IMPACT OF STRUCTURAL ADJUSTMENT POLICIES ON THE ENVIRONMENT IN BANGLADESH

by

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1. INTRODUCTION

This report aims at improving our understanding of the impact of structural adjustment policies (SAP) on the environment in Bangladesh. Obviously, the domain of SAP is very broad and may not be always well defined, so are its impact on environment. However, one advantage of this study has been that the domains of SAP and their impacts on environment have been determined through a lengthy process of three regional consultative meetings, six focus group discussions and a workshop at the national level (Bhattacharya and Titumir 1998a). These domains reflect concerns of the people on their environment and how they affect their life and livelihoods. This study will try to provide evidence and follow-up arguments to explain the causality structured by those who are the immediate victims of environmental degradation. Thus it has to be made clear at the outset that by construction this is not a technical exercise in environmental impact assessment. It will try to fit in important environmental concerns in a broader perspective for the purpose of pursuing a more acceptable development strategy. The development strategy has been termed more acceptable in the sense that it is expected to be shaped by the participation of a wide spectrum of people. Again this is not a very novel exercise. Such attempts have been variously packaged as sustainable development or sustainable livelihoods. The value added from the current exercise lies in rationalising a jigsaw puzzle already solved by the people – i. e. looking up and assembling secondary evidence to establish the link between SAP policies and its impact on environment in Bangladesh.

An analysis of the concerns related to environmental impact of SAP policies coming up from the SAPRI consultation process can be summarised very briefly like this: attempt to pursue the twin development objectives of increasing food production and to follow an export-led growth path has resulted in serious land degradation problems and loss in biodiversity. Two sources of land degradation problems have been identified: excessive use of fertilisers that resulted in the decline in micro nutrients and erosion of soil fertility and unplanned growth in shrimp cultivation that has led to increase in salinity of soil and to loss in biodiversity. Description of this casual relation, as perceived by people, will be discussed in detail later. For the moment, this broadly defines the domain of our analysis mentioned above. We will therefore divide our analysis into two parts: land degradation due to excessive use of fertilisers and land degradation and the loss of biodiversity due to shrimp culture in the

coastal regions of Bangladesh. However, before we embark on such a venture, a detail description of the causality mentioned above has to be presented. This is done in the following section.

2. THE RELATIONSHIP BETWEEN STRUCTURAL ADJUSTMENT POLICIES AND ENVIRONMENT IN BANGLADESH: OUTCOME OF THE CONSULTATIVE PROCESS

The participants in regional consultative meetings and focus group discussions expressed their views on many aspects of environment. Obviously, the impact of SAP on environment will vary by region and also the understanding of the impact will also depend on the type of the participant. Many issues came up in the consultative process and these issues have been summarised with the help of Figure 1. The impact on environment originates from the negative externalities that arise from pursuing a set of development strategies. In the present context the key development objectives are increasing food production and pursuing an export-led growth strategy. The World Bank "supported the Government's primary objective to increase foodgrain production, to the end of attaining self-sufficiency and a more equitable income distribution (World Bank 1990, p. iii, underline original). The World Bank also supported the strategy of the Government "to develop a broader and diversified industrial and export base" (World Bank 1990, p. iv, underline original). Also the outcomes of these objectives were desired to be **rapid**, "the World Bank Group's mission is to help Bangladesh reduce poverty by promoting rapid, job-creating economic growth and interventions" (World Bank 1998, p. 1, author's underline). These two sets of development strategies were thought to have generated two sets of environmental impacts as depicted in Figure 1. Note that the two sets have been separated for the purpose of exposition whereas in reality such separation may not be possible. For example, privatisation (as a policy for following an export led path of growth) is likely to have an impact on the use of spurious fertilisers (as an element of the growth objective of increasing food production) if not regulated properly. Let us look at the first set of cause and effect. Excessive emphasis on (rapidly) increasing yield has led to excessive use of fertilisers. On the other hand current input pricing policy distorts related prices of various types of fertilisers (say between phosphatic and nitrogenous fertilisers as we will se later) resulting in the use of an unbalanced mix of fertilisers. Such pricing policy may have led to use of spurious fertilisers as well. Liberalisation of imports may also have resulted in excessive use of fertilisers or use of spurious fertilisers or use of an unbalanced mix of fertilisers. Thus excessive use of fertilisers, use of spurious fertilisers and their use in

inappropriate mix may have caused land degradation as reflected in a decline in micro nutrient and erosion of soil fertility. This set of "cause and effect" chain takes us to the major issue of fertiliser policy.

The second set of cause and effect takes us to the issue of shrimp management policy. The specific structural adjustment policies here involve promotion of non-traditional exports and privatisation. Availability of cheap labour and supply of a product of nature helped shrimp producers and exporters to benefit from market opportunities outside. Shrimp culture in the coastal region of Bangladesh has resulted in many negative environmental consequences. One of them is increased salinity of soil and the another is loss in biodiversity (resulting from shrimp seed collection and throwing away of by-catches).

Thus the environmental impacts of SAP call for participation of the civil society in the formation of two sets of policies: fertiliser policy and shrimp management policy. Such participation essentially means pressurising the policy makers to incorporate environmental consequences in the policy formulation process.

3. METHODOLOGY

We have already mentioned that this report is not based on any standard environmental impact assessment technique. Several such methods are available: counterfactual method (what would have happened without SAP or the "before and after approach"), "with or without method" or control group approach (compare clusters of SAP pursuing and SAP not-pursuing countries/regions), or general equilibrium method and so on. All these methods have their strengths and weaknesses. For example, a general equilibrium method would have been more appropriate for the current study but lack of data, particularly longitudinal data, is a major bottleneck for carrying out such exercise. By design, this report is entirely based on published work, both by the World Bank and by other institutions and individuals. This is a desk-review geared towards accumulating evidence to understand the causality described in Figure 1. No primary data has been used in the preparation of this report. Therefore, in effect, this report will be using findings from studies that applied the various methods mentioned above.

One strong criticism of our approach would be that of the identification problem. The causality described in Figure 1 could have been generated by processes other than those

related to SAP. We strongly refute this argument. We will provide evidence to show that structural adjustment policies did play a strong role in shaping and intensifying the causality. At the least, it played a catalytic role in the environmental degradation process. Thus this report will look at World Bank documents, scrutinise the impact of some project interventions and their evaluation by the Bank itself and others and so on. Of course, we cannot be precise or quantify the extent to which SAP were responsible for the environmental degradation but the fact remains that these policies did play a major role. This is important for understanding the issues involved and to find the ways for the involvement of the civil society to improve the environment. Understanding this role is as important as understanding the numerical dimension of the problem. Note that we are not belittling the importance of numbers. Such numbers, if available, will definitely improve our understanding and help us influence policy choices. But as long as these numbers are not available or are costly to generate we think one is capable of carrying out the analysis this report has intended to pursue.

As stated earlier and depicted in Figure 1, we will have to look at two broad policy issues involving the impact of SAP on environment: the fertiliser policy and the shrimp management policy. We will take up the former first.

4. FERTILISER POLICY AND ENVIRONMENT

Though the "era of adjustment" started in Bangladesh from mid-1980s with policy based sectoral lending of the World Bank and contracting of the Structural Adjustment Facility with the IMF, as long as the agricultural policy in general and fertiliser policy in particular are concerned the dividing year has been 1983/1984. This is the period the BADC withdrew from the retail and wholesale markets for fertilisers, abolished the licensing requirement for the fertiliser dealers and so on.

As pointed out by Ahmed (1995), the changes in preliberalisation practices in agricultural markets have been quite substantial in Bangladesh as compared to some other South Asian countries. Besides impressive improvement in macroeconomic indicators (Bhattacharya and Titumir 1998b; Zohir 1997), subsidies in food and fertilisers had been drastically reduced. The gap between domestic and world prices of rice declined sharply and Bangladesh was able to abolish the rationing system. Opening of import and export of foodgrains to private sector was completed. Bangladesh was able to transform the domestic and external trades in

fertiliser from a strong public monopoly to a healthy competitive structure. Table 1 presents the selected indicators of liberalisation and their change over time in Bangladesh. This Table has been adapted from Table 1 of Ahmed (1995).

Table 1. Selected Indicators of Liberalisation and their Changes over Time in Bangladesh

Indicators		**Preliberalisation (1977-84)**	**Postliberalisation (1985-92)**
1. Exchange Rate	1a. Rate of change in official rate	8.1	8.0
	1b. General Policy	Fixed multiple	Floating uniform
2. Inflation Rate (%)		20.2	9.1
3. Weighted Tariff Rate(%)		94	31
4. Budgetary subsidy as % of public development expenditure	4a. Food grain	12	4
	4b. Fertiliser	26	0
	4c. Irrigation	7.1	4.2
5. Nominal Protection Coefficient of Rice (import parity)		.70	.94
6. Public procurement of grains from producers		Compulsory/ Voluntary	Voluntary
7. Public distribution of grains to consumers		Rationing (7%)	Market
8. Restriction on domestic trade in grains		Movement restriction occasionally	No restrictions
9. Restrictions on export/import	9a. Food grains 9b. Fertilisers	Public monopoly Public monopoly	Open Market Open Market

It should be noted that there are direct and indirect impacts of SAP as long as fertiliser policy is concerned. Direct impact relates to changes brought to the use of fertiliser whereas indirect impact relates to use of budgetary savings. In the literature the direct impact of SAP is only

studied. Table 2 draws the timeline for the process of the liberalisation in the fertiliser market in Bangladesh. This Table is an extended version of Ahmed (1998)'s Table 3.1.

Table 2. Timeline for the Liberalisation of the Fertiliser Market in Bangladesh

Time Span	Actions	Pre or Post liberalisation?	Comments
1963	EPADC or East Pakistan Agricultural Development Corporation was formed to procure and distribute fertilisers	Preliberalisation	
1977-78	- BADC became the dominant player. Fertiliser distributed through transit, intermediate warehouses and TSCs - Private dealers got license to sell in a restricted area - Prices fixed by government - Private dealers had to maintain registers	Preliberalisation	Numerous problems associated with excessive bureaucratic control
1978-83	BADC withdrew from retail and wholesale markets	Postliberalisation	
1982-83	Licensing requirements abolished and restrictions on movement removed	Postliberalisation	
1982-84	Deregulation of fertiliser price	Postliberalisation	Competitive market started to develop
1989	Private traders allowed to purchase directly from factory gates and port points	Postliberalisation	
1992	Free import from world market	Postliberalisation	

Ahmed (1995a) measured the impact of input market reforms on the production of rice in Bangladesh by using a multiequation model in which a dummy variable distinguished between pre and postliberalisation periods. Ahmed (1995)'s counterfactual results indicates that reforms in the fertiliser and irrigation markets of Bangladesh can be reasonably credited

with the remarkable success in rice production over the period 1984-1992. Ahmed (1995) has estimated that reform measures contributed to approximately 20 to 32 per cent of the increase in production. This increase is primarily attributed to the impact of reform on fertiliser consumption and private sector irrigation development. Bangladesh would have remained immersed in foodgrain shortages and higher food prices had there been no changes in the fiscally unsustainable public interventions in agricultural input markets.

A few figures will help us to understand the extent of liberalisation of the fertiliser market. In 1979-80 the extent of budgetary subsidy on fertiliser was US$83m. This amounted to 28% of total development expenditure on agriculture and rural development at that financial year. Similarly, in 1983-84 the extent of budgetary subsidy on fertiliser was US$57m. This amounted to 14% of total development expenditure on agriculture and rural development at that financial year. The cost of distribution also declined from US$25-30 per ton before liberalisation to US$15 per ton after liberalisation (Shahabuddin and Islam 1997).

We will now make a few comments on the findings presented so far on the liberalisation of fertiliser policy. **First**, the analysis is based on the immediate effects, not on the indirect effects. These indirect effects, as mentioned before, relate to the use of budgetary savings brought about by a reduction in subsidy. Unless we make the assumption that the benefits from these secondary effects is non-negative we cannot rely on the extent of total benefit (that is the counterfactual argument). The important issue is how much of these budgetary savings has gone back to the agriculture sector either in meeting the cost of providing extension services or in developing human capital. This is a difficult task since budgetary savings are fungible but it is a valid question to ask how these secondary effects can be taken into account.

Second, although the liberalisation of the fertiliser market started well ahead of liberalisation in other markets the nature of the preliberalisation period has to be understood. It should be noted that the market for fertilisers involved participation by a large number of private dealers although they were constrained in many aspects of their operation. While administered price prevailed along with some other restrictions such as limited boundary of operation, at the retail level a market-like institutions did develop at that time. This helped towards the boom of private dealers as there was hardly any institutional vacuum. Thus the institutional arrangements between the preliberalisation and the postliberalisation may be different in many aspects but they were complementary in some other aspects. A market-like

situation with a large number of private dealers were already there and this property rights setup did not constrain but rather facilitated the emergence of a new set of property rights.

Third, and as a corollary to the second, privatisation of the fertiliser market never always delivered what was expected. The markets ran into frequent troubles and government interventions had to be made. This is vindicated by the fertiliser crisis of 1995 when the government had to even bring in the civil administration to distribute fertilisers amongst the farmers. While explanations such as oligopolistic market structure at the level of factory gates may be convincing, it remains valid that market interventions can be called for when imperfections are detected. Note that these interventions are not always those of Stiglitz type (state intervention due to market failure due to information failure). In many cases markets failed due to political failures (Box 1). Thus alluding to "market imperfections" is not good enough. The source of market imperfection has to be identified. In many cases the source of market imperfection was political patronage where the fertiliser dealers served political interests rather than the interest of the farmers. The solution also should not be seen in replacing the market mechanism altogether and revert back to a BADC type system. A regulatory framework has to be designed and maintained for expected performance of the fertiliser market. A regulatory framework may also be needed because the private sector may lack the incentive for maintaining adequate warehouse facilities and monitoring of seasonal demand for fertilisers or it may be difficult to generate competition at the factory gate level due to the size of the market.

Box1: Oligopoly or political patronage?
A recent news published in a national daily (Prothom Alo, March 28, 2000) reports of oligopolistic price setting in Bogra. In the northern region of Bangladesh the use of fertiliser is highest in Bogra. Recently, urea is selling for more than Tk. 300 per bag where the government set factory gate price is Tk. 265 per bag. The difference cannot be explained by transportation cost. About 35 additional dealers have been approved by the authority in Bogra to stabilise the price of fertiliser in the current boro season. However, according to the report the selection of the dealers has been based on political considerations. About half of them is not genuine fertiliser traders. A prerequisite for getting a dealership is that the applicant should have a fertiliser shop. A large number of the dealers had no shop for fertilisers, the report quoted.

Finally, the imbalance in general subsidy levels is now generally acknowledged. As Ahmed (1998) points out that recently the use of phosphatic and potassic fertilisers has been declining relative to nitrogenous fertilisers since the reform began to take root. The former is crucial for long run conservation of soil fertility. The former therefore has to be subsidised more.

Experience suggests that it is difficult for the farmers to differentiate between SSP and TSP that brought up the issue of spurious fertilisers in 1995 in the limelight. The removal of subsidy from fertiliser thus went to a point where the relative market price issue was somewhat neglected. Recently problems associated with sale of adulterated fertiliser are been reported in the printed media. This again raises the issue of regulating the market. This is one of the major source of imbalance in the use of fertilisers which came up during the SAPRI consultative process.

The Dilemma of Excessive Use of Fertiliser

The participatory process came up with a view which is apparently contradictory. The participants in the consultative encounters have mentioned that one of the effects of SAP policies has been **excessive use of fertilisers**. Now removal of subsidy implies increase in price of fertilisers (which has indeed been the case) then how does one explain the increase in use of the fertilisers? Shahabuddin and Islam (1997, p. 3-3) have estimated that the growth in fertiliser use has declined from 13.16 per cent in the seventies to 9.98 per cent in the eighties to 6.63 per cent in the nineties. This is what one would have expected from a withdrawal of subsidy on fertilisers. However, when Shahabuddin and Islam (1997, p. vii) went on to explain the declining trend in yield they had to refer to issues such as "soil fertility" and "cultivation in relatively less suitable land". Thus, the increase in use of fertilisers, though at a declining rate, can be explained by the attempt of the farmers to apply higher doses of fertilisers to withstand yield decline problems due to land degradation (Pagiola 1995, p. 18). As Pagiola (1995, p. vii) mentions, "farmers often claim that yields have been declining and that higher fertiliser applications are necessary to maintain yields". A recent study carried out by Toufique (1999, p. 27) vindicated this. The findings presented there are based on a questionnaire survey of 199 farming households, 88 from Chandina and 111 from Madhupur. To get a more long-term perspective the farmers were asked about the trend in the use of chemical fertilisers in the last 10 years. About 97% of the farmers believed that the use of chemical fertilisers has been increasing over the decade. Declining soil fertility (47%) and lower yields (45%) were singled out by the farmers to account for the increase in use of chemical fertilisers. In fact in this context the response lower yield is a mirror image of the response of declining soil fertility. Thus, in this context, the response "excessive use of fertilisers" referred to land degradation issues to which we will now turn our attention.

Evidence on Land Degradation

Arresting land degradation has been one of the stated objective of the World Bank (World Bank 1998, Annex 1, p. 7). World Bank (1998) diagnosed that deforestation is the third highest in the world in Bangladesh and protection against floods, erosion, salinity is desirable where it is feasible. The report also showed concern about overuse of pesticides for vegetables. This was a serious concern expressed by Pagiola (1995).

Soil degradation relates to erosion, waterlogging, salinity and depletion of nutrients. As Brandon (1998) mentions all these are found in Bangladesh. About 10% of net cultivated land suffers from medium and high salinity in the dry season. Another 10 % in the hilly areas is considered highly eroded. More than half of the total land has impeded drainage and they suffer from waterlogging and poor aeration (Karim 1993, p. 21).

Precise linkage between decreasing yield and land degradation is difficult to establish because the former can be caused by a host of factors (inefficient application of inputs, for example). Also it may be difficult to isolate long run from short run trends. Thus land degradation may not be observed in terms of decreased production per se but in morphological evidence of environmental change that has a negative impact in the productive capacity of land (World Bank 2000).

Direct study of soil quality shows evidence of land degradation in highland agroecological zones. Such land degradation is attributed to increasing cropping intensity (Karim, Z. and M. Miah, Demonstration/Development of Fertiliser Use in Bangladesh", unpublished but quoted in World Bank 2000). Soil quality is measured as the extent of organic matter between 1969-70 and 1989-90. World Bank (2000) also quoted a BIRRI study conducted in 1993 where it was found that application of organic matter in combination with nitrogen resulted in higher grain production than that produced in nitrogen-only or organic matter-only plots. However, average annual grain production over a period of nine years declined with every combination of organic and /or chemical treatment with the decline more pronounced when organic and inorganic nitrogen fertilisers were applied together. These are, of course, conflicting results. A more recent BARC study (quoted again in World Bank 2000) found that about 33% of total land acreage falls below the minimum threshold (defined as mineral such as sulphur, zinc content of at least 1.72%) for sustainable cultivation. Several factors are responsible for land degradation:

- inadequate fallowing
- absence of soil conservation measures
- cultivation of fragile or marginal lands
- unbalanced fertilisers use
- agricultural intensification
- advance of mono-culture rice
- capital constraint
- increased use of crop residues and cow manure as fuel in lieu of leaving them on the fields
- FCDI obstructing natural inundation of land

Thus a large number of factors could be responsible for land degradation and some of them are the outcome of following SAP in Bangladesh. This implies that non-SAP factors are also crucial in halting environmental degradation. In this sense reduction of subsidy on fertilisers can really have a devastating effect. We have already noticed the gradual rate of decline in the use of fertilisers. At the same time it is the total increase of fertilisers that has maintained a positive growth rate of crop, to quote Pagiola (1995, p. vii), "if increase in input use had not counteracted the effects of degradation, yields might have fallen even further". Pagiola (1995, p. vii) boldly mentions that, "chemical fertiliser use has increased, but not sufficiently to compensate for the higher rates of offtake and has been offset by reductions in applications of farmyard manure, which is in increasing demand for use as fuel." We see an inconsistency between Pagiola (1995) and Ahmed (1995, 1998). While Ahmed (1995, 1998) could not find any problem with the reduction in the use of fertilisers, Pagiola (1995) thought that the rate of use of chemical fertilisers was not sufficient enough to compensate for nutrient losses. This possibly happened because Ahmed (1995, 1998) did not take account for any environmental factor in his calculation.

Thus we have to make a choice. There is strong evidence that post-subsidy prices of fertilisers have resulted in unbalanced use of fertilisers. Bangladesh now subsidises mainly nitrogen, so farmers over-apply it and under-apply phosphate, potassium type of fertilisers. This has to be corrected. The correction may be made through increasing subsidy on phosphate and potassium type of fertilisers. On the other hand there is a strong evidence on land degradation and increasing use of fertilisers is attempting to make up for this. A removal of subsidy on fertilisers may possibly has worsened the situation. While policy shift should have taken place in generating an incentive systems for using more farmland manure and

other organic fertilisers, it has rather gone towards removal of subsidy on fertilisers. One option that was open to the policy makers would have been to use the budgetary savings from the removal of subsidy on encouraging the farmers to use organic fertilisers and take necessary measures through the government's extension services to stop land degradation. Thus there seems to be less scope for disagreement for getting the prices of different types of fertilisers right through changes in existing subsidy structure. One has to evaluate such policy in the context of small farm based agrarian system that has taken agricultural intensification to the limits. A withdrawal of subsidy from fertiliser will have an adverse effects (lower profits) on all type of farms, particularly on share-croppers and small farmers. These distributional issues should be taken into consideration while reducing subsidy on fertilisers.

5. SHRIMP MANAGEMENT POLICY AND ENVIRONMENT

Before the extensive shrimp culture practices that exist today traditional bheri/gher aquaculture was practiced in the coastal belt of Bangladesh. In 1950 more than 100 farms were involved in shrimp farming through trapping and rearing wild shrimp fries that came with tidal wave. The coastal embankment project of the sixties eroded this practice and made these lands suitable for rice cultivation. In the seventies the farmers began to produce shrimps in the polders in response to strong demand for shrimps in the international market. At the same time production of rice became unprofitable due to water-logging that resulted from poor drainage. This triggered off the boom in shrimp culture and its adverse impact on the environment followed. Thus both internal (historical existence of shrimp farming in a small scale, production of rice turning unprofitable and the like) and external (favourable conditions in the international market, promotion of non-traditional exports, privatisation and so on) factors influenced the boom in the production of shrimps in Bangladesh. Shrimp farming gathered momentum during the transition from a more inward looking development strategy characterised by high degree of regulation and control on international trade to a strategy that promoted investment in export-oriented activities by private agents.

The following incentives were given to the shrimp sector in the process of pursuing an export-led growth strategy:

- zero tariff access of imports
- fiscal incentives for exports
- income tax rebate

- speedy customs clearance
- cheap credit
- leasing of private and khas land in favourable terms
- institutional support for setting up downstream factories

Shrimps now account for about 9 per cent of total national exports (Talukder 1999) and this sector grew at rate of around 9 per annum during the last decade (Bhattacharya et al. 1999). However, we do not have reliable estimate of total employment of labour force in this sector. But existing figures show that exports, catch and the number of ghers have been increasing and given the fact that shrimp cultivation is extensive in nature we can expect employment to have decreased in this sector (Toufique and Hasan 1998). It should be noted that a large proportion of the labour force in the shrimp processing sector is women.

Evidence on Environmental Degradation due to Shrimp Culture

As rightly observed by Bhattacharya et al. (1999), existing literature mainly include perception and case studies on socio-economic, politico-economical and a bit on environmental consequences of shrimp farming. Literature on scientific study of the impact of environment is scant and of limited coverage. Existing literature reflects three views: pessimistic, optimistic and a reformist view:

Pessimistic view: shrimp culture is unsustainable because the negative externalities are systematic, endemic and irreversible. Therefore the culture of shrimp has to be banned.

Optimistic view: shrimp generates income, employment and foreign exchange and their benefits outweigh the associated costs.

Reformist view: there are negative environmental externalities but they can be taken care of through policy intervention. This is a moderate view trying to minimise the concerns raised by the first view and maximise the benefits expressed in the second view.

Here are the findings of some secondary studies:

- Manju 1996 applied a before-after approach to identify what might be called **forced livelihood diversification**. In village Chalbunia, the percentage of population belonging to the category of rice-cultivators decreased from 33% to 13% while corresponding percentage for those involved in shrimp-cultivation increased from 20% to 32%.

- Manju 1996 found **income loss for the peasant households** due to shrimp culture. Income losses occurred from decline in rice productivity, loss of poultry and livestock and erosion of homestead vegetation and social forestry. Manju (1996) found that post-shrimp income level of local peasant households was only 62% of the pre-shrimp level.

- Adnan (1991), by applying a with-without approach, found **loss in vegetation and livestock**: Half of jackfruit and mango trees were destroyed and one-third of cattle heads disappeared in the shrimp polders during 1987-90.

- A scientific study sponsored by Nijera Kori (1996) found **increase salinity and soil degradation and vegetation loss**.

The actions mentioned in the literature, their consequences for development and their impact on the environment and interventions recommended have been summarised by Bhattacharya et al. (1999) in Table 3.

Table 3. Literature on Shrimp Culture in Bangladesh: A Summary of Environmental Concerns

Action	Consequences for Development	Environment Impact on	Intervention Recommended
Land lease by outside entrepreneurs	Use of land only to maximise short-term profit without concern for long term sustainability	- deforestation - destruction of mangrove ecosystems (biodiversity) - destruction of alternative source of livelihoods	a. ensure participation of the stakeholders in the management of shrimp farming and stricter implementation of existing laws b. introduce zoning and declaring certain parts of the country to be non-shrimp area
Lease of government (khas) land for shrimp culture	Traditional rice culture replaced by shrimp culture	- disentitlement of landless - intensification of poverty - prevalence of environmentally unfriendly practices	a. enactment of laws ensuring participation of landless people in any use of khas land
Salt water penetration within embankment for substantial period	Increased salinity in the area	Gradual degradation in the quality of land and soil-nutrient resulting in accumulation of sodium chloride affecting rice production	a. develop land use policy and environmental guideline for shrimp culture b. develop optimal practices for rice-shrimp mixed culture
Use of extensive methods of shrimp cultivation causing inundation of large tracts of land	Large area remaining under water for substantial period of time	a. destruction of homestead cultivation, fruit orchards b. rupture in the subsistence cycle	a. encourage semi-intensive method of cultivation b. zoning and area mapping
Indiscriminate fish fry collection	Destruction of fish biodiversity and increased exploitation of preferred species	Over fishing	Develop shrimp hatcheries

Economic Costs and Benefits

Bhattacharya et al. (1999) makes an attempt to incorporate environmental costs in measuring the economic costs and benefits of shrimp cultivation. There are direct (land degradation, health hazards and mangrove destruction and so on) and indirect (loss in biodiversity, social impact and so on) costs of shrimp cultivation. These costs are not always immediate and therefore spread over time. It has been found that the benefit (measured by the foreign exchange earnings from shrimp exports) of shrimp cultivation well exceeds the costs of shrimp cultivation. To be precise, the environmental costs of shrimp cultivation would be in the range of 21-30% of total benefits. Some limitations of this study have been made explicit: only on-site costs of shrimp culture were considered and some broad assumptions were made and findings from other countries had to be considered.

Note that the estimates by Bhattacharya et al. (1999) are based on macro aggregates. Farm level study was not done to estimate environmental costs. Talukder (1999) on the other hand estimated the financial costs and benefits of shrimp culture at the farm level and under different farming systems but he ignored all environmental costs. He has found that the benefits of shrimp culture far exceeds its cost. We can now look into his estimates by transplanting environment costs almost in a surgical way. Assuming that such cost could be as high as 30% of the benefits from shrimp culture we have included the environment cost of shrimp culture at the farm level by multiplying the value of catch by .30. The results are presented in Table 4, Table 5 and Table 6.

Table 4: Annual Profitability of shrimp-rice farming systems (southwestern region, Paikgacha, Khulna)

	Own Gher	**Own and rented Gher**
a. Benefits	50063	44355
b. Financial costs	19767	16959
c. Environmental costs	15019	13307
d. Total costs (b+c)	34786	30266
e. Net Return (d-a) f. Return per Taka when environmental costs are considered (a/d)	15277 1.44	14090 1.47
g. Return per Taka when environmental costs are NOT considered (a/b)	2.53	2.62

Table 5: Annual Profitability of shrimp monoculture (Southwest region)

	Paikgacha, Khulna	Shamnagar, Satkhira
a. Benefits	65652	110676
b. Financial costs	38258	56814
c. Environmental costs	19698	33203
d. Total costs (b+c)	57954	90017
e. Net Return (d-a)	7698	20659
f. Return per Taka when environmental costs are considered (a/d)	1.13	1.23
g. Return per Taka when environmental costs are NOT considered (a/b)	1.72	1.95

Table 6: Annual Profitability of shrimp farming under different methods of cultivation (Southeast region)

	Shrimp-Salt Culture (improved traditional)	Shrimp Monoculture (semi-intensive)
a. Benefits	132728	836980
b. Financial costs	70562	187678
c. Environmental costs	39818	251094
d. Total costs (b+c)	110380	438772
e. Net Return (d-a)	22348	398208
f. Return per Taka when environmental costs are considered (a/d)	1.20	1.91
g. Return per Taka when environmental costs are NOT considered (a/b)	1.88	4.46

As can be seen from these Tables that net returns, after taking into account environmental costs into considerations, from shrimp farming are still positive and it seems that shrimp culture is still a profitable activity under all farming systems. The rate of return declines due to incorporation of the environmental costs but it is still greater than unity. On the other hand the net returns also decline but they are still positive when environmental costs are incorporated in the calculation. The strong policy conclusions that can be drawn from this exercise is that the gher owners can be taxed by an amount which (as a percentage of the value of catch) can lie between the numbers in g and f, i. e., the tax rate can lie between the rates of return when environmental costs are *not* taken into consideration and when the environmental costs are taken into consideration. However, the tax rates should adequately maintain the incentives for investing in shrimp farming. The tax revenue thereby collected

can then be spent on those who suffered from environmental degradation in one way or the other. This is the classic tax-subsidy solution for internalising externalities of environmental degradation. The only problem of pursuing such policy is measurement and implementation (political contestation).

The Response of the World Bank

The effects of shrimp cultivation on the environment, as the analysis of the previous section suggests, have been fairly well documented, at least in qualitative terms. In the near absence of quantitative estimates, opinion may vary on the extent of the impact but in general most will agree that it is a serious matter of concern. However, looking through the World Bank documents, one can find that such concern was missing initially. The environmental impact of shrimp culture was gradually recognised by the World Bank, not possibly because new quantitative findings based on fancy models started to come up but possibly because by that time public concern on the environmental impact of shrimp cultivation was getting increasingly binding. The NGOs played a strong role in this regard. In this section we will focus on World Bank's changing views on environmental degradation due to shrimp culture in the coastal region of Bangladesh.

The changing perception of the World Bank can be best depicted by evaluating its experience with the shrimp culture project and its plan regarding the Fourth Fisheries Project. Approved in 1986, the total cost of the shrimp culture project was US$36.7 million. The project aimed at intensifying the production of brakish water shrimp in the coastal areas through the introduction of improved water management and related shrimp culture practices. It also aimed at generating foreign exchange earnings and increasing incomes and economic activities in the coastal areas. The project expected to strengthen fisheries administration and extension services, initiate procedures for controlled salt water intake in polder areas for the purpose of shrimp culture, modify land lease policies, improve capacity utilisation of the shrimp processing industry and improve marketing of shrimp. It was evaluated that the project was "largely successful in achieving the objectives". The report has the following to inform about its environmental impact (World Bank 1994, p. 10):

there are no environmental effects caused by the projects. The land use pattern and the ecological balance have not changed as a result of project interventions. On the contrary, some of the diverse effects which existed under pre-project conditions, such as water-logging

and uncontrolled cuts in embankments for the constellation of sub-standard inlet structures, have been minimized or eliminated by the project interventions. No mangrove forest has been destroyed as a result of the project

Note that this is a finding based on the report provided by a local consultant hired by the World Bank. The World Bank report does not question these findings or any limitations involved in generating these findings. Unless we have access to the report prepared by the local consultant we cannot go any further rather than endorsing the World Bank view. What becomes clear is that the World Bank commissioned a project component for studying the impact of the project intervention on the environment. This endorses the importance of environmental issues that was cropping up and gradually getting prominence. But, unfortunately, the entire report has nothing much to say on the environment than what has been quoted above.

Also, the project admitted of learning the lesson that "the NGOs role in organizing and motivating shrimp farmers facilitated the achievement of project objectives" (p. 13). This is possibly the initial stage of World Bank's growing concern on involving the local people in development efforts.

Getting back to the issue of environment some questions can be raised. The length of the project was short – five years and in the initial years it was delayed and hampered by land tenure conflicts. The report admitted that "a longer implementation period would have been more appropriate". Thus, we can assume that not enough evidence was available for the study on environment impact assessment. This is important because many environmental costs are unevenly spread over time and may show up after a long gestation period. Thus we would take the above conclusion about the environmental impact assessment of the project with caution. This is exactly what is missing in the World Bank report.

A BIDS evaluation of the same project does not endorse the view expressed in this report. Rahman and Azad (1995, p. 37) makes the following point:

the traditional shrimp culture even though did not affect environment in Cox's Bazaar, there have been a number of negative environmental consequences of it in Khulna region especially in non-project areas. However, a part of the project area in Khulna (e.g. Hanirabad and Munkia in polder 20) was also affected, mainly because of the presence of an

outsider leaseholder who, due to unplanned culture, created some problems, such as harvest was prolonged and it affected transplantation of Aman crops. The planned activities of the project were also obstructed by him for which the environmental condition of the area further deteriorated. The project could do nothing as he managed to take long-term lease from the beginning of the project

Thus there is an explicit inconsistency between World Bank's evaluation of the impact of the project on environment and BIDS' evaluation of the environmental impact of the same project. Let us leave the matter here and see World Bank's strategy for the Fourth Fisheries Project as long as shrimp culture is concerned.

The project appraisal document for the Fourth Fisheries Project (World Bank 1999) reflects the shift in World Bank view not only on the impact of shrimp culture on environment but also on its impact on more pressing social issues. The document admitted that "the expansion of shrimp farming has raised important issues regarding land and water use in the coastal areas." (p. 4). One important issue mentioned in the document relates to land use conflicts where the poor social groups are the losers (p. 4):

The contrasting demands of rice farmers and those involved in shrimp farming have generated frequent conflicts in which poorer social groups in shrimp farming areas have often been the losers

Some environmental aspects of shrimp cultivation and its adverse impact on the local people have also been explicitly mentioned in the document (p. 4):

Unplanned shrimp farming development has led to degradation of agricultural land and negatively affected the livelihoods of local people

Thus land degradation due to shrimp cultivation has been admitted by the World Bank so is the adverse impact of shrimp cultivation on the local population. The project appraisal document also admitted of the outbreak of fish diseases (p. 4):

outbreak of diseases, particularly "White Spot" may continue to threaten the shrimp culture

The adverse impact of biodiversity brought about by collection of wild shrimp fry has also been recognised (pp. 4-5),

The sustainability of shrimp farming is also threatened by its reliance on the collection of wild shrimp fry. The activity now sustains a large number of households using cheap methods that supply key seed inputs to shrimp farmers but may, in the process, be gravely damaging wild stocks of both shrimp and other aquatic species

The Fourth Fisheries Project has been categorised as Environment Category B because (p.26):

the project components were found to have relative limited environmental impact potential; and for those adverse impact which could potentially occur, there exists reasonably straightforward and understood mitigation measures to mitigate impact

As long as the coastal shrimp aquaculture is concerned two potential adverse impacts have been envisaged in the document:

i. the shrimp culture period extends into rice growing period reducing the time needed for paddy to mature; and

ii. the collection of wild shrimp seed increases fishing pressure on shrimp larvae and other larvae further threatening coastal biodiversity and marine and inland fisheries productivity.

The project contemplated to combat the adverse impact of shrimp cultivation by adopting several measures:

i. project area will be limited to those where shrimp is alternatively cultivated with rice or salt

ii. no new area will be developed under the project

iii. project practice will be limited to improved extensive type (target production, 400 kg-shrimp/ha/yr.)

iv. BWDB approved sluice gates will be constructed to replace existing farmer's illegal cuts

v. 80% of the land-owning farmers will have to agree to bear the cost of maintenance of the sluice gates serving their respecting blocks (this will stop overlapping of shrimp and rice cultivation)

vi. training 29,500 seed collectors in improved collection methods and 500 shrimp seed traders on the best method of transport of seed to the farmers.

As compared to the Shrimp Culture Project the Shrimp component of the Fourth Fisheries Project seem to be more benign to environment. This does not follow from World Bank's evaluation of the Shrimp Culture Project. In the shrimp component of the Fourth Fisheries Project the World Bank has been more cautious. It identified the associated problem quite clearly and took measures that would not potentially accentuate the problem. Limiting to existing shrimp cultivation area where shrimp is cultivated with rice or salt and within the improved extensive type of shrimp culture system, this is likely to be the case. Training of the seed collectors is also a positive step in mitigating the adverse environmental effects of shrimp culture. Current seed collection methods seriously affects biodiversity. This has been one of the concerns that came out from the SAPRI consultative process. One of the stated development objectives of the Bank has been to prevent loss of natural habitats in forestry, coastal fisheries and biodiversity resources (World Bank 1998, p. 10, Annex 1, World Bank 1991, pp. 52-3).

It is now generally agreed that shrimp cultivation per se is not the main cause of environmental degradation, it is the haphazard and unplanned way of shrimp cultivation which is more responsible for environmental degradation. We do not hold the extreme views that shrimp farming will go on unabated or should be stopped in all places. As long as actions can be taken to minimise environmental losses and its social impact there is no reason why shrimp culture should be stopped. The issue is of formulating a appropriate shrimp management policy and implementing it.

CONCLUSION

This report has made an attempt to improve our understanding of the impact of SAP on the environment in Bangladesh. It is entirely a desk-review based work. We scanned through World Bank documents and other relevant literature that directly or indirectly dealt with similar issues. By construction, this is not an exercise in environment impact assessment. The various meetings of the SAPRI consultative process have generated a picture that shows how SAP policies were thought to have affected the environment. This report found sufficient evidence in the existing literature to support the explanation that came out from the consultative process.

We have seen that the pressure to increase food production has resulted in adopting policies such as excessive emphasis on (rapidly) increasing yield, withdrawal of subsidy and liberalisation of imports. Adherence to these policies has generally resulted in excessive use of fertilisers, use of spurious fertilisers and inefficient use of various type of fertilisers. These had serious impact on the quality of land: nutrient content in soil declined and fertility of land eroded. *This took us to the issue of fertiliser policy*.

We have also seen that the objective of pursuing an export-led growth strategy has led to adoption of policies such as promotion of non-traditional exports, for example, shrimps. Privatisation was promoted to boost up exports. In the shrimp sector this resulted in rapid increase in shrimp production. The negative effects or externalities of increasing shrimp production are loss in biodiversity and increasing salinity of soil. Of course, there are other related environmental concerns but these came up clearly from the consultative exercise. *This took us to the issue of shrimp management policy.*

Very few will disagree with the objectives of increasing food production and also of pursuing an export-led growth path in a globalised world. We have also provided available evidence on the effects of SAP policies. Again, there can hardly be any dispute on that, however, controversy can arise on the extent of the effects. This is more due to numerical ignorance than due lack of our interest in it. Serious quantitative study on environmental impact assessment is missing. Therefore we have looked at the inadequacy of the SAP policies more in qualitative terms.

As long as the fertiliser policy is concerned we have seen some lapses in the existing policy and therefore there is a room for improvement in this policy. Reduction of subsidy on fertilisers have resulted in (i) improper mix in the use of fertilisers, and (ii) insufficient use of fertilisers to compensate for nutrient losses. Therefore, the issue of fertiliser subsidy has to be reconsidered on the ground of efficiency, environment and equity. The issue is how do we make up for land degradation and there are other policies that may work well as compared to reducing the use of fertilisers by removing subsidy. For example, encouraging farmers to use organic fertilisers through NGOs or the government's agricultural extension networks.

As long as shrimp cultivation is concerned we have seen the World Bank taking a more cautious approach, albeit gradually. Initially the environmental impact was either ignored or

considered to be of secondary importance. Gradually, particularly in the Fourth Fisheries Project, the Bank became environmentally cautious. A total ban on shrimp production will have strong macroeconomic effects and at the same time an unbridled production of shrimp will have serious environmental consequences. Existing evidence shows that shrimp culture is highly profitable even when environmental costs are taken into consideration at the farm level. Therefore there is nothing apparently wrong in increasing shrimp production as long as it is not done in an unplanned manner.

Now the question is how the civil society can participate in the policy formulation process. This is already taking place in one form or the other. The NGOs are playing an important role by serving in various committees of the government at various levels. These committees are formed either for formulating policies or for implementing them. The general approach of the NGOs has been those of generating awareness and promoting advocacy at the grassroots level. Advocacy and awareness work and World Bank's attitude to environment somehow vindicates this. Such strategy helps to promote local resistance to environmental degradation and this is where the civil society should play a major role. The impact of environmental first falls on its victims – i. e. the local people. They are the one who can describe how it affects their life and livelihoods and hence their voices have to be heard first. The problem is that the victims are not homogenous – they are differentiated and therefore they have different capabilities to withstand environmental degradation. Of course, there are environmental problems which affects every body (arsenic contamination of ground water) in a negative way whereas there are environmental problems that does not affect everybody in a negative way – there are losers and gainers. Thus what is needed is a community response to environmental degradation and the civil society should work for that.

RECOMMENDATIONS

Fertiliser Policy

1. The issue of fertiliser subsidy has to be reconsidered not only on the ground of efficiency and equity but also in the context of its relation to environment.

2. The imbalance in general subsidy levels has to be removed/reduced. Bangladesh now subsidises mainly nitrogen, so farmers over-apply it and under-apply phosphate, potassium

type of fertilisers. The latter is crucial for long run conservation of soil fertility and hence it has to be subsidised more.

3. A regulatory framework has to be designed and maintained for expected performance of the fertiliser market.

4. To halt the process of land degradation the farmers should be encouraged to use organic fertilisers. This can be done by the NGOs or by the government's agricultural extension networks.

Shrimp Policy

5. Shrimp production will have to be done in a planned manner (for example, zoning), not in a haphazard way.

6. Existing laws relating to shrimp production has to be strictly enforced.

The Role of Government, Civil Society and the NGOs

7. The NGOs and the civil society at large should promote local resistance to environmental degradation. Promoting community response towards the right direction can help to decrease environmental degradation.

8. Substantive quantitative study on environmental impact assessment is required for formulating environmental policy.

References

1. Adnan, S. (1991), Minority View of Appraisal Mission for Phase-III of DDP Regarding Project Policy Towards Shrimp Culture: An Alternative Approach". Report Prepared for the DDP Phase III Appraisal Mission, mimeo, Dhaka, October.

2. Ahmed, R. (1998), Assessment of Past Agricultural Policies, in Faruqee (1998).

3. Ahmed, R. (1995), Agricultural Market Reforms in South Asia, American Journal of Agricultural Economics, 78 (3), August, pp. 815-19.

4. Ahmed, R. (1995a), Liberalization of Agricultural Input Markets in Bangladesh: Process, Impact and Lessons, *Agricultural Economics*, Vol. 12, pp. 115-28.

5. Bhattacharya, D., M. Rahman and F. Khatun (1999), Environmental Impact of Structural Adjustment Policies: The Case of Export Oriented Shrimp Culture in Bangladesh, Centre for Policy Dialogue, Dhaka.

6. Bhattacharya, D. and R. Titumir (1998a), In Search of Unheard Voices: A Pre-Study Consultation Exercise on Structural Adjustment Policies in Bangladesh, paper presented at the First National Forum of SAPRI Bangladesh held at Dhaka, October 20-22.

7. Bhattacharya, D. and R. Titumir (1998b), Towards Demystifying a Process: The Structural Adjustment Policies in Bangladesh, paper presented at the First National Forum of SAPRI Bangladesh held at Dhaka, October 20-22.

8. Brandon, C 91998), Environment Degradation and Agricultural Growth, in Faruqee (1998).

9. Faruqee, R. ed. (1998), Bangladesh Agriculture in the 21st Century, The University Press Limited, Dhaka.

10. Karim, Z. (1993), Land Use Policy for Bangladesh, Bangladesh Agricultural Research Council.

11. Manju, T. (1996), Political Economy of Shrimp Culture in Bangladesh, Poverty Research Report 13, Grameen Trust, (in Bangla).

12. Nijera Kori (1996), The Impact of Shrimp Cultivation on Soils and Environment in Paikgacha Region, Khulna (Limited to Polders 20, 21, 22, 23 and 24).

13. Pagiola, S. (1995), Environmental and Natural Resource Degradation in Intensive Agriculture in Bangladesh, Paper No. 15 of the Environmental Economics Series, World Bank, June.

14. Rahman, A. and L. Azad (1995), Final Assessment of the Shrimp Culture Project (IDA Credit 1651-BD and UNDP Grant BGD 85/120), Terminal Report, Bangladesh Institute of Development Studies.

15. Shahbuddin, Q. and R. Islam (1997), Agricultural Growth and Stagnation in Bangladesh: A Review of Growth Potentials and Policies, Bangladesh Institute od Development Studies, June.

16. Talukder, R. (1999), Financial Profitability of Shrimp-Based Farming Systems in Bangladesh, paper presented at the workshop on Economic, Social and Environmental Implications of Shrimp-Rice Integrated Farming Systems in Bangladesh, held at Dhaka, December.

17. Toufique, K (1999), Sustainable Rural Livelihoods in Bangladesh, Institute of Development Studies at the University of Sussex, Draft Report.

18. Toufique, K. and Hasan, R. (1998), Technological Capability in the Shrimp Processing Sector in Bangladesh, Bangladesh Institute of Development Studies, Dhaka.

19. World Bank (2000), Bangladesh Study of Land Issues, SASRD, World Bank Dhaka Office, 2000.

20. World Bank (1999), Project Appraisal Document on a Proposed Credit in the Amount of SDR 20.6 Million (US$28.0 Million Equivalent) to the People's Republic of Bangladesh for a Fourth Fisheries Project, Rural Development Sector Unit, South Asia Region, April 27.

21. World Bank (1998), Memorandum of the President of the International Development Association and the International Finance Corporation to the Executive Directors on a Country Assistance Strategy of the World Bank Group for the People's Republic of Bangladesh, March 6.

22. World Bank (1994), Project Completion Report, Bangladesh, Shrimp Culture Project (Credit 1651-BD), November 4.

23. World Bank (1991), Bangladesh: Environment Strategy Review, Report No. 9551-BD, November 14.

24. World Bank (1990), Review of the experience with policy reforms in the 1980s, June 29.

25. Zohir, S. (1997), Macroeconomic Performance During Adjustment: The Case of Bangladesh, The Bangladesh Development Studies, 25 (3 and 4), pp. 99-128.