000

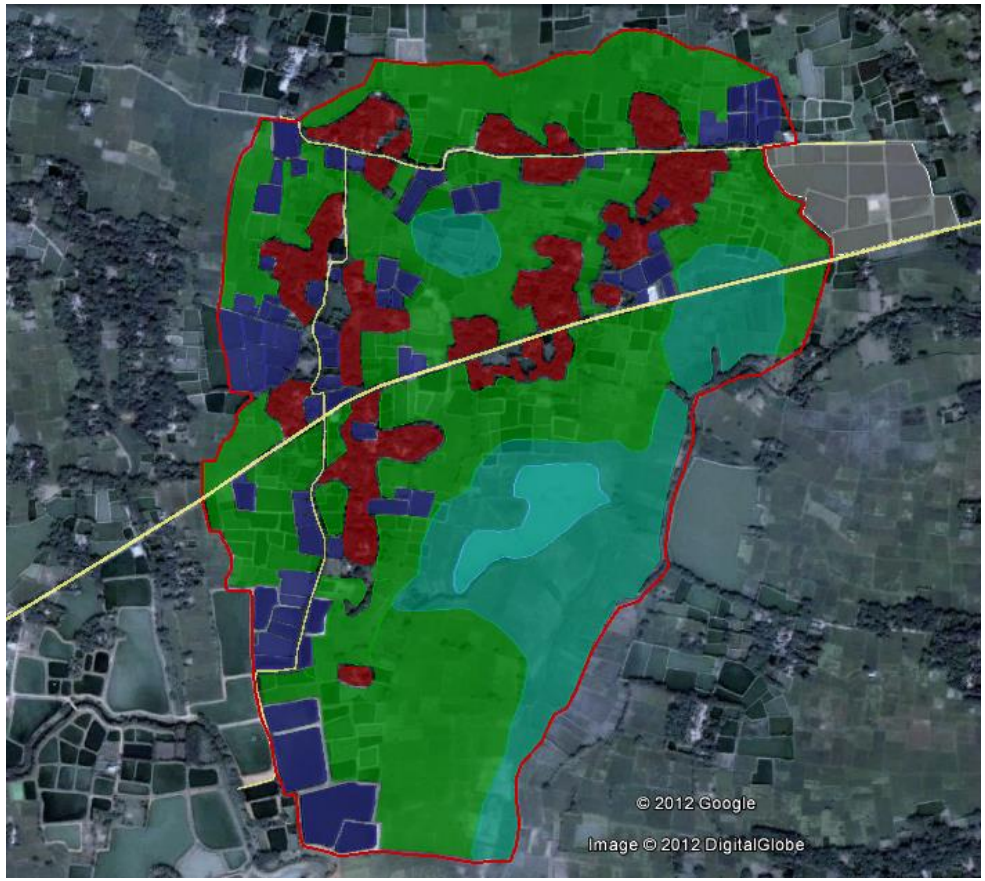


Figure 4.6 Bawalia land use 2000-2004

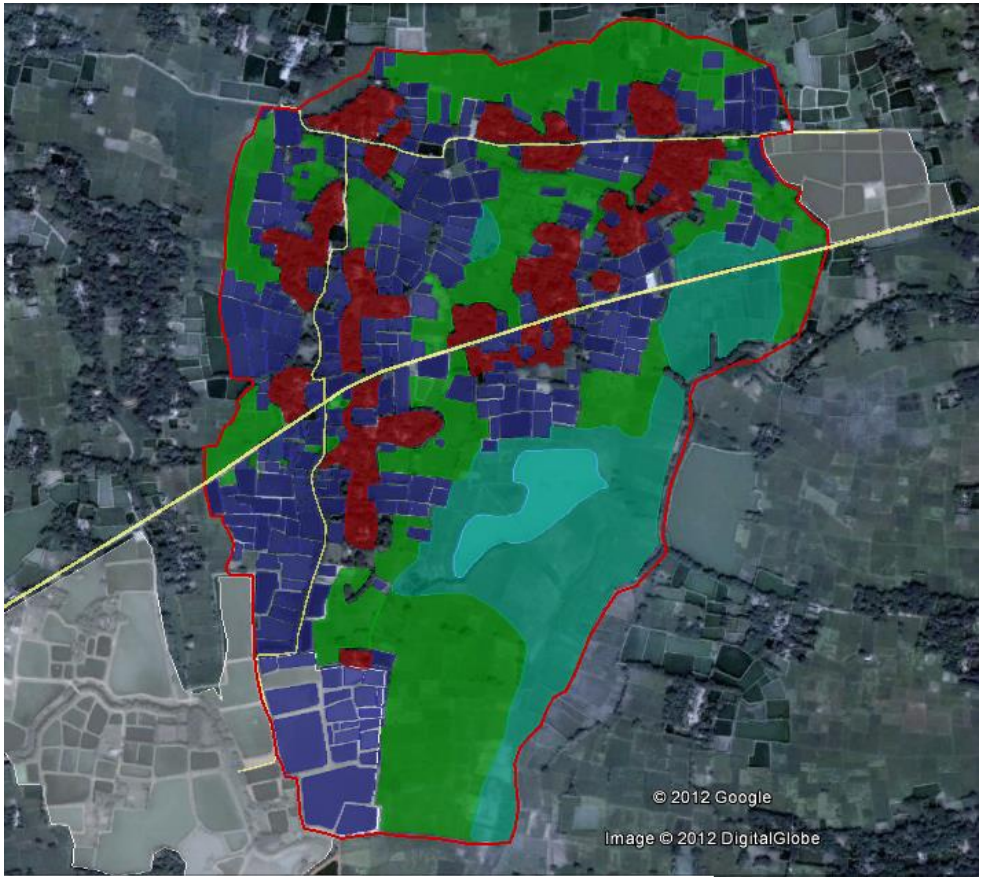


Figure 4.7 Bawalia land use 2005-2007

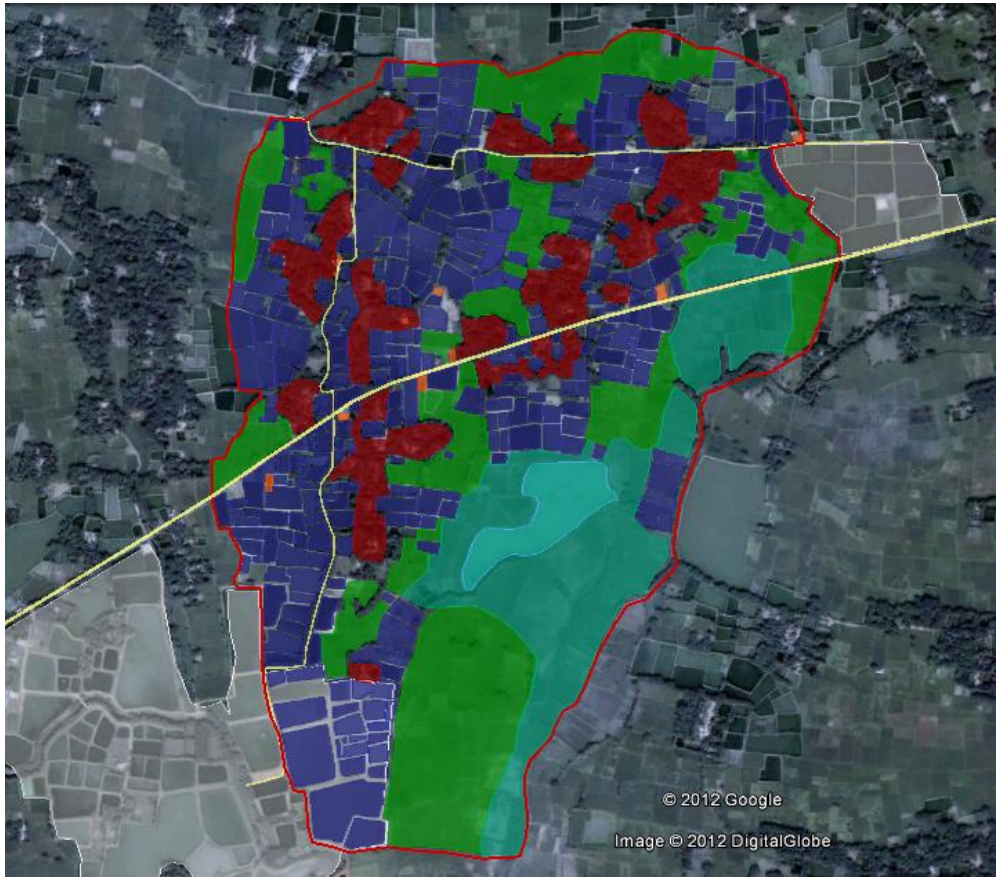


Figure 4.8 Bawalia land use 2008-2012

4.2.3 Changes in land relations

While Bawalia surely isn't the only 'pangasius village' in the area, many surrounding villages haven't experienced a pangasius boom as Bawalia has. There are several reasons for this. Firstly, within the wider area Bawalia lies inside of a low lying area that is more suitable to build ponds in. Ponds in Bawalia can contain water naturally throughout the year while this is not the case in a higher altitude area, in which ponds need to be filled using water pumps. This thus increases the investment costs greatly. Apart from this limitation, the incentive to use the land in a different manner was greater in Bawalia, where much of the land is only suitable to produce a limited amount of rice crops a year. This in comparison with a nearby village called Radakanai, that is situated at a slightly higher altitude which enabled the inhabitants to grow three crops a year. They do not only grow rice but also commercial crops such as vegetables and sugarcane. It has been mentioned at several occasions that Radakanai used to be a better off village compared to Bawalia because of their ability to grow more crops. This situation however, is now reversed because of the amount of farmers producing commercial pangasius in Bawalia. A second reason why pangasius developed in Bawalia is the easy access it has to the Dhaka-Mymensingh highway. Bawalia is cut in two by a paved road from which it is only 3.8 km to the highway. Since pangasius is transported by large trucks that do not travel onto the dirt roads, an easy to use road such as Bawalia has is a necessity. Thirdly, of great importance is the closeness of the village to two markets known as Boilar and Danikhula market. The latter lies at the intersection with the Dhaka-Mymensingh highway, while the former lies only a few kilometres west of Bawalia. Even though these markets only started selling pangasius feed a while after pangasius was introduced, the easy access to inputs such as feed, antibiotics and pangasius fry, made it easier for some of the smaller farmers to start pangasius. A greater distance to a market would increase the transportation costs. The three mentioned reasons are all related to Bawalia's geography. Another final reason that was of importance was the starting of nearby Pankuri and Reza Ali pangasius farms. These two farms started at the beginning of '00s and became an example for Bawalia's future pangasius farmers. Even though Reza Ali had created some very large ponds, it was clear from their smaller ponds that pangasius grow out culture was also a possibility at a smaller scale. Whereas Reza Ali was an outside investor, originally from Comilla, the owner of Pankuri had connections with Josim Uddin, who initiated the first pangasius farm in Bawalia that started out small. Regardless of the preferable conditions in Bawalia, the development of pangasius culture in Radakanai has started and is expected to continue in the future.

In all of Bangladesh the existing inheritance laws lead to an increasing fragmentation of the land and the rising population resulted in greater competition for land, thereby increasing the value of land and affecting existing land arrangements. In general, sons inherit an equal amount of land from their father, resulting in increasingly smaller plots. Whereas selling land is still considered a last resort, leasing land has become very common. While these developments are valid throughout Bangladesh, the tremendous increase in the competition for land and increase in leasing value of land in Bawalia has its roots primarily in the introduction of pangasius. While exact numbers for the value of land before 2005 are unknown, several accounts from respondents made it clear that it has increased many fold since the introduction of pangasius early 2000s. Especially in the last 5 years the leasing value of land, the most common land arrangement since the introduction of pangasius, has increased a lot. Where the yearly lease value was around 940,- US $ per hectare in 2007, in 2012 it is most commonly between 1410,- and 1650,- US $, indicating an increase of 50 to 75.5% in 5 years' time.

Some outliers of 1880,- and even 2355,- US $ have also been mentioned. While the survey lacks the ability to show the change in lease value over time[7], it does present a similar range of leasing value with landowners leasing out land receiving between 940,- to 1570,- US $/ha, with an average of 1230,- US $/ha[8]. Perhaps an even more significant effect of the boom crop than the increasing leasing value, is the break away from value of land being primarily based on biophysical characteristics. Before pangasius was introduced, the value of land was primarily based on the number of months it remained inundated throughout the year. Plots on a low lying area, producing only one crop of rice a year, were lower in value compared to plots on which three crops of rice could be cultivated. With the introduction of pangasius the lease value of land not only increased but also resulted in a redistribution that made certain plots more valuable than others. Ponds that have direct road access obtained a higher lease value, whereas road access isn't of importance for agricultural land on which rice is cultivated for household consumption. Ponds with direct access to the road save on the extra transportation costs of carrying the fish from the pond to the road and are therefore higher in value. While the value of a plot far away from the road did increase throughout the boom crop, it didn't increase as much in comparison to a plot positioned closer to the road. Thus simultaneously to the increase in the overall land value, a redistribution of the value of land took place. This resulted in many landowners witnessing either an increase or decrease in land value relative to that of other landowners' land. This process is illustrated in Figure 4.8, that shows how the pangasius boom crop made the landowner of plot 3 (low area but direct road access) better off compared to all other landowners (in relative increase of land value), even though his land used to be

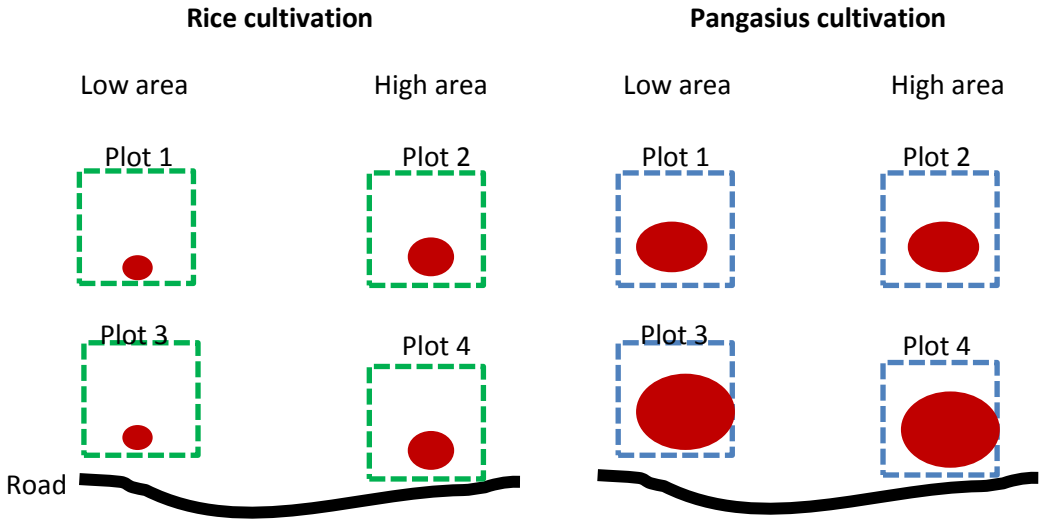


Figure 4.8 Changing conditions of leasing values

lowest in value.

It has to be noted however that the differences in leasing value are not solely determined by the geographical location of a plot. The purpose of the land also influences the leasing value since agricultural land is lower in value compared to land used for aquacultural purposes. Another

[7] The survey does not provide the year in which the lease was initiated.

[8] This number is taken from 12 survey respondents, excluding one outlier that was left out. The survey shows the overall income received from leasing out land and does not separate between multiple plots, nor between ponds and crop land leased out. Therefore all farmers leasing out crop land were left out. Since the income from leasing land does not account for the different leasing values among ponds, only farmers leasing out 1 pond were included.

influencing factor is the competition for land between farmers, raising the amount that is paid for a lease. Not alone did this increase the lease value asked it also led to the introduction of paying an advance on the lease, instead of just paying the lease each year during the extent of lease period. Reza Ali was the farmer in Bawalia initiating paying an advance on the lease to land owners. When pangasius cultivation in Bawalia really took off the demand of an advance became more and more common among landowners leasing out to pangasius farmers. Nowadays this makes it increasingly difficult for less capital rich farmers to lease in land, since the necessity of an advance makes the starting capital needed for pangasius cultivation even larger.

Table 4.1 Pond ownership in Bawalia

Pond ownership status	**# of households (%)**
Pond owners	**63 (62,4%)**
Current operational status of pond(s)	
Leased out	11 (10,9%)
Owned	23 (22,8%)
Combination of owned, leased/shared/mortgaged in or out	29 (28,7%)
Non pond owners	**36 (35,6%)**
Current operational status of pond(s)	
Shared in pond	1 (0,9%)
Leased in pond	14 (13,9%)
No pond operated	21 (20,8%)
Operational status unknown	**2 (2%)**
Total	**101 (100%)**

Source: WorldFish survey

The increasing number of ponds obviously led to a sharp reduction in the amount of agricultural land available. Cultivating rice for household consumption is deeply ingrained in Bangladesh' rural lifestyle and many households prefer growing their own rice instead of buying it from the market. However, the lack of enough agricultural land caused by the introduction of pangasius led households to move away from growing rice themselves. Nowadays, 59% of Bawalia's households purchase rice for consumption. The reduction in agricultural land also caused a shift away from sharecropping as the most dominant land arrangement. A sharecropping contract for rice cultivation is most often agreed upon for the extend of one crop only. Since pangasius requires a both a longer investment term and a higher investment, leasing land in periods of 5 years[9] became the most common form of tenancy. That leasing land has become the dominant land arrangement in producing pangasius is also shown by Table 4.2. Out of the 101 households surveyed 65 are involved in pangasius cultivation. Within this group of pangasius farmers 21,5% rely entirely on leasing in their ponds and another 37%[10] are involved in a combination of both owning and leasing (in/out) their ponds. Table 4.1 shows that not all pond owners are pangasius farmers with 10,9% leasing out all of their ponds. The same table shows that 14 out of the 36 households that do not own a pond, leases in ponds and cultivate

[9] While lease periods of 5 years are most common, leasing periods ranging from 4 to 10 years have been mentioned.
[10] Derived from the '40%' in Table 4.2, not considering the 2 cases in which leasing did not occur (i.e. 'owned + share out')

pangasius. These (landless or land-poor) farmers represent over one-fifth of all pangasius farmers in Bawalia (see Table 4.2).

Table 4.2 Pangasius farmers' pond ownership in Bawalia

Pond ownership status	# of households that are pangasius farmers (%)
Pond owners	**49 (75,4%)**
Current operational status of pond(s)	
- Owned	23 (35,4%)
- Combination of owned, leased/shared/mortgaged in or out	26[1] (40,0%)
Non pond owners	**15 (23%)**
Current operational status of pond(s)	
- Shared in pond	1 (1,5%)
- Leased in pond	14 (21,5%)
Operational status unknown	**1 (1,5%)**
Total	**65 (100%)**

[1] Most cases involve leasing ponds. 23 households have a combination of either 'owned + lease out/in' or 'owned + lease out + lease in'. There are only 2 cases of 'owned + share out' and 1 case of 'Lease in + lease out'.

Source: WorldFish survey

4.3 Livelihood pathways

4.3.1 Introduction

This section explains the way households have been affected differently by the pangasius boom crop. For many households in Bawalia their livelihoods has changed dramatically. This section identifies and discusses several livelihood pathways of households with similar starting points but different outcomes resulting from the pangasius development. Each of the next three sections represent a social class within the village. While this is a simplified representation of reality, some level of categorization remained necessary in order to tell the story of developing livelihood pathway in a comprehensible way. The main aim of this exercise is to show the array of livelihood pathways that are observed in Bawalia. The first social class are the landless households. Belton et al. (2012) describes functional landlessness as households owning less than 0,2 ha of land. This results in functional landlessness being as high as 55% among Bawalia's households. However, there is quite a distinct difference between owning no extra land accept your homestead and having a 0,1 ha pangasius pond or cultivable land. Therefore, this thesis defines landlessness as households owning not more than their homestead area and homestead garden. Households owning less than 0,2 ha but owning a small plot of cultivable land and/or a pond are thus not included in the first section. definition. The second social class includes the small land owners. The final social class, containing fewest households, are the large land owners. In general they differ from the former category in size of landholding and capital. The small land owners have little capital and thus more difficulty in starting pangasius culture. Also, changes in land arrangements tend to affect them more. Some overlap between households of the different livelihood pathways presented in the following sub-sections will exist. As will be shown, pangasius farmers can be found within all categories.

4.3.2 Landless households

Landless labourers

Landless people own none cultivable land and are primarily condemned to working as a labourer and/or sharecropper in gaining a livelihood. Since the increasing competition of land and the lack of crop land still suitable for cultivation, the sharecropping system has become less common. On many occasions labourers mentioned that they do not own any land apart from their homestead and didn't own any in the past either. Because of the increase of labour opportunities their lives improved greatly. The most significant increase in labour opportunities in Bawalia is related to pangasius cultivation. Common forms of labour in Bawalia include aquaculture labour (e.g. feeding, guard), fish harvesting, earth work labour (exists mainly of digging and excavating ponds) and agricultural labour (e.g. planting, weeding, harvesting). These types of labour don't require much specific skills which makes that a labourer often doesn't confine himself to only one type of labour. However, labourers prefer the aquacultural related labour over agricultural labour, for two main reasons. Firstly, aquaculture labour is needed on a more regular basis throughout the year, whereas agriculture is more strictly bound to certain seasons. Secondly, agricultural labour is physically more intense and working days are longer. While aquacultural labour days are shorter than agricultural labour days, the daily wage remains similar. Due to the increase in pangasius cultivation and the associated labour preferences, Bawalia's landless labourers became mainly occupied with aquacultural related labour which led to a shortage in agricultural labour. This shortage was resolved by migratory labourers both from nearby villages and from different areas in Bangladesh. The labourers from far away stay in the area for about one or two months during the rice culture period. This arrangement started around 2007, following the time that pangasius cultivation really took off in Bawalia. The survey supports these findings and shows that 83% of the aquacultural related labour is executed by labourers from Bawalia. For agricultural labour done by Bawalia labourers this number is 63%. Qualitative data indicated another specification to this number by showing that the agricultural labour that is done throughout the year, like weeding, is mainly done by local labourers. Seasonal agricultural labour such as planting and harvesting however, is done by both migratory and local labourers. Many landless labourers have thus gained a more secure income by the increased labour opportunities provided by pangasius cultivation in their village. This shows that one doesn't necessarily need physical access to a resource to be able to benefit from it. Through labouring, landless people are able to obtain some benefits of exploiting land resources, via cash or in kind payments (Ribot and Peluso, 2003). In Bawalia, exploiting land for pangasius instead of the traditional rice cultivation resulted in an increase in labour opportunities. Hence, the landless people in Bawalia mentioned a significant increase in their living standard that is related to the introduction of pangasius in their village. However, one side note has to be made, that is related to the sharecropping system which has become less common. Compared with the traditional homestead village Nogua[11], which is similar to Bawalia before the introduction of pangasius, sharecropping is a far less frequent land arrangement. Whereas in Bawalia only 30% of the households cultivating rice share in (a part of) their crop land, in Nogua this is still 60%. Even though sharecropping isn't exclusively done by the landless, it is their only way of gaining direct access to crop land. The

[11] A village incorporated in the WorldFish poverty survey. Nogua is a traditional village located within Mymensingh district and in which commercial pangasius production is close to non-existent and thus has not 'boomed'.

decreasing amount of crop land available that resulted in an increasing competition for land thus leads to the exclusion of landless to crop land.

Landless pangasius farmers

Landless people tend to be among the poorest households with the main constraints to start pangasius culture being the lack of both capital and land. While the majority of landless households work as labourers and do not cultivate pangasius, a group of landless pangasius farmers does exists. Out of the 65 pangasius farmers identified in the survey, 21.5% rely entirely on leasing in their ponds (see Table 4.2). These pangasius farmers own only their homestead land, with some owning a small garden and one household owning a small forest area. None of the households own any cultivable land. On average these 'lease in' pangasius farmers own around 0,05 ha which would be considered functionally landless in the definition described in the introduction above. The majority of these pangasius farmers cultivate on a small scale. Section 4.3.3. will go into the cultivation methods of small scale pangasius farmers, defined as farms with three or less ponds. However, apart from small landless pangasius farmers, Bawalia does have some examples of landless pangasius farmers that were successful in expanding their production over the years. Some of the largest pangasius farmers are landless and started out with little resources. Before they started pangasius they earned an income from rickshaw/van pulling, labouring (e.g. earth work) or sharecropping. We spoke to Oid Fokid, who previously gained a living as a rickshaw puller and who started pangasius culture in 2007. He increased his farm with one pond each year since 2007, thus currently operating five ponds. When asked about what made him so successful regardless of his lack of land ownership, he mentioned his low household costs since he had a small family at the time of beginning pangasius. Also having only sons and at an age at which they were also earning an income helped significantly. Three out of the four household members were earning an income at the time of starting. Regardless of these reasons, he mainly considers himself very lucky. Cases like these were coined the zero-to-hero cases. Oid Fokid mentioned that Bawalia knows six farmers that are like himself. Oid Fokid is considered to be part of the Top 10 largest pangasius farmers of Bawalia. Within this Top 10, four pangasius farmers are zero-to-hero cases, starting out like Oik Fokid did.

For both livelihood pathways, the landless small scale and the zero-to-hero pangasius farmers, capital was one of the main constraints in order to start a pangasius farm. To collect the necessary investment households resort to different strategies. Strategies mentioned were; using own savings, selling cattle and/or taking a loan from relatives/NGOs/banks/*majahan*[12]. Often multiple loans from different sources were necessary to collect enough funds to start pangasius culture. Loans from relatives are often without interest or with a very low interest rate. Many small scale pangasius farmers also work as labourers. This indicates that for many pangasius farmers, cultivating pangasius is only one of their livelihood activities.

As mentioned, an estimated 21.5% of Bawalia's pangasius farmers rely entirely on leasing in ponds. Most farmers belonging to this group are landless small scale pangasius farmers. Since the leasing prices of land rose dramatically, their ability to maintain access to ponds and thus be able to continue pangasius culture will possibly reduce in the future. The introduction of advance payments for leasing land also contribute to this, though not all land owners require an advance. Landless pangasius farmers have been quoted saying that they will be facing difficulties if the land owner will

[12] Local money lender

ask for an advance on the lease in the future. The zero-to-hero pangasius farmers on the other hand have been very successful and are considered to have gained enough capital to be able to continue leasing in land or possibly even buy land.

4.3.3 Small land owners

Pangasius farmers

Before the introduction of pangasius, people belonging to this category worked on their land cultivating rice and supplementing their income by working as a labourer. Different from the landless, who have no land and little capital, people belonging to this category generally own a small plot of land and have some capital. This made it somewhat easier for them to start pangasius culture.

In general, the small land owners, as well as the landless, weren't part of the first group of farmers that started pangasius in early '00s. A few years after the first pangasius farmers started, some smaller land owners also shifted their cultivation to pangasius. Different livelihood pathways are identified within the group of small land owners that started pangasius. The first pathway include the farmers that started pangasius cultivation and continued ever since without increasing the number of ponds. Logically, the second pathway are those farmers that started pangasius and became successful enough to expand their cultivation. The third pathway involves those farmers that started pangasius regardless of their preference for rice cultivation. Because of their land becoming waterlogged they were bound to start pangasius culture. Waterlogging occurred on plots that became surrounded by ponds which led to water infiltration that made rice cultivation (near to) impossible. The problem of waterlogging started to occur several years after pangasius was introduced, when more and more ponds emerged.

This part will discuss the production methods of small scale pangasius farmers, that includes most small land owners. These are farmers that have three or less ponds, containing 83% of the pangasius farmers in Bawalia (see Figure 4.4). The small scale pangasius farmers can be a landless labourer, a small land owner, but also a large land owner. While surely there are large land owners that cultivate pangasius in three or less ponds, the largest share of these small pangasius farmers are either landless or small land owners. The high production costs of pangasius farming is often mentioned by respondents as a problem to small land owners, and is also identified by Ahmed et al. (2010) as the main constraint. The previous subsection already mentioned some strategies to collect capital in order to start pangasius culture. Apart from those mentioned, the small land owners are also able to sell or mortgage some of their land to gain enough capital. Most of the small scale pangasius farmers are economically not that strong and therefore the stocking density in their ponds depends mainly on the amount of feed a farmer can afford. Farmers cultivating more than one pond often make use of a rotating cultivation system. For example, a farmer uses one pond as a nursery, the pangasius in the second pond receives just enough feed for the fish to survive while the third pond receives a large amount of feed. After the third pond is harvested, the second pond will switch to the higher feeding intensity. The nursing pond will become the grow out pond with the low feeding intensity. This system of different feeding intensities in multiple ponds is very common among small scale pangasius farmers.

It is very common for pangasius farmers to borrow feed ingredients from feed shops and pay it back after the harvest. All small scale pangasius farmers produce their own feed in one of the many feed mills in Bawalia. Feed ingredients are bought from nearby Boilar market and Dhanikula market. It is

most common for a small scale farmer to rent a feed mill machine and produce the feed himself. Another option is hiring feed mill labourers to do it for them. Bawalia's pangasius farmers prefer the locally made feed over buying industrial feed, because of lower costs and the certainty of the ingredients when made by themselves. Many farmers buy feed on a regular basis since they cannot afford to buy enough feed for an entire grow out season at once. Often they also lack the storing capacity to keep the fish feed over a longer time period. The feed pellets normally dry under the sun, but during the raining season farmers sometimes feed pangasius with wet pellets.

Small land owners cultivating pangasius on their own land will maintain their access to land as long as they didn't lease it out to a farmer that combined several plots into a larger pond. There are quite some farmers that lease out their land and lease in somewhere else, often because they rather have a pond near their homestead. It has been mentioned on many occasions that land owners would like to get their land back after the lease is finished, with many of these land owners intending to start pangasius cultivation themselves. It is thus possible that these pangasius farmers lose the access to a nearby pond they currently lease in.

Leasing out land

Next to the small land owners that were able to start pangasius, there is a large group of people that lease out (part of) their land to other pangasius farmers. Again, different pathways can be identified leading to a household leasing out their land. First, there are small land owners that were able to start pangasius but had to stop their cultivation after obtaining a loss in 2008. Most of these farmers leased out their land afterwards, but rare examples of farmers selling their land have also been mentioned. A second pathway is that of those farmers that saw their land becoming waterlogged, but were not able to start pangasius culture themselves, resulting in them leasing out their land. The waterlogging problem of cultivable land threatens rice cultivation as a main income source for many households. Another example is that of a small timber tree plantation that is negatively affected by waterlogging, inhibiting the growth of trees. Some areas that used to be able to cultivate three crops of rice a year, now only grow one crop a year because of water infiltration. The fact that these areas are still under rice cultivation regardless of the lower yield it provides, shows that many households value the growing of rice for their household consumption highly. It was mentioned on many occasions that people prefer growing their own rice over buying rice at the market. However, during some interviews it did occur that the younger generation is more open towards buying rice, indicating a shift in mentality between generations regarding the need for being self-sufficient. The third, and final, pathway includes those farmers that lease out (some of) their land willingly. Some farmers have a lack of manpower to work on the land themselves and don't mind leasing out their land since the lease value is high. Another reason can be that farmers need to increase their capital and lease out one plot so they can start pangasius on another plot. As for the landless households, most people belonging to this social class supplement their income with activities such as (skilled) labour, trading, low level government jobs or self-employment jobs such as rickshaw pullers and tailors.

The pathways mentioned in this section show that for many small land owners the direct access to land changed dramatically after the introduction of pangasius. Owning a plot of land doesn't equal the access to it. Having to lease out land after it became waterlogged, which was the only option for some farmers, is a clear example of this. Another example indicative of land ownership not being the

same as access to it, is that of Usman. This example clearly revealed an implicit effort at intimidation in excluding someone from their land. Hall et al. (2011) not only discuss violence but also include different forms of intimidation as part of the use of force as a power of exclusion. Usman is a small land owner that used to cultivate pangasius in two ponds. He obtained a loss in 2008 and leases out his ponds ever since. His initial plan was to cultivate carp in his ponds, something that doesn't require much investment. However, Reza Ali was very inclined in leasing Usmans ponds, since he already reached an agreement with surrounding farmers on leasing their ponds. Reza Ali's close relationship with some of Bawalia's most influential and wealthy households and possibly his status as a former UP-member helped him in reaching his goal. In the end Usman was persuaded to lease out his land to Reza Ali. His land is now part of one of Reza Ali's larger ponds in which ten farmers own some land. Before the introduction of pangasius leasing land wasn't as common as it currently is and a farmer regained its direct access to it after the leasing period finished. Since the introduction of pangasius many plots have been combined to form larger ponds. In those cases in which plots from farmers belonging to the same family are combined into one pond, this often doesn't lead to any problems. However, problems did arise on some of the other occasions in which plots were combined, and in which often more people are involved. In 2002 Reza Ali offered four times the market value of 235,- US $/ha, resulting in many people eager to lease out their land. Many of the plots leased out to Reza Ali were combined into ponds as large as 1.2 ha, which is double the size of the largest pond mentioned in the survey. Two years are remaining on the current lease and the prediction is that the lease value will be between 1400-1500,- US $/ha at the end of the lease period. Reza Ali offers 950,- US $/ha instead of the market value. Farmers owning land inside of the pond are unsure on how this situation will develop itself in the future. Many farmers do not want to lease out their land to Reza Ali anymore but are unable to free themselves from the situation since their land currently only exists as water. Farmers that are on the sides of the pond are technically able to build a dike around their former plots and reclaim their 'land', unlike the one in the middle of the pond. These examples clearly show the influence Reza Ali has in the village and the lack of power small land owners have.

4.3.4 Large land owners

Households belonging to this category tend to be among the households that are best off. This is thus also a far smaller group compared to the two categories presented above. The pangasius farmers that are large land owners tend to be more economically stable. The zero-to-hero farmers are among the largest pangasius farmers of Bawalia and their production system is thus comparable with those described in this section. Whereas the small scale pangasius farmers often make use of the rotating system, the larger farmers have a more constant feeding intensity throughout the cultivation period. Economically stable farmers can afford to keep the fish in the pond over winter, when the market price is low. This proved to be of great importance during the 2008 crisis. While many small scale pangasius farmers occurred a big loss, the farmers that didn't needed to harvest their ponds didn't have any losses or only very minimal. Even though the pangasius farmers that are large land owners might be more economically stable, the survey showed that borrowing feed is common among all types of farmers. Larger pangasius farmers, depending on the number of family members involved the farm, need to hire semi/permanent labour that fulfils tasks such as feeding and guarding. Regarding the market orientation not much difference between pangasius farmers was seen. All pangasius cultivated in Bawalia is sold within the national market. On one occasion we heard of pangasius being transported to India by truck, but it was mentioned that this was very rare.

The manager of Pankuri farm mentioned that sometimes they arrange the selling of pangasius to a wholesale market themselves. But since the management of this can be time consuming they also use a middleman sometimes. The market orientation of large pangasius farms depends on the market price of pangasius and the variation of this at different markets. Dhaka is the nearest wholesale market but also has the lowest price. Markets in Sylhet, Jessore and Rangpur provide a higher price for pangasius, but transportation costs are also higher because of their location with respect to Mymensingh. Pangasius farmers the size of Pankuri have greater knowledge about and can anticipate better to variations between regional market prices.

Naturally different livelihood pathways for larger land owners as a result of the pangasius development can be recognized. Where some joined in the pangasius boom, not all large land owners made the switch. It is also not as one might expect the case that larger land owners cultivated pangasius at a larger scale. Many larger land owners choose to culture pangasius in a few ponds only. In general, the livelihood of large land owners has been affected least of all categories. Since they were always better off their access to land didn't change much. They had direct access to land and they still do. Because of their economic situation, they were able to make the shift to pangasius when their land became waterlogged. They will also remain able to lease in ponds if needed regardless of the higher prices and advances necessary. However, they are not safeguarded from all wrongs. The case regarding the large ponds from Reza Ali that combined several plots of land does also include some of the large land owners. This experience increased the resistance towards outside investors for most of Bawalia's inhabitants. One farmer stated he rather leases out his land to a relative or neighbour.

4.4 Conclusion

This chapter provided insight in the pangasius boom crop in Bawalia and the way households from different social classes were affected differently by it. The introduction and development of pangasius clearly led to an increase in the competition for land, that resulted in the continuing rising lease value of land. Apart from an overall increase in lease value, also specific areas received a higher leasing value. Whereas land value previously was based upon yearly rice profits, now this shifted to higher land value for plots with easy road access, to simplify pangasius transportation.

This chapter describes multiple livelihood pathways resulting from the development of pangasius. They have been categorized by their connection to social class in which households are considered to have similar starting points namely, the landless, the small land owners and the larger land owners. Most of Bawalia's inhabitants belong to either of the two first groups. Actual land ownership did not change as much, since selling land is not considered common practise and is only done as a last resort. However, the access to land, described in chapter two as also the ability to benefit from it, has changed dramatically for some. Landless labourers gained a lot by the increase in work possibilities related to pangasius. Landless pangasius farmers have been able to gain directly from pangasius by leasing in land. However, for many of these farmers the future is rather unsure because of the still increase leasing value and the wish of many land owners to regain access to their land. Small land owners that are cultivating pangasius on their own land are not facing these problems. However, since many pangasius farmers have a combination of leasing in ponds and leasing out ponds somewhere else, their future access to land might not be so straightforward either. The

livelihood options of most small land owners also have increase because of more labour opportunities. Many landless and small land owners have a range of income generating activities, with most people earning an income from different forms of labour (daily, (semi-)permanent). Changes in the livelihoods of the larger land owners haven't been as dramatic as they have been for the landless and small land owners. Also the effects of the changing land arrangements have a minimal effect on their capacity to continue pangasius.

In discussing the production of pangasius in Bangladesh, Belton et al. (2011) state that despite average operating costs being 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. With 65 out of 101 households being pangasius farmers, with many of them belonging to the lower social classes, Bawalia has a very high participation rate and shows that pangasius cultivation in Bawalia hasn't been exclusive to capital rich land owners. The social status of the zero-to-hero cases in the village definitely changed most of all households and are indicative for an increased level of class mobility. Thus, while recognizing that most households not directly involved in pangasius are so because of financial constraints, the case presented in this chapter does provide a different picture than the one portrayed above by Belton et al (2011).

Characteristic for Bawalia is how almost all households are either directly or indirectly involved in pangasius culture, while none of the current pangasius farmers had any previous experience with commercial aquaculture. For most of the pangasius farmers it has been the biggest investment they have ever made. Overall, Bawalia is amidst an agrarian transition, with the increasingly growing commercial aquacultural system showing a radical shift away from the former subsistence *agri*cultural farming system.

5. Beel culture – Medila village

5.1 Introduction

Similar to the previous chapter, this chapter aims to identify and discuss evolving livelihood pathways by looking into the geographical characteristics of the area of interest and its class- and land relations. The focus is on how these drivers evolved throughout the development of pangasius. This will provide insight into the socio-economic and biophysical effects of the boom crop on the village and its inhabitants.

The village central to this chapter is known as Medila, and is located in Bhaluka Upazila, part of Mymensingh district. The most central point lies 3.8 kilometres East of the Dhaka-Mymensingh highway and is situated closer to an urban area, the town of Bhaluka, and to the country's capital city Dhaka. A development related to pangasius and therefore similar to that of Bawalia took place in the last two decades in Medila and some of the dramatic outcomes of the boom, as seen in Bawalia, also apply to Medila's case. However, whereas Bawalia adopted a production system in which pangasius is cultivated in small ponds, Medila's pangasius is produced in large scale beels, which are lowlying floodplains. This chapter describes the introduction and development of pangasius in Medila in a similar way as the previous chapter. By doing so the chapter will demonstrate that the pangasius boom crop in Medila led to considerable different outcomes on livelihood pathways compared to that in Bawalia. Some demographic differences between the two villages can already be noted in Table 5.1. This shows that Medila, with a surface area of 3.23 km^2 and a population density of 678 people per km^2, is larger and more spacious compared to Bawalia. As mentioned this chapter follows the same outline as the previous one, providing for an easy comparison between the two villages. The next section therefore starts with a description of the village prior to the introduction of pangasius.

Table 5.1 Village demographics[13]

	# of households[1]	Average HH size[2]	Total (estimated) population	Village area (km^2)	Population density (/km^2)
Bawalia	377	4.68	1764	1.53	1153
Medila	552	3.97	2191	3.23	678

[1] Source: Bangladesh Bureau of Statistics, 2011

[2] Source: WorldFish survey

[13] The WorldFish census was only conducted for 2 *para's* while the BBS National Census of 2011 was conducted for the entire village and is thus deemed more accurate. The village population used in this thesis is however derived from the average household size taken from the WorldFish survey instead of the total population numbers in the BBS National Census conducted early 2011. While the number of households is not considered to vary that much in one years' time, this might not have been the case for household size. Therefore the most recent study was chosen.

5.2 Pangasius culture in Medila

5.2.1 Historical overview of Medila

Medila and Bawalia differ dramatically in their geography, which already from the start of the pangasius boom, led to the emergence of two very different pangasius villages. Medila is situated in a much lower lying area compared to Bawalia. The satellite images presented in Figure 5.3 to 5.6 demonstrate a much larger coverage of the lowlying beel areas, compared to that at Bawalia. The area almost exclusively exists of freshwater wetlands with some areas drying up earlier in the winter months compared to others. This large scale wetland ecosystem, an concatenation of beels that is inundated for several months of the years, is commonly known as an *haor*. A thin line exists between what is called a beel and what is called an haor. However, when mentioning the haor, Medila villagers specifically meant the large wetland at the Eastern side of the village. In previous times and during the raining season, the haor used to connect all beel areas surrounding Medilas homestead areas. The small dirt roads at the southern side of the village, see Figure 5.3, are thus known to have flooded during the raining season and thereby extending the hoar all throughout the southern side of the village. More so than in Bawalia, Medila village existed during the raining season of small islands solely containing people's homestead. Naturally some beels are slightly higher than others and thus providing better crop land for rice cultivation. However, agricultural land suitable for three crops a year, as was common in various parts of Bawalia, is very rare in Medila. In 1972 a new rice variety, the now common *boro* rice, was introduced, making rice cultivation possible in the haor. Before this time rice cultivation in the haor only existed in some small areas that were suitable for *amon* rice. Because of its large scale the haor produces a huge amount of boro rice each year, but the area remains to be suitable for only one crop per year. Figure 5.1 provides an image of a natural beel, showing how most of Medila's surroundings looked like before the introduction of commercial fish culture.

Figure 5.1 Natural beel

In 1976 the president of that time, Ziaur Rahman, proclaimed Medila as a model village, being one of the ten model villages located throughout Bangladesh. Inhabitants of Medila state that their village became a model village by being a self dependent village with a low crime rate and with well

educated people who also trained households of surrounding villages on issues such as family planning. Medila villagers expressed different views regarding the influence that Medila's model village status had on the development of their village. In the years that followed several development projects where undertaken in and around Medila. The construction of the main road started at Bhaluka's intersection with the highway. Two sluice gates were build nearby Medila to control the regular flooding of the area. To protect the families, a floodcenter was made that provided shelter during floodings, most significantly during the flooding of 1988. However, respondents indicated that projects aimed at improving Bangladesh' infrastructure occurred throughout the country during those years. Therefore, no certainty can be given about the influence of the village's status on its socio-economic development. What became clear through interviews and FGDs is that many villagers are proud of Medila becoming a model village in the '70s and while some point out that this is still the case, there is no indication that the model village status currently provides Medila with any advantages over other villages.

In large wetland areas such as the one Medila is a part of, fishing has always been an important activity for many households. Eventough there were not too many fishermen earning their main income from selling natural fish, many of the poorer households caught fish on a regular basis for their household consumption. During the last 20 years the natural fish stock around Medila, with most fish species being native, declined drastically. Medila inhabitants stated multiple reasons for the decline, including 1) the creation of sluice gates closing natural waterways and thus inhibiting migration of fish, 2) water pollution caused by nearby established (garment) factories and 3) a decrease in the total natural water body by the creation of aquacultural beels that are permanently closed off. Fish species that were common 20 years ago and now have become rare are; mystus tengara (Tengra), Heteropneustes fossilis (Shing, Stinging Cathfish), Channa striata (Shoal, Striped snakehead). Some species, such as the Wallago attu (Boal), Ompok pabo (Pabda catfish) and the Sperata seenghala (Ayair, Giant river catfish) have disapeared from the area completely. This corresponds to the assumption of many experts that the general pattern in Bangladesh shows a decrease in inland capture fisheries (Belton et al., 2011b). The main reasons for this decline includes both the reduction in habitat or the degration of it, resulting from a number of factors identified by Alauddin and Hossain (2001) as; large-scale siltation, land reclamation for agriculture, construction of embankments, dykes and irrigation structures, excessive removal of surface water for irrigation, discharge of untreated effluent by industries, the increased usage of chemicals in agriculture and over-exploitation of certain fish species that results into the depletion of fisheries. Medila inhabitants, as well as Bawalia's, have often expressed their preference in taste of natural fish species over those cultivated. The decrease of the natural fish stock together with people's preference of natural fish resulted in a big increase in their market value. As can be seen in Figure 5.6, apart from the haor, one natural beel at the southern side of Medila still remains. Many people owning land in this beel nowadays dig small ditches for fishing purposes at the end of the raining season. This extends the time in which it is possible for them to catch natural fish for both household and commercial usage. It has been mentioned by several respondents that while the natural fish stock decreased, the rising market value led to an increase in the number of people earning some income from fishing, though they are often not regarded as professional fishermen.

Apart from the importance of fishery as a source of income, Medila has many other work opportunities that are not related to either agriculture or aquaculture. It therefore differs from

Bawalia in which the majority of people earn their main income from work related to agriculture and aquaculture. Compared to Bawalia, Medila is located further south towards Dhaka. The relatively small distance to the countries capital but also to the Upazila capital, Bhaluka, made that Medila's inhabitants have a wider range of work opportunities available. The survey showed that Medila, compared to Bawalia, has a greater share of the population earning their main income from being self employed (e.g. mechanic, carpenter), working in trading or working a job with a monthly salary (e.g. government job, garment worker). Apart from this 32% of all households in Medila also obtain a part of their income from remittances sent to them from family members working abroad. Bawalia on the other hand doesn't have very much income from remittances from abroad. The first time that people found ways to work abroad was during the mid-90s. Since working abroad is very lucrative and because family members often help each other with arranging foreign jobs, this phenomenon snowballed into a significant income source for many households.

Eventhough the two villages discussed in this thesis differ greatly in geography and occupation opportunities, similarities can be found. In both villages rice cultivation has been a central part of rural lifestyle for many years with it being the main occupation for most households. Compared to Bawalia, Medila still has a lot of agricultural land available for rice cultivation, mainly in the haor. The survey shows that in Medila over two-third of the households (69%) consumed rice in the last three days that they produced themselves, as opposed to buying it from the market. In Bawalia producing rice is less common nowadays, since not much agricultural land is left. Only 39% of the households in Bawalia consumed rice they cultivated themselves. The introduction of the new *boro* rice species marked an important change in Medila as well, since it made the haor suitable for rice consumption. Another similarity between the two villages is the large increase in population[14].

5.2.2 Introduction and development of pangasius culture

In both Bawalia as Medila, carp aquaculture for household use existed already before the introduction of pangasius. In Bawalia this took the shape of small homestead ponds in which separate households produce some carp for their own consumption. However, in comparison to Bawalia, carp cultivation in Medila grew into a commercial activity long before pangasius aquaculture kicked off. While the previous chapter showed small scale aquaculture in ponds, both commercial carp and pangasius aquaculture is done primarily in beels in Medila village. Whereas all of the water surrounding Medila during the raining season was connected in some way to eachother in previous times, the introduction of beel aquaculture put a stop to this. The beel areas that became used for aquaculture were sided by naturally higher lying areas or by artificial blockades such as roads, dikes or homestead areas. The beel on the south-east of the village, currently known as Biswas beel, became permanently seperated from the open beel by heightening the road on its eastern side. The dike on the northern end already existed at the time and the area on the west side has some homestead areas and is naturally higher than the beel itself.

The first beel to be used for aquacultural purposes was Molliks beel, located at the north-east, starting cultivation in the mid '90s. A large group of landowners that owned land in the deeper parts of the beel cooperated in cultivating carp during six months of the year. Initially they didn't feed the fish with most of the produced fish used for household consumption and only a small part being sold to the market. In 1996, when they decided to start commercial carp culture, the group was reduced

[14] The increase in population is however not shown by an increase in homestead area in Figure 5.3 to 5.6, for it is unknown where and how much this increased.

to 30-35 landowners who started feeding the fish homemade feed. The costs and benefits where devided among all landowners that joined. Beel land owned by people that didn't join the cooperation was leased during six months of each year, the extend of one cultivation period. During the other six months of a year the area was cultivated with one crop of rice by sharecroppers or by the landowners themselves.

Throughout the late '90s and early '00s more and more aquacultural beels were created that produced carp during the raining season (see Figure 5.4 and 5.5). However, not all of these beels included as many people as in Molliks beel, with other beels being cultivated by a single owner. Beel ownership occasionally changed, not only when pangasius was introduced but also during the time that carp cultivation was still dominating the village. Reasons for a change in beel ownership include the ending of a lease period with a new fish farmer offering a higher lease, or a beel owner that cannot continue culture because of a lack of funds. In some cases of land owners cultivation carp in a cooperative manner, multi-ownership problems arose that could not be solved within the cooperation resulting in leasing out the area.

The first two beels in which pangasius was cultivated (see Figure 5.5), were operated by Biswas, a large feed company, and Kayun, who is an influential Medila inhabitant that recently became the local Upazila chairman. With the introduction of pangasius, cooperated fish cultivation by local landowners became obsolete. Pangasius beel cultivation is done around the year and requires a much higher investment, that proved to be too high for many of the small land owners previously cultivating cooperatively. Several reasons were observed as to why the six months carp, six months rice cultivation scheme disappeared completely and became replaced by pangasius. Firstly, rice production after six months of fish culture turned out very low, making it less benificial to continue culitvating rice. Farmers in a village in Comilla district, in which the inhabitants were undertaking floodplain aquaculture similar to that of Medila, also observed elevated nutrient concentrations, affecting their potato crop production (Toufique and Gregory, 2008). Secondly, yearround cultivation requires a relatively smaller amount of feed since the fertilized water remains in the beel throughout the year causing algal blooms which are consumed as food by filterfeeding carps. In the six months cultivation scheme these nutrients are lost after each cycle, when the water retreats from the beel. A third reason was that the pangasius beel farmers offered a very high lease value for the land, making many farmers eager to lease out. A fourth and final reason was mentioned by a farmer that was part of the group of farmers cultivating carp in Molliks beel. He mentioned that the fish harvesting time was always a very busy time in which all 30-35 farmers had too help. Since all farmers had other income generating occupations, a lack of manpower during harvesting time was common. This, together with the increasing lease value, could have made the decision of leasing out land an easier step to make. The situation discussed in this chapter shows resemblance to the large-scale shrimp aquaculture in Southern Bangladesh, in which 'shrimp-lords' aquired land from local farmers through lease and purchase (Ito, 2002). In total, out of the 13 pangasius beel farmers operating within in the village, 5 (possibly 2 more) are operated by outside investors, aquiring access to land mostly via leasing. Unlike some examples of boom crops given in chapter two, the outside investors in Medila are all from within Bangladesh.

While most pangasius is cultivated in beels, there are also some ponds that grow out pangasius. However, most of the ponds are small ponds used as nurseries for both carp and pangasius. Since this is a smaller investment, nursing carp or pangasius is done also by the less capital rich farmers.

They sell their fingerlings primarily to the pangasius beel owners of Medila. These nurseries started to arise after pangasius was introduced. Figure 5.2 shows a small pangasius beel with a small section

Figure 5.2 Small pangasius beel with a nursery

reserved a as nursery. In comparison with the pangasius farmers in Bawalia, both nursery farmers and growout pangasius farmers in Medila use factory-made feed. Therefore, Medila doesn't have the numerous feed mills that are to be found in Bawalia. Another difference between the two village is the variety of labour opportunities that arose as a result of the pangasius boom crop. Pangasius pond cultivation in Bawalia appears to have provided more aquacultural labour opportunities in comparison to Medila. This topic will be further discussed in section 5.3.

Most of the beels in which carp was cultivated shifted to pangasius cultivation after 2006. During these years and mainly in the last couple of years also new beels have been created, thereby decreasing land available for rice cultivation. The world food crisis in 2008 put a hold on the creation of new ponds or beels for the length of a year. Whereas the year 2008 had a profound impact on the then pangasius farmers in Bawalia, this was not the case for Medila. In Bawalia the crisis led to large losses for pangasius farmers, that resulted in many of them losing access to their previously cultivated ponds. The large pangasius farmers in Medila were financially strong enough to undergo the crisis, thus leading to no noteworthy effects on the development of pangasius in the village. During the time in which fieldwork was conducted it became clear that a large new pangasius beel is soon to be created next to the brickfield inside of the haor. Negotiations between the brickfield owner (the prospective beel farmer) and the local land owners were on going. This example indicates that the pangasius development in Medila didn't reach its maximum yet.

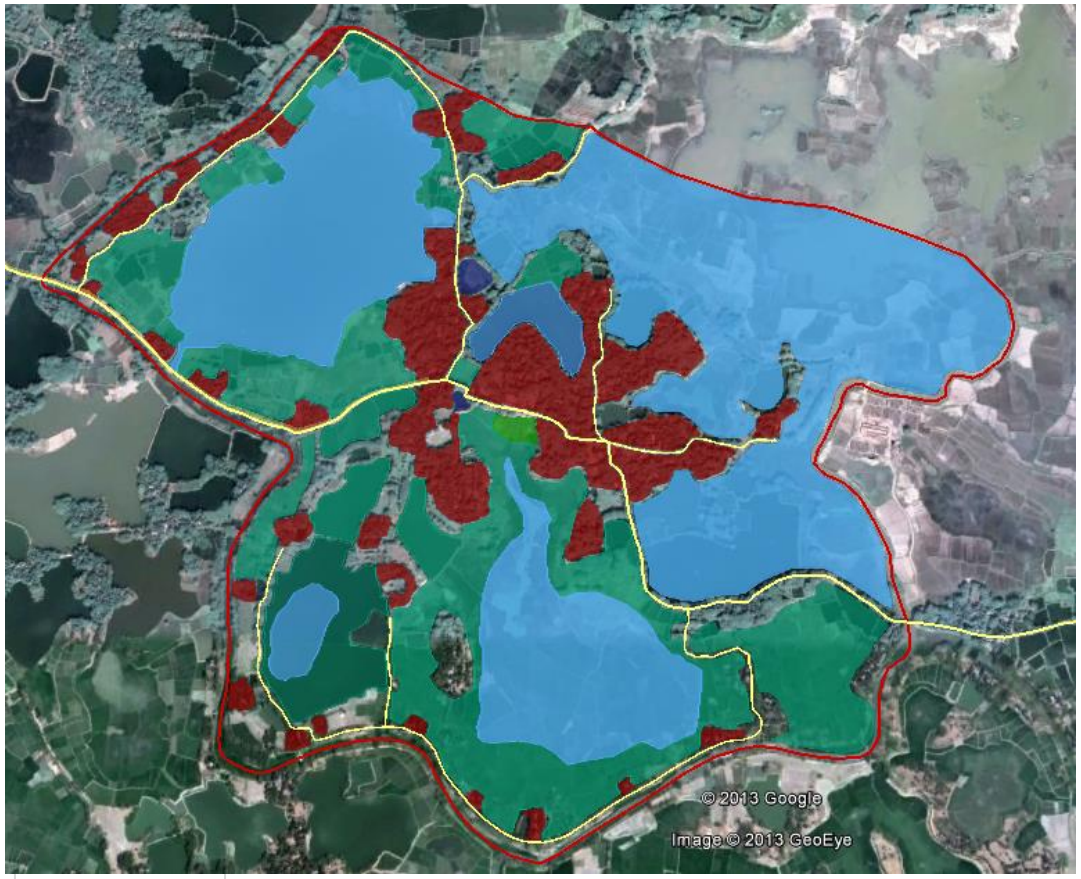


Figure 5.3 Medila land use before 1990

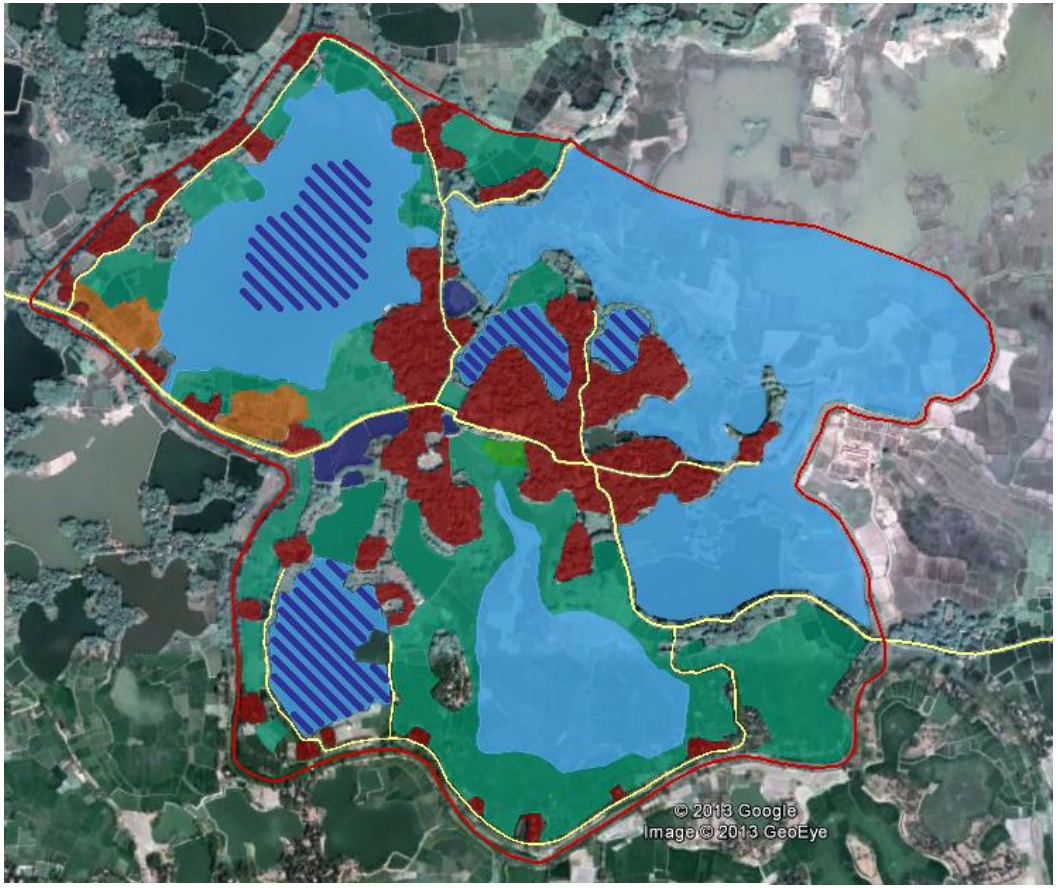


Figure 5.4 Medila land use 1990-2000

Legend
6 months fish cultivation + 1 rice crop
Year-round fish cultivation
Beel: 2 rice crops per year
Beel: 1 rice crop per year
Homestead area
3 rice crops per year
Brickfield
Currently fallow land
Small dirt road
Semi-paved road

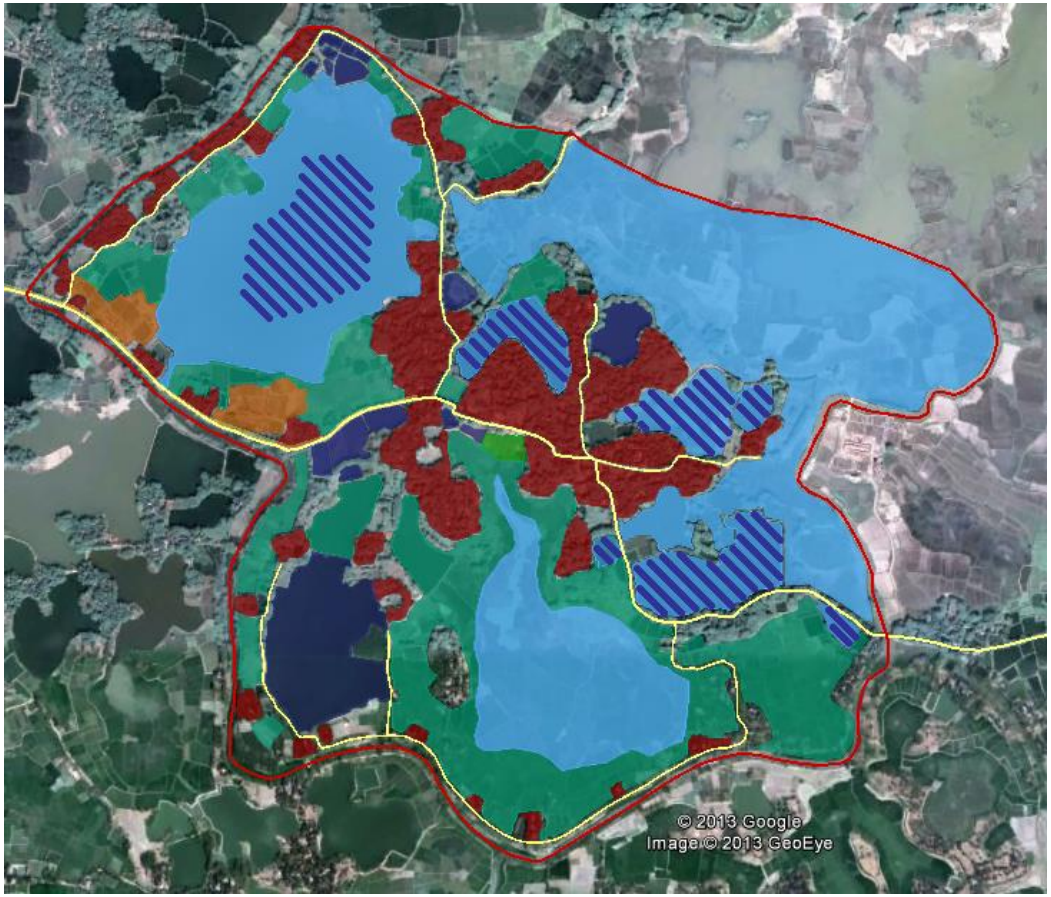


Figure 5.5 Medila land use 2001-2005

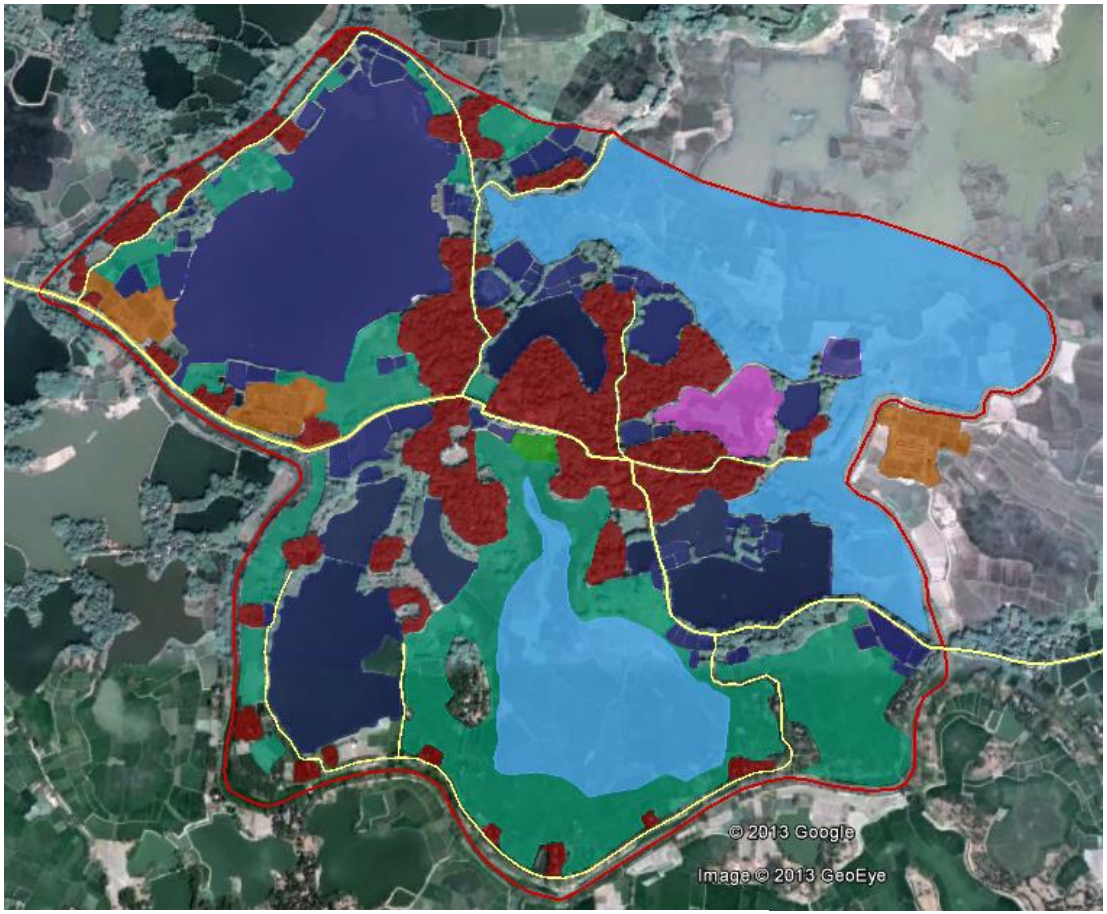


Figure 5.6 Medila land use 2006-2012

5.2.3 Changes in land relations

Pangasius aquaculture in Medila developed in a very different manner than in Bawalia. While there are some ponds that cultivate growout pangasius in a smaller scale, most of the cultivation is done in large beels. As table 5.2 shows, pond ownership in Medila is with 10% also much lower compared to that of Bawalia, where 62,4% of the households own a pond. Medila's geography as a lowlying area containing several natural beels made that large scale beel cultivation became the most dominant form of pangasius aquaculture. Figures 5.3 to 5.6 also clearly indicates the lack of many ponds. One reason for why Medila cultivates pangasius in beels rather than in ponds is that in some areas of the village many of the small ponds experience difficulties in containing a high waterlevel throughout the year. During the dry months the watertable drops dramatically, making yearround cultivation near to impossible. Most of the small ponds present in the village are thus used as nurseries. One farmer stated that a shallow tube well cannot pump up water during the dry season making him dependent on deep tube wells. Since his ponds don't have an inlet that is connected to a deep tube well he uses a shallow machine in the dry season to pump water in his ponds from the beel.

Table 5.2 Pond ownership in Medila

Pond ownership status	# (= %)[1] of households
Pond owners	**10**
Current operational status of pond(s)	
Leased out	5
Owned	1
Owned + Leased in	1
Leased out + Shared out	1
Shared out	1
Mortgaged out	1
Non pond owners	**89**
Current operational status of pond(s)	
Leased in	2
No pond owned or leased etc.	87
Operational status unknown	**1**
Total	**100**

[1] Since the sample size is 100, the percentage equals that of the number of households.

Source: WorldFish Survey

Another reason for why Medila prefers beel cultivation over that in ponds, is because the high risk of regular floodings makes creating ponds in a beel area problematic. These ponds would require very high dikes and thus a large investment. In the years of 1998, 2000 and 2010 large floodings occurred. In 2010, many pangasius farmers lost (part of) their production when the dikes overspilled. As Figure 5.5 and 5.6 show, most of the pangasius beels were created in areas surrounded by higher elevated land (e.g. the main road, homestead areas) so that only one side had to be raised in order to close off the connection to the haor. Medila's yearround pangasius cultivation is a riskful activity, challenged by a highly fluctuating watertable and regular floodings in the raining season. The differences in

geography between the two villages are thus the main driving force behind the development of the two production systems.

One of the main reasons why pangasius developed into such an important activity in Medila is its easy connection to the Dhaka-Mymensingh highway. This road was made in 1978 and paving of it started at the Dhaka-Mymensingh highway intersection in 1992 and gradually increased towards Medila. The road passes through the middle of Medila which makes that most beels have a direct access to it, therefore facilitating pangasius cultivation. Several other villages in Medila's vicinity cultivate pangasius in beels. Key to this is a good road connection. The quality of Medila's main road deteriorates after it leaves the village on the eastern side, thus it is said that pangasius cultivation is less developed in those areas. This is also the area where many of Medila's labourers come from.

Throughout the '90s and '00s the competition for land increased dramatically, which led to an increase in the land value. The main drivers behind the increasing competition for land are the fast growing population and the introduction of (pangasius) aquaculture that greatly reduced the amount of land available for agriculture. At the time that carp cultivation started in Molliks beel in '95-'96, the lease value for land owned by people that didn't join the cooperative was 47,- US $/ha, for six months of the year. The other six months of the year land owners gained an income from their land by producing one crop of rice. After the first lease period was finished, this increased to 235,50 US $/ha in 2006, again for only six months of the year. In 2012, the lease value made another jump when Mollik leased in the total area with a lease value of 1650,- US $/ha per 12 months. Other pangasius beels show similar lease values. Two beel farmers that started pangasius cultivation in 2006 paid landowners a lease value of 707,- US $/ha per year. After a five years lease this increased to a current lease value of 1884,- US $/ha. One farmer mentions that he leases out land situated in Taraquls beel since '06-'07. The first five years of the lease he received 754,- US $/ha per year, which is increased to 848,- US $/ha per year for the remaining three years of the lease. He says that the lease value is more than he previously earned from rice cultivation, but that he still feels that he is losing out because the current lease value is at 1884,- US $/ha. In previous times, the value of land was based upon the amount of rice a farmer could produce on it. A lease value thus more than compensated the loss in rice production for a farmer. Nowadays the competition for land is very high and the value of land is determined by the person placing the highest bid. Since the competition for land remains high, an even higher lease value can be expected in the future.

While the pangasius production system in Medila differs dramatically from that in Bawalia, it had similar outcomes regarding the increase in land value. At the time a beel was leased out for pangasius cultivation the value of the land increased tremendously. However some beel plots increased more in value than others. Previously, plots situated in the lower areas of the beel had very little value. These plots were often inundated for 12 months of the year, with only one specific rice variety able to grow at these conditions. With the introduction of year round pangasius cultivation, plots in the middle of a beel suddenly received the same lease value as land on the bankside. For those farmers owning land that is inundated for 12 months of the year, where rice cultivation is near to impossible, the relative increase of revenues from the land is much higher compared to the farmers that could already cultivate one or two crops.

The increasing competition for land didn't only effect the lease value, it also led to changes in the sharing system. Sharing land has been common in Bangladesh for many years. It provides access to

land for the landless, while landowners who don't have to cultivate the land themselves still receive a share of the yield, either in cash or in kind. Alauddin and Hossain (2001) discuss the problem of access to land by the landless and near-landless and observe an overal decline in the size of landholding associated to the declining trend of sharecropping, for landowners prefer to keep their land to themselves. In order to safeguard some agricultural land it has become more common over the last 20 years for a sharecropper to pay a cash deposit to the landowner. This has been initiated for the first time around 15-20 years ago by sharecroppers that were competing for plots of land to cultivate rice on. However, not all sharecroppers have to pay this deposit. In those cases in which a landowner directly shares out land a deposit is common. In cases in which land is leased in by a farmer who then shares out the land, often no deposit is asked for. The latter case involves a farmer who tends to be more capital rich since he already leases in the land. This farmer doesn't need the deposit. Sharecroppers have also stated that in many cases in which a good relationship between the landowner and sharecropper exist (e.g. family ties), no deposit is asked for. Regarding the costs, one farmer stated he paid an advance of 470,- US $/ha last year. To indicate the increase in competition the man points out that 15 years ago he paid an advance of between 95,- and 140,- US $/ha.

Private property rights in the natural floodplains existed already before the introduction of pangasius cultivation. It was however limited to the six months of the year when rice was cultivated, making it common property for the rest of the year. The small indigenous fish species caught from these floodplains were of great importance for especially the poor, since they are higher in micronutrients compared to cultured species such as carps (Belton et al. 2011). The privatisations of the previously open access beel restricts the access to the beel. Last year molliks beel yielded mola (*amblypharyngodon mola*), a small indigenous fish species, worth of 3100,- US $, which was shared among the cooperative carp cultivators. This year no more mola will be caught in this beel because it is currently being converted into the a pangasius beel. This process corresponds to the case described by Deb (1998), in which the transformation of multiple-use coastal resource system into a privately owned single-purpose use deprives the coastal communities of their traditional resource use rights. Often these communities have been using the resource in question for generations. And though often people are not regarded as professional fishers, many of the poor and also other social classes were previous to the privatisation of the floodplain involved in subsistence fishing, with some also selling some fish in local markets (Toufique and Gregory, 2008), as also observed in the case of Medila.

5.3 Livelihood pathways

5.3.1 Introduction

As in the previous chapter, this section describes the ways Medila's households have been affected by the pangasius boom crop. The same three categories, with landholding as a starting point, are taken to discuss the different pathways undertaken by Medila's households. As in Bawalia, Medila has a large group of landless households, who represent the first category. The definition of landlessness, used by Belton et al. (2012) show that 58% of the households are functionally landless. As described in the previous chapter this thesis uses a different definition. Households solely owning a homestead and a homestead garden are included in this definition, accounting for 43% of the households in Medila. As is common for most households, they gain an income from multiple

sources. Whereas two separate pathways are described, most households are involved with both of them, that is labour and sharecropping. However, since sharecropping is still an important livelihood activity in Medila (in comparison to Bawalia) a distinction between the two is made. The second social class described in this section comprises of small landowners. Since pangasius culture in Medila is primarily done in beels that require an immense investment, small landowners are only involved in aquaculture in the form of pangasius and carp nurseries. However, most households belonging to this social class lease out (part of) their land to pangasius beel farmers, either willingly or not. This latter pathway is also represented in the third and final social class, that of large landowners. Similar to the small landowners, many lease out their land to the pangasius beel farmers. Apart from leasing out land some larger landowners have been in the position to start pangasius grow out culture in a beel. While some beels are cultivated by large landowners from Medila, the largest pangasius beels are cultivated by wealthy outside investors. Unlike Bawalia, where pangasius farmers are to be found in all social classes, in Medila pangasius farming is confined to only a few large landowners.

5.3.2 Landless

Labourers

In Bawalia, the introduction of pangasius led to a tremendous increase in labour opportunities, from which many landless households gained. In Medila, pangasius cultivation developed differently, with far less labour opportunities arising from it. Nowadays beel owners in Medila also use digging machines, resulting in less man labour needed to dig and excavate ponds and beels. A total of 100 and 101 households were surveyed in Medila and Bawalia respectively. Within these households only one person works as an earthwork labourer in Medila, whereas 30 household members in Bawalia state earthwork as either their main or second occupation. In Bawalia, pangasius is harvested throughout the year providing work for many labourers. Medila on the other hand, has only about 10-15 pangasius beels in total, providing far less work for fish harvesting labourers. Not only did beel cultivation provide less labour opportunities, also many of the aquacultural related jobs are fulfilled by labourers from nearby villages. Medila inhabitants are more often occupied in non aquacultural related self-employment, trading or salaried jobs such as in the garment industry (see also Table 5.3 below). These jobs are not considered that labour intensive compared to aquacultural related labour and provide a higher income. Since these non-agri/aquacultural related jobs are available, Medila inhabitants prefer these types of work. A large share of the aqua- and agricultural labour workforce thus come from villages that are further away from the highway and Bhaluka. In those villages work opportunities are less and wages are lower.

In general, Medila's vicinity to an urban area offers a wider range of job opportunities and is therefore less oriented on aquacultural related labour as is the case in Bawalia. The survey data, regarding the first and second occupation of all household members over the age of 8, supports these findings. Table 5.3 differentiates occupation related to agri/aquacultural work and non agri/aquacultural work. It shows that in Medila a much lower percentage (54%) of the working population gains their main income from work related to agriculture or aquaculture, as is the case for Bawalia (78%).

Table 5.3 Occupation in Bawalia and Medila

Occupation	Bawalia				Medila			
	Main occupation		*Second occupation*		*Main occupation*		*Second occupation*	
	% of working population	% related to agri-/aquaculture	% of working population	% related to agri-/aquaculture	% of working population	% related to agri-/aquaculture	% of working population	% related to agri-/aquaculture
Labour	**17%**	**15%**	**15%**	**14%**	**13%**	**8%**	**7%**	**5%**
Agricultural labour		6.3%		2.7%		6.4%		5.2%
Earth work labour		8.0%		10.8%		0.9%		-
Fish weighing		0.6%		-		-		-
Feed mill labour[15]		-		0.7%		-		-
Rice mill labour		-		-		0.9%		-
Trader	**3%**	**1%**	**1%**	**1%**	**15%**	**5%**	**3%**	**2%**
Salaried worker	**12%**	**5%**	**6%**	**3%**	**20%**	**1%**	**4%**	**1%**
Self-employment	**14%**	**6%**	**13%**	**11%**	**23%**	**11%**	**13%**	**8%**
Fish harvesting		4.5%		6.8%		5.5%		3.5%
Fishermen		0.6%		2.7%		-		4.3%
Guard		0.6%		-		-		-
Rickshaw/van pulling		0.6%		1.4%		5.5%		-
Production	**1%**	**0%**	**3%**	**0%**	**0%**	**0%**	**0%**	**0%**
Farming and livestock	**51%**	**51%**	**61%**	**61%**	**29%**	**29%**	**72%**	**72%**
Working own crop farm		3.4%		22.3%		22.9%		25.2%
Sharecropper		-		-		0.9%		0.9%
Fish farming		34.7%		8.1%		1.8%		2.6%
Livestock/poultry rearing		12.5%		29.1%		3.7%		43.5%
Other self-employed farming		0.6%		1.4%		-		-
Other	**2%**	**-**	**2%**	**-**	**0%**	**-**	**0%**	**-**
Total	100%	**78%**	100%	**90%**	100%	**54%**	100%	**88%**

Source: WorldFish survey

[15] Some feed mill labour has been categorized under 'salaried worker', since they often receive a monthly payment.

Sharecroppers

As mentioned in the start of the chapter, cultivating rice for household consumption is still common among households in Medila. This section describes the effects of the pangasius development on landless households that earn a large share of their income from sharecropping. The survey shows that 62 out of the 100 households grow rice themselves, of which 40 households cultivate rice on shared in land. Within these 40 households, 85% relies entirely on sharing in land for their rice cultivation and do not own any other crop land. The remaining 15% share in some land but also cultivate some rice on land owned by the household. Sharecropping is mainly done by households that own little or no agricultural land. It provides them access to land, and in return they have to share the plot's yield with the landowners, while investing time and labour into the cultivation. Sharecropping is considered by many villagers to be an income generating activity that demands intensive labour but has low returns, with many villagers stating that sharecropping isn't profitable anymore because of the low market price for rice and high input prices.

The increasing competition for land, described in section 5.2.3, makes it more difficult for (near) landless households to gain access to land by sharing in a plot. In the past sharing in land did not require any initial investment apart from the input costs such as fertilizer and seeds. The increasing competition however led to many sharecroppers having to pay a deposit for the land they want to share in. One sharecropper mentions the difficulties he has with managing the money to pay the deposit. The approaches of the farmer to manage the deposit vary from using his own savings, to taking a loan or resorting to selling an agricultural asset (e.g. a goat). In the 15 years that he has paid a deposit for sharing in land, the amount of the deposit has been quadrupled. Increasing competition on agricultural land, partly induced by the pangasius development, thus leads to the exclusion of land for landless sharecroppers. Medila villagers mention that the number of people that still sharecrop has been halved since the '90s. However, the lack of agricultural land available isn't the only reason for this. Because of the increase in input prices and a low market price for rice, sharecropping as an income source has become less profitable over the years. A combination of high input prices and a low market price, a reduction of agricultural land available and the initial deposit that is nowadays often necessary to share in land, resulted in many farmers searching for other sources of income.

5.3.3 Small land owners

Leasing out land

This section describes two examples that occurred in Medila that present a clear picture of the problems related to leasing out land. As was the case in Bawalia, many households in Medila owning some agricultural land saw themselves forced to lease out their land to pangasius beel farmers. The first example discusses this process and the reluctance of small land owners in leasing out their land. Secondly, an example is discussed that is concerning the problems that originated between land owners and beel farmers.

This is best explained by discussing one (recent) case. In 2012 Mollik leased in a large area that formed the biggest pangasius beel in Medila so far. Around 130-135 people leased (part of) their land to Mollik, an outside investor that has yet to start cultivation. Not all landowners were eager to lease out their land and on many occasions respondents stated they leased out 'because everybody else did'. It were only the larger landowners that actually met Mollik, most of whom were leaders of the collective carp cultivation. These larger landowners were interested in leasing out to Mollik, since he

offered a much higher lease in comparison to what the landowners currently were gaining from the land. This group of landowners, who often enjoy an important status in the village, persuaded the other smaller landowners in leasing out. In this way many small landowners lost access to their land, either willingly or under pressure from more influential and larger landowners. Many households still prefer to be able to grow their own rice even though the income from the lease is higher than the income they generate from rice cultivation. In general, landowners that do not own any land apart from the land inside the pangasius beel are discontent with the situation, since they cannot grow rice elsewhere. Landowners that also have some land elsewhere, in the open beel or the haor, are more interested in receiving the income from the lease since they have the opportunity to cultivate rice somewhere else. This example shows that peer pressure by influential (large) land owners led to small landowners leasing out their land and thereby giving up on rice cultivation. While the case of land owners leasing out to Mollik is discussed here, similar stories are known to have happened in other pangasius beels as well.

The following example shows the extent to which farmers might lose control over their land when they have leased it out. In 2006, Chowdury leased in a beel from 50 local landowners for a five year period. The beel is surrounded on most sides by homestead areas. During the lease period the households noticed an increase in the bankside erosion of the beel, caused by the year round pangasius culture. During the negotiations undertaken at the start of the second five year lease period, the households affected by the erosion requested to Chowdury to repair the bankside of the beel and to take immediate precautions to prevent further erosion. Chowdurys plans on making a dike in a couple of years which is unacceptable to the landowners who already lost part of their homestead area. Another aspect of the problem is that Chowdury made a loss with his pangasius culture, which might be the reason why he is unwilling to pay for the repairs. The conflict between Chowdury and the landowners who have their homestead next to the beel led them to distrust Chowdury. They state to have become unsure whether he would not disappear at the end of the lease period without paying the lease of the final year. A local meeting was arranged with the beel landowners, Chowdury and some of Medila's political figures, to settle the dispute. In the meeting it was decided that Chowdury had to pay the lease and create a dike to prevent further erosion of the homestead areas. Paying the lease at the start of the year is common throughout Medila, and it has been done by Chowdury as well in his first term. He has paid the first lease amount of the second lease period to some of the beels' smaller landowners, but the family interviewed, who own close to 20% of the land in the beel and are thus one of the larger landowners, didn't receive any lease yet. At the time of the fieldwork the negotiations regarding the new lease contract were already on-going for about six months, with no agreement in sight. Chowdury still has some carp in his beel but the last pangasius harvest was already one year before. The family interviewed mentioned that they rather wanted to cultivate the beel themselves after the first lease period ended, but that they didn't have sufficient financial backing. They express being very uncertain about whether their homestead will be safeguarded from further erosion and whether they will receive the lease amount. They state that erosion occurs in every pangasius beel, but not all beels have as many homestead areas adjacent to it. Nevertheless, repairing damage occurring from erosion is an important part of the lease contract with Mollik. Also, two examples concerning (the risk of) erosion are known where beel farmers, both having family ties in Medila, repaired or prevented the damage. In the case of shrimp culture in Southern Bangladesh a growing amount of conficts between shrimp farm owners and paddy cultivators have been observed, sometimes resulting in bloodshed (Deb, 1998). While tragic

events like these have not yet occurred in Medila, it does seem that the small paddy farmers have fallen victim in the hand of pangasius beel farmers, similar to the case of large shrimp farmers (Deb, 1998). It remains unclear what local authorities can do against these powerful pangasius beel farmers.

It is important to note that while the above might suggest otherwise, not all landowners had problems with leasing out their land. Households which members are involved in other professions and previously shared out the land they owned, prefer the current situation in which they lease out the land. Since sharecropping has become less profitable over the years, the high lease value provides a more lucrative option for them. Another reason for people to lease out land is the fact that rice generates only a very little surplus income these days, with the market value of rice being low while the cost for agricultural labour is high. For those landowners owning land in surplus to what they need for their own subsistence requirement for rice, leasing out land is then a more attractive option.

Nursery farmers

Since the introduction of commercial aquaculture some of Medila's small and larger land owners started nursery cultivation with which they provide fingerlings to the beel farmers. Whereas many of the pangasius beel farmers come from outside of Medila, nursery farmers includes the local landowners. As mentioned above, remaining a high water level in ponds in Medila requires more effort compared to Bawalia. A cultivation period for a nursery is much shorter than that of a grow out pond and the necessity for a pond to contain water year round thus doesn't exist. Issues with water management is however, only one reason as to why most farmers only use their ponds as nurseries. For many farmers, the large investment that is required for grow out pangasius culture keeps them from cultivating pangasius through an entire grow out cycle. Many of these nursery farmers are satisfied with selling fingerlings, since this already provides them with a significant increase in their income.

Medila has one feed mill and that is only used by the owner itself. Nursery farmers thus solely use factory feed for their ponds in which they nurse either carp or pangasius. To cope with the problem of not finding enough fingerlings to stock their beels, several pangasius beel farmers created own nursery ponds at the sides of their beels. Most of the nursery farmers started cultivation after pangasius took off around 2005-2006. While pangasius beel culture might reach its maximum within a couple of years, nursery cultivation in smaller ponds requires only small areas and could therefore continue to grow.

5.3.4 Large land owners

Leasing out land

For both Bawalia and Medila, the category of large landowners contains the smallest number of households in comparison to the two categories described above. Many large landowners own land inside pangasius beels that they lease out to pangasius beel farmers. As for small landowners, larger land owners don't mind leasing out this land as long as they still have some land available for rice culture elsewhere. Another reason mentioned to not lease out land, is that sedimentation in the beel increases the elevation of the land. This is unwanted since it negatively effects rice cultivation. Using

a beel for aquaculture makes it thus unsuitable for rice cultivation after some years of pangasius cultivation.

Since most of the valuable agricultural land in Medila is now converted into pangasius beels, the larger landowners owning land in the open beel do not want to lease out this remaining agricultural land. This is considered to be the main reason as to why this beel hasn't become a pangasius beel yet. The larger landowners are most influential in whether or not to lease out a beel for pangasius cultivation, so their reluctance in leasing out is decisive. Larger landowners thus have a better bargaining position and more control over maintaining access to their land. However, while they have this influential power over smaller landowners, larger landowners are in their turn also controlled by the beel farmers, meaning that they are not safeguarded from conflicts like in Chowdurys beel.

Pangasius beel farmers

Depending on what counts as a a beel, and what is a pond or a *kuri*, Medila has around 13 pangasius beel farmers. Between 5-7 of these beel farmers are from Medila itself. They are without exception large and wealthy landowners, who often have an important political status in the village. Opposed to most of Bawalia's pangasius farmers, Medila's beel farmers are only involved in the management of the cultivation. In this sense they have more similarities to the owners of the Pankuri and Reza Ali farm. Another difference is that pangasius beel farmers almost always uses nightguards. Bawalia farmers mentioned it being impossible to steal pangasius since it involves a lot of noise. Whereas Bawalias ponds are situated relatively close to its homestead areas, most beels in Medila stretch out to the edges of the village, making it easier to steal. Another difference with pond cultivation is that beels are far less intensively used compared with the ponds in Bawalia. Similar to Bawalia, pangasius beel farmers in Medila stock as many fingerlings as they can afford to grow out. However, one beel farmer mentioned a lack of supply of fingerlings, forcing him to stock fewer fingerlings than he wanted. Many beel farmers buy their fingerlings from multiple sources, with some also owning nurseries themselves. Since about 4-5 years ago beel farmers started using excavation machines to create the dikes and nursery ponds in their beels. These machines were initially only used in the brickfields. Nowadays all beel farmers use them for they are both faster and cheaper compared to man labour. Man labour however, remains necessary since the machines cannot access all places.

As is the case for nursery farmers, pangasius beel farmers only use factory-made feed in their beels. Some buy this ready made, others provide the raw materials and rent a factory mill to have their own feed made. Regardless of the dominance of beel culture, there are some pangasius pond farmers in Medila. They use their smaller ponds for nursery and the bigger ponds for growout. There are no pangasius farmers with only one pond as in the case in Bawalia. The pangasius pond farmers in Medila have maybe three small nursery ponds and 2 larger growout ponds that are managed on a daily basis by someone else. Pond cultivation of pangasius only started after the pangasius development in the village took off.

5.4 Conclusion

This chapter provided a clear description of the development of the pangasius boom crop in Medila and discusses the evolving livelihood pathways related to it. By elaborating on the livelihood

pathways this chapter provided more insight into the effects of the boom crop on the rural society in general and more specifically on its inhabitants. This will form the basis for a discussion concerning the aquarian nature of aquacultural boom crops and in what way this affects households differently to that of agricultural boom crop. Since both case studies have been presented, this conclusion will already provide some comparison between the two.

Pangasius cultivation in Medila developed rather differently from that in Bawalia. Medila's geographic location as a low-lying area made that cultivation in large beels became the most dominant production method. The beel culture developed in Medila is a higher capital demanding activity in comparison to the small scale pond culture in Bawalia. Unlike in Bawalia, where farmers from all three social classes (landless, small and large landowners) joined the pangasius boom, Medila's pangasius beel farmers consists only of large landowners and outside investors. Medila's vicinity to Bhaluka, the largest town in the area, provides a wide range of working opportunities that are unknown to Bawalia. Many of the pangasius labour is undertaken by labourers from villages further located from Bhaluka. There is thus some spillover effect of the pangasius boom crop to nearby villages. Another interesting aspect of Medila is that many of its households found opportunities to work abroad for some years, sending back remittances to their families. In many occasions this provided the starting capital for a nursery, the one aquacultural activity that is also practised by the smaller landowners.

Households have been effected by the pangasius boom crop in different ways. The changes in land arrangements, most significantly the increase in land value, loss of access to land by leasing out and the changes in the sharing system, influenced the households' livelihood pathways significantly. In many cases land owned by a large number of local landowners, is now controlled by one pangasius beel farmer. Even though these beel farmers lease the land and technically not own any of it, the local landowners lost their direct access to it. Chances of getting their land back are slim and even when they do it is often not suitable anymore for rice cultivation. Many of these smaller landowners own no land apart from the plots inside of one pangasius beel. In many cases they were persuaded in leasing out their land by the villages' large landowners. Apart from the small landowners, a large share of the landless households who used to sharecrop land now lost their access to land to pangasius beel farmers. In order to sharecrop land and thus maintain their access to land, they often have to pay a cash deposit to land owners. However, many of Medila's inhabitants found work opportunities elsewhere and prefer these over labour intensive work such as agricultural or aquacultural related labour. With only a handful of pangasius farmers originally from the village, many of its households finding none agri/aquacultural jobs elsewhere and with the decreasing availability of agricultural land, Medila's inhabitants are far less involved in an agrarian lifestyle these days, compared to the people of Bawalia.

Similar to Bawalia, households in Medila were highly affected by the pangasius development, mainly because of its effect on the existing land arrangements and land value. The transition from a traditional agricultural system into a more commercial one however, didn't include as many households in Medila as was the case for Bawalia. This indicates that class mobility is not as an important livelihood pathway driver as it is for Bawalia.

6. Discussion

6.1 Introduction

This thesis shows boom crops as a specific type of agrarian transition. The dynamics of this capitalist development differ from 'regular' agricultural expansions in their rapidity and intensity. Boom crops are primarily known for their fast emergence and, in some cases, also go bust in an abrupt fashion. The boom crops intensity relates both to the amount of land devoted to the crop and the number of people that participate in the boom crop. Many farmers in Bawalia and to a lesser extent in Medila responded to the vision of prosperity brought by the new and highly lucrative crop. The previous two chapters clearly illustrate this booming character of the development of pangasius production in Mymensingh, Bangladesh. They aimed to investigate the effects on households by identifying and describing the different livelihood pathways originating in the two villages as a result of the pangasius boom crop.

By identifying multiple livelihood pathways within a village and between villages, this thesis shows the multidimensional character of an agrarian transition. The stories of a particular site are connected to the broader trend of commercialisation of the rural areas as seen throughout South and Southeast Asia. It is only by understanding the changing livelihood pathways of the people at the core of an agrarian transition that one can draw out potential generalizations about the drivers of livelihood pathways and in a broader sense about agrarian transitions. The following section of this chapter looks into the three most important driving forces of the different pathways by comparing the two villages on the key concepts set out in the analytical framework and that were most important in both Bawalia and Medila. It discusses the way local geography, access to land and class mobility shaped the originating livelihood pathways. Section 6.3 integrates these themes into an understanding of the pangasius boom crop in the two villages and the varying effects it has on households livelihoods. It discusses how households are not only affected by the boom crop, and by agrarian transitions in general, but also how they have an active role in shaping the transitions of which they are part of. The chapter continues by broadening its scope again, in the form of a theoretical discussion concerning the possible difference between agrarian and aquarian transitions. Finally, a conclusion is presented, discussing recommendations for further research.

6.2 Evolving livelihood pathways in Bawalia and Medila

6.2.1 Moving beyond randomness

The introduction of capitalist dynamics in rural societies often brings many changes for rural households. Resulting from a higher orientation towards the market, the once secluded villages witness an increase in rural-urban interpenetration. The changes related to this boom crop lead to both new opportunities, as well as to drawbacks for the households involved. Prior to the boom crop many people in Bawalia and Medila were on similar livelihood pathways. As has been identified in the previous two chapters, the new opportunities and drawbacks led to a wide divergence of pathways, thereby increasing the complexity of the rural society. The pathways in Bawalia and Medila, that evolved in light of the pangasius boom crop, show how some households have been able to move beyond poverty, whereas others have indicated to be worse off compared to their pre-boom lives. What determines this variation in outcome, seems to be random at times. However, as

De Koninck, Rigg and Vandergeest (2012: 23) suggest, "these pathways are not entirely random, but particular outcomes can be associated with how people are likely to act in the context of distinct sets of *enabling conditions*" (i.e. drivers). Thus, while generalizations from different cases are always problematic, it is possible to make suggestions about certain drivers that enable particular pathways, to resolve this sense of randomness in agrarian transition studies. The livelihood pathways as presented in this thesis singled out a set of drivers. These drivers proved to be instrumental in defining the course of livelihood pathways and in their turn the course of the boom crop. While these drivers play a significant role in determining the course of a livelihood pathway, it is important to recognize that ultimately it is households themselves that make these livelihood decisions. This thesis recognizes the agency of people at the centre of the agrarian transition and shows that people not only encounter and respond to changes in rural livelihoods, but also play an active role in shaping these changes. Thus while people in Bawalia and Medila actively adapt to changes occurring in their environment, their actions are also shaped and constrained by processes that are either related to the boom crop or not.

The conceptual diagram presented in the analytical framework (Figure 2.3) present the three drivers, geography, land access and class mobility, and highlights their interconnectedness. This diagram will be used in section 6.3 to illustrate the relative importance of each driver in determining livelihood pathways, at certain times during a boom crop.

6.2.2 Geography

The two empirical chapters clearly show the major difference between Bawalia and Medila in terms of their natural surroundings and how this influenced the pangasius development in the two villages. While this thesis places geography as one of the drivers of livelihood pathways, it is careful to stay away from geographical determinism in which the biophysical conditions of a specific site are given primary importance. Not only is geography part of a *set of conditions,* together with class mobility and land access, the concept itself should also be extended. Geography (nature) isn't merely the context where activities are undertaken, it includes the interactions between human agents and active nature that shapes the agrarian transition and is therefore an important driver of it.

The pangasius development in both Bawalia and Medila was initially shaped by its geographical conditions, but in turn also became instrumental in shaping local geography. As presented in the two previous chapters, the two villages are visually very different from each other and have quite distinctive natural surroundings. The pangasius development in the two villages were shaped accordingly to their geographical differences, leading to the development of two different production systems. The high risk of flooding associated with the lowlying area surrounding Medila prevented the development of pond cultivation. The existing natural beels that could be disconnected from the haor proved to be the best opportunity for pangasius cultivation. These pangasius beels are large in size and therefore require very high investment costs. This made that small scale culture is non-existent in Medila, apart from some small nurseries. Bawalia, on the other hand, developed into a pangasius pond village. Here, the necessity to cultivate pangasius in large beels didn't exist since flooding is far less frequent for it is a higher elevated area. Farmers in Bawalia were able to convert their own land into ponds instead of being limited to certain existing natural depressions as was the case in Medila.

Apart from how the pangasius boom crop was shaped by geographical conditions, an important point for discussion is the way the pangasius boom crop shaped the natural landscape and to what extent it did this. As shown in the second chapter, large scale land conversions are characteristic to boom crops. However, where most of the boom crops documented in scientific literature involve land, and are thus agricultural in nature, this thesis describes an aquacultural development in which water is the main element. In line with Fougères, this thesis underlines the importance to differentiate between agricultural and aquacultural transitions. Fougères (2008) argues that water as the essential biogeochemical force of production in aquaculture makes a significant difference for production. The wetland reconstruction necessary for aquaculture, as seen in both Medila and Bawalia, are "analogous to how agriculture changes land, yet it is an order of magnitude more radical" (Fougères, 2008: 74).

While Fougères bases his statements regarding the distinctiveness of capitalist development in aquaculture and fisheries on coastal shrimp cultivation and live reef fish fisheries, this thesis claims that the same can be made for inland pangasius cultivation in Bangladesh. The adapted satellite images provided in the chapter four and five clearly show a radical change in the landscape caused by the pangasius boom crop. In Medila the boom crop led to the reconstruction of a large cluster of interconnected wetlands with a high diversity of native fish species, into a collection of artificial lakes disconnected from the haor, and in which the high water level is constant year round. Nowadays, the wetland that was highly marginal from an economic perspective by having little production in former times, is now intensively cultivated throughout the entire year. While Bawalia contains fewer wetlands the reconstruction of the landscape was as comprehensive as of that in Medila. In Bawalia, highly valuable agricultural land was converted into ponds, turning the green landscape that was mainly used for rice cultivation into a blue landscape that is used exclusively for aquaculture.

What differentiates an aquacultural boom crop from an agricultural one is not solely the radical change of the landscape, but more so the permanent character of it. While it might be technically possible, however very costly, to fill up a pond or to restore the link of a pangasius beel with the surrounding wetland, the permanent inundation and intensive fish cultivation affects the soil composition. Local farmers mentioned that rice cultivation on land formerly used for pangasius production isn't profitable. The intensive usage of feed in pangasius cultivation leads to hyper-fertility of the soil so that rice plants cultivated on these soils provide only a very low yield. Apart from this, the intensive usage of feed also increases the sedimentation in the beel. If this land were to be used for rice production afterwards, its productivity would be negatively affected. That is to say, a small change in elevation can have a major impact on the number of crops produced yearly on a plot, therewith also reducing the value of the land.

The permanent character of boom crops can also be observed by the fact that the investment decisions that lie at the basis of the land transformation span multiple years, and therefore counts as a decision that cannot easily be reversed. The cases described in this thesis however show that it isn't only the long-term investment that makes it difficult to reverse the changes made, the physical alterations in the landscape are dramatic to such an extent, making it highly unlikely to ever be restored into its original setting. Thus, stating that the land usage changed as a result of the introduction of a new crop is not awarding it with enough recognition. It goes beyond a change in land usage for most of the land in Bawalia and Medila ceased to be land. Since aquarian capitalism grapples with wetland and marine areas where the key biogeochemical factor is water instead of

earth, Fougères (2008) prefers to use the term *territory* instead of land. He does this to "get away from the exclusive equation of geographical spaces of production with land" (Fougères, 2008: 70), that is limited to agriculture. While this thesis uses the notion of land (in the sections concerning land relations and geography), it recognizes the usefulness of *territory* in order to describe the complex transformations of the landscape from a (semi-)natural ('fluid') ecosystem to a permanently closed ('solid') ecosystem, as was seen in Bawalia and Medila. The natural ecosystem is 'fluid' in the sense that the seasonal variation in inundation makes defining it as either land or water complicated. The more 'solid' ecosystems that arose in both Bawalia and Medila is characterized by a higher permanence in its environment, i.e. the year round high water level in enclosed beels/ponds, to provide better conditions for commercial aquaculture.

Territory however, comprises of more than geographical space. People proclaim ownership or entitlements over territories, thereby embedding it in the social relations of production. Discussing nature as territory therefore also includes conflicting claims over property or changing land relations that are continuously contested (Fougères, 2008). The idea of a shift from a 'fluid' ecosystem to a more 'solid' one, includes thus not only the changes in the landscape as originally discussed above, but also includes the changes in land relations, as in the case of Bawalia and Medila. For example, some of the more 'fluid' land relations, such as short-term sharecropping arrangements, that were present in pre-pangasius times, gave way to more 'solid' arrangements. The main point made in this paragraph, and central to the notion of nature as territory, is that neither geographical changes nor changes in land relations occur in a vacuum, but are interconnected to each other. The following section will focus more on the social aspects of territory by discussing the effect of the changes in land access and land relations on livelihoods. Discussing both sides of the notion of territory provides better insight of their importance as a driver in livelihood pathways, as well as demonstrating the avoidance of geographical determinism.

6.2.3 Land access

The boom crop as seen in Bawalia and Medila corresponds mostly to the concept of an 'insecure boom', which Hall defines as when 'the basic nature of pre-boom land relations are being thrown into question' (Hall, 2011a). This strongly corresponds to the above mentioned claims over property and changing land relations drawn out by Fougères' in his discussion of nature as territory. This section will show how the pre-boom land relations, characterized by their fluid nature of ownership have become contested in light of the pangasius boom crop. The term 'solid' ecosystems as presented above does not imply land relations as being set in stone. There does however seem to be a more permanent character to the new land relations, which will be explained below. Important to note is that while they may be more permanent, this doesn't mean that land relations are not contested or that conflicting claims on land do not exist.

Returning to Hall's differentiation of boom crops, if landholding would be the main point of attention one could declare the development as a 'secure boom', since the formal land rights existing prior to the boom crop remained in place. Many of the local smallholders are also currently still the landowners. This however doesn't show the whole story since many actors, including smallholders, local elites but also outside investors, have tried to either gain access/control or remain in control over land. And while the market power might have been most noticeable in shaping land access, which is another characteristic of a secure boom, uses of each of the four powers (market, force, legitimation and regulation) have been observed in the two cases. Several processes regarding

changes in the land relations and access to land are identified in the previous two chapters. First of all an increase in the value of land has been noticed, a common feature among boom crops. This led to an increase in the competition for land that initiated the second and third processes. The second process includes the decreasing usage of the traditional sharecropping system. Thirdly, the leasing of land has increased significantly since the introduction of pangasius. The disappearance of sharecropping and mortgage and the creation of leasing as the most common form of tenancy is also observed by Ito (2002), who discusses changes in the agrarian structure in the context of shrimp and prawn development in Southern Bangladesh. A key notion to the rise of leasing land as the most common form of tenancy in Bawalia and Medila is the increasingly permanent character of leasing, which is a specific feature of an aquacultural boom crop as explained in the geography section. An important conclusion of this thesis is that the pangasius boom crop didn't only increase the struggles for access to land, it also led to a move away from land ownership equalling access to land. This will be explained below by introducing the concept of direct and indirect access. This section continues by discussing the second and third processes more deeply.

Ribot and Peluso (2003: 156) speak of access as "all possible means by which a person is able to benefit from things", in this case from land. Previous to the boom crop many villagers owned some land on which they cultivated rice themselves. Sharecropping land to another farmer was a very common land arrangement that allowed landowners to still directly gain from their land without cultivating it themselves. Sharecropping is often considered a harsh existence since the farmer is only temporarily given access to the land and he has to pay the land owner with 50% of the yield. It does however provide landless households access to land. This is in line with the notion, part of the definition of access, that one doesn't necessarily have to own a resource to still benefit from it. For the landowners sharecropping also provided security of regaining full access to the land after the short-term sharecropping arrangement ended, which was either after one cultivation period or after one year. The increasing competition for land, caused to a large extent by the pangasius boom, led to the introduction of a deposit system for sharecropping. This is a significant change to the previous sharecropping land arrangement and excluded many poor landless households from access to land.

In general, sharecropping accommodates short-term low cost investments and is therefore not considered to suit pangasius cultivation that requires a long-term commitment and high investment. Leasing land however, with contracts lasting multiple years, met the pangasius production qualifications better and therefore quickly became the customary use in both Bawalia and Medila. In this arrangement farmers were able to benefit from leasing out land at high value, often higher than what they would earn from rice cultivation themselves. They did however lose their ability to cultivate the land themselves. This shows the importance of differentiating between *direct* and *indirect* access. Farmers still obtain an income from the land and thus benefit from the resource, but the lease contract prevents them from any direct access. Since leasing periods are on average between 5-10 years, farmers lose their direct access for a number of years. One implication of this is that while the land value increases quickly during a boom crop, the initial lease value holds for all years for which the agreement is signed. This makes that some landowners lease out their land below the current market value. In this case landowners still have indirect access to their land but they cannot benefit it to the fullest and therefore have increasingly less control over it. The lack of controlling access to land a farmer still owns but has no direct access to, is an important outcome of the pangasius boom in both Bawalia and Medila. Another significant change in land relations is that landowners that lease out their land for a number of years used to be certain to get it back after the

lease contract was ended. This is however not the case for land leased for pangasius cultivation purposes. Several examples of combining a number of rice plots into a large pond have been observed in Bawalia. In the pangasius beel village of Medila this practice has been common at an even larger scale, in which up to 100 landowners own land in one pangasius beel. Since the land usage changed to such a dramatic extent these landowners can be almost certain to never have the opportunity to regain direct access to their land. Their 'land' is now part of a large water body. Indirect access to land thus means that a landowner gains an income from land but lost control over the power to exclude others from it. This last example of landowners losing access to 'their' land in the beel clearly shows the interconnectedness of geographical changes and contested land relations that are united into the notion of territory.

Naturally, not all land owners find it problematic to lease out their land to pangasius farmers and to receive a high leasing value in return. However, in both villages it was found that the powers of exclusion (Hall et al., 2011) are an important aspect in the changes of the local land relations. Both villages showed the use of force by influential inhabitants in order to persuade the landowners to lease out and thereby excluding them from their direct access to land. Because of these imbalances in power relations among village inhabitants it is not always sure that a landowner can get its land back after the lease has ended. The cases concerning small landowners who were forced to lease out land show that social dimensions between people can be more important than official property rights, as mentioned by both Ribot and Peluso (2003) and Borras and Franco (2010). In Medila this is an even greater issue with the larger landowners exercising force in order to exclude the smaller land owners from their land. While force in this case doesn't imply outright violence, it does include implicit efforts at intimidation, both defined by Hall as being part of force as a power of exclusion. Similar interactions leading to the exclusion of land occur between neighbours that have competing interests concerning land usage. Hall (2011) describes these as 'everyday processes' that are part of 'Intimate Exclusions'. With this concept Hall wants to indicate that the powers of exclusion doesn't exclusively belong to the wealthy and powerful actors. The following example will illustrate these 'every processes' and simultaneously shows legitimation as a power of exclusion in the context of this thesis. In both villages the observation was made of landowners sometimes resigning themselves in the situation of losing access to their land. Since using land for pangasius aquaculture is more profitable this is often considered to be a more favorable land usage compared to the 'unproductive' rice cultivation. This discourse of land productivity, in combination with other powers of exclusion force (persuasion) and market (high land leasing prices), helped pangasius farmers to support their claim on land. The final power of exclusion is that of regulation, including formal and informal rules governing access and exclusion to land (Hall, 2011). In the context of Bawalia and Medila governmental involvement in the pangasius boom crop is limited. However, this doesn't imply the inexistence of formal regulations concerning property rights. These regulations play a role in determining the ownership of land, which in its turn influences (however not equals) access to land.

Prior to the introduction of pangasius households not owning any land were able to gain direct access to land via sharecropping. Households that did own land had, in most cases, full control over who could access their land. Since pangasius cultivation started the existing land relations were challenged by various actors aiming to gain access to the newly valuable land. This had a profound effect on the ability of both landowners and landless households to access land. A landless labourer in Bawalia saw its access to land increase for the growth in labour opportunities is directly linked to the change in land use, i.e. from rice to pangasius cultivation. While the increase in labour

opportunities also benefited the small land owners, many farmers belonging to this category would argue that they lost access to their land. They were unable to start pangasius cultivation themselves and numerous landowners saw themselves forced to lease out the land because of waterlogging or by being pressured to do so by elite villagers and large landowners. While in previous times a landowner had the power to exclude others from their land, this is no longer the case. Nowadays many landowners own land on paper but increasingly lose control over access to their land, both direct and indirect. Landowners whose land have been part of a pangasius farm for many years might resort to selling their land. Selling land however, is considered a 'last resort' to most landowners, something that is only done when a household is in financial trouble. This makes that while land relations where hugely affected by the pangasius boom crop, land ownership did not change that much since pangasius first started.

6.2.4 Class mobility

An interesting outcome of the pangasius boom crop in Bawalia and Medila is the increased mobility in the socio-economic classes. The previous chapters illustrate this mobility by discussing different trajectories, placed within distinct classes, that arose as a result of the introduction and rapid development of commercial pangasius cultivation. While Breman (2000) argues that the capitalist penetration in rural agriculture increases the vulnerability of life at the bottom of the rural economy, this does not apply to the case presented in this thesis. The casualization of employment, one of Bremans arguments to support his claim, did not take place in the context of pangasius production in Bawalia and Medila. Another important point for discussion, related to the effect of the introduction of capitalism in rural societies, is the need for decoupling landholding to rural poverty.

Chapter two shows a classification regularly made in literature. The primary differentiation made is between those controlling the means of production and those who do not. The latter include those who sell their labour as a commodity, whereas the former are the farmers owning the commodities produced (Roseberry, 1978). The classes representing this classification, i.e. labourers, peasant farmers and capitalist farmers (see Table 2.1) are found in both Medila and Bawalia. It is important to bear in mind that this classification is limited in recognizing the intense complexity of the rural socio-economic class differentiation within the two villages. Yet, the three socio-economic classes do provide an analytical tool to demonstrate the increased class mobility as a result of the pangasius boom crop.

In previous times both villages were similar to each other in the sense that it was traditional agricultural villages that were by far the largest proportion of landless or small landowners. These households were among the poorest families in the village with few opportunities to emerge from poverty. The large landowners formed a small elite group of wealthy farmers. While having similar class dynamics in previous times, the introduction of pangasius cultivation led to different outcomes in the two villages discussed. Changes in class mobility proved to be more profound in Bawalia compared to Medila. With the introduction of pangasius, in which the relations of production are closer to that of (quasi-) capitalists, many farmers in Bawalia that took up pangasius production shifted in class. Those farmers that previously worked on their own land became capitalist farmers employing wage labour. The zero-to-hero cases take this to an even higher level, by showing that also landless labourers were able to become successful pangasius farmers and moving up in class as a result. Before they could start pangasius they often benefitted from the increasing labour opportunities related to the pangasius production that was already on the rise in their village. Several

of these previously landless labourers currently belong to the largest pangasius farmers in the village. Apart from these (rare) cases, the biggest change can be witnessed in the lower socio-economic class, the landless, that saw their income increase significantly by the increase in labour opportunities. For many households with some access to land however the pangasius development meant that they had to lease out land which resulted in the loss of farming as a livelihood option. These former peasant farmers shifted from working as a farmer to becoming wage labourers.

The introduction of pangasius provided local inhabitants of both Bawalia and Medila with new labour opportunities, benefiting large numbers of landless households and small land owners. Breman states that the emergence of capitalist dynamics in rural areas, as is the case in boom crops, leads to a casualization of employment. This involves an increase in the preference of outside labourers and the usage of short-term labour contracts. Labour related to pangasius however involves no more short-term labour contracts and daily wage earners than was the case for rice production. And while for both rice and pangasius cultivation landless labourers are limited to certain seasons, the pangasius season provides labour almost throughout the entire year. The labour related to pangasius is often done on a daily contract only, signalling a possible vulnerability of this type of labour. Villagers however favour this type of labour over that of agricultural labour, since the latter is more labour and time intensive. Overall, the strong increase in labour opportunities for landless labourers made it easier for them to obtain a secure livelihood compared to pre-pangasius times.

In comparison to Bawalia, Medila didn't witness as much change in the existing class structures that can be traced back directly to the pangasius development. None of the landless or small landowners were able to start pangasius culture and in many cases these farmers also lost access to (sharecropping) land, thereby losing control over the means of production. This shows that due to pangasius beel culture these landless and small landowners had to resort to wage labour, indicating a downward shift in socio-economic class. However, regardless of their inability to gain direct access to the pangasius development and their loss of control over the means of production, many of these households did observe an increase in income. The increase in job opportunities related to the economic development occurring throughout Bangladesh created an increase of income for many rural households. Medila has more households involved in non-agrarian occupations and has a higher work force that found job opportunities abroad, both of which are preferred to labour related to pangasius. This shows that changes in class structures have occurred in Medila, but is only partly related to pangasius. Bawalia's development on the other hand is more confined to pangasius while influences from rural trends exogenous to the village, as can be seen in Medila, is relatively small. Since many households in Bawalia are involved in local aqua/agricultural activities the rural-urban interpenetration is less shown here compared to in Medila.

A range of new livelihood pathways have emerged that is closely related to the increased class mobility discussed in this section. The livelihood pathways are however still determined by the agency of the people involved, which is why individual cases such as the zero-to-hero cases, occur. These individual cases however, do not stand on their own, and several more pathways have been identified. The increased complexity of the rural society, caused by the emergence of new livelihood pathways, indicates that there is more to rural poverty than merely landholding. This discussion thus refers to the idea of rural poverty being viewed as inversely related to the size of landholding (Ali and Penia, 2003). This thesis however, shows a different development. Currently the households owning no or little land aren't necessarily among the poorest classes of the village. This decreasing influence

of landholding on class differentiation is an important outcome of the pangasius boom crop. Several other factors are involved in defining class relations in villages such as Bawalia and Medila. One notable factor is that of land *access*, as opposed to land*holding*. Other factors influencing class relations in the context of Bawalia and Medila include the labour opportunities related to pangasius production and the non-agricultural labour opportunities brought about by the wider economic development occurring at a regional and national level. While these factors mainly influence the lower classes, the changes in access to land appears to have an effect on class mobility in all socio-economic classes.

Whether the increasing class mobility will lead to a more egalitarian society remains yet to be seen. It does however seem to positively influence Bawalia's class relations since the the pangasius development seen in Bawalia is more initiated from local landowners and also includes smaller landowners. As discussed above, this was made possible because of the small scale pond culture that provided local inhabitants with the possibility to invest in pangasius, whereas the large scale beel culture in Medila needed such a high investment that was far beyond the range of most villagers. As shown throughout this thesis the small scale bottom up initiated development in Bawalia provided substantial opportunities for both small landowners and landless people, as opposed to the development in Medila that is characterised by large scale aquaculture led primarily by outside investors. The bottom up development in Bawalia is largely responsible for the class mobility that occurred in the village during the boom crop since it provided households from all classes with chances to benefit from pangasius cultivation. With the on-going boom crop not yet reaching its climax, class mobility will continue to influence life at the rural society.

6.3 Evolving livelihood pathways in an agrarian transition

This thesis shows how the introduction of one 'crop' can have very diverse outcomes on rural households in particular and on the rural society in general. The boom crop affected people's livelihood in a variety of ways and demonstrates most clearly that "class in agrarian contexts is no longer primarily about land and agrarian production relations, but is multidimensional" (Rigg and Vandergeest, 2012: 21). This indicates that a boom crop reaches all levels of society and is not limited to farmers. The scope of the boom crop is illustrated in the two empirical chapters that aimed to provide a broad view of the impact of a boom crop on rural livelihoods. Nevertheless, some elements have not been discussed, such as changes in migration and gender patterns.

While the pangasius boom crop changed the rural society of the two villages in very different ways, it did provide insight into some general driving forces of livelihood pathways. The three driving forces identified in this thesis have been discussed in the previous section. These driving forces proved to be of most importance in enabling and structuring livelihood decision in the two transitional villages in Mymensingh that were affected by the pangasius boom crop. This thesis states that agrarian transitions are best understood by their effect on livelihood pathways. Therefore, identifying drivers of these pathways provides insight into some of the processes related to agrarian change that remade the rural society.

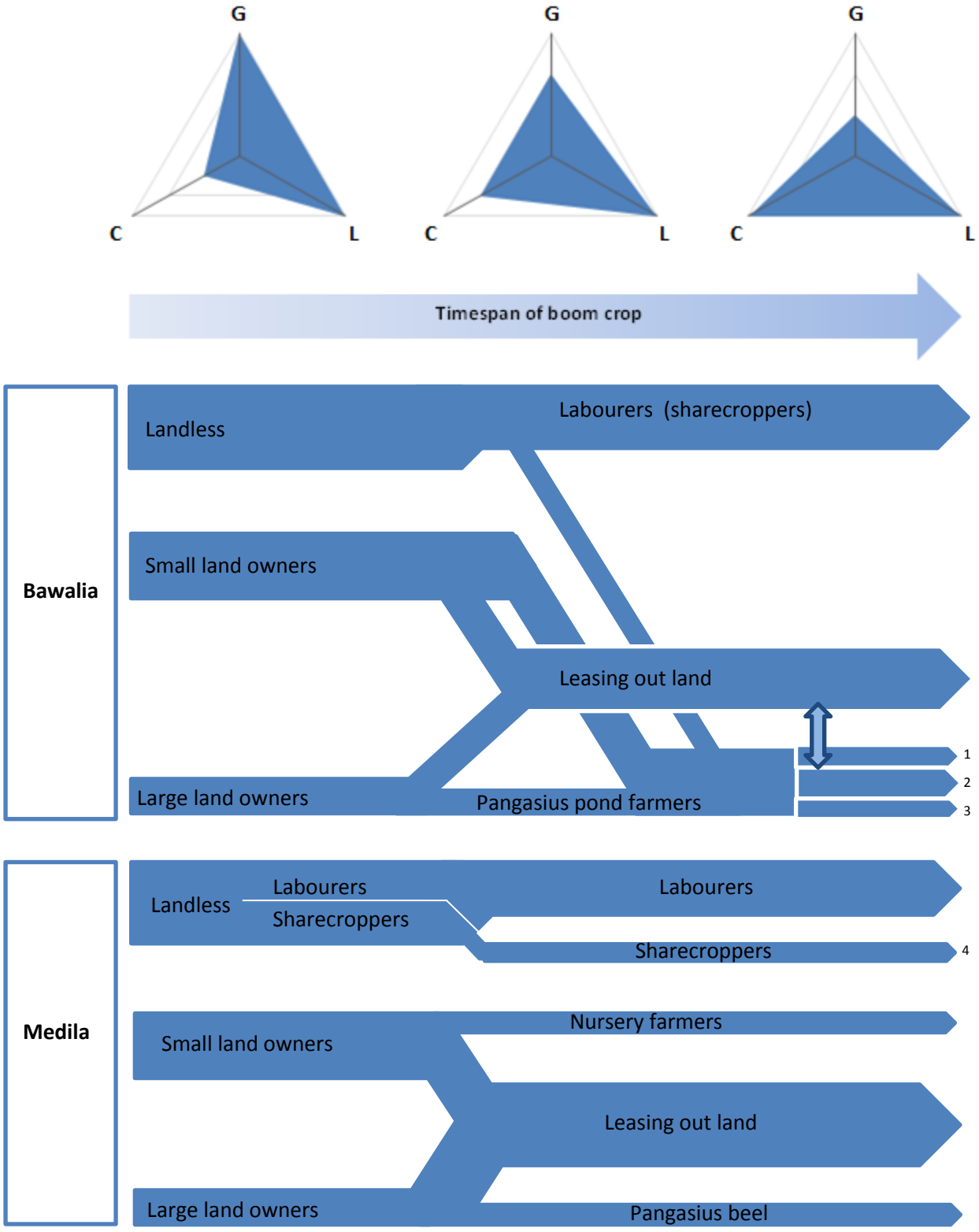


Figure 6.1 Evolving livelihood pathways

Figure 6.1 Evolving livelihood pathways

The *thickness* of the arrows represent how many people are part of that particular livelihood pathway. However, it does not reflect the actual situation, since this would mean that the large land owners arrow would be far too small to be able to create a clear diagram.

The *splitting of an arrow* coincides with the timeline of the boom, meaning that in Bawalia the large land owners started pangasius first, after which followed by small land owners and then the landless.

The *light blue arrow* connecting small pangasius farmers and large pangasius farmers with leasing out land, indicates an on-going exchange between people of these livelihood pathways. Small land owners that lease out land might start pangasius cultivation when the lease is ended and vice versa.

[1] **Landless pangasius farmers**. They can be both small or large pangasius farmers, but are kept separate because they entail a different livelihood pathway.

[2] **Small pangasius farmers**. Originating both from landless and large land owners.

[3] **Large pangasius farmers**. Originating both from landless and small land owners.

[4] As mentioned, landless people are often involved in both sharecropping and in working as labourer. Sharecropping is thus not necessarily a separate pathway, even though the arrow might suggest this. The arrow is made separate here to highlight the different importance this land arrangement has in Medila, relative to that in Bawalia, where it virtually disappeared

It is important to recognize that while livelihood pathways are never set in stone, an agrarian transition increases the rate in which livelihood pathways evolve. Since pathways evolve over time, the importance of each pathway driver also changes during the course of the boom crop, as is illustrated in Figure 6.1. Geographical characteristics had a strong influence on livelihood decisions early on in the boom crop and played an important part in the divergence of production methods used in the two villages. Over the years the landscape in both villages changed irreversibly. The importance of geographical characteristics decreased when most of the physical space has been altered. In the case of land access, the overall importance in shaping livelihood pathways remained stable. However, a series of processes occurred of which the importance varies over time. Initially the increase in land value and the competition of land was of most importance. Later on in the boom crop these processes had a profound influence on existing land relations, indicating a decrease in sharecropping and an increase in leasing land. Throughout the boom crop the control over access to land became increasingly complex, signalling another change in land relations. The third driver, class mobility, became progressively more important in shaping livelihood pathways. While expressed differently in the two villages, the boom crop affected class mobility in all socio-economic classes, both positively as negatively. New labour opportunities both related to pangasius and not, seemed to be a major determinant of class mobility in the cases discussed. Another element of the process of class transformation is the differential access to land, thereby showing the interconnectedness of the drivers.

As portrayed in chapter four and five, the outcome of the pangasius boom crop was very different in Bawalia compared to Medila. The most evident difference is the creation of small scale local pangasius farmers in Bawalia, whereas Medila's pangasius farmers often come from outside of the village and produce pangasius on a large scale. While the boom crop results in different outcomes, the drivers of the livelihood pathways however, appear similar in both cases. This substantiates the claim that the three drivers identified could be of similar importance in other boom crops elsewhere as well. The foundation of this line of thought is that it is not the commodity (crop) that defines the agrarian transition, it is how people respond to it and how it alters their lives. Figure 2.1 in the theoretical chapter shows that many similar studies have been done in agrarian studies, involving a

variety of commodities ranging from coffee to shrimp and rubber to live reef fish. While the commodities of these studies are very distinct in their properties, the commonality between these cases can been found in the way actors shape the conditions in which agrarian transition takes place, and thereby influence the different outcomes. Often similar trends are identified occurring in these transitional societies, including primitive accumulation, greater dependence on market relations, commoditization, disappearance of peasantries, de-agrarinization (and re-agrarinization) (Breman, 2000, Rigg, 2006, Fougères, 2008) of which some appear in this thesis. This thesis claims that livelihood pathway drivers provide insight into the development of agrarian transitions. The rationale behind this idea is that by understanding trends at the household level one gets a clear picture of the multidimensional character of the agrarian transition. This insight into the scope of the agrarian transition at the household level then provides the starting point for understanding some of the broader trends of agrarian change. The three drivers, which are both social and physical in nature, structure the livelihood decisions of households which shapes the agrarian change at a wider scale. The pangasius boom crop therefore resulted in a remaking of both the landscape of the villages and of the livelihoods of the people living in those villages.

6.4 Agrarian vs aquarian transitions

The main research question of this thesis questions whether the aquacultural nature of the pangasius boom crop leads to different effects on households than is the case for agricultural boom crops. This section thus aims to discuss possible differences of rural transitions, involving either agricultural or aquacultural commodities. This discussion is initiated by Fougères (2008: 254) who states that "the capitalist processes operating in fisheries and aquaculture are analogous but not reducible to the processes operating in agriculture".

The previous section has already discussed the permanent character of the shift in land use from agricultural to aquacultural. This has been discussed both in the sense of the actual transformation of the landscape from land to water, and the shift from 'fluid' land relations based on natural seasonal changes to stable and 'solid' land relations such as leasing land for a fixed number of years. This paragraph will elaborate a bit more on the latter, i.e. the shift in land relations. Fougères' research is limited to coastal territories and reefs, which is very different from the inland aquacultural development discussed here and thus making it harder to draw parallels between it and discuss it within the concept of aquarian transitions. Fougères (2008) states that the property relations of territorial spaces remain ambiguous and contested. While the property rights in Medila and Bawalia are not ambiguous in the same sense to those of coastal territories or reefs, they are ambiguous in the sense that the boom crop complicated them. The boom crop made it increasingly difficult to see who holds control over a territorial space. In Medila none of the pangasius farmers are the actual landowner of the area they operate in and in Bawalia this is also becoming increasingly complicated by the fact that households often have a combination of ponds leasing in and out, and of the fact that small plots are only part of a large pangasius pond. The shift from land to water was instrumental in aggravating this complexity. Whether this observation holds for other cases of aquacultural development remains to be the question and is an important topic for further research.

Another important difference between aquarian and agrarian transitions is the pace in which they develop. An aquacultural development appears to have specific characteristics that make it transpire

in a boom crop manner. In the case of pangasius in Bawalia and Medila, the quick development of the newly emerging crop has not only been driven by the willingness of households, resulting from the high prices of the crop. It is the water element of the commodity that plays a crucial role in the rapid nature of the pangasius development and shows why entire villages are driven into this boom. The moment land usage changed from agriculture to aquaculture also the land usage of the plot next to it is affected. In Bawalia, many examples were seen of farmers that were forced to convert their land into a pangasius pond, since the land wasn't suitable to grow rice anymore because of waterlogging resulting from adjacent ponds. In Medila, it was not so much the physical conversion of a plot that consequently defined the one next to it. Here, the manner in which the larger landowners wanted to utilize the land changed. They preferred the high lease from the pangasius beel farmers and successfully convinced the smaller landowners to lease out against their own preferences of cultivating rice. In this way an entire beel was converted into an aquacultural asset. Thus, as a landowner aiming to convert your rice plot into a pond or aquacultural beel, you subsequently also define the fate of the plot next to it. While taking care to avoid determinism, since other factors might be of equal importance in the origination of a boom crop, this process contributes strongly to the fast and widespread adoption of aquaculture in a village.

This thesis suggests that the effects of an aquacultural boom crop on households are to some extent different than that of an agrarian transition. This difference lies in the increasing complexity in land relations when land gave way to water, the permanent character of this change and the observation that the characteristics of an aquacultural commodity lead to a 'booming' development of aquaculture.

6.5 Conclusion

This thesis shows the story of two villages in rural Bangladesh that became the setting of an agrarian transition changing the lifestyle of many inhabitants. The two villages did however develop in their own different ways, with the level of direct involvement of the population diverging extensively from one another. That no universal trajectory for the development of a boom crop exists has been shown in the characterization of a variety of boom crops in chapter two. The pangasius boom crop described in this thesis shows many similarities with the boom crops described by Hall. The characteristic that differentiates Bangladesh' pangasius boom crop to other boom crops, is its lack of production for international markets. And while Hall doesn't claim boom crops to be exclusively driven by export demand, this thesis states that the importance is not where the commodity is transported to but that it is a major break with former times in which commercial agricultural production for markets outside of the village or the nearby area was non-existent. Pangasius production in Bangladesh thus represents a good example of an internal boom crop that takes place inside its own borders, but of which the effects on households are just as extensive as for boom crops that focus on international markets. The agrarian transition as observed in Bawalia and Medila is still very much on-going. Many events occurred very recently and new pangasius ponds and beels were still being excavated at the time of the fieldwork. Based on the growth of the urban population leading to an increase in the demand for pangasius in cities such as Mymensingh and Dhaka, the pangasius boom crop in Bangladesh is expected to continue in the near future and include more rural villages.

Intensive fieldwork has been conducted over a time span of 2,5 months. While this is sufficient for the creation of a clear overview of the current effects of the boom crop, it does provide some limitations concerning the discussion of previous years. The analysis of this thesis is thus primarily based on accounts of respondents looking at changes in their village in retrospect. To offset this limitation, data has been recovered by the use of both personal interviews and FGDs and by creating a large number of respondents to verify the stories told. Regardless of this limitation it is safe to say that every household has been affected by the emergence of pangasius production in their village, as has been shown throughout the empirical chapters. These chapters started with a description of the development of pangasius and gave the physical alterations in the landscape a prominent position. However, whereas the large scale conversion of land into ponds and aquacultural beels provide a clear picture of the changes related to the boom crop, it are its implications on people's lives that matter. The social dimensions related to the boom crop provide a true insight into the effects of a development. These social dimensions are best described by using the concept of livelihood pathways.

The empirical chapters clearly show how the agricultural based livelihoods in Bawalia and Medila, that consisted out of small scale subsistence farming was challenged by the introduction of the cash crop pangasius. This shifted the focus of farmers away from agriculture and towards aquaculture. This thesis set out to unravel the effects of this agrarian (or, aquarian) transition that is currently still on-going. The empirical chapters have shown how the landscape changed. They have shown how people's interaction with the land changed, and it has shown how people's interaction with each other has changed. It has been made clear throughout the thesis that village life has been remade in both villages, however to a different extent. In agrarian change it is the set of livelihood pathways, representing the interactions of people with their surroundings and with each other, that shapes village life. Hall has discussed a range of different outcomes and effects of boom crops, that has been summarized in chapter two. However, Halls description of boom crops is often limited to a comparison between countries or an analysis of the outcomes of a boom crop. This thesis not only narrowed the focus to the outcome on livelihoods specifically, it also aimed to take a step back by investigating the underlying drivers that enable the different outcomes on livelihood pathways. The two villages have very unique outcomes to the pangasius boom crop, but the creation of new livelihood pathways appears to be similarly influenced by the three drivers, i.e. class mobility, geography and land access, thereby reinforcing their importance. These drivers thus might be of equal importance in other boom crops as well, which also demonstrates the importance of knowing how their role develops over time and in what way these drivers influence each other. Even though change appears to occur simultaneously in the short time span of the development of a boom crop, a differentiation can be made in the relative importance between the driving forces. Thus while geographical characteristics were most important at first, changing class structures are becoming increasingly more apparent during the boom crop, in different extents in both villages. The access to land has remained an influential driver throughout the boom crop, but has seen many changes occurring to existing land relations.

This thesis not only describes the dramatic changes occurring in people's lives as a result of the boom crop, it explains how these changes have developed, thus adding to the understanding of the development of livelihood pathways under boom crop conditions. This thesis analysed the evolving livelihood pathways on a local level. Driving forces operating on the national and regional level have been ignored. Possible further research could therefore focus on some of the 'larger' driving forces

such as migration patterns, governmental policy regarding (pangasius) aquaculture, both on a regional and national level or possibly on the development of other, competing cultured fish species. The research done in this thesis provides a comprehensive overview of the effects of the pangasius boom crop on local rural livelihood pathways, allowing for a greater understanding of the socioeconomic characteristics of the boom crop, that was still missing in the scientific coverage of pangasius production in Bangladesh.

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8. Appendices

Appendix I List of interviews and FGDs

Bawalia

	Respondents	No. of interviews/FGDs			
		Bawalia		**Outside of Bawalia**	
		Male	Female	Male	Female
Interview	Fisherman	1	-	-	-
	Pangasius farmer	17	2	2	-
	Labourer (i.e. earth work, van pulling, harvesting, agriculture, aquaculture)	4		2	-
	Feed shop owner	-	-	3	-
	Truck + water station + feed mill owner	-	-	1	-
	Old women	-	2	-	-
Total		**22**	**4**	**8**	
Focus Group Discussion	Census	2	-	-	-
	Time line of village	2			
	Women	-	2	-	-
	Labourer	3	-	-	-
		-	-	2	-
Total		**7**	**2**	**2**	

Medila

	Respondents	No. of interviews/FGDs			
		Medila		**Outside of Medila**	
		Male	Female	Male	Female
Interview	Pangasius farmer/manager	6		-	-
	Pangasius nursery farmer	3	-	-	-
	Fisherman + sharecropper	3			
	Labourer or Self-employed worker (agriculture/aquaculture related work)	8			-
	Labourer or Self-employed worker (non- agriculture/aquaculture related work)	5	2		
	Feed shop owner	-	-	1	-
	Other	3	-	-	-
Total		**28**	**2**	**1**	
Focus Group Discussion	Sharecroppers	1	-	-	-
	Time line of village	5	-	-	-
	Birunia village	-	-	1	-
	Women	-	1	-	-
Total		**6**	**1**	**1**	**-**

Appendix II Interview topic list

Core topics	Questions asked	
Pangasius farming	Type of culture: beel, pond, nursery	
	Area cultivated and ownership status	
	Investment costs and source of investment (loan, selling assets, gift)	
	Production intensity (stocking density, amount of production)	
	Type of feed and feed costs and payment	
	Technical advice	
	Cooperation between pangasius farmers	
	Market orientation and transportation costs	
	Market price of pangasius and carp (current and previous years)	
	Type of water exchange	
	Fish diseases	
	When was the pond build? What were the excavation costs?	
	Involvement of outside investors in pangasius farming	
Occupation	Labour (seasonal, permanent), agriculture (sharecropping, own land), pangasius farming	Time of starting this occupation
		Previous occupations
		Income (in kind, cash)
		Work availability
		Other income generating activities
Land	Size of land ownership	
	Current operational status of plots owned/operated	
	Competition for land/ponds (sharing/leasing)	
	Rice cultivation for household consumption	
	Current and previous lease value and lease period of the land	
	Year land first used for pangasius cultivation	
	Reasons for leasing out land	
General information regarding the village	Start of pangasius in the village/area	
	Previous land usage	
	Scale expansion of pangasius farming	
	Most important historic events of the village	
	Migration to and from the village	
	Risk perception of pangasius farming	
Perception of previous and current livelihood status	Livelihood affected by pangasius	
	Overall life better or worse off compared to 15-20 years ago	