COMMUNITY RESPONSES TO ENVIRONMENTAL DEGRADATION DUE TO SHRIMP AQUACULTURE IN BANGLADESH

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1. INTRODUCTION[*]

This paper looks at community responses to adverse impact of shrimp aquaculture on environment in semi-saline zones in Bangladesh. This is an important issue because if we do not know how people are responding to such changes in agrienvironment we cannot formulate any effective resource management policy.

We have developed a simple framework to study community responses to environmental degradation. One can observe responses from the *insiders* – those who immediately suffer from environmental degradation, and from the *outsiders* (NGOs, civil society) who side with the insiders. These actors can respond **directly** to environmental degradation, say by launching a strong movement against shrimp culture. They can also respond **indirectly** and this is subtle. Actors can write contracts to maximise their gains which in effect can reduce environmental degradation as an unintended outcome. In this framework the key outside agent is the NGOs. Direct response, in its purest form, encapsulates collective action issues where the environment is the explicit concern. Indirect response involves immediate profit

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maximisation where environment may not be an argument in the individual calculus but can still come up consequentially in an implicit way. Most responses to environmental degradation due to shrimp culture in Bangladesh fall in these four categories (insider-direct, outsider-direct, insider indirect, outsider-indirect) or a combination of them with differential weights.

For the purpose of this research we have studied two polders in the semi-saline zone in Khulna. In one of these polders (No. 22) an active NGO named Nijera Kori has been mobilising people against shrimp culture by manufacturing and processing "voice". They have taken the direct route but ignored or subdued the inherent profit maximising behaviour of the landowners – large and small. Therefore success has been limited and property rights have been seriously attenuated. The situation has also become complex due to conflicting state policies and pathological donor interventions in the past. In terms of our framework this polder therefore represents an outsider and direct response to environmental degradation.

In the other polder (No. 23) the insiders took an indirect route. They maximised profit at the cost of environmental degradation. However, they were able to minimise adverse environmental impact by making an explicit contract that allowed paddy and shrimp culture in their respective seasons. This happened in the presence of some NGOs who played a role supportive to shrimp aquaculture. In terms of our framework this polder therefore represents an insider and indirect response to environmental degradation.

In polder 23 we have observed that the community has, to some limited extent, addressed the issue of environmental degradation *but* more as an *unintended outcome* rather than as a direct attack on environment. We explain this by their effort to reallocate property rights and by their response to a an economic opportunity that most of them never contemplated but got very much attracted to when it was available. This opportunity was triggered off by globalisation – showing up in this case as an increased demand for raw shrimp from the shrimp exporters who started to participate in the global market (Toufique 2001). Environmental concerns were pushed to the minimum or at best made secondary by the community. While this can be termed as "downward optimal coping", that is, people bearing with more adverse environmental hazards, but the fact remains that to most of the community profit motives have driven environmental issues to the sidelines. Direct attempts to respond to environmental degradation came from a section of NGOs, the state and often from the donors (Toufique 2000). But this had very limited success as we observed in polder 22. Landowners in this polder spent more time in resolving conflicts informally and formally and had to spend more time in sorting out legal issues with a diverse set of actors rather than in production of shrimp.

The indirect route involved rapid changes in property rights structure at the farm level. These include demise of outsider ghers, emergence of local ghers, proliferation of small ghers, instability of gono ghers, falling farm size and so on. Such changes could not fully take place in polder 22 because of the presence of the anti-shrimp NGO and inappropriate state policies. Earlier studies hinted at some of these changes but neither substantiated them nor discussed their implications for environmental management. These changes have been playing an important role in minimising environmental deterioration and will continue to do so in the future. In this paper we present our findings and explain why such environmental management was possible in one polder but not in the other. The key issue here is changing property rights and the flexibility of property rights changes. We emphasise that unless these

changes are taken into consideration the separation between policy objectives visualised at the policy maker level and policy outcome at the ground level will widen further.

The paper is organised in the following way. The next section presents myths and realities involved in the debate on the impact of shrimp culture on the environment. Section 3 develops the analytical framework for the study while section 4 describes the research methodology. Sections 5 and 6 present and interpret the finding from the study. Finally, section 7 concludes the paper.

2. ENVIRONMENTAL DILEMMA: MYTHS AND REALITIES

Shrimp is cultured in the southwest of Bangladesh, mainly in the Khulna-Satkhira-Bagerhat region (KSB region). It is also cultured in the districts of Chittagong and Cox's Bazaar in the southeast. The organisation of production is quite different in the two regions. In the latter the land use trade-off is between shrimp and salt and in the KSB region the trade off is generally between rice (mainly Aman) and shrimp. In this paper we will not deal with the southeast region.

A large part of the KSB region is semi-saline. If managed properly there should not be any conflict between rice and shrimp. In the dry season, salinity is high and rice cultivation is hardly possible. It is the right time for raising shrimp. Attempts to grow rice in this season have been a failure in this region. In the wet season (excessive rain) salinity of water is too low for raising shrimp. This is the right time to grow rice – aman.

Existing studies on the impact of shrimp culture on environment are often descriptive, lack analytical rigour or are ideologically motivated. Longitudinal studies are almost absent. It is therefore important to unpack the myths and realities of the popularly known environmental impacts of shrimp aquaculture.

Myth 1

The general impression is that the ***pre-shrimp environment was static and pristine***. This is false. Pre-shrimp agrienvironment changed from time to time and from place to place. There are two things that come up sharply from this literature review undertaken by BCAS (2001). *First*, there were changes before shrimp farming was introduced in this region. A pristine picture of an environmental harmony in a pre-shrimp state of nature is a myth. The complex interactions between the nature and the community have always been there. Shrimp came to the community as a new dimension at a time while they were already exposed to changes and interacted with the local elites, bureaucracy and the like. *Second*, shrimp is just one component of the rural system although it has wider impact on land ownership, property rights, livelihoods, consumption, exchange and the like. Without shrimp, the community had to address other environmental problems associated with managing commons, demographic pressure on natural resources and so on. In fact before shrimp aquaculture started in Chakoria in the southeast of Bangladesh, expansion of agriculture and demographic pressure resulted in rapid depletion of the forests.

Myth 2

Frequent reference is made to ***losses of common property resources*** (CPRs). The history of CPRs is not well-known in Bangladesh although this term has been sufficiently used and misused. As long as shrimp aquaculture is concerned, in most cases these were de facto CPRs. In these de facto CPRs the owners of land refrained from exercising their rights

because the private net benefits from maintaining and enforcing all rights over land declined in the dry season.

CPRs have been increasingly privatised or captured by the rich in Bangladesh. If this is the case or to say the least a tendency towards this, then the poor has been potentially suffering less. They possibly had lesser or poorer access to the CPRs in any case. Counterfactually, the CPRs – if remained - would have gone to the rich or the poor would have had inadequate access to it or would have had access to inferior CPRs.

Myth 3

It has been also frequently argued that ***the poor and the landless suffered more from the losses of CPRs***. This is not correct. When the fallow lands were used as grazing grounds they were benefiting the owners of livestock. It was *not directly* benefiting those who did not own livestock. Similarly, when aman was cultivated widely under sharecropping arrangements, those who had some land and bullock power mostly got tenurial rights as the landlords preferred to rent their lands out to them. So the main losers of shrimp culture was not the landless but people with some land and some livestock. These are the people who played a key role in driving away the outsiders and starting shrimp culture by themselves.

It is now generally agreed that shrimp aquaculture has increased income and livelihoods – both for men and women. These were possible obviously at an environmental costs. But existing estimates show that net social benefits after taking into account environmental costs have been positive (Toufique 2000).

The crux of the environmental problem

Environmental problems are the mirror images of property rights problem. In fact the complexity of rights generated by gher aquaculture has never been seriously studied. Let us now present the environmental problem in precise terms.

The shrimps are either trapped from a common-pool of saline water or bought from a hatchery. These are then allowed to grow in shrimp farms made on private lands. Thus shrimp aquaculture involves combining resources owned under different property rights regimes: water from a common pool and land from landowners.

At this stage we need to explain the physical characteristics of the resource system in some detail. The two most crucial factors of production are land and water. While private property rights dominate ownership pattern of land, saline water is taken from a common pool. A shrimp farm combines these two resources and generates another resource system called a gher or a shrimp farm. Since shrimp aquaculture is scale-neutral and there is no entry barrier set by technical know-how[1], it could expand extensively. Extensive expansion was also possible because of the existence of a large number of absentee landlords, unequal ownership of land and very poorly defined rights over common pool source of saline water. This is the

[1] In Polder 23 there has been hardly any technological change since shrimp aquaculture begun in this area. The gher owners take many measures to stop fish virus and much of it comes from experience of the gher owners or their employees. There is hardly any role of government extension services. Fisheries experts in the Fisheries Research Institute allegedly know more about sweet water fish than about shrimp. There is one local fish decease expert in the private sector with a chamber in the Thana headquarter.

relationship between physical characteristics of the resources and the configuration of property rights in shrimp culture (Schlager et al.1994).

What are the environmental implications of this property rights configuration? Note that the owners of the land and the owners of the ghers are different sets of agents. The gher owners are the residual claimants and directly bear no resource degradation costs of the land they rent in from a set of landowners. Therefore, they are least concerned about the environmental consequences of shrimp culture that is directly related to land degradation. We here have a classic case of asset misuse – the gher owners do not take care of the quality of land that is related to rice farming.

There are three ways by which these externalities can be internalised. *First*, by writing an enforceable contract between the landowners and the gher-owners where provision for compensation for land misuse can be explicitly included. We have seen that this is one of the common terms of contract between the owners of land and the owners of ghers. *Second*, by reducing the proportion of rented in land in a gher. As the ownership of land gradually coincides with ownership of gher asset misuse becomes less of a problem.[2] Again our and other findings show that this has been the trend – the owners of ghers are owning most of the land in a shrimp farm. *Third*, by making a direct attack on environment as allegedly happened in polder 22.

We are not saying that these are the only environmental problems facing the shrimp belt. As one allows saline water to slip in a polder there is a whole bunch of environmental problems for which there could be no easy solution. We are dealing with one environmental problem but this is the most crucial environmental problem associated with shrimp culture.

3. COMMUNITY RESPONSE TO SHRIMP AQUACULTURE: A SIMPLE ANALYTICAL FRAMEWORK

In this section we will develop a simple framework that will help us to nest the issues under discussion into a proper perspective.

The Framework

Response to environmental degradation can come from two sources, from "within" the community and from "outside" the community.[3] In many poor countries the outside community may play a greater role because they have better access to information, are more organised, educated and are strongly linked to the global network. The community that responds from outside could be what is loosely understood as the "civil society", for example. In this paper we will consider the state, NGOs, donors and the like as agents outside the community. The particular state organs are the local administration, DOF (Department of Fisheries) and WDB (Water Development Board). In this paper we will focus mainly on the NGOs as the key agent that processes responses to "voice". In fact the Thana/District/National Shrimp Management Committees frequently have NGO

[2] But note that this does not rule out resource mining. Resource mining is theoretically possible under any property rights configurations.
[3] We fully understand that in reality there is no outsider or insider, all are players in the same strategic game.

representatives as members. While the NGOs help to create "voice", others such as the state responds to "voice' or do not.

Be it from outside or inside, these agents can interfere *directly* with environmental issues. The outsiders such as the NGOs can initiate an anti-shrimp awareness program. Likewise, the insider community response could be a direct one. The insiders can collectively fight against environmental degradation directly by not deciding to go for shrimp aquaculture. The agents outside the community can capture these direct movements in which case they do not have to manufacture voice and they may only have to play a catalytic role. Indirectly the NGOs can address environmental concerns by providing support services to the shrimp farms. The state can also do this. For example, the DOF may implement a zoning law along with the WDB and the local administration can help in the enforcement process.

Similarly, the insiders can *indirectly* address environmental issues. The positive environmental impact of this kind could very well be unintentional. For example, the actors such as the gher owners and the landowners (who rent out land to the gher owners for shrimp culture) can mutually sign and enforce a contract where, by stipulation of the contract, enough time is set free for aman cultivation after completing shrimp aquaculture in a given crop year (defined by the period of aman and shrimp cultivation). On the other hand outsiders such as the NGOs can provide support services and credit to the shrimp farm owners. This support service may have strong environmental awareness elements plugged into it.

Now what is a direct response and what is indirect has to be made clear within the context of this framework. We use the word direct in a situation where the environment comes first as the "big issue" and viewed by the actors as the main objective of action. Indirect response does not take the environment as the prime object although it may play a secondary role or it could lead to an unintended environmental outcome.

One major problem with outsider led direct attack on environment is this: the main factor that contributes most to collective action could not be easily identified. It may be difficult to distinguish the objectives of the outsiders and the insiders. They can have different objectives but can still act together through a series of implicit contracts. The outsiders may induce the insiders to raise environmental concerns by developing a clientelist relationship with the latter. This clientelist relationship may be based on state resources. For example, the NGO may help the landless in acquiring khas land. The implicit contract between the outsider and insider could be that the insiders may get some benefit from siding with the outsiders – say by having more secure rights over khas land. Failure to do so may have serious consequences – cancellation of membership of the NGO for example. Such cancellation of membership in effect will weaken their rights over khas land. In this case the voice of the outsider comes out as the voice of the insiders and as mentioned above these can be two different voices. The explicit voice is directed against environment but the implicit voice is interest in property rights over khas land. We can call this an implicit "voice swapping".

This pattern of responses to environment is presented in Table 4.[4]

Table 3. 1: Pattern of responses to environmental degradation

[4] We provide one example of each type of response for simplicity but many others could be cited.

Type of agents	Type of Response	
	Direct **(Type 22 Response)**	***Indirect*** **(Type 23 Response)**
Inside the community	**A**. e. g. localised movements for addressing environmental problems	**B**. e.g. positive environmental impact as an unintended outcome
Outside the community	**C**. e. g. NGO launching anti-shrimp awareness program	**D**. e.g. NGOs providing support services to the shrimp farms

Indirect responses generally involve more independent decision making by individuals from inside the community. This decision making is primarily based on profit maximisation motives and the gains are immediate. On the other hand direct responses involve strong collective action efforts by individuals where immediate gains may not be clear to the participants.

Polder 22 comes close to the unshaded cells A and C and polder 23 comes close to cells B and D (i. e. the shaded region). We describe the polders in the following section.

4. DESCRIPTION OF THE POLDERS AND RESEARCH METHODOLOGY

We studied polders 22 and 23 in Paikgacha Thana in the District of Khulna. Polder 22 has strong presence of Nijera Kori whereas their presence in Polder 23 is nominal. Caritas got involved in Polder 23 under the Third Fisheries Project. Their role in Polder 23 was supportive to shrimp culture.[5] There are some small NGOs involved in these polders but their activities are very limited and impacts imperceptible. Polder 22 therefore reflects an area with strong anti-shrimp activities whereas no such resistance has been witnessed in polder 23. This contrasting scenario fits very well with our research objectives. Polder 22 represents enhancing and manufacturing of voice by an outsider agent whereas polder 23 represents a contractual domain where environmental voice can hardly be heard but environmental problems are partially and consequentially taken care of.

We have taken a more qualitative approach for studying polder 22 whereas our approach has been more quantitative for studying polder 23. This is expected because of limited shrimp culture in polder 22 and unabated shrimp culture in polder 23.

We have studied 85 shrimp farms from polder 23. The fieldwork was done between August 2001 to January 2002. These farms have been purposively chosen from the polder. We wanted to maximise on the geographical spread of the farms so that they have differential access to source of saline water. Although all of these farms were considered for some estimation purposes (particularly for opinion survey type questions), in most cases we limited our analysis to 81 farms. We dropped four farms. One of these farms was an outsider farm (this is the only outsider farm in polder 23) and three of them were gono ghers. The rest are locally known as local and pocket ghers. Local ghers are generally large in size (17.56 ha on the average in our sample) whereas pocket ghers are generally small (.86 ha on the average in our sample). We have 28 local ghers in our sample and 53 pocket ghers. This figure did not come from any proportionate sampling but from our effort to maximise the geographical spread to capture as much diversity as possible. Thus for most of our analysis the sample size

[5] It has to be emphasised that this paper has no intention to conduct a comparative study of two NGOs.

is 81. Our fieldwork experience suggest that the sample is under-represented by pocket ghers – the ratio of pocket ghers to local ghers in Polder 23 is much larger than our sample would suggest.

The main purpose of studying these farms was to understand the recent trend in property rights structure and their implications for resource management.

5. RESULTS FROM THE SURVEY OF SHRIMP FARMS IN POLDER 23

The historical pattern of growth of shrimp farms in Polder 23 has been a movement from a period of very limited shrimp farming to a period where the outsiders started to dominate the scene almost entirely. This happened in the 80s. It is during the 80s the local collaborators of the outsiders realised that they have been ripped off money. Gradually the insiders started to refrain from extending existing contracts with them and the outsiders had to leave lock, stock and barrel. The outsiders left almost peacefully – more or less it was a "contractual exit". People gave hari land to the emerging local gher owners. The 90s saw the emergence of local farms, large and small. The smaller ones are known as pocket ghers or sometimes mini ghers. Below we present our findings from a survey of 81 shrimp farms.

The owners of ghers have not totally moved away from rice production

For most of the gher owners primary occupation is shrimp culture. But this is not so for a large number of pocket gher owners. A sizeable number of them are involved in fish trading and other businesses. This shows that they do not earn sufficient income from shrimp culture. Given that pocket gher owners have smaller farms, they cannot depend solely on ghers and hence they have to pursue other livelihoods. This enhances their coping mechanisms in a situation when they are more vulnerable to shocks such as spread of fish disease in the shrimp farms. What is clear though is that crop agriculture is not their main occupation but it is an activity they have not yet given up.

For a large number of pocket gher owners secondary occupation is shrimp culture. But for most Local gher owners the most important secondary occupation is agriculture followed by fish trading and business. Previous occupation of the gher owners was mainly agriculture. Interestingly, a large number of them were students. When we consider primary and secondary occupations both the local and pocket gher owners seem to have a well diversified livelihood portfolio.

Thus we see that a large number of gher owners are also involved in rice agriculture. In fact the gher owners did not altogether moved away from rice agriculture. This is possible because it is a semi-saline zone and aman is still cultivated in a large tract of land in Polder 23. But more important is the fact that the conflict between aman and shrimp production has been avoided at the cost of lower aman productivity.

Interestingly, a majority of the owners own other ghers and 91% of them have rented out land to other ghers. This happened mainly due to fragmentation of land. People own land in small parcels that are spread across a given area.

Local ghers have almost replaced outsider ghers

It was almost unanimously stated by the respondents that the number of pocket gher has been increasing and that of outsider gher has been declining. Less and less local people are also joining up with the outsiders to form a gher. There is only one outsider gher in Polder 23.

This shows that the outsider intervention in shrimp farming has already become a history. The opinion of the respondents about the trend in gono gher is divided. This springs from lack of understanding of what a gono gher really means.

Gono ghers: A fragile form of organisation of production?

Gono ghers are a new and therefore not well-understood form of organisation of production. Some gono ghers were developed in the process of withholding outsiders from intercepting the local economy. In a village called Khaliarchar, a gono gher was developed to stop an outsider named Montu from getting involved in shrimp aquaculture in that village. Others were developed in response to contract failures where the lessors were not given rent on time or not at all or when land was not released for aman cultivation in violation of the contract.

In Polder 23 there are about 15 gono ghers but people have different notions about gono ghers. We studied three gono ghers. Our findings are stated below:

1. All members of gono ghers are landowners.
2. Profits and costs are shared according to the extent of land ownership.
3. Land ownership in the gher is heavily skewed towards large landowners. A rough estimate suggests that those who own more than 20 bighas of land own about two-third of the land in the shrimp farm.
4. Management and accounts are maintained by the large landowners.
5. Land owners share profit but take account of hari rates first.

In a nutshell there is nothing gono about a gono gher. It is more like a jointly owned gher where hari payments are implicit. The positive role, if any, gono ghers play may only relate to as a mechanism for breaking up large ghers. At the same time there is nothing new about gono ghers. Gono ghers existed even in the 1980s. These types of farms were observed by Guimareas (1989) in early 1980s.

Some sees rays of hope in gono ghers. While this can turn up to be a successful organisation of production the inherent fragility of this system has to be recognised. It should be emphasised that gono gher may suffer from all sorts of collective action problems. They include, free riding, over reporting of costs, under reporting of profits, lack of co-ordination due to heterogeneity of members and the like. However, a gono gher makes it possible for landowners to have two sources of income: one from rent and the other from profits sharing from shrimp farming. If they were only lessors, the second component of the income would be non-existent. This is true for any gher where ownership of land and gher coincides though.

The size of ghers is falling rapidly

In our sample more than half of the local ghers were established in the 80s and the rest in the 90s. In contrast about 80 per cent of the pocket ghers were established in the 90s. This means that the growth of the pocket ghers has been a very recent phenomenon. Interestingly, almost half of the local ghers sprang up at the same time.

When we compared the average size of the ghers that were created in the 80s and those that were formed in the 90s we observe that the Local ghers established in the 80s had a larger size as compared to those that were established in the 90s. In fact the average size of local ghers declined by more than a quarter in the 1990s. On the other hand the average size of the pocket ghers remained unchanged. It is clear that the average size of gher has a tendency to fall in size – the age of large ghers is gradually withering away.

The area of the farms has also declined from the period of their inception to the period when they were interviewed. This is true for all type of farms. This means that as a whole a part of the land in shrimp farms had split away at some stage of the life cycle of the shrimp farms.

We see changes in the size of the ghers mainly because of transactions in the land market. Most of these transactions took place in the tenurial market – lands were taken out or brought in through hari contracts. The size of ghers was often stabilised through the same mechanism. Either existing hari land was bought by original owners of the ghers or those who owned land in the gher had left but their land was retained as hari land by those who stayed back.

We observed that the local ghers grew out from breaking up a coalition of local and outsider gher owners whereas the pocket ghers, most being fairly recent, grew out of breaking up of local and pocket ghers.

The following figures about the number of ghers in the Thana of Paikgacha has been provided by the Thana Fisheries Office of Paikgacha (Table 5.1):

Table 5.1: Number of Ghers in Paikgacha

Year	No. of Ghers	Area (ha)	Production (mt)	Productivity (kg/ha)	Av. Size of Gher (ha)
1999	930	15461	3400	220	16.62
2000	950	15461	3500	226	16.27
2001	2538	15942.6	2870	180	6.28

The sudden jump in the number of farms in 2001 has not been explained by the authorities. We can also learn about the trend of average farm size from other studies (Table 5.2):

Table 5.2: Average Farm Size as Reported in other Studies

Study	Average Farm Size (in ha)
Guimareas (1989)	68.4
CARITAS report quoted in BCAS (2001)	21 in 1993 and 6 in1996
TFO (Paikgacha, 2001)*	6.28
DFO (Khulna, 2000, for all Thanas)*	3 to 15 ha
This study (2002)	6.64

*TFO is Thana Fisheries Office and DFO is District Fisheries Office.

The study conducted by Guimareas (1989) is the oldest and refer to early and mid 80s. This was followed by CARITAS reports where they provide figures from 1993 and 1996. The rest are very recent and covers a period between 2000 and 2002. We observe a clear picture of declining shrimp farm size from Table 5.2.

A gher now has lesser number of owners

We compared the number of owners when the ghers were established and the number of existing owners during the period of interview. We have found that

- the number of local gher owners declined by 21per cent.

- the number of pocket gher owners increased 25 per cent.
- there is no gher (local or pocket) with owners larger than three owners.
- pocket ghers generally have a single owner.

Thus contrary to popular belief we find that the ownership pattern of gher has changed from a multi-owner to a single-owner form. This possibly explains why pocket ghers proliferated. This also explains declining shrimp farm size.

Increase in local gher increased local employment

There are two types of labour employed in a gher. They are temporary and permanent labourers. Temporary labourers are those who are hired on a daily basis if and when needed. They are typically involved in shrimp harvesting, construction of dykes, land preparation and so on. They are generally paid on a daily basis. On the other hand permanent labourers are hired for an entire year. They are generally paid on a monthly basis. Such permanent labourers are involved in guarding and some of them work as Managers and Clerks of the enterprise. These labourers are also classified into those who come from the locality and those who come from outside the locality. Sometimes the difference between local and outside is blurred and depends on the views of the subject.

Both the pocket gher owners and the local gher owners hire temporary labourers entirely from the locality. This is not the case for permanent labour. They are hired more by the local gher owners whereas the pocket gher owners hardly higher them. That both the pocket and local ghers are now increasingly employing local permanent labour indicates that these labourers are now locally available. This is creating more local employment.

Inverse farm-size and productivity/profitability relationship in shrimp farming

We have observed that the farm sizes are increasingly getting smaller and smaller over time. This may have strong productivity implications and brings out the old issue of the relationship between farm size and productivity. Are large farms more productive than small farms? Do large farms make more profits than the small farms?

We have seen that the small shrimp farms are more productive than the large shrimp farms. In comparison to Local ghers profits per unit of land for Pocket ghers are higher for all crops: shrimp, white fish and aman. Shrimp, which is the primary product (in the sense that it is the main crop that is cultivated) makes more than three times profit as compared to those made by local ghers. This implies that the pocket ghers, having very small farm size, are very intensively cultivated. We have also seen that the pocket ghers receive higher prices for shrimps. We cannot explain why this has been the case. Our guess would be that the Pocket Ghers produce shrimp of higher grades, can skip some middlemen barriers in the complex marketing chain or something else we were not able to find. Pocket ghers are therefore not a constraint to the growth of shrimp farming. Since they are more efficient as compared to larger local ghers, a proliferation of pocket ghers does not imply losses in efficiency. This has strong implications for resource management strategies.

Mixed attitude towards outsider actors

We wanted to know the attitude of the shrimp farm owners towards external actors such as the NGOs, the Water Development Board, the Department of Fisheries, and the Local Administration.

The general impression that one can get from these responses is that the respondents agree that profit has been increasing and more and more people are finding a source of livelihoods in form or the other. No large out-migration has been observed – there is more or less a stable labour force in Polder 23. A large number of landless found employment in ghers and gher related livelihoods. Women found new work such as in liming or even in dyke construction or repair. But these benefits are not equally shared and that there are losers and gainers. The adverse impact of shrimp culture on the environment is also acknowledged.

On the other hand the role of the NGOs remains ambiguous. They have been providing credit and helping them to construct sluice gates. But again the fact remains that they are made aware of the adverse impact of shrimp culture on environment by the NGOs. The role of the public agencies like the WDB, DOF is less ambiguous. They perform their assigned responsibilities. On the other hand the role of local administration is less clear. What is clear from the responses is that these farms are vulnerable to various types of extortions, from DOF, WDB to the local administration (mainly in the form of bribes and contributions). This has to be seen in a more general scenario of deteriorating law and order situation in the country. But it remains clear that the shrimp farms are affected by these rent-seeking activities.

Implications of changing property rights on environment

We have stated that the crux of the environmental problem lies in the separation of the ownership of ghers from the ownership of land. Obviously, there are other environmental problems as long as saline water is brought into any area. But in the semi-saline zone the crucial question is whether existing property rights structure allows production of shrimp and aman. This can be made possible by three factors:

(i) gradual fusion or merging of landowners and gher owners, and

(ii) formal contracts that protect the rights of the two types of agents, the landowners who rent out land and the gher owners who rent in land.

(iii) direct attack on those who spoil the environment.

Let us discuss (i) and (ii) in turn. The third is dealt in section 6.

We have witnessed a proliferation of small ghers. We have been referring to them as pocket ghers. They have the least gap between the two ownership types. Only 17% of total land in Pocket Ghers is under rental contractual arrangements that are locally known as hari. The corresponding figure for local gher is 81%. As farm size becomes smaller and smaller the proportion of rented in land to total land of the gher will always get smaller and smaller. CARITAS findings as quoted in BCAS (2001) also show that access to ghers is lately achieved more from landownership than from land leasing. In fact, the era of outsider gher owners of the 1980s involved a property rights regime where the owners of ghers (the outsiders) owned no land. As these ghers started to break up, smaller and smaller ghers increased in number and started to dominate in Polder 23. This implies that the gher owners were having a large chunk of the land owned by themselves. This is clear from CARITAS finding as presented in Table 5.3.

Table 5.3: Pattern of shrimp holding 1993 and 1996

Indicators	1993	1996
% of landowners leasing out their land for shrimp farming	66	47
% of landowners actively involved in shrimp cultivation	34	53

Less and less landowners are now leasing out their land for shrimp culture and at the same time the proportion of landowners actively involved in shrimp farming has also been increasing.

When the ratio of own land to lease in land in a gher increases, there is likely to be less collective action problems. But in Polder 23 collective action effort is directed more towards profit maximising and not directly towards environment management. The aman-shrimp conflict is resolved through the same mechanism. Since most landowners are also shrimp farmers they have an in-built incentive to go for aman farming in suitable lands. But, as we will see below, this has taken a more formal contractual route. Also note that this has also taken care of asset misuse problem. The gher owners can now take more care of the lands they own.

A gher is formed through a formal contract. This formal contract is recorded in the office of the sub-registrar in the form of a deed. Formal license for shrimp culture is issued by the DOF and WDB formally allows the farms to bring in saline waters to the ghers. Such formal contracts did not exist in "pre-shrimp" period when all the sharecropping contracts were oral. Such oral sharecropping contracts can be seen all over Bangladesh. Interestingly it does not take more than a week to do a hari deed but the formal process is lengthy. The DOF takes a month for issuing license (they have to wait for the duplicates that comes from the sub-registry office). Then the WDB takes a couple of weeks for providing formal permission to withdraw water. The shrimp farms do not wait for these formalities to complete, they start to carry on their business as soon the deed is done.

The typical terms and conditions of a deed are presented in Box 5.1. These contracts will define the parties (generally the gher owner is the first party), specify the boundary of the ghers, the period of contract and an explicit mention of penalties to be paid for any breach of the contract.

Box 5.1: Main elements of a deed

1. The owners of the gher can use mud for creating dykes but they should always consider that this does not do any damage to the cultivable land.
2. The owners of the gher can construct and use sluice gates anywhere on the rented land.
3. The owners of the gher should supply water as demanded by the landowners for rice cultivation.
4. The owners of the gher can culture shrimp during the season and can have a space for preserving shrimp on the land inside the gher.
5. The second party (hari landowners) cannot catch fish without the permission of the owners of the gher.
6. Annual hari has to be paid in two installments. Half on 15 Falgun and half on 15 Sraban.
7. Lease contract will be terminated if hari installments are not paid.
8. Any crop damage due to the faulty dykes for which the owners of the gher are responsible has to be compensated. The compensation has to be determined by taking into consideration production in neighbourhood lands.
9. The owners of the gher will not be liable for any compensation for any natural disaster that may break the dyke and damage the crops.
10. The gher owners cannot transfer the land through gift or purchase or by any other means and if they do that then the contract will become null and void.
11. The owners of the gher should allow adequate time for rice cultivation (15 Sraban to 15 Bhadra). If land is cultivated under sharecropping arrangements the major terms and conditions (output and input sharing) are also well specified.

Like any contract the two parties attempted to protect their interests in this contract. The gher owners tried to make sure that they can produce shrimp and the landowners make sure that they can produce rice in the respective seasons. This externality problem is solved by the formal contract. There is some attempt by the landowners to minimise asset misuse and this is reflected in conditions 1 and 8. There could be many implicit contracts that may or may not take care of these externalities and the two parties can also mutually take care of them through informal institutions. Also this formal contract may not be always enforced. The important point here is that we observe a formal contract where the agents, in the process of maximising their profit, make sure that the asset land is not misused and in effect some environmental problems are well taken care of.

Contractual conflicts that are frequently resolved formally in the courts involve

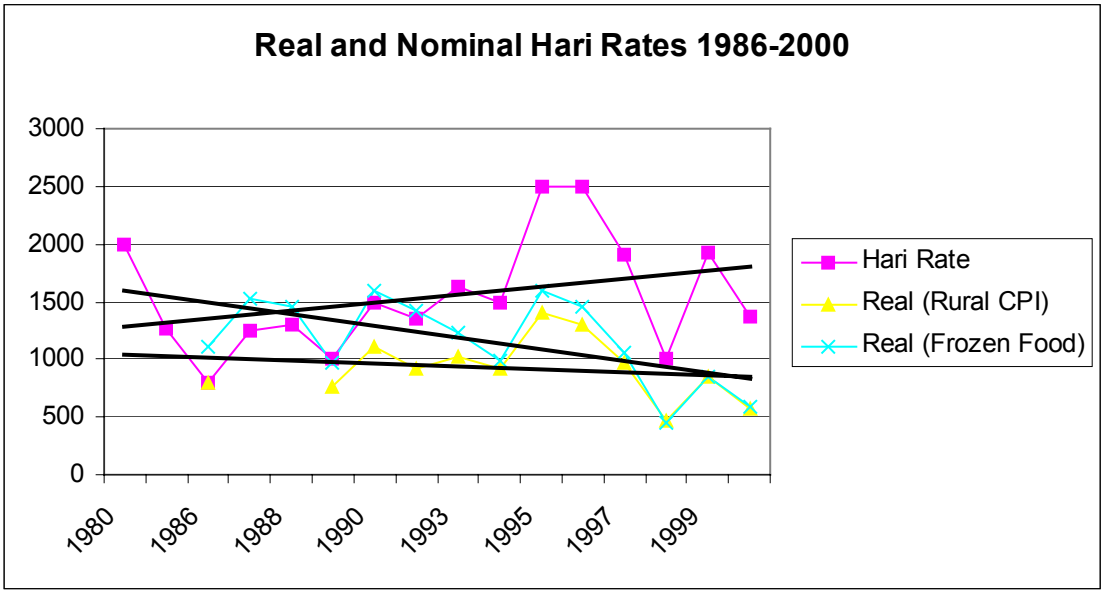
- boundary of shrimp farms
- theft
- breaching of contract
- ownership of ghers (many claimants of owners, see condition 10)

We have gathered this information from interviews with lawyers from Paikgacha.

Asymmetric Contractual Power between the Land and Gher Owners

We will state that hari contracts are unequal. There are many reasons to believe why this is the case. *First*, the first item in the contract is stated in rather weak terms. The gherowners are just requested to take care of the lands and no compensation stipulations are there for any breach of this condition. We have recorded instances when this condition is frequently violated. *Second*, hari money is hardly paid in time or in full amount. This is another source

of asymmetric contractual position between the two parties. In both first and the second cases disputes are often resolved in the courts while many are settled out of the court. *Third*, under existing laws if landowners of 80% of land sign a deed for shrimp farming the rest having land inside the gher has no choice but to agree to lease out their land in similar terms and conditions. *Fourth*, hari money is paid in installments and over the period of contract (generally 3-5 years) it remains constant (term 6) whereas profits from shrimp culture may vary and expected profits are generally positive. We have estimated real hari rates (by using rural CPI and then by using unit price of exported frozen food). We have found that hari prices increased in nominal terms but decreased in real terms. The nominal hari rate has increased over the period 1986 through 2000 by an average annual rate of 5.06%. The real hari rates adjusted by the rural CPI and by prices of exported frozen food have declined by an average annual rate of 1.99 and 3.34 percent respectively.



We have found that in Local ghers as much as 80 per cent of total land is under hari contracts. The crucial question then is why landowners still lease out their land under hari contracts when they can potentially have shrimp farms of their own?

Hari land does not convert to Pocket or Local ghers because of many reasons. Generally a local gher is comprised of one large landowner and a number of small hari-land owners. Locational advantage, social power, failure of the hari owners to act collectively all contribute to stable hari proportion in a gher. Transaction costs of creating a dyke is also an important constraint. The cost of creating and maintaining such dykes may be prohibitively high for a small farm but not for larger ones. This situation is further aggravated by increasing land fragmentation. Another crucial element is access to saline water. Usually the gher owner enjoys this right due to locational advantage. Small ghers also have lower ability to manage risks (say fish virus). Also hari contracts vary from 3 to 5 years and hence the landowners are often contractually stuck for some time.

Despite this there is a tendency towards breaking up of ghers. Gher owners make all effort to foil these collusive behavior from some hari owners. To what extent hari lands can be converted to gher lands depends on the effectiveness of collective actions and social power of the agents. A large gherowner will always want to keep the size of the gher large.

The pocket ghers also suffer from many disadvantages. On the average a local gher is 84 yards away from the main source of saline water and the corresponding distance for pocket gher is 394 yards. For this reason the pocket gher owners face more problem of exchanging saline water. We have found that only a small fraction of Local gher owners have problems in exchanging saline water. The most common problem is bringing in saline water through other ghers. Also the pocket gher owners hardly get formal source of finance for establishing and running their ghers. Most of the formal credit has gone to the Local ghers. More than half of the Pocket ghers could not produce aman because they have serious problems of regulating water.

Under these objective conditions the voice dimension therefore may relate to small and large shrimp farms – not so much to the impact of shrimp culture on environment. The anti-shrimp NGOs may not find these areas as a breeding ground for raising environmental concerns and issues. They can possibly bring about the issue of minimising the adverse impact of shrimp farming – not outright ban on shrimp culture.

These changes in property rights structure open up the scope for more intensive shrimp culture and the role of the government lies here. With strong government policy of equitable supply of saline water, and fusion of some hari land, large ghers can gradually break up to smaller ghers. The crucial issue then would be how to manage a small farm-based shrimp production and a move from semi-intensive to intensive shrimp culture may be one important public option. The bottom line is that the major issue now is distribution rather than environment in a situation of increased anonymous transactions by new transactors. The presence of a large number of lawyers in Paikgacha Thana vindicates this proposition.

6. ANTI-SHRIMP STRATEGY BY NIJEARA KORI IN POLDER 22

In this section we will describe another outcome of an environmental conflict. In Polder 22 Nijera Kori manufactured and crystallised environmental voice against shrimp aquaculture. In terms of our framework it was a direct response to environmental degradation made by a collusion of insiders and outsiders. But there is more than what meet the eyes. This will become clear as we present and analyse the case study below.

Polder 22: The Background

Polder 22 covers an area of around 1,500 ha. The polder is semi-saline. It is located 45 km south-west of Khulna district under Paikgacha *Upazila.* The Polder was developed under the pilot project of Delta Development Project (DDP). Among the aims of the project was conservation of fresh water to produce two paddy crops in one year and to prevent intrusion of water from the sea into the intricate system of river and tidal creeks in the area.

DDP started to face problems as the rich farmers inside the polder started to show interest in shrimp farming. It was at that time Nijera Kori appeared in the Polder. Nijera Kori started its activities in 1984 by organising the landless people in the Polder with an objective of preventing shrimp farming (among others) in the area. They formed 28 landless groups in 14 villages of the Polder.

BOX 6.1: DELTA DEVELOPMENT PROJECT

The history of the Delta Development Projects (DDP) goes back to 1975. DDP aimed at starting a process of integrated development through improved engineering techniques, water management, agricultural practices and organised socio-economic activities. The first phase of the project was initiated in January 1981 in Polder 22.

In the third phase of the project in 1987 it was realised that the project had been too ambitious in its goals and purposes. Actual implementation was not fully in line with the original goals. The combination of the goals of socio-economic development on one side and physical polder development on the other proved to be extremely difficult. The technical aspects of the project was appreciated but the socio-economic component of the project turned out to be a controversial issue.

Activities of Nijera Kori in Polder 22

Social mobilisation has been amongst one of the most important programmes of Nijera Kori. In the shrimp belt of Bangladesh, Nijera Kori has emerged as a major anti-shrimp actor. It has been campaigning against shrimp culture because of its negative environmental and social impacts. It organises the poor, particularly the landless, help them to take lease of government khas land for cultivation, make them aware of the negative environmental impact of shrimp culture and try to stop shrimp farming as much as possible.

Though the organisation claims that it has been quite successful in its campaigning against shrimp culture, the actual outcome has been rather limited. With an exception of Polder 22, it has not been able to mobilise the people to refrain from shrimp culture in other polders. In Polder 22, it has achieved limited success in protecting the area from shrimp culture. This was done through mobilising the landless groups against the landowners. However, there has been a very strong move towards shrimp culture in recent times. Most importantly, there were other factors that helped Nijera Kori to achieve this limited success which we will discuss below.

Nijera Kori has the following aims and objectives in its anti-shrimp movement in Polder 22:

- Building public opinion against shrimp farming and preventing shrimp farming by any means.
- Encouraging paddy cultivation, cattle rearing, tree plantation etc.
- Helping the landless in getting the acquired lands and other *khas* lands.
- Propagating the negative environmental and other impacts of shrimp culture.
- Raising the level of awareness of women.
- Making the ignored aware of their rights etc.

Nijera Kori has been successful in mobilising the landless people and helping them in forming the landless groups. It has also helped the landless group in getting the lease of khas and BWDB lands adjacent to the embankments. Initially, it has also been successful in encouraging the people for paddy cultivation, cattle rearing, tree plantation etc. All those were possible for them because they were at that time working under the umbrella of DDP where the rules and regulations set out for the project were favourable for their activities. However, after withdrawal of DDP with virtually no success, Nijera Kori started to lose its ground. An increasing number of landowners started to move towards shrimp culture.

Polder 22: The Empirical Reality

While it is true that Nijera Kori has been partly successful in preventing shrimp culture in the area, the reason for this success has not only been their campaign against shrimp culture. The reason is that they were able to help the landless to acquire leasing rights over khas and BWDB lands. Also, intake of saline water is not yet permitted into the Polder. This was done under the DDP. However, it has been observed that the livelihoods of these organised landless people have been depending to a large extent on shrimp related activities that have been effectively practiced all around them. The objectives of DDP have not been achieved as it was not able to produce two crops and the land remained fallow during winter. As a result, the livelihoods of the landowners suffered to a large extent. The landowners had to depend on only one crop during the year, i.e., *aman.* Obviously, the landowners had no other alternative but to try for shrimp culture which had already started at the periphery of the embankment.

The main source of conflict between the landless and the landowners within the Polder was marked by Nijera Kori's effort to make official arrangement of the *khas* and BWDB acquired land for the landless through the land redistribution programme of the government. Although the government made acquisition of those lands during construction of embankments, the landowners were still paying land taxes to the government. The activities of Nijera Kori created tension and conflict between the landless and the landowners of the Polder. To add to the complexities, the period of land lease expired in 1996. It may be mentioned that these lands were initially leased out to the landless for a period of 10 years as per the terms and conditions of the DDP. While the landowners have been trying to get their land back, the landless people have been forcibly occupying those lands with active support from Nijera Kori. The conflict aggravated and confrontation began when the rich landowners found shrimp farming profitable. They faced two major constraints. The organised landless people was against them and were heavily backed by Nijera Kori. On the other hand shrimp culture in Polder 22 was prohibited in line with the objectives of the DDP. The conflict and confrontation went as far as killing of a woman of the organised group that turned the control in favour of the landless people. A number of court cases have been going on. Nijera Kori has been bearing all the expenses of these court cases on behalf of the landless. The area was declared by the government as non-shrimp area under DDP and intake of saline water into the Polder was prohibited by law at that time. After withdrawal of DDP, Shrimp Culture Regulation Committee of Khulna Division gave permission for shrimp farming in the area on the basis of the request made by more than 85% of the landowners of the area. Later, upon filing a case against the decision of the Court by some NGOs led by Nijera Kori on behalf of the landless people, the decision has been withheld and the issues of whether shrimp culture be permitted or not are now under the consideration by the Court.

As already mentioned, it is now observed that Nijera Kori is losing its ground in the Polder. A section of the beneficiaries organised under Nijera Kori are also not very active. Shrimp culture has also been observed to start at the periphery of the embankment. It has also been reported that there are currently 142 shrimp farms in the Polder.

One interesting observation is that though the landless groups mobilised by Nijera Kori are against of shrimp culture in the Polder, they are carrying out shrimp culture in the lands adjacent to the embankment. This is contradictory to the professed ideology under which they are organised by Nijera Kori. This implies that the environmental consideration is not the main reason for opposing shrimp culture in the area. There are other reasons that played the key role. These include receiving support from Nijera Kori, getting lease of khas and BWDB land, and the legal situation that exists with respect to shrimp farming in the area

The landless people, with support from Nijera Kori, are trying to continue their leasing rights over land beyond the tenure of the lease. On the other hand, the original owners of those land are now claiming that they should get the priority in getting the lease of those land. Both the parties are continuing their legal battles while the lands are still occupied by the landless.

Nijera Kori also provided all kinds of support to them including financing their struggle against the landowners. Therefore it has so far been successful in mobilising at least a section of the landless people and keeping them in its campaigning against shrimp culture.

Since the lands around the embankment are under control of the landless people, the landless people do not allow the landowner to drain in the saline water into the Polders. Intake of saline water into the Polder is not yet permitted. But the landowners are now desperate to go for shrimp culture. Consequently, frequent conflicts take place between the two groups with respect to draining of the saline water into the area. In addition there are strong conflicts with respect to supporting or opposing shrimp culture in the Polder.

The end result today is that there are conflicts between the two groups and consequently violence is also taking place quite frequently in the area. Normal agricultural practices, paddy or shrimp or both, are therefore hampered. People of the area, both landowner and landless, are now trapped in a situation where all of them are compelled to waste their time, money and energy for fighting each other.

Polder 22 could not solve major environmental issues. There is only one rice crop. Shrimp farming is done by the members of Nijera Kori along the embankment as well as by the landowners in their lands. The ground rules are not set by formal institutions – in fact they have made things worse. There are conflicts in many directions but the core issue is unbridled shrimp culture by the landowners. This is constrained by Nijera Kori and by the State. To what extent the voice of the landless represents a true environmental voice is anybody's guess. The fact remains that they benefit from being a part of Nijera Kori – they get khas lands. Thus the driving force may not be environmental concern because the members of Nijera Kori are involved in shrimp culture. The driving force could very much well be access to khas land. As a consequence Polder 22 is not going through changes in property rights structure similar to those observed in Polder 23.

7. SUMMARY AND CONCLUSIONS

This paper aimed at understanding community responses to environmental degradation due to shrimp aquaculture in the southwest of Bangladesh. A large part of this zone is semi-saline and therefore it is possible to grow shrimp and rice in there respective seasons. We have developed a simple framework to analyse and understand community responses to environmental degradation caused by shrimp aquaculture. In one setup of this framework we can have a direct attack on environmental issues by a collusion of insiders and outsiders. In the other setup of the framework we can have unrestrained profit maximisation by a group of landowners that may result in unintended but favourable environmental outcome. The former situation describes the activities of Nijera Kori in Polder 22 where a large number of landless people are mobilised against shrimp culture. The latter represent the situation in polder 23 where changes in property rights enhanced profit making from shrimp aquaculture with some positive spin off for environment. Both these polders are located in the Thana of Paikgacha in Khulna.

Environmental and social problems associated with shrimp culture have repeatedly been misconstrued. The central point we make is this: as long as saline water is brought into a polder there are some environmental problems that can hardly be solved without stopping entry of saline water. As long as saline water is allowed to enter a polder landowners will grab the opportunities of shrimp culture. But, in this process of profit making, some environmental damage will be done but others will be taken care of – at least to some limited extent. A major source of environmental damage comes from land degradation. But this can be minimised. We have to understand the nature of environmental problem. There are two sets of people having property rights over two sets of resource systems. The land owners have rights over land and the shrimp farm owners have rights over the shrimp farm. The saline water is drawn in from a common pool. This ownership separation leads to asset misuse – the shrimp farm owners do not have any incentive to take care of the vital resource – land. Land, the scarcest factor of production, is exposed to misuse. Under these circumstances the two actors can write down explicit contracts to protect their assets or there can be a merging of the two types of actors. Both this processes are in motion in polder 23. The average farm size has been falling, the proportion of rented in land to total land in shrimp farms has also been falling and people are writing formal contracts and thereby making all effort to protect their assets.

Polder 22 could not make these changes in property rights. The presence of a strong anti-shrimp NGO distorted the property rights structure. They have organised a large section of the landless and helped them to establish their rights over government land around the embankment. These agents were responding most against the environmental impact of shrimp culture. Unfortunately, we observed this group of people to involve in shrimp culture in the lands they acquired from the state with active support from Nijera Kori. State attitude towards this polder has been ambivalent. Initially it helped Nijera Kori to pursue its objectives. Shrimp culture is still prohibited in this polder. Therefore this polder is prone with complex conflicts between a multiple set of actors. While the actors in Polder 23 were gradually changing property rights so that more shrimps could be produced the actors in Polder 22 were spending more time in the courts, in the offices of local administration or may be in the circles of power in Dhaka and beyond.

We have argued that there has been a discord between outsider voice and insider response in Polder 22. The civil society and the media, state and the like have been very vocal about deteriorating environment whereas those who suffer from it directly are nonchalant. While this may reflect a gap between private and social calculus but the gap is hardly showing any sign of disappearing. Interestingly, those who have received lands and support from Nijera Kori are responding most to environmental degradation. The steam for collective action may have not necessarily come from concern over environment but from concern over rights over acquired khas land. Thus environmental voice can often get distorted.

In many ways people are concerned more about fish disease, government support and so on. The major source of conflict may relate to contract failures, inability of the landowners to come out of the rental contract, further breaking up of larger farms and the asymmetric relationship between land owners and gher owners on the one hand and the large and small ghers on the other. Environmental issues are pushed to the sidelines.

The crucial issue for policy formulation is to devise a strategy which is based on medium and small shrimp farms. Although we have found that small farms are more productive than the

large farms and they make more profits nothing much can be gained from existing technology. Existing property rights structure can somewhat take care of the distributional issues but not productivity enhancing issues. We think that the material conditions for a shift towards more intensive shrimp farming is gradually appearing in Polder 23 and effort should be made to remove all the obstacles to shrimp aquaculture in Polder 22 or similar polders. The missing element here is knowledge, skill and lack of government support. Rather than distorting voice the outside agents should address these issues. This does not mean that people should not be made aware of adverse environmental impact of shrimp aquaculture. The environmental voice should also take into consideration the voice of profits!

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