A: THE CONTEXT

6.1 Introduction and Background

As in other sectors, the primary objective of Structural Adjustment Programmes was to facilitate the transformation of the production system of the agriculture sector of Bangladesh. the Bangladesh agriculture was already on the road to modernization from traditional to chemical and mechanical agriculture since the fifties. The SAP came in in the eighties and it was geared towards attaining the efficiency of the production system under the same paradigm under which the Bangladesh agriculture was evolving with 'new technology'-based production system widely known as the Green Revolution (GR). The GR technology has its own inherent weaknesses which are coming to the fore with the passage of time. The measures implemented under the SAP may have added more service/disservice to the GR technology-based production system of the Bangladesh agriculture. An objective evaluation of the SAP for the agriculture sector, therefore, needs to isolate the respective effects and impacts.

The question whether a country like Bangladesh with 'complex, diverse and risk-prone' agricultural environment (Box 6.1.1) is suitable for GR technology was posed by both agricultural and social scientists long ago (Chambers et. al. 1989: xvii-xx). However, in the backdrop of stagnation and/or negative growth in production and yield of HYV crops in the post-GR era in several Asian countries, the sustainability of GR technology is faced with a new challenge and has become a heated issue in recent time which needs to be addressed properly. Although sustainable agriculture has a variety of definitions and interpretations, a conceptual framework has been used by defining its key characteristics as a guide to better understanding of the role of the SAP in the agricultural development of Bangladesh.

Multiple-case designs have been used as a research strategy for this study. This participatory evaluation is based on a series of consultations with a number of stakeholders which constitute the core part of the primary data collected for this investigation. Secondary data collected from a variety of sources have also been complemented as and when required for the analysis. The multiple-case studies are based on the investigation at the two locations in two agroecological regions immensely endowed with water resources — one with groundwater in northwest region and the other with surface water in south-central region of the country. Kalai *Upazila* of Joypurhat district, an intensively irrigated area of the country and Babuganj *Upazila* of Barisal district representing low irrigation coverage have been selected for the field investigation.

Different stakeholders have different problems and priorities with regard to a particular issue. As suggested by the commentators at an earlier review meeting on the preliminary findings of this study, all the viewpoints of the stakeholders are presented thoroughly and separately as much as possible in the report for understanding clearly their respective positions. Efforts have however been made to arrive at conclusions on the hypotheses at the end of each chapter.

The fieldwork was conducted during March-May, 2000 at both the locations simultaneously. Two teams of five facilitators/co-facilitators each were formed for carrying out the field investigation. Most of the fieldwork was completed in March at the community level. The members of the teams had to work hard to organize several consultations there when the farmers and agricultural workers had tight time schedule for *boro* cultivation. Their contribution to the data gathering process is gratefully acknowledged.

The report has twenty chapters organized under four parts. The part one presents the context which has four sections containing the introduction and background; Bangladesh agriculture in context: a brief survey of critical issues; the methodology, and the profile of the study locations. Part two is about the immediate outcomes of the SAP-led measures which has five sections including mechanized irrigation; chemical fertilizer; pesticides; rural finance from public sector lending institutions, and public domestic procurement. Part three is concerned about the long-term outcomes of the SAP-led measures with seven sections discussing participatory poverty assessment; the markets: labour, land and indigenous credit; inequality; food security; gender issues and the environment. The part four includes two sections on the stakeholder perspectives — one at the institution and organization level, and the other at the community level. The last part discusses conclusions and the outlook for the future.

Box 6.1.1: Three Types of Agriculture Summarized

Types / Characteristics	Industrial	Green Revolution	Third/'CDR'
Main locations	Industrialized countries and specialized enclaves in the Third World	Irrigated and stable rainfall, high potential areas in the Third World	Rainfed areas, hinterlands, most of sub-Saharan Africa, etc.
Main climatic zone	Temperate	Tropical	Tropical
Major type of farmer	Highly capitalized family farms and plantations	Large and small farmers	Small and poor farm households
Use of purchased inputs	Very high	High	Low
Farming system, relatively	Simple	Simple	Complex
Environmental diversity, relatively	Uniform	Uniform	Diverse
Production stability	Moderate risk	Moderate risk	High risk
Current production as percentage of sustainable production	Far too high	Near the limit	Low
Priority for production	Reduce production	Maintain production	Raise production

Note: CDR⇒ Complex, diverse and risk-prone
Source: Chambers et. al. (1989: xvi)

6.2 The Bangladesh Agriculture in Context: A Brief Survey of Critical Issues

> "Productive potential of the new technology is indeed large"
>
> — the conclusion of the WB report (Faaland and Parkinson 1976:132)

> "The main thrust of agricultural expansion can come only from increased productivity through the application of modern technology: new and better seeds, better and fuller use of fertilizers, pesticides and water control; as well as more effective institutions for organizations of production, distribution and marketing"
>
> — Faaland and Parkinson (1976:124)

. . . . . .

> "All agricultural and rural departments are now I.R.R.I. rice minded"
>
> — Rene Dumont (Vylder 1982: 127)

> "In some areas, crop yields have been stagnant or even declining — although some of the decline in land productivity is camouflaged by higher fertilizer application … The loss in yields due to this degradation is almost certainly over 1 percent per year … There has been virtually no increase in the yields of modern varieties since 1979/80, and most rice yield increases have come from the transition from local to modern varieties — a transition that will be essentially complete in five years"
>
> — Brandon (1998: 113)

6.2.1 A Paradigm Shift in the Production Process: Transformation from Traditional to Chemical Agriculture

The Green Revolution was Born

Notwithstanding the deceleration in its productivity and increasingly lower contribution to the GDP,[1] the importance of agriculture to the Bangladesh's common masses is well recognized. In terms of population, production (most particularly food production), employment, agriculture is still the vital sector of the economy. Given one of the most populous countries in the world and the widening gap between population and food, any responsive government cannot but give serious attention to the crucial task of rapidly augmenting food production to fill the gap. In the early fifties, the government of this land presently forming Bangladesh took a measure of far-reaching significance in order to "draw the maximum benefit from the quick yielding potential" of Bangladesh agriculture (Faaland and Parkinson 1976: 131). Chemical fertilizer was introduced in 1951-52 to harness the yield potential. But production did not rise as expected because local varieties was found awkwardly non-responsive to chemical fertilizer. Meanwhile, there has been a 'breakthrough in plant-breeding technologies at the International Rice Research Institute in the Philippines (IRRI)' (ibid: 127) which made IR-8 available to the Bangladesh farmers through Comilla cooperative system in

1965 (Faidley and Esmay 1976: 134). The use of pesticides was started in 1957 and it gained momentum with the introduction and spread of the imported high responsive varieties in the country (Islam 1990: 122). But these varieties euphemistically known as 'miracle' were found extremely vulnerable to growing pest attack and so the application of pesticides started picking up. To give a push to the transformation from the traditional to chemical agriculture, the Academy for Rural Development at Comilla (now BRDB) initiated pilot project to provide farmers mechanized irrigation services, and its expansion across the country began in 1968 (Haq 1967: 146). All the prerequisites for chemical agriculture were thus met and the Green Revolution took off.

The concept of the new development strategy was very much appealing to the government for a number of reasons. First, this development strategy "represents an attempt to substitute technical change for institutional change, to use scientific progress as an alternative to social progress. Instead of land reform the Third World was encouraged to concentrate on the introduction and rapid diffusion of high-yielding varieties of food grains, notably wheat and rice" (Griffin 1999: 144). Secondly, this strategy is scale neutral. That is, its benefits can be shared by large and small farmers alike. Thirdly, it would lead to higher demand for labour in rural areas and also higher wage rates. Fourthly, it would permit multiple cropping to spread through its shorter growing season of some new varieties. Fifthly, increased food supply would bring about a drop in food price which would have positive impact on poverty.

The Green Revolution with all those attractions came into being and the production process of the Bangladesh agriculture began undergoing transformation — from low-input agriculture to high-input agriculture based on external inputs and knowledge. This new technology has evinced great expectations of the politicians, donors and policy planners alike.

A Great Expectation

The policy planners were supposed to come up with a feasible plan to achieve a production level that "Bangladesh will cease to be a net importer of foodgrains by 1985". All the previous plans of the country had a pious hope for the achievement of foodgrain self-sufficiency but its long-term dependency on food import has persistently become a normal phenomenon. While current rice production runs at a level of 10 to 11 million tons annually, known technologies could quadruple output by the end of the century" (Faaland and Parkinson 1976: 132). The new technology was expected to grow rice by either of the three rice

[1] The lower contribution to GDP is likely due to flawed measurement technique. "The underestimation is mainly due to the fact that the services rendered by agriculture in the common interest are not reflected in market prices (eg., landscape amenity, bio-diversity, drinking water supplies)"(Wohlmeyer 1998:306).

production strategies shown below. The potential for rice production in Bangladesh was delineated as follows (ibid: 133).

Potential Rice Production
(million tons)

Year	Inputs Only	Inputs Plus Irrigation	Inputs plus Full Irrigation and Drainage
1983	16	26	35
1993	19	32	42
2003	22	38	51

With the passage of time the difference between the output potential and output realized widened. The unattainment of the target set a dismal background against which the policy planners were led to look for suitable policies to deal with the concerns in this regard. The formulation of the SAP as a policy package got immediate endorsement by the policy planners and donors as a rescue model for the Bangladesh agriculture. The SAP came in to provide further momentum to the spread of the Green Revolution technology in the Bangladesh Agriculture. Some aspects of the Green Revolution technology and its attendant consequences has been focussed below while discussing the sustainability of the agriculture.

6.2.2 The Initiation of Structural Adjustment Programme (SAP)

A series of policies were formulated and implemented under the domain of the SAP and beyond to translate the above expectation into fruition since the late seventies. The policies sought to achieve the objective of increasing the scale and efficiency of public investment in agriculture and water resources management mainly by relying on the actors of the private sector, that is, by expanding private irrigation facilities, and enhancing greater private sector involvement in the distribution of agricultural inputs and equipment to the farmers. In order to achieve the objective and operationalize the mechanisms, a series of other policies were also formulated. Those policies were geared towards enhancing production efficiency, and institutional and programme development. The policies, inter alia, were formulated to ensure adequate credit to creditworthy borrowers; to eliminate economic subsidy on fertilizer prices; to improve the efficiency of public expenditure for poverty alleviation; to develop institutional framework for poverty alleviation; to improve public domestic procurement; to enhance the role of women in development; to protect the quality of the environment, etc. Various strategies and measures had been in place to achieve these goals and objectives. Now time has come to look at the reality, and prepare a balance sheet of the Bangladesh agriculture over the last post-SAP decade particularly in respect of the above objectives. Some aspects of the Bangladesh

agriculture have been highlighted very briefly in the following paragraphs with a view to giving a feel about the disservice done to it.

6.2.3 Is the Chemical Agriculture Sustainable?

6.2.3.1 Evidences From Quantitative Exercises

i. Growth in rice production

Chemical agriculture in Bangladesh passed through 35-50 years and the question of sustainability of this sector has already been subjected to close assessment in Bangladesh and other practising countries. The results of various studies on the post-Green Revolution phase of agriculture in some neighbouring countries demonstrate disconcerting trends in growth and productivity of the sector. Deep concerns are now being expressed about the sustainability of the growth achieved so far in those countries such as, Pakistan, Philippines etc. The sustainability of rice production in Bangladesh has already been looked into by a number of researchers.

The short-term success of the Green Revolution in Bangladesh is not due to increase in yield, but rather to conversion from local to HYV rice: In Bangladesh, Buffes and Gautam (1995) have carried out a quantitative investigation into the sustainability of rice production before and after 1987 a cut-off point for the major policy reforms having significant bearing on the Green Revolution. Their results show that the annual rice production grew at 2.60 percent and 2.84 percent in the pre- and post-1987 periods respectively, while the rate of growth in rice area was estimated at 0.47 percent and 0.81 percent respectively. Annual HYV yield in the pre-87 period registered a decline of 0.41 percent while it increased by 1.42 percent in the post-87 period. They conclude that "the success of the Green Revolution in Bangladesh should be attributed mostly to the conversion from local to modern rice varieties and not to increase in modern variety yields".

Growth in rice production in top performer districts decelerated over the period from 1967-68 to 1993-94: Another quantitative inquiry carried out at a more disaggregated level by Mahmud et al (1993) and updated by Shahabuddin and Rahman (1998) reveal a more discouraging picture about the sustainability of the growth trend in rice production for the period from 1967-68 to 1993-94. Mahmud et al. looked at the past trend of growth in rice production, disaggregated by regions (former districts) over the period. As shown in Exhibit 6.2.1, the different regions (former districts) of the country are ranked according to the rate of growth of rice production during four ten-year overlapping periods since the end sixties: 1967/68 to 1977/78, 1973/74 to 1983/84, 1979/80 to 1989/90 and 1985/86 to 1993/94. It is interesting to

note that the growth rate of rice production at the national level conceals large variations across the regions. It is worthy of note that the growth points shifted from one region to another over the periods. With at least medium growth in one period or another, the early starters have generally (with a few exceptions) lagged behind other regions in later periods. In other words, out of the 10 top performer districts, only one could steadily maintain upward trend over the four sub-periods. However, all others have had a variety of trends converging to a downward trend over the periods. Various agronomical constraints such as intensification of rice monoculture, and cultivation of *boro* in increasingly less suitable lands are adduced by the authors to be the likely causes of the declining growth pattern in rice cultivation in these districts (Shahabuddin and Rahman 1998: 61-62).

ii. Trends in land productivity

A mere look at the growth trends is not enough to understand the sustainability of rice production. It may happen that production is rising at the expense of the incrementally higher doses of various material inputs such as fertilizer, and irrigation water. The inefficient use of inputs therefore needs to be looked into. The inefficient use of inputs has recently emerged as one of the major concerns about the Green Revolution in Pakistan (Byerlee and Siddiq 1994: 1345-1361) Shahabuddin and Rahman (1998) made an effort to assess the trends in the contribution of modern inputs such as chemical fertilizer, and irrigation to growth in rice production. They estimated productivity indicators from annual increments in the land productivity in relation to yearly changes in the use of chemical fertilizer per unit of net cultivated land and in the proportion of irrigated land out of total net cultivated land. They thereafter estimated the trend growth rates of these annual productivity indicators. The productivity indicators provide a disconcerting picture about factor productivity in Bangladesh. The productivity estimates for irrigation exhibit a declining trend (-6.99 percent per annum) over the last two decades indicating that the productivity gains through irrigation have been on the decline. The estimates of incremental fertilizer productivity also exhibit a similar declining trend (-4.41 percent) over the last two decades. These all indicate the inefficiency of agricultural inputs being used in the production of rice cultivation in Bangladesh.

iii. Average food gap widened and per capita availability of foodgrains declined

With 2.2 million metric tons in the early eighties (1980/81-1983/84), the food gap (difference between net foodgrains production and foodgrains requirement) progressively widened over the period from 1980/81 to 1995/96 except the period 1988/89 to 199/92 when it considerably declined (to 1.9 m.m.t.). The food gap thereafter started increasing (to 2.9 m.m.t.) during the mid-nineties (Table 6.2.1).

The overall contribution of the net for production to the food requirement of the country remained almost unchanged at around four-fifths (85.8%in 1980/81-1983/84 and 85.5% in 1992/93-1994/95) over the period with some fluctuations around the turn of the eighties.

Average per capita foodgrain in the mid-nineties remained below the corresponding level in the early eighties: As measured by Shahabuddin and Rahman (1998) total availability of foodgrains grew at 1.70 percent (rice: 2.01% and wheat: -0.28%) over the 1980/81 - 1995/96 period which lies below the population growth of 1.90 percent during the same period (Table 6.2.2). As a result, per capita availability of foodgrains declined at 0.20 percent during the period. The average per capita availability of foodgrains during the early eighties stood at 445.4 grams/day which subsequently increased to 472.4 grams/day during the late eighties. However, the positive trend reversed thereafter and registered declining trend in the first half of the nineties. The average per capita availability of foodgrains dropped to 426.0 grams/day during 1992/93 to 1995/96 which remained below the corresponding level (445.4 grams/day) in the early eighties.

iv. Yield gaps were considerable

There exists a margin of yield gap between the yield realized and the yield potential across major agricultural crops produced in the country. The difference between the yield realized at the farmers' level and that at the experimental stations is not only considerable, the gap is also higher compared to the yield obtained at the demonstration plots. The yield realization rates at the farmers level for *boro* , *aman* and *aus* ran at 40, 39 and 46 percent respectively compared to the yield realized at the demonstration plots in 1994 (Exhibit 2.2). The wide yield gap is attributable to a host of agronomic, social, and environmental factors. Although these yield gaps points to the possibility of increasing the yield to a large extent but the current practices seem to stand in the way of attaining it.

6.2.3.2 Evidences of Environmental Degradation

The sustainability of the agriculture can be better understood in terms of the indicators of unsustainability. The following taxonomy of unsustainability indicators (Exhibit 6.2.3), as proposed by Dutch researchers, would serve as a guide in this regard (Ayres 1998: 8).

- **Pollution** of natural systems resulting in acidification and toxification of the environment.

♦ **Depletion** of natural resources: renewable, non-renewable, and semi-renewable. Biodiversity is a case in point which may not have a well-developed market but it is also subject to depletion, although not commonly thought of.

♦ **Encroachment** (human intervention) affecting natural systems, eg loss of groundwater or soil erosion.

There are ample evidences that the Bangladesh agriculture has been, by now, so treated in various ways through the changes in production processes and the types of inputs used under the 'package' associated with the Green Revolution that it caused worsening degradation of the agricultural environment of the country. Some of the evidences are briefly presented below for the illustration.

i. Pollution

As far as the acidification and toxification of the agricultural environment is concerned, agrochemicals played a major role in polluting it in direct and indirect ways, the full assessment of which is not yet made. However, it is widely recognized that agro-chemicals (pesticides and chemical fertilizers) are the main culprits in causing the damage not only to the agriculture itself, but to the flora and fauna as well.

Pesticides: Plants grown from HYV seeds are organically weak and extremely susceptible to pest attack. HYV cultivation without pesticides is unimaginable. The growth of HYV cultivation is positively associated with that of pesticides. Pesticides have had disastrous effect on ecosystems (including human health) and environment in two ways by rapid evolution of new breed of pests, resistant to the pesticides applied, and increasing pesticide hazards. HYV cultivators are required to apply pesticides at incrementally higher rate to deal with pest infestation because it contribute "to evolution of "Superpests" that are immune to the chemicals. Resistance to pesticides has also been developed in a certain species of fungi as well as in seeds" (Islam 1990: 121). Another associated damage caused by pesticides is that it kill "non-targeted organisms including parasites and predators of pests that were innocuous prior to the application of pesticides, resulting in outbreaks of those pests. Repeated application of insecticides over a long period to protect vast areas of rice fields have been reported to have serious adverse effects on the microbial population, essentially needed for maintaining soil health" (ibid: 121). Pesticides also serve to pollute the adjacent water bodies such as ponds, canals, and marshy lands that are widespread in the country. During rainy season, crop fields treated with pesticides are inundated and all the pesticide residues are carried to those water bodies by either the flowing stream of rainwater or flood water. As a result "the use of insecticides has reduced the natural population of fish, bird, pollinators, arthropod and

vertebrate predators and parasites. Thus the use of insecticides has had an indirect role in polluting the environment by creating ecological imbalance in at least those areas of the country where insecticides are in continuous use" (ibid: 122).

Pollution by pesticides take numerous routes. In polluting the environment, pesticide residues travel through crops to the soil, from the soil to birds/mammals and then to man by way of food; from the soil to water bodies, to fish and thereafter to man/birds/mammals and so on (ibid: 122)

Pesticides use in the OECD countries has leveled off or even declined in recent years (Wohlmeyer: 1998: 281) but that in Bangladesh is increasing particularly against insect pests of rice (Islam 1990:121). Although Bangladesh's farmers use pesticides less compared to other countries, "ninety percent of the agricultural use of pesticides is for rice, with farmers' expenditures on pesticides per hectare of paddy being more than five times higher for HYV rice than for traditional varieties" (WB 1991: 45).

Fertilizer: The farmers of the country are the intensive users of fertilizers among the neighbouring countries. They tend to apply overdose of fertilizer out of ignorance about the basic characteristics of their soil, and doses and application of chemical inputs. Leaching of nitrogenous fertilizer pollute neighbouring surface water or groundwater resulting in damage/"harm to crops, fish or domestic water supplies. In addition, water bodies with high nitrate levels encourage the growth of algae which are toxic to fish and cause skin irritation, and may encourage weeds which obstruct waterways and harbour insect pests" (WB 1991: 47). Although no assessment of this damage is available, it is widely reported in the media that fish mortality and fish diseases are common phenomena in the rural areas (Ali 1994: 165).

ii. Depletion

The production process associated with the Green Revolution demands intensive use of agrochemicals by depleting various non-renewable, semi-renewable and renewable natural resources. In Bangladesh, chemical fertilizer is now intensively being used in cultivating various HYV crops and its rate of application is increasing overtime with consequent increased mining of natural gas, an almost lone natural resource of the country. With the present reserve of 15 trillion cubic feet (equivalent to more than 20 years consumption of gas at present levels of demand) (WB -1991: 38), the manufacturing of fertilizers is consuming around one-third of all the natural gas consumed in the country (Table 6.2.3). But in absolute terms, the volume of natural gas used by fertilizer factories is increasing almost steadily and persistently overtime. The country's eight fertilizer industries consumed 1,591 million cubic metre of natural gas in 1989-90 and the consumption climbed to 2,266 million cubic metre in 1997-98, an increase of

42 percent over the last eight years (Table 6.2.3). The rate of consumption of natural gas is certain to keep increasing at a much higher rate after the setting up of several proposed fertilizer factories in the future. The Green Revolution is putting increasing demand on the limited reserve of natural gas which has more other socially desirable uses such as electricity and industries. But the limited supply of natural gas is a key constraint on the generation of electricity causing slowdown in the growth of industry and other productive sectors.

iii. Encroachment

Natural ecological imbalance due to heavy abstraction of groundwater for irrigation: The higher growth achieved by the HYV-based agriculture in Bangladesh is attributable to higher growth of mechanized irrigation in the country. The mechanized irrigation in Bangladesh is mainly based on the intensive abstraction of groundwater. Groundwater irrigation accounted for 77 percent of the irrigated land in *rabi* season, as against 23 percent by surface water in 1989/99 (NMIDP 1999: Appendix 1). Notwithstanding enough potential for groundwater abstraction as estimated by Bangladesh National Water Plan Organization, drawdowns of the aquifer have been observed particularly in several districts in the north-west region of the country. The problem is frequently encountered in those areas where the overdraft condition rate is higher. As a result, a number of STW's run dry during the peak time of *boro* cultivation (Ali 1987: 318). The groundwater of 51 *Upazilas* monitored by DPHE and NMIDP over the period from 1986 to 1997 shows that the proportion of *Upazilas* with the water table beyond the maximum suction lift limit increased from 25 percent in 1986 to 31 percent in 1997 representing worsening trend in the drawdown of water table in the same *Upazilas* (Table 6.2.4). In consequence, many ponds have turned dry, soil moisture within the upper shallow aquifer is being exhausted, many fruit and deep-rooted trees are affected, etc which all together giving way to upsetting the natural ecological balance (Khan 1990: 142).

Degradation of groundwater and soil properties: Too-intensive abstraction of groundwater is also posing threat to the quality of the groundwater by allowing the rapid intrusion of saline water inward in some of the districts of the central and south-eastern districts such as Brahmanbaria, Chandpur and Noakhali districts. Some of the intensively irrigated districts such as Bogra, Dinajpur, Satkhira, etc have already been affected by the effects due to the presence of excess amount of some harmful minerals in the groundwater.

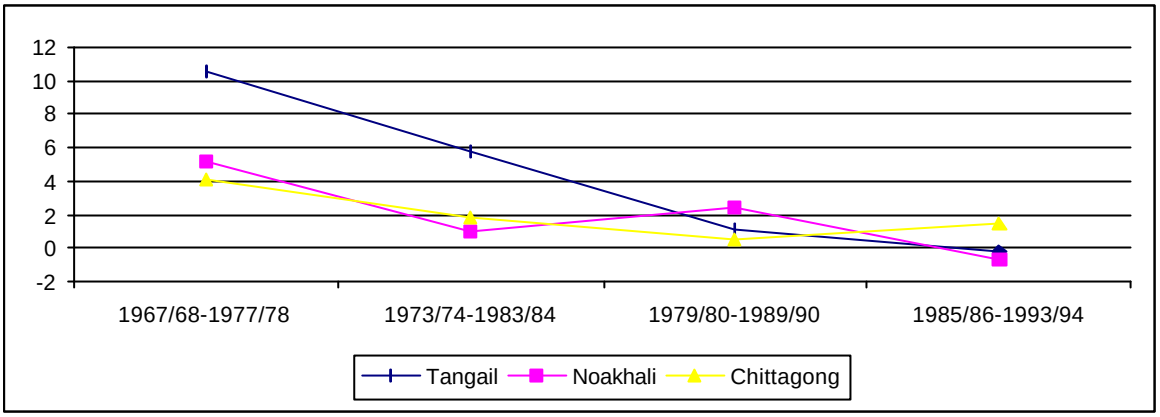
The groundwater contains minerals including salt and the continuous use of it for irrigation is also degrading soil properties which is ultimately hampering crop production (ibid: 144).

Land subsidence: The most damaging impact of high abstraction of groundwater is observed in the case of land subsidence which takes place very slowly. The buildings in the residential areas, particularly in urban or metropolitan cities face great threat due to land settlement problems. There is an evidence that the heavy groundwater abstraction in the Dhaka metropolitan area has led to a decline in land subsidence in the eighties (Khan 1990: 149). Therefore, the phenomenon that the same problem may also have occurred in the rural areas particularly where the overdraft condition is severe cannot be ruled out.

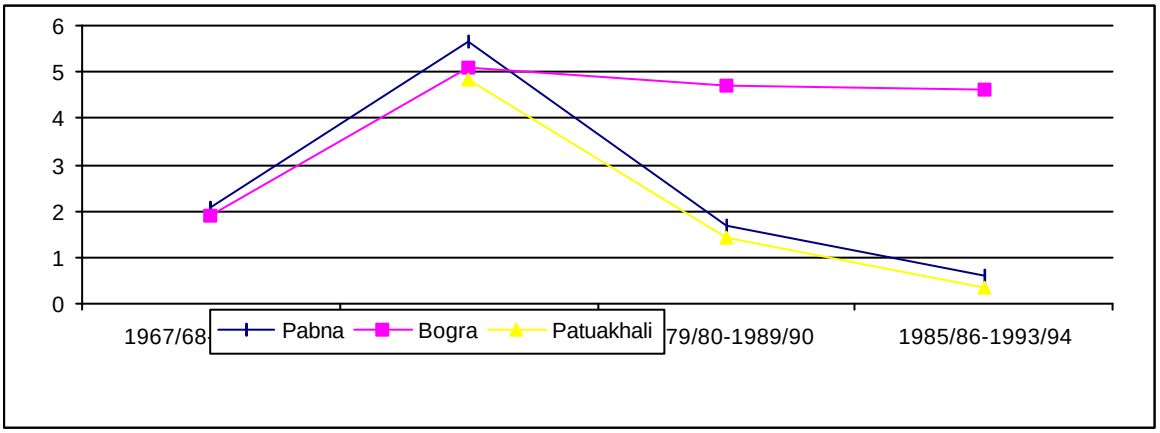
The Green Revolution is causing arsenicism in Bangladesh. The association between groundwater-based irrigation and arsenicism is being highlighted by scientist and environmentalist. The groundwater contamination process has been elucidated by Ahmed (1998) in the following way: "Since the 1970s growing use of groundwater for irrigation has, in general, resulted in lowering in aquifer levels during the dry season … When ground water is abstracted through tube-wells and pumps, the left-over interstitial spaces get exposed to ambient air (oxygen) and/or oxygenated water. In such an oxidizing condition, arsenopyrite minerals are oxidized … At the end of the dry season the interstitial cavities are recharged with water and the newly formed arsenates and arsenites get solubilised in it. The same process presumably has continued for the past three decades. The groundwater table has thus become contaminated with arsenic" (pp. 28-29). The contamination of the groundwater with arsenic has been a serious health hazard in the nineties and its actual spread and damaging impact is still unknown.

Exhibit 6.2.1: Trend Rate of Growth of Rice Production for High Performer Districts During Four Ten-year Overlapping Periods Since the End Sixties

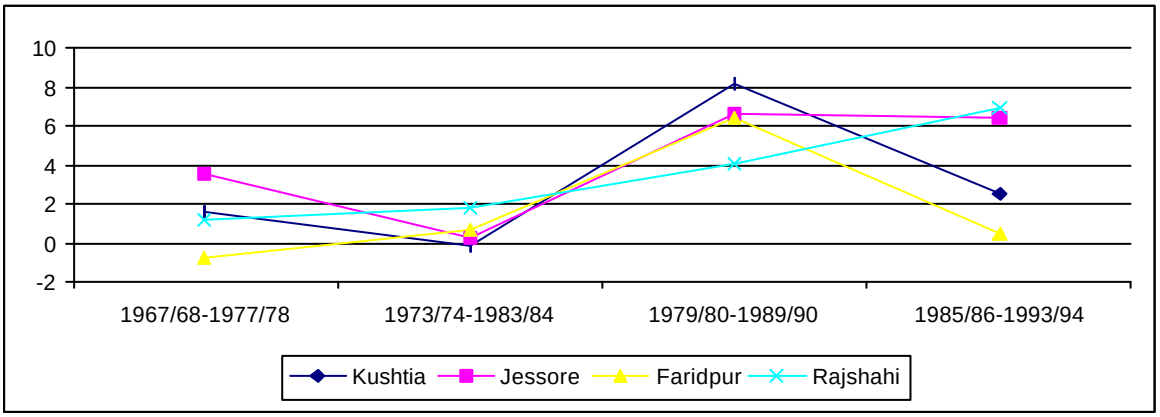
A. Top Performer districts during 1967/68 to 1977/78 (Chittagong, Noakhali and Tangail)



B. Top performer districts during 1973/74 to 1983/84 (Pabna, Bogra, Patuakhali and Tangail*)

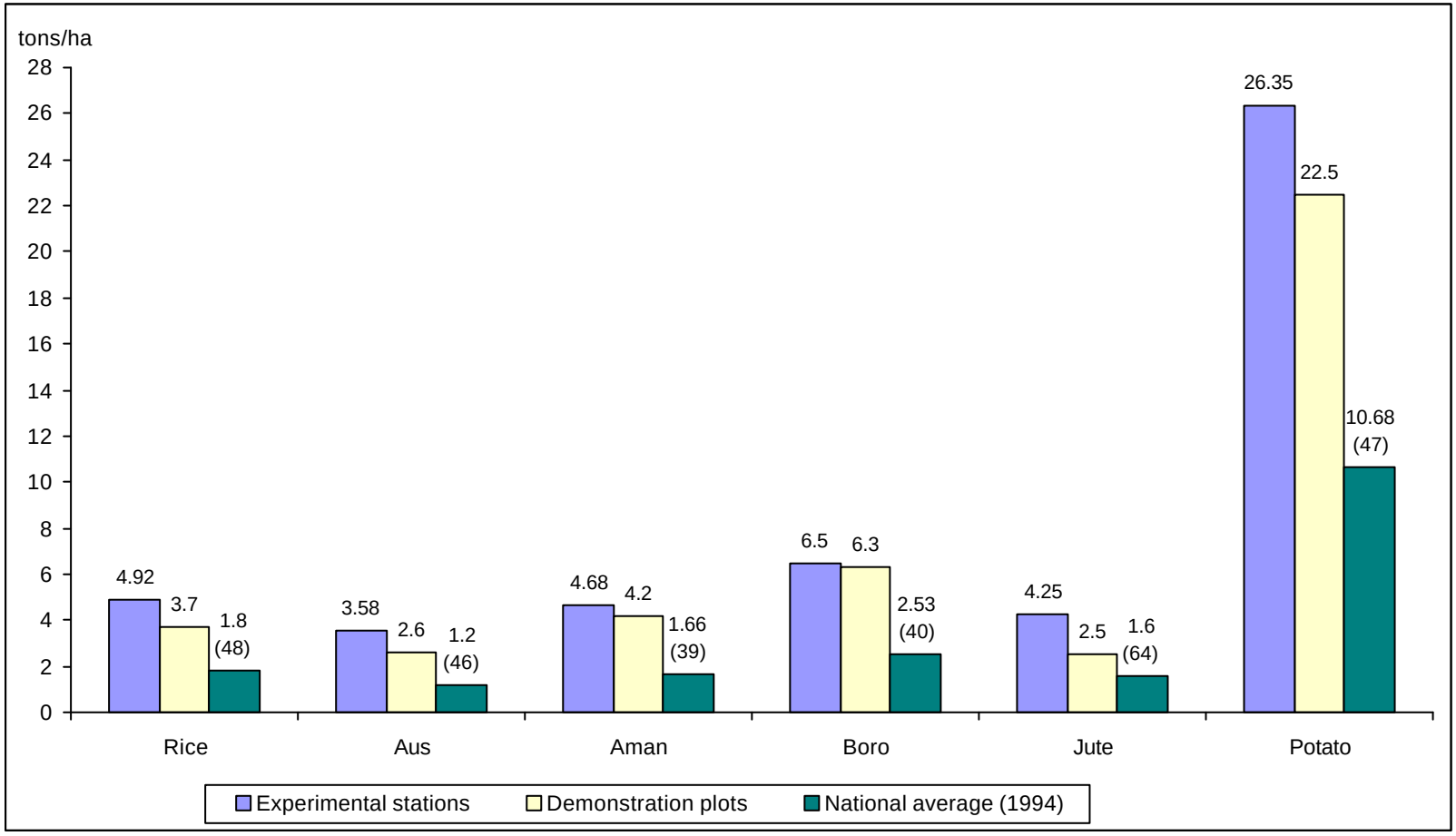


B. Top performer districts during 1979/80 to 1989/90 (Kushtia, Jessore, Faridpur Rajshahi and Bogra)**



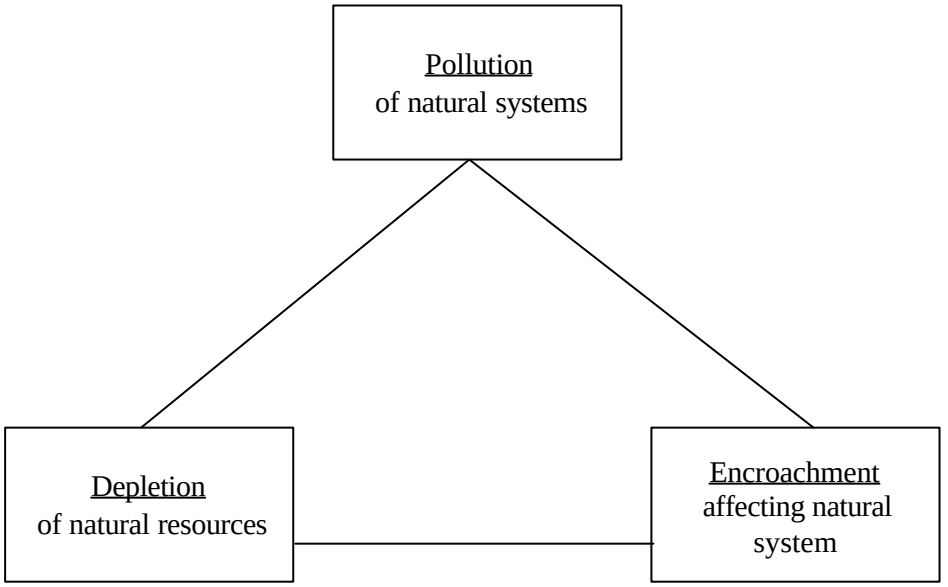
Note: * ⇒ trend for Tangail is shown in Section A
** ⇒ trend for Bogra is shown in section B
Source: Shahabuddin and Rahman (1998: 61-62)

Exhibit 6.2.2: Potential and Existing Yield of Major Crops in Bangladesh, 1994



Note: Figures in the parentheses show percentages of demonstration plot averages
Source: Shahabuddin and Rahman (1998: 85)

Exhibit 6.2.3: Taxonomy of Unsustainability



Source: Ayres (1998:8)

6.3 The Profile of The Study Locations

Field investigation was carried out in two villages, namely Sailgun (south-west) of Kalai *Upazila*, Joypurhat district and Dehergati (middle) of Babuganj *Upazila*, Barisal district. These two villages represent different levels of irrigation coverage in two different geographical regions north-west and south-central regions of the country. Sailgun is an intensively irrigated village (ILV) and Dehergati represents a village with moderate level of irrigation coverage (MIV). This chapter highlights mainly agroecological and agricultural features of the selected study locations. By study locations we broadly mean the selected *Upazilas* and districts, although the central focus of the investigation has been on the selected villages. However, the overall understanding of the village-based case studies in their proper context demands other relevant information on the surrounding areas. The profile of the study locations comprises the presentation of the profile of both the surrounding areas of the study villages and of the study villages themselves. The profile of the two *Upazilas* representing the surrounding areas of the study villages is based on secondary data and those of the study villages are on the primary data collected during March-May 2000.

6.1.3 Brief Profile of the Study *Upazilas*

The selected study *Upazilas* representing different agroecological conditions expectedly differ in a number of respects having a significant bearing on the agriculture of the respective areas. The major characteristics of the two *Upazilas* are presented below (Table 6.3.1).

6.3.1.1 Demography

Kalai and Babuganj *Upazilas* had almost equal family size of 7.0 and 6.9 respectively in 1991, a much higher size compared to the country average of 5.6. With almost equal land size, Babuganj had a large population size (135,905) in 1991 than that of Kalai (114,183).

6.3.1.2 Agroecology

Kalai *Upazila* cuts across two agroecological regions, namely Level Barind Tract (AEZ 25) and North Eastern Barind Tract (AEZ 27) (Map 6.4.1). Babuganj, on the other hand, comprises Low Ganges River Flood Plain (AEZ 12) and Ganges Tidal Flood Plain (non-saline) (AEZ 13a) (Map 6.4.2). "Agroecological region may be defined as an area where the agricultural environment is virtually identical" (Hussain 1992:368). It is a representation of four parameters of the area concerned, namely physiography, soil, depth and duration of seasonal flooding and climate (ibid).

6.3.1.3 Nutrient Status

On a four points scale ranging from 'very poor', 'poor', 'fair' and 'good' for measuring nutrients content in the soil, soils of both the *Upazilas* are characterized by fair grade of nutrient content in those agroecological regions (Table 6.3.2). In Kalai *Upazila*, by and large, the Level Barind Tract lies in the high sulfur deficiency region of the country (Zaman 1985) and the North Eastern Barind Tract has very high deficiency of nitrogen (N) and potassium (K) (Table 6.3.3). On the other hand, the Low Ganges River Flood Plain and Ganges Tidal Flood Plain regions in Babuganj, have low to medium content of zinc in the soil. Nitrogen and phosphatic nutrient contents are very low in the AEZ regions under this upazila.

6.3.1.4 Availability of Cultivated Land

In terms of per capita cultivated land, both the study *Upazilas* have less dispersion from the national level — 25 decimals for Kalai, 22 for Babuganj, as against 25 for Bangladesh. The per household cultivated land in Kalai, Babuganj and Bangladesh stands at 2.54 acres, 2.10 acres and 2.0 acres respectively.

6.3.1.5 Intensity of Land Utilization

Land is being intensively utilized in both the *Upazilas* compared to the overall national trend. The cropping intensity is now running at 239 percent for Kalai which is much higher than the national level (176%). Babuganj has also a bit higher cropping intensity at 191 percent than the national level. While Kalai has almost no single cropped land (0.1%), Babuganj has 29.5 percent as against the national average of 37 percent. Kalai has also the highest proportion of triple cropped land at 39 percent, as against also much lower coverage under this category of land in both Babuganj (19%) and Bangladesh (13%).

6.3.1.6 Source of Irrigation Water and Irrigation Coverage

In terms of net cultivated area in *rabi* season, Kalai has 99 percent of her land irrigated in this season, one of the rare few *Upazilas* of the country with so much irrigated land, is far ahead of both Babuganj (17%) and the country average (43%).

Irrigation water in Kalai *Upazila* is mainly sourced from groundwater (95%), but surface water is found the only source of irrigation water in Babuganj. Groundwater and surface water nationally account for 77 percent and 23 percent of the total irrigated land respectively in 1998-99.

6.3.1.7 Irrigation Equipment

The growth of irrigation equipment operated in both the study *Upazilas* shows a modest upturn in the late nineties. DTWs grew at a modest rate of 8 percent compared to 2 percent for STWs over the last five years in Kalai *Upazila*. Union-wise breakdown of the operated irrigation equipment indicates that there has been a steady upward trend for electric-operated irrigation devices in Kalai. But DTWs increased at a much a higher rate (62%) than electric-operated STWs (32%) in various Unions of Kalai over the last five years. On the whole, the growth of STWs shows a high rate of deceleration over the period. It is also evident from Table 6.3.4 that the number of diesel-operated STWs dropped very fast in Kalai over the same period.

Except for LLPs, there is no other irrigation devices used in Babuganj *Upazila* because of its total dependence on surface water for irrigation. Irrigation pump grew by a faster rate over the preceding decade in Babuganj than that in Kalai. Babuganj has, however, seen a slowdown in the growth of LLPs during the latter half the nineties (5% per annum) than that it was achieved in the first half of the decade (24% p.a). The precipitous change in the number of operated LLPs as is evident from Table 6.3.5, is mainly due to both supply and demand factors such as the rehabilitation programme of the government, availability of LLPs from the Southern Region Agricultural Development Project (a DAE Project), and occasional spurt in farmers' demand following the years of crop damage in the monsoon, etc.

6.3.1.8 Food Production

With cultivable land larger by only 62 hectares than that of Babuganj, Kalai grows 67.2 thousand metric tons of foodgrains almost two and a half times as high as food produced in Babuganj (27.4 tmt). The lower production of foodgrains coupled with a higher food requirement due to larger population size, Babuganj has a meagre surplus of food amounting to 4.5 thousand metric tons equivalent to 16 percent of her total food production compared with a huge food surplus of 48.3 thousand metric tones (72% of total production) in Kalai

6.3.2 Profile of the Study Villages

6.3.2.1 Demographic and Educational Aspects

Household, population and family size: There are at present 78 and 90 households in the study hamlets, namely Sailgun (south-west) and Dehergati (middle) respectively. Sailgun (SW) and Dehergati (M) have a total of 334 and 491 populations including 195 (58%) and 276 (56%) adult persons respectively (Table 6.3.6). The family size is found a bit higher in Dehergati (5.4) than it is in Sailgun (4.3). Family size in Sailgun was lower at 3.6 about 10/12 years before.

The family size in Dehergati compares very well with that of Bangladesh average (5.6), but Sailgun has a higher divergence from the same.

Family labour: Family labour including adult and child labour currently comprises about 55 percent of the total population of both the study villages (Table 6.3.7). Out of the total number of family labour, adult labour constitutes about 93 percent and 89 percent in Sailgun and Dehergati respectively. About half of the child labour in Sailgun and two thirds in Dehergati are constituted by girls.

Occupation of the household heads: Cultivation is the main occupation of the household heads in both the villages (Table 6.3.8). More than three-fourths of all the households in Sailgun and more than half in Dehergati are engaged in the cultivation of seasonal crops. More households seem to have increasingly taken up agriculture as their main occupation over the last 10-12 years. Households selling wage labour, the second most important occupation in both the villages, accounts for 9-10 percent and 14-17 percent of households of Sailgun and Dehergati respectively. Services including salaried service and self-employed service is found another important category of occupations in which around 20 percent of households are engaged in Dehergati, although not even a single household is found engaged in this occupation in Sailgun.

Regarding the secondary occupation of the household heads, wage labour and trading are found the major occupations in Sailgun, whereas cultivation followed by wage labour constitute an overwhelming portion of all the household heads engaged in secondary occupation in Dehergati (Table 6.3.9).

Education of the household heads: A higher proportion of the household heads of Dehergati appear to have had much longer period of schooling than those of Sailgun. Those with 10 years and more of schooling constitute around 19 percent of the households in Dehergati compared to 5 percent in Sailgun (Table 6.3.1). On the other hand, a higher proportion of the household heads (43%) are found either illiterate or almost illiterate in Sailgun than those (28%) in Dehergati. The proportion of household heads with at least primary level of education is also higher (47%) in Dehergati compared with those (40%) in Sailgun.

6.3.2.2 Agroecological Characteristics

Farmers' perspectives on the five basic parameters of the agroecology of the study villages have been collected. The parameters are topography (elevation of land), soil type, rainfall, source of water and flood proneness. As reflected by the non-poor farmers of Sailgun and the poor farmers of Dehergati, there has been no noticeable change in those parameters

over time in Sailgun, although Dehergati has witnessed changes in some of the parameters over the last 10-12 years (Data Box 6.3.1).

Topography: An overwhelming proportion of land (90%) in Sailgun is of medium elevation whereas lowland predominates (70%) in Dehergati.

Rainfall: Sailgun is endowed with adequate precipitation in the rainy season, Dehergati is reported to have witnessed a fall in the precipitation from five months to four months over time.

Water: Sailgun predominantly depends on its groundwater (90%) as a source of water. Surface water contributes only 10 percent in her water requirement. On the other hand, canal and rainfall have been the only sources of water in Dehergati. Dehergati is currently being affected by a higher content of iron and salinity in water which was not experienced before.

Flood: Sailgun is almost free from flood hazard all through. The flood proneness in Sailgun runs at about 4-5 percent of all land. But Dehergati is extremely affected by flood every year, although its severity has improved over time. As high as half of all her land is now prone to seasonal flood compared to 80 percent 10-12 years before.

6.3.2.3 The Agriculture

6.3.2.3.1 The Cropping Pattern and Crop Mix

Crop calendar: Data Boxes 6.3.2 and 6.3.3 show crop calendars of the study villages. The crop calendars of both the villages reveal some differences between the cropping seasons of the two villages. As for *rabi* crops (except for *boro*), cropping season in Sailgun seems to start one month later than in Dehergati, from November to mid-March but the season ends in the same month (mid-February to mid-March) in both the villages. *Rabi* season spans four and a half months in Sailgun in contrast to five and a half months in Dehergati. The cropping season for *boro* begins from early January in both the villages but it spans four and a half months in Sailgun, as against three and a half months in Dehergati.

Both the villages do not have any crop in the *kharif* - 1 season (pre-*kharif*). That is, there is a long gap (two and a half months) between the harvesting period of *boro* and the transplantation of *aman* in both the villages. The major crops such as *aus* and jute which used to be grown before in *kharif* -1 season are no more cultivated nowadays in any of the study villages. It is worth mentioning that cropping pattern without any of the pre- *kharif* crops result periodic gap between the two seasons — *robi* and *kharif* -2.

Aman is a single crop grown in *kharif*-2 season. The cropping season for *aman* covers three and a half months in both the villages. It however starts one month earlier in Dehergati from mid-July/mid-August than in Sailgun.

Cropping pattern and crop mix: Within the time span of the last 10-12 years or so, there has been no noticeable change in cropping patterns in Sailgun, an intensively cultivated village, expect for switching over of cropped land among various patterns. Sailgun has four cropping patterns across three types of intensity of land utilization. Various crops of local variety which have disappeared from the village used to be grown much earlier say two decades before in this village. Sailgun has now the following cropping patterns (Table 6.3.11).

i. *Boro*
ii. *Boro* + *aman*
iii. *Potato* + *boro* + *aman*
iv. Mustard + *boro* + *aman*

Out of the four, potato + *boro* + *aman* has emerged as the most widely used cropping pattern constituting the largest-proportion of cropped land thereunder. The above cropping patterns include four crops in various crop mixes. Out of the four crops now grown in Sailgun, *boro* and *aman* are grown in almost all cultivable land in the two different crop seasons and they have no competing crops now (Table 6.3.12). As a late *rabi* crop, *boro* does not have to compete for land, but other early *rabi* crops are found to compete for the share in cropped land in Sailgun. Out of the two early *rabi* crops, namely potato and mustard, potato now comprises a larger portion of cropped land than mustard. The increase in cropped land under triple crop combinations has led to an increase in the cropping intensity in the village from 239 percent to 257 percent over the last 10-12 years.

Dehergati representing medium irrigation coverage has seen a marked change in her cropping patterns over the last 10-12 years. At present the agriculture in Dehergati has three cropping patterns, namely (Table 6.3.13):

i. *Aman*
ii. *Aman* + *khesari*
iii. *Aman* + *boro*

Dehergati had the following cropping patterns before in addition to the above three:

iv. *Aman* + *mung*
v. *Aman* + mustard
vi. *Aman* + *aus* + *mung*
vii. *Aman* + *aus* + *khesari*
viii. *Aman* + *aus* + mustard.

In Dehergati; one important change that has occurred over time in cropping pattern and in the intensity of land utilization is that the presently practised cropping patterns do not have

any triple crop mix which was found before. Although this has led to an increase in double cropped land, the overall cropping intensity has eventually dropped from 262 percent to 173 percent over this period in the village. The drop in the cropping intensity in the early years of HYV cultivation is also reflected in the national level data and has corroborative evidences in other studies (Khan 1988: 123 and Mahmud 1988: 16).

Only three crops, namely *aman*, *boro* and pulses (*khesari*) are now grown in Dehergati. *Boro* has a 60 percent share in total land cropped in the *robi* season (Table 6.3.14). *Aus*, a major *kharip*-1 crop, is not grown in this village at present. Pulses (*mung*) and mustard are also not grown now in Dehergati.

6.3.2.4 Cultural Practices of Boro Cultivation

Boro cultivation builds on different cultural practices in the study villages some of which are briefly mentioned below (Data Box 6.3.4).

Type of land: *Boro* is now cultivated in all types of land in Sailgun, but its cultivation was limited to only low land before. But in Dehergati, it is always grown in low land.

Land preparation: Land is being tilled now by power tiller in both the villages. Traditional ploughs are also conjunctively used in Dehergati.

Period of seed bed: The period of seed bed spans from mid-November to mid-January in Sailgun and there has been no change in this period. Timing for seed-bed extends from mid-October to mid-December in Dehergati and the period tends to fall over time from 40/50 days to 30/40 days.

Mode of transplantation: Both ways of transplantation, namely in-line and random transplantation are found in practice in both the villages nowadays. However, random transplantation was predominant before in both the villages.

Applying organic manure: It used to be applied in much higher proportion before in both the villages, but its application has sharply declined over time. In Dehergati, its share in total fertilizer used has gone down from 25 percent to only 2 percent during the last 10-12 years.

Irrigation schedule: It appears that no specific time schedule is followed for irrigating land in both the villages. This indicates that unscheduled irrigation practice not only causes wastage of water but it may also have had negative affect on yield as well.

Method of weeding: In Sailgun, weeding is now conjunctively done by herbicides and manually and there has been no change in this practice over time. However, only manual method is in practice in Dehergati for this operation.

B. INTERMEDIATE OUTCOMES OF SAP-LED MEASURES

6.4 Mechanized Irrigation

> "The quality of LLPs has deteriorated. Now, the pack of the machine contains a 'free gift', but the quality of the product is poor. Earlier, there used to be no 'free gift' in the pack, but the machine was up to the mark … Substandard machines are presently being imported. The importers earn handsome profit by importing substandard machines. Nonetheless, irrigation equipment is available … Locally-made spares are not upto the mark because they are made from improper metal. Foreign spares are not locally available, because they are costly and in low demand".
>
> — Imrul Kaiser, an equipment seller, Barisal

> "We demand the re-introduction of the scheme [command area]. Without the scheme, the installation overkill of DTWs and STWs continues unabated causing much disservice [to the people]".
>
> — Non-poor farmers of Sailgun (SW), Joypurhat

> "People cannot afford to buy irrigation equipment (LLPs) for lack of fund and therefore cannot irrigate their land even where water is available."
>
> — Poor farmers of Dehergati (M), Barisal

6.4.1 Status of Irrigation in the Study Villages

6.4.1.1 Early Days of Mechanized Irrigation in the Study Villages

The two study villages appear to have different lengths of experiences with mechanized irrigation. Sailgun (SW) in Joypurhat district came under mechanized irrigation in the early eighties since the installation of a DTW in 1982 under the rental system in force then. The DTW was installed by BADC through the organizational support of BRDB which formed an organization for the DTW-based irrigation management in the village comprising 22 farm households. Out of 70 farm households with first access to irrigation, 52 of them gained the access in the eighties representing 77 percent in the village.

Unlike Sailgun, Dehergati(M) in Barisal have come in touch with unmechanized irrigation since far earlier time. It appears that Dehergati started using mechanized irrigation before the independence of Bangladesh, although the coverage at the farmer level was limited. The expansion of irrigation got impetus in the nineties during which a significant portion of the farm households first used irrigation services. Out of 76 farm households, 47 brought first their cultivable land under mechanized irrigation in the 1990s in the village, showing 62 percent coverage at the farmer level (Table 6.4.1).

6.4.1.2 Parallel Expansion of Mechanized Irrigation and HYV Cultivation

There seems to exist a close relationship between the accessibility of irrigation water and the adoption of HYV crops in both the study villages. As the cultivators increasingly

gained access to irrigation water, they started growing HYV crops in the irrigated land (Table 6.4.1). The HYV adoption grew by almost the same rate as the accessibility of irrigation water in both the villages increased. Almost all of them with access to irrigation service cultivated HYV crops showing strong association between the access to irrigation service and adoption of HYV technology (Table 6.4.1). The similar correspondence between the accessibility of irrigation services and HYV cultivation is also observed in Dehergati. Out of 76 households with access to irrigation, 74 cultivated HYV crops in the village.

Farmers who first adopted HYV cultivation varied with regard to the selection of the varieties. China-IRRI, as termed by the villagers, was cultivated most widely by the adopters (58 out of 78 farm households) as their first paddy variety in Sailgun compared to IRRI-8 in Dehergati (66 out of 74) (Table 6.4.2).

6.4.1.3 Demand for Irrigation

Total Demand for Irrigation Services

Both the study villages have seen increasing tendency of irrigation demand in respect of both cultivators and irrigated land. Overwhelming part of the demand for irrigation services has been in *rabi* season. Very few farmers need irrigation in other cropping seasons. There is some demand for irrigation service during *kharif* seasons in Sailgun but there is no demand for irrigation in Dehergati in the same seasons. During *rabi* season, the demand for irrigation in terms of proportion of farm households increased from 56 (83%) to 64 (97%) over the last 10-12 years in Sailgun whereas it increased from 49 (70%) to 61 (76%) in Dehergati over the same time (Table 6.4.3).

The Unmet Demand for Irrigation Services

Despite remarkable growth in irrigation services in the study villages, there remains a portion of cultivated land unirrigated as yet in both the villages. The proportion of the unirrigated land in Sailgun is lower (7%) compared to that in Dehergati (29%) (Table6.4.4). It is evident from the table that the overwhelming portion of the unirrigated land is held by the non-poor (middle and well-off households) in both the villages — 81 percent in Sailgun and 61 percent in Dehergati.

6.4.1.4 Irrigation Coverage

Irrigation coverage seems to have expanded during *rabi* season in both the study villages over time. The number of irrigators rose from 37 to 55 and from 39 to 58 for STWs and DTWs respectively in Sailgun (Table 6.4.5). For LLPs in Dehergati, the number of

irrigators rose from 52 to 70 during the same time. Although the farmers used irrigation water in *rabi* season, they did not use it for *aman* crop in *kharif* season in both the villages.

Farmers' perception shows that there has been an impressive expansion of irrigation coverage in terms of irrigated land in both the villages. According to the perception of both the poor and non-poor farmers, irrigation coverage in *rabi* season (for *boro* crop) peaked from 50 percent of cultivated land 10-12 years before to almost cent percent (95-100%) at present in Sailgun (Data Box 6.4.1). The expansion of irrigation coverage in Dehergati has also been remarkable, although not up to the extent achieved in Sailgun. In Dehergati, the proportion of irrigated land in *rabi* season rose from 25-50 percent to 80 percent over time.

As explained by both the poor and non-poor farmers of Sailgun, the explosive growth in irrigation coverage in *rabi* season is attributed to the availability of irrigation service through the installation of STWs and DTWs in the village. Moreover, unlike in the past, farmers are more conscious about the profitability of *boro* crop and they are more hardworking nowadays.

The cause of impressive growth of irrigation coverage in Dehergati is almost the same as in Sailgun (Data Box 6.4.1). The poor farmers of Dehergati hold that the increased availability of irrigation service in the village has been the main reason for the expansion of irrigation in the village. The non-poor farmers, on the other hand, believe that the increased availability of irrigation equipment, upswing of the irrigation demand and increased availability of uninundated land have together contributed to the irrigation expansion in the village.

6.4.1.5 Number of Irrigation Equipment

The irrigation capacity in the villages went up during the last 10-12 years. The number of irrigation equipment currently owned by the villagers includes 6 STWs and 3 DTWs in Sailgun (Table 6.4.6). The farmers of Sailgun had owned 7 STWs and 1 DTWs 10-12 years before. This large number of equipment owned by the farmers do not necessarily imply that all of them are effectively and extensively being used for irrigation purpose. STW can be used for a variety of purposes such as tilling land, threshing paddy, husking rice etc. Apart from irrigation, these machines are also used for other purposes.

As irrigation in Dehergati is totally dependent on surface water, farmers deploy LLPs for irrigating their land. Irrigation capacity in Dehergati, in terms of the number of pumps, also increased over time from as low as 2 LLPs to 4 (Maps 6.4.1, 6.4.2 and 6.4.3). However, the farmers of Dehergati(M), own only 2 LLP at present.

6.4.2 Stakeholders' Perspectives on Irrigation Issues

The findings mainly based on various stakeholders are presented in this section. The presentation has been in such a manner that the specificity of their viewpoints are maintained and therefore their views captured at different levels are presented separately and sequentially.

A. At the Community Level

A.1 Farmers' Perspectives

The field investigation was conducted more thoroughly at the community level among the farmers, labourers, equipment owners including women. Although the methods used for the investigation differed because of the type of the informants/participants, participatory methods were used in most of the cases. Whatever the methods, tools and techniques were used, all served to uncover the reality of relevance to the study.

Field findings focused on various irrigation-related issues are presented below under three different headings, namely broader issues; particular issues, and the overall assessment of the major irrigation regimes which the farmers already aware of.

6.4.2.1 Focus on Some Broader Issues

6.4.2.1.1 Constraints Diagnosis of Irrigation

In order to diagnose irrigation-related problems at the farmer level, the following inter-related questions were asked: What are the major problems with irrigation in the village? When did it emerge first? When it was aggravated? How long has it been persisting (every year/occasional)? What are the causes of those problems? How those problems can be dealt with?

A. Village: Sailgun, Joypurhat

Both the poor and non-poor farmers were asked to reflect on those questions and come up with appropriate measures. According to the poor farmers of Sailgun, they encountered the following problems with irrigation in the village (Data Box 6.4.2A).

i. Power failure (rank 1)
ii. Loss of irrigation water (rank 2), and
iii. High irrigation charge (rank 3)

Power failure has emerged as the number one problem affecting irrigation in the village since 1989-90 and it has worsened since eight years before. The main cause of the power

failure is high demand for electricity. They demanded that uninterrupted power supply be ensured. The loss of irrigation water, the second most serious irrigation-related problem in the village, has been caused by the lack of capital and it can be solved by constructing *pucca* (concrete) drains in the crop field. As identified by the poor farmers, high irrigation charge stands out as the third ranking problem in the village. Irrigation charge remained unchanged all through. Profit motive of the equipment owners constitutes the main cause of the problem. They recommended to lower power charge for facilitating the reduction of the irrigation charge in the village.

The non-poor farmers of Sailgun identified two different sets of problems for the electric-powered pumps and the diesel-powered pumps in the village. They diagnosed the following problems with electric-powered pumps as under:

i. Load shedding (rank: 1)

ii. High power tariff (rank: 2)

iii. High wage rate (required for the construction of *kutcha* (earth) drains/ furrows (rank: 3)

iv. Wastage of water due to *kutcha* drains/furrows (rank: 4)

The problem identified by the non-poor framers with diesel-powered equipment are as follows:

i. High diesel price (rank: 1)

ii. Diesel is not always available (rank: 2)

iii. Spares are not always available (rank: 3)

The beginning of almost all the problems identified by the non-poor farmers was traced during the latter half of the eighties such as power failure since 1985-86, diesel price hike in 1990 etc. They mentioned high electricity demand as the cause of load shedding, and tampering of the meter reading (by unscrupulous REB personnel) being the cause of high power tariff. They recommended to ensure the [uninterrupted] supply of electricity to deal with the load shedding; to reduce power tariff for the reduction of the power expenses, and to provide credit for the construction of concrete furrows.

B. <u>Village: Dehergati, Barisal</u>

The poor farmers identified the following constraints on irrigation in the village:

i. Lack of water for irrigation (rank: 1); and

ii. Poor quality of irrigation equipment (rank: 2).

Inadequate water flows in the canal has been identified as the root cause of the shortage of irrigation water in Dehergati. The quality of irrigation equipment was poor because available equipment get disordered repeatedly.

The poor farmers put forward the following mitigating measures (Data Box 6.4:2B):

i. Excavate/re-excavate canals;

ii. Import high-quality machines and spares;

iii. Curb adulteration of fuel and lubricant.

The non-poor farmers identified the following major problems:

i. Inadequate water in canals (rank: 1), and

ii. There was no STW and DTW in the area (rank: 2)

They also pointed out that the inadequacy of canal water first emerged in 1980 and started worsening since 1990. The problem is widespread now in the region. They also highlighted the causes of the problems. As canals in the area have not been excavated/re-excavated by the government, they cannot hold enough water. No STWs/DTWs have been drilled in the area so far.

They, therefore, recommended to excavate/re-excavate canals and drill STWs/DTWs in the area to solve the identified problems

6.4.2.1.2 Investigation into a Particular Problems: Low Irrigation Coverage in the Village: A wide cross-section of farmers' perspective

By and large, Barisal region has had low irrigation coverage which has also been investigated to identify the underlying factors. Another hamlet of Dehergati — Dehergati (East) was selected which has a fairly lower irrigation coverage compared to other hamlets of the village. The key question posed for the investigation: Why has the village so limited irrigation coverage? A wide range of farmers identified the following constraints on the development of irrigation in the village.

A. Agro-climatic condition and Geophysical condition

i. Canals have been silted up and therefore river water cannot flow in and the flow of natural tidal water is obstructed through those canals.

ii. Unpredictable agro-climatic condition particularly in the case of rainfall and flooding has multiplied the risk factors constraining farmers' motivation and initiative.

iii. Unutilization of groundwater

B. Affordability and availability of inputs

iv. High irrigation charge amounting to 1/4th of the harvest is demotivating farmers.

v. High tillage charge amounting to Tk. 7 per decimal for double tilling is raising cost of farming

vi. Exploitative tenurial pattern such as sharecropping demotivates farmers to invest.

vii. Less availability of agri-inputs on the local market.

C. Institutional factors

viii. Limited access to bank credit particularly by the poor farmers.

ix. Lackadaisical institutional role in canal development

x. Limited role of support institutions such as DAE, BADC, etc. at the field level.

xi. Corruption of the concerned agencies/organizations in implementing canal development programmes.

They came up with the following mitigating measures:

a. Undertake canal re-excavation program.

b. Drill DTW, and

c. Provide credit on easy terms.

6.4.2.2 Focus on Some Particular Issues

The particular issues pertaining to irrigation will be focused in this sub-section, namely irrigation equipment, irrigation services, and comparative assessment of various irrigation regimes by the farmers.

6.4.2.2.1 On Irrigation Equipment (Table 6.4.7)

i. Cause of inadequate number of equipment: Poor farmers hold that people cannot afford to buy LLP for lack of fund in the area (Barisal)

ii. Availability: As viewed by both the poor and non-poor farmers, irrigation equipment and spares are now easily available on the market.

iii. Affordability: They expect to own equipment and therefore they need support from the government for this purpose.

- Price of irrigation equipment have dropped including all devices.
- Bank loan is not easily accessible particularly to the poor because of lending complexities, corruption and hassle.

iv. Quality of the equipment: According to the non-poor farmers, substandard machines are retailing on the market and an STW can hardly remain serviceable throughout a season. The farmers are being cheated.

v. Fuel/power: The owners of electric-powered DTW are required to pre-pay Tk. 25,000 as minimum tariff to REB for getting electric connection regardless of how much is consumed. It is a financial burden on the owners.

vi. Withdrawal of various restrictions:

- The measures that scrapped the import restrictions have been hailed both by the poor and non-poor farmers.
- This has, however, facilitated the import of substandard equipment.
- The measure rescinding the spacing and siting criteria is also viewed by the non-poor farmers as a positive step because it benefited farmers.
- However, due to the multiplicity of the equipment in the village, social conflicts are on rise.

vii. Availability of technical services: According to the non-poor farmers, the technical services provided by locally available private consulting firms are not upto the mark. They do not properly follow various technical norms and criteria while drilling the equipment.

- Adequate number of mechanics are now available and the repairing of the equipment can be done now at a lower cost. Equipment owners can now repair their machines by themselves.

6.4.2.2.2 On Irrigation Service (Table 6.4.7)

Availability and accessibility: In the eyes of the poor farmers of Dehergati, the availability of irrigation service has increased because of the increased number of the equipment. But its availability is conditioned by the availability of canal water. Moreover, irrigation water is inaccessible to many upland farmers.

As perceived by the non-poor farmers, they are faced with uncertainty about getting irrigation water on account of *kutcha* (earth) canals/furrows in Sailgun. They therefore recommended to construct concrete drains/furrows.

The non-poor farmers of Dehergati pointed out that irrigation coverage had been lower because of inadequate pumps, lack of canal water. They also recommended to lower irrigation charge.

ii. Irrigation charge: As viewed by the poor farmers of Dehergati, irrigation charge remained unchanged over time and it hovers at $1/4^{th}$ or $4/16^{th}$ of the harvest. However, very recently there has been an agreement between the farmers and pump-owners to lower irrigation charge to $3/16^{th}$ and it would come into force from the year 2000.

The non-poor farmers of Sailgun mentioned that there had been a change in irrigation charge from Tk. 650/700 per *bigha* (33 decimals) to Tk. 600 for STW over time. The irrigation charge for DTW also dropped from Tk. 600/650 per *bigha* to Tk. 400/500 per *bigha* during the same time due to the mounting competition among the equipment owners in the village

The non-poor farmers of Dehergati confirmed that irrigation charge had dropped to $3/16^{th}$ of the harvest. The present mode of paying irrigation services [in kind and after the harvest] is convenient for the farmers.

iii. Quality of irrigation services: As assessed by the poor farmers in Sailgun, they did not get water in time and adequately. The problem, however, been eased during the last two years. The poor farmers of Dehergati were however satisfied with the quality of irrigation service in terms of timeliness.

According to the non-poor farmers of Sailgun, farmers did not face any problem with irrigation water because of easy availability of mechanics in the area. The non-poor farmers of Dehergati confirmed that farmers did not face any quality-related problem as long as there was adequate water in their canals.

iv. Distribution of irrigation water: The non-poor farmers in both the villages pointed out that conveyance of irrigation water was constrained by *kutcha* (earth) drains/furrows which cost them Tk. 5,000 every year for the construction of the drains/furrows.

v. Contrast between the systems: As assessed by the poor farmers, they benefited more from the privately-owned and-managed irrigation system than the previous system, because the equipment owners could manage now their affairs by themselves.

In the eyes of the non-poor members, everybody gained access to irrigation services under the present system than before because there had been inadequate mechanics that time. Besides, the technical capacity of the block managers has also been built up by now.

6.4.2.2.3 On Comparative Assessment of Various Irrigation Regimes by the Farmers

6.4.2.2.3 (A): Gainers and losers of the privatized ownership of irrigation equipment

Poor farmers' perspective

As viewed by the poor farmers of Sailgun, equipment owners, and large and medium farmers have been the gainers of the privatized irrigation system (Data Box 6.4.3). Equipment owners gained by earning a lot from selling irrigation water, and large and medium farmers also gained by cultivating their sizeable chunk of land.

According to the assessment by the same poor group, the poor farmers and sharecroppers of the same village the losers of the private ownership. The poor farmers could not gain because they had small pieces of land and they did not have enough money to invest in cultivating. The sharecroppers could not gain because they had to rent in land from other owners. They also had to borrow money at exorbitant rate of interest. As a result, they could not gain any, rather they sustained losses.

The poor farmers of Sailgun put forward the following measures to mitigate the problems: (i) construct *pucca* drain; (ii) ensure uninterrupted power supply and (iii) lower irrigation charge.

The assessment by the poor farmers of Dehergati shows that all the categories of farmers including the pump owners gained from the privatized irrigation system (Data Box 6.4.3). The farmers benefited by getting the opportunity to cultivate [in the dry season which was not possible before] their land and many of them gained the affordability to buy irrigation pump. The pump owners benefited a lot by selling irrigation water. The poor farmers recommended the following measures for the improvement of irrigation:

i. Undertake quality control measures to ensure the import of high-quality equipment.
ii. Curb the marketing of fake spares.
iii. Combat the adulteration of fuel.
iv. Lower fuel price for the onward reduction in irrigation charge.
v. Impart training to the mechanics and provide necessary support.

Non-poor farmers' perspective

As prescribed by the non-farmers of Sailgun, the gainers of the private irrigation system include irrigation machine owners, farmers and agricultural workers (Data Box 6.4.3). The equipment owners derived benefit from the system because the cost of operation of the machine was less and income is more. Moreover, they could repair their equipment by themselves. The non-poor farmers on the other hand, held that nobody did lose from the system

and only the environment has been negatively affected. To mitigate the problem, they recommended to delimit the command area for the machines.

The non-poor farmers of Dehergati held that those who had gained from the privately owned irrigation equipment were farmers [non-poor farmers], pump owners and small farmers (Data Box 6.4.3). The non-poor farmers benefited from the privatization through buying irrigation equipment at the market and many of them rented out irrigation pumps to others. They also maintained that farmers including pump owners and BADC officials had been among the losers of the privatization program. The pump owners suffered loss by buying substandard machines and spares. BADC officials lost by missing the opportunity of getting bribe.

The non-poor farmers of Dehergati came up with the following remedial measures:

i. Ban import of substandard equipment
ii. Combat adulteration of fuel and lubricants.
iii. Import high-quality spares.
iv. Lower prices of spares.
v. Make the spares accessible to the farmers.
vi. Make necessary arrangement so that farmers can rent irrigation equipment at reasonable service charge.

6.4.2.2.3(B): Comparison between different ownerships of irrigation equipment

So far, farmers gained valuable experiences with three types of equipment ownership and irrigation management in Bangladesh, namely private ownership, public ownership and cooperative ownership. The farmers of Sailgun passed through all the three types of equipment ownership and irrigation management during their two decades long irrigation experiences. A DTW was first installed in Sailgun in 1982 and then its ownership was transferred to a group of farmers and since then it was being owned, operated and managed by that farmers group in the village. Meanwhile, several farmers bought several irrigation equipment including both STW and DTW covering both diesel-powered and electric-powered equipment. The farmers of Dehergati had experiences with only two types of ownership — private and public ownership. There had been no irrigation equipment under cooperative/group ownership in Dehergati till now.

The farmers, both poor and non-poor, were asked to express their feeling about those types of equipment ownership and irrigation management which they already passed through. Their perceptions are presented sequentially (Data Box 6.4.4) below.

i. Poor Farmers' Perspective

a. Private ownership:

Strengths :

- Independent planning is possible (Sailgun)
- Machines can be bought cheaper (Dehergati)

Weaknesses :

- Irrigation charge is higher (Dehergati)

b. Public ownership (BADC)

Strengths :

- The spares were of high quality (Sailgun)
- Irrigation machines used to be installed at their own responsibility (Sailgun)
- The quality machines were available (Dehergati)

Weaknesses :

- Everything used to be controlled by government rules (Dehergati)
- Irrigation machines would not be easily available (Dehergati)

c. Cooperative/group ownership

Strengths :

- All the members had earned handsome income (Sailgun)

Weaknesses :

- Decisions could not be taken promptly because of the non-participation by many members (Sailgun)

ii. Non-poor Farmers' Perspective

a. Private ownership:

Strengths :

- It can be operated independently (Sailgun)
- The machines are available (Dehergati)
- The spares are available and cheaper (Dehergati)

Weaknesses :

- Irrigation machines (STWs and DTWs) and its spares are substandard (Sailgun)
- Irrigation pumps and its spares are fake (Dehergati)

b. Public ownership (BADC)

Strengths :

- Installation of the machines in indiscriminate fashion was restricted (Sailgun)
- The spares had been of high quality (Sailgun)
- The quality of the machines and spares were superb (Dehergati)

Weaknesses :

- The machines and spares had not been easily available (Dehergati)
- The machines and spares were also costly (Dehergati)

c. Cooperative/group ownership

Strengths :

- Farmers benefited from installment facilities [irrigation charge] (Sailgun)
- Collective management (Sailgun)

Weaknesses :

- The farmers had to suffer (Sailgun)

6.4.2.2.3(C): Participatory assessment of three irrigation regimes by farmers' priority matrix

There has been a participatory assessment of the three above-mentioned irrigation regimes by way of constructing priority matrices by the two categories of farmers. This would serve to meaningfully quantify farmers' perspectives on the three types of irrigation markets in respect of various indicators on a certain rating scale and analyze them at the aggregate level.

In the participatory exercises conducted for different categories of farmers, as many as 38 indicators subsumed under 8 categories were used to elicit farmers perception on the three types of irrigation markets, namely private, public and cooperative. Farmers were asked to assess those irrigation markets in terms of 38 indicators on 1-5 rating scale ranging from 1 for 'very bad', 2 for 'bad', 3 for 'average', 4 for 'good' and 5 for 'very good'. This exercise was conducted in detail in Dehergati. A shorter version of the exercise was, however carried out in Sailgun. In the shorter version of the exercise, four out of eight categories of indicators were used as the items for the assessment by the participant farmers. Another difference from the detailed one is that the rating scale has been with points from 1 to 100 where 1 for the lower limit (worst) and 100 for the upper limit (excellent). The 38 indicators used for the assessment of the irrigation system related to the following categories of indicators:

i. Irrigation equipment (number of indicators: 7)
ii. Infrastructure for distribution of irrigation water (number of indicators: 13)
iii. Distribution of irrigation water (number of indicators: 5)
iv. Quality of irrigation service (number of indicators: 7)
v. Effect (number of indicators: 3)
vi. Irrigation charge(number of indicators: 2)
vii. Impact (number of indicators: 7)

The list of 38 indicators (and its eight categories) along with the scores are shown in the Data Box 6.4.5. The summary of findings of the detailed and shorter exercises are shown in Tables 6.4.8 and 6.4.9. Interesting finding have come out from those participatory exercises. The findings based on the farmers' priority matrices indicate that farmers' priorities differ not

only across their economic categories but also regionally. Key findings of the exercises are as follows:

The Poor farmers' assessment

The poor farmers were found to differ on singling out the most desirable irrigation regime out of the three assessed. Based on the total score for the three irrigation markets, privately-owned and -managed irrigation has come out as the most desirable one according to the assessment by the poor farmers of Dehergati (Barisal) whereas cooperative/group-based irrigation has come to the fore in view of the poor farmers of Sailgun (Joypurhat).

The score against 38 indicators rated on 1-5 rating scale by the poor farmers of Dehergati add up to 166 out of 190 showing an achievement of 87 percent for the privately owned/managed irrigation system compared to the score 62 (37%) out of the maximum of 190 for the publicly-owned/managed irrigation system (Table 6.4.8). As they had no experience with cooperative/group-based initiative in the village, there has been no assessment of this type of irrigation system.

At the disaggregate level, all the categories of indicators were rated very highly by the poor farmers of Dehergati in favour of the privately owned managed system. Contrarily, the public system had very poor rating by the poor farmers in terms of almost all the indicator categories. Only the indicators related to the categories 'equity' and 'irrigation charge' were ranked rather highly — 60 percent and 50 percent respectively in favour of the public system but still low compared to those for the private system. But in the case of the private system, all the categories of indicators had exceedingly high score because all the indicators under those categories were rated very highly by the participants. The poor farmers also expressed profound satisfaction particularly about the distribution of irrigation water, quality of irrigation services, and effect.

The assessment by the poor farmers of Sailgun provides a strikingly different result. The poor farmers assigned the highest score — 350 out of 400 (87%) — in favour of cooperative/group-based irrigation system compared to 330 (82%) and 320 (80%) for the private and public systems respectively (Table 6.4.9).

Despite the variation in their priority patterns for different irrigation systems, one common aspect has been established. That is, the public system was rated poorly by both the poor farmer groups representing two different regions.

Non-poor farmers' assessment

In Dehergati, the non-poor farmers also rated the private system highly than its counterpart public system, although the difference between the scores were not that much prominent (Table 6.4.8). Based on the scores of the 38 indicators, a total of 128 score out of 190 (67%) was assigned by the non-poor farmers in favour of the private irrigation system in contrast to 115 (60%) in favour of the public system. At the disaggregate level, the public system was given higher score over the private system in respect of irrigation equipment (66 vs 54) and infrastructure for distribution of irrigation water (70 vs 65). Both the systems had equal ratings for irrigation charge (70) and effects (60). The private system has an edge over the public system with regard to the other four categories of indicators.

On the other hand, the non-poor farmers of Sailgun had opted for the public system relative to other systems. The public system had the total score of 250 out of 400 (62%) while the private and cooperative/group systems had 230 (57%) and 200 (50%) scores respectively. At the disaggregate level, public system had higher score than the other systems in respect of irrigation equipment and distribution of irrigation water.

Regional diversity appears to have some important influence on the priority pattern of the two categories of farmers. The priority pattern for the two areas/regions is found different in two respects. First, privately owned and managed irrigation system has come up as a commonly preferred option from both the poor and non-poor farmers in Dehergati. Second, more interestingly, the privately-owned and -managed irrigation system has been a less desired irrigation system to both the poor and non-poor farmers in Sailgun.

B. At the institutions/organizations level

Public Sector Institutions

BADC and DAE, the two public sector institutions together constitute an important component of the field investigation.

DAE

The DAE, one of the government departments in the country, work with the farmers at the grassroots level. Block Supervisors, the agricultural extension workers of the DAE, are deployed at the block level in each *Upazila*. There are 10 and 20 Block Supervisors (BSs) posted respectively in the study *Upazilas*, namely Kalai, in Joypurhat district and Babuganj in Barisal district. Two consultations were held with the BSs in the said *Upazilas*. Seven out of 10 BSs in Kalai *Upazila* and 19 out of 20 BSs in Babuganj *Upazila*, participated in Focus Group Discussions arranged for the consultations.

Two different data gathering methods were used — one is participatory and another is conventional — to properly capture their views on the agriculture in general, and on irrigation and fertilizers in particular in the study locations. The perspectives of the agriculture extension workers gathered through FGDs have been presented in Section 18 in details. Their perceptions captured through individual interviews are also presented in this section.

6.4.2.3.1 Constraints diagnosis of the irrigation in Kalai *Upazila*, Joypurhat

The BSs of Kalai *Upazila* were asked three questions on the state of mechanized irrigation in the *Upazila* and they are:

i. What are the major problems afflicting the irrigation in the *Upazila*?
ii. What are the problems which arose during the last 10-12 years?
iii. What remedial measures need to be taken to mitigate those problems?

The Block Supervisors identified the following problems facing the irrigation in Kalai *Upazila* (Table 6.4.10):

i. Wastage of irrigation water on account of *kutcha* drains/furrows (temporary)
ii. There is no limit on irrigation charge
iii. Inadequate knowledge about irrigation
iv. Declining water table
v. Protracted social conflict stemming from private ownership of DTWs
vi. Scattered drilling of irrigation machines
vii. Irregular irrigation service
viii. Scarcity of diesel.

Out of the eight identified problems, wastage of irrigation water due to *kutcha* drains has come out to be the most widely cited problem by the BSs.

The problems that sprang during the last 10-12 years are as follows (Table 6.4.10).

i. Declining water table
ii. Lack of drains in dry season (in the autumn season)
iii. Diesel is not timely available
iv. Wastage of water due to *kutcha* furrows
v. Inadequate electricity

Declining water table identified by all the participant BSs as the menacing issue confronting the Bangladesh agriculture was caused during the last 10-12 years. Other serious problems afflicting irrigation also originated during the same period.

The agriculture extension workers put forward the following mitigating measures (Table 6.4.10).

a. Construct *pucca*/concrete drains/furrows to avoid wastage of water
b. Install STW 5 to 7 feet down beneath the surface so as to lift water at the normal flow
c. Determine area-specific irrigation charge
d. Impart training to farmers in irrigation
e. Determine the command area for DTW and STW
f. Formulate rules/norms for the distribution of irrigation water

Out of the above-mentioned measures, almost all the BSs recommended the first two measures for the mitigation of the problems.

6.4.2.3.2 Cause of low irrigation coverage in Babuganj *Upazila*, Barisal

A Focus Group Discussion was held for consultation with the BSs in Babuganj *Upazila*, Barisal. Out of 20, 19 BSs took part in the discussion. A single question was posed for the deliberation by the BSs: "What are the major causes of underdeveloped irrigation in Barisal and what measures need to be taken to deal with them?" They identified the following problems (Table 6.4.11).

i. Inadequate canal water
ii. Costly power pump and its spares
iii. Inadequate rental power pumps
iv. Inadequate DTWs
v. Scarcity of spares
vi. Inadequate mechanics
vii. Uneven cultivated land
viii. Lack of concrete drains
ix. Rental power pumps are costly
x. The government did not pay proper attention to irrigation projects
xi. Inadequate access to credit facilities
xii. Discontinuity of rental power pumps under BADC, etc.

The agriculture extension workers of Babuganj recommended as many as twenty measures to improve irrigation system in the area. Some notable measures are placed below (Table 6.4.12)

i. Excavate/re-excavate canals
ii. Augment the canal water by primary pumps/raise the gate of regulators

iii. Lower the price of irrigation spares

iv. Drill DTWs on an urgent basis

v. Provide credit for buying irrigation equipment/provide irrigation pump on easier term

vi. Construct concrete drains/furrows

vii. Provide adequate pumps at the *Upazila* level [on rental basis]

viii. Provide rental pumps at a cheaper rate

ix. Provide power pump through BADC

x. Skilled mechanics are needed, etc.

C. At the market level

C1. Irrigation equipment and spares market

The number of sellers of irrigation equipment are very few at the local level and they are localized at the district town. Two equipment traders with their business shops at Barisal town were interviewed. Both hard and soft data were gathered from them relating to the marketing of irrigation equipment. The interviews covered the issues such as type of machines available; country of origin; price; availability of machines and spares; quality; trend of sale; maintenance and repairing, and after-sale service, etc. Collected information are presented below (Tables 6.4.13A and 6.4.13B).

i. Type of machine and country of origin

Both old and new machines are on the market. Old machines are sold to the farmers and are also bought from them for onward resale. Most of the old machines were found costly and their present market value is still much higher than the new machines available on the market. Those old machines used to be rented by BADC before. Yanmar Kobuta, Ruston, JD and Lister were the brand names of some of the old machines being marketed there. These old machines originated from Japan, England and Germany.

All the new machines on the market were imported from China and the range of the machines was also found wide. Farmers mostly buy these machines because they are cheap. These cheap machines are not resold and bought back as in the case of the old machines.

ii. Price, availability and demand

There is no dearth of irrigation equipment on the market. Both old and new machines are available and buyers do not face any supply-side problem.

Old machines once used to be on a rental basis under BADC system, are still found serviceable and its retail price is still very high compared to the new ones (China) available on the market. For example, Kobuta (Japan) and Ruston (England) currently retails at Tk. 30,000

each whereas, new machines such as Dongfeng (China) and Chang Chai (China) are selling as low as at Tk. 7,700 each. The price of those machines increased over time in the range from 8 percent to about 60 percent.

As assessed by the interviewee sellers, buyers mostly selected cheaper brands such as Diamond Tricircle, Chang Chai, and Dongfeng whose prices currently ranges from Tk. 7,600 to 22,000.

iii. Quality of machines and spares

The quality of the above-mentioned old machines are 'very good' as rated by the equipment sellers but buyers cannot usually afford them. The quality of the new ones are either 'bad' or 'average'. These new machines are mostly bought because they are cheaper.

The equipment importers tend to import those substandard machines because they can earn more profit by doing so.

Similar is the case with the spares. The spares available on the market are either locally made or imported from India. The locally made spares were reported to be of very poor quality because they are not made from proper metals. Foreign spares are not locally available now because they are expensive. Poor farmers demand cheaper spares.

iv. Repair services

Repair service is available. If approached, the equipment sellers engage mechanics for repairing the machines. At present, there is no dearth of the mechanics [at the district town level]. Equipment owners repair their machines by themselves in the case of ordinary troubles but they have to take it to the town for repairing in the case of serious troubles where it is repaired by skilled mechanics.

v. Provision for after-sale service

The sellers do not provide any after-sale service. They are not liable for any defect with the machine if found after sale and therefore they provide the buyers with no warranty.

vi. Competition among the sellers

A fair degree of competition was reported to have existed in the equipment market at the district level. It was informed that there were at present two importers of the machines in the district town (Barisal).

vii. Privatization of the trade

The sellers held that the current system was yielding more benefit because buyers could buy machine any time on the market and they could also get it repaired because the market had adequate number of mechanics and workshops.

viii. Recommendations

- Take measures to locally manufacture irrigation equipment
- Ensure the quality of the equipment
- Deploy surveillance team to ensure the import of quality machine, and keep its price within farmers' affordability

C2. Repairing service market

As part of the field investigation, repairing service market for irrigation equipment was looked into in both the study areas. Although repairing service is available at the village or Union levels, albeit in varying degrees, the number of mechanics or workshops are still very few which does not permit carrying out any group-based consultations with the mechanics/repairers. Therefore, individual interviews were conducted with 10 mechanics covering both the study locations — five in Kalai *Upazila* and 5 in Babuganj *Upazila*. The main objective of the interviews with irrigation mechanics was to focus on constraints on the growth of the market at the local level.

Constraints Diagnosis

Irrigation equipment mechanics were asked the following open-ended questions in the interviews:

i. What are the major problems faced by irrigation pump repairing workshops in the area?
ii. Why do irrigation pumps get disordered so often?
iii. What are the key tools used by irrigation pump repairing workshops and what are their retail prices?
iv. What measures need to be taken for upgrading the technical capacity of irrigation pump mechanics/workshops?

Major Problems Facing Irrigation Equipment Mechanics/Workshops

Irrigation equipment repairing workshops/repairers encounter the following problems (Table 6.4.14).

i. Lack of capital/inadequate machineries/tools
ii. Load shedding/power failure
iii. Limited market for manufactured spares
iv. Lack of spares
v. Lack of skill
vi. Underdeveloped transport network
vii. Lack of government patronage
viii. Illiteracy.

Most of the interviewees informed that their working capacity was handicapped by the lack of capital/inadequate machinery/tools and load shedding/power failure.

Causes of Irrigation Equipment Disorder

As identified by the mechanics, the following are the main causes of equipment disorder (Table 6.4.15):

i. Unskilled handling of the machine
ii. Adulterated fuel (diesel) and lubricant
iii. Poor-quality spares
iv. Voltage fluctuation
v. Using locally made poor quality shafts (imported shafts are not available)
vi. Technical knowledge of farmers is poor
vii. Wrong setting and wear and tear of certain spares (eg head, bush pin, piston, etc.)

Major Tools Used in Equipment Repairing Workshops

For repairing irrigation equipment, workshops usually require the following tools along with their appropriate market prices (Table6.4.16).

i. Drill (Tk. 12,000/Bangladesh)
ii. Gas welding machine (Tk. 20,000/Bangladesh)
iii. Welding (Tk. 8-12,000/Bangladesh)
iv. Lathe (Tk. 45,000-46,000/Bangladesh, Tk. 40,000-45,000/India)
v. Shaper (Tk. 60,000/India)
vi. Boring (Tk. 65,000/China)
vii. Tamper (Tk. 4 lakh)

It is seen from the above that setting up a workshop involves a sizeable amount of investment in the setting of a workshop with the above-mentioned tools.

Recommendations for Upgrading Technical Capability of Irrigation Equipment Mechanics /Workshops

The interviewees put forward the following recommended measures to deal with their problems (Table 6.4.17).

i. Provide practical training at the government training centres (eg BADC)/found training centre
ii. Provide bank loan/government support to procure required machines
iii. Ensure uninterrupted power supply
iv. Provide high-tech machines
v. Ensure the accessibility of required machines
vi. Lower power tariff
vii. Scale up production
viii. Identify unauthorized factories producing poor-quality spares
ix. Provide marketing facilities for the output of workshop

Adulterated Fuel Damages the Equipment

As viewed by the mechanics, adulterated fuel and lubricants are the major causes crippling irrigation equipment and affecting irrigation services (Box 6.4.1). In the case of diesel, used or thrown-out diesel is mixed with pure diesel. Sometimes kerosene and water is used to adulterate diesel. In addition, some chemicals such as sodium carbonate are used to treat used lubricant for adulteration purpose. The consequence of using adulterated fuel and lubricant is damaging. It eats into the machine life and irrigation pumps get damaged repeatedly.

Equipment Buyers are Being Cheated

The buyers of STW machines are increasingly being subjected to fraudulent practices of unscrupulous traders (Boxes 6.4.2 and 6.4.3). Equipment buyers are not getting their machines serviceable upto the reasonable period as per the specifications of the machine. Sometimes the life of STW is exhausted within one season. Buyers are buying substandard machines unknowingly because they are not able to differentiate between a substandard and a standard one. As a result, STW buyers have to sustain financial loss and irrigation is affected as well.

C3. Rental market for LLPs in Barisal

The sale of irrigation equipment (LLPs) did not pick up in Barisal as fast as in other regions of the country over the last 10-12 years for various reasons. Farmers of this region

mainly depend on the rental market for the procurement of LLPs during the *rabi* season. At present both the public sector institutions and a handful of private sector firms are catering to the equipment need of the farmers (Box 6.4.1). The farmers of Babuganj *Upazila* can now rent LLPs from either of the two sources under the public sector institutions (DAE) — DAE, Babuganj *Upazila*, and Southern Region Agricultural Development Project (SRADP) of DAE, Barisal Sadar. The current rental charge as fixed by DAE is much lower compared to the private sector source (Tk. 5,000 in the case of private sector versus Tk. 1,500 as rent + Tk. 1,500 as security in the public sector) (Table 6.4.17 and 6.4.18). The installation of LLPs under rental arrangement markedly increased during the late nineties (Table 6.4.19). It shows that farmers increasingly used LLPs, although they did not/could not buy it as many as they used during that period. As the ordinary farmers are mostly sharecroppers and very poor, they could not afford to buy it. The discontinuation of the rental system under BADC had a negative effect on the use of LLPs in Barisal region during the early nineties. Even the ongoing major irrigation project BWDB had to suffer due to the discontinuation of the rental programme during the late eighties (Box 6.4.5). But the initiation of a new irrigation project by DAE, namely SRADP in Barisal and other neighbouring districts had a positive impact on the use of LLPs in the district.

6.4.3 Discussion

The information-gathered need to be compared to the set of hypotheses specified in order to draw tentative conclusions. Each hypothesis will be examined in the light of the collected information and the perspectives of the stakeholders involved.

1. Related to Import Liberalization

Hypothesis 1.1: The removal of import restriction has facilitated the increased build-up of manufacturing capacity of irrigation equipment and spares in home market

The range of irrigation equipment available on the market includes foreign products — mainly from China. So far, no indigenous private entrepreneur has come forward to manufacture irrigation equipment in Bangladesh. Chinese equipment are predominant on the local market.

The information show that the goal contained in the hypothesis has not been achieved so far and therefore the hypothesis does not stand.

Hypothesis 1.2: The removal of the standardization rule requiring to import certain types of irrigation equipment has furthered the availability of irrigation equipment

There is no dearth of irrigation equipment on the market. The range of irrigation equipment available on the local market is wide in terms of variety, capacity and price. Buyers can now select from a wide range of equipment available on the market.

The collected evidences support the hypothesis on the increased availability of irrigation equipment.

The hypothesis therefore stands rejected.

Hypothesis 1.3: The removal of import restriction has furthered farmers' access to irrigation equipment

The lower price equipment has been available on the market over time, and farmers with limited financial capacity can afford now to buy it.

The increase in the number of irrigation equipment such as STW and DTW also suggests that irrigation equipment has come within the affordability of even the poor farmers as found in Sailgun, Joypurhat. Even then, many poor farmers of Dehergati could not afford to buy irrigation pump (LLP) even though they needed it for their cultivation. Mostly the non-poor farmers could buy it particularly due to their increased access to bank loan and better financial standing.

Regarding the accessibility of irrigation equipment, the hypothesis does not stand because the benefit is found to have been availed by the non-poor farmers because of their better financial condition and access to bank finance. The poor farmers could not benefit from the lower price of the equipment.

The hypothesis therefore stands rejected.

Hypothesis 1.4: It has benefited the farmers with regard to the quality of the equipment and spares

As reported by the equipment sellers, the quality of most of the machines presently being marketed is not up to the mark. Substandard machines are currently being imported by the importers because it is more paying to them. In addition to this, as the substandard machines are cheap and in high demand, the importers get added fillip to import it. The high-quality equipment is not available on the market because they are too costly.

The farmers who bought the substandard machines did suffer. Farmers bought it because it were cheap. But eventually they could not get the desired level of benefit from those substandard machines.

Equipment owners are also faced with serious problems with substandard spares which predominate the local market. Market is replete with locally manufactured spares whose quality is very poor because it is not made from proper metal. Indian spares are also available but its quality is also poor. Quality spares are not imported by the traders due to the same reasons mentioned above with regard to the equipment.

The farmers' experiences with irrigation equipment and spares bought on the local market during the last 10-12 years provide ample evidences that they have not benefited out of the import liberalization particularly in respect of the quality of the machines and spares.

Therefore, all the information gathered from various stakeholders such as equipment sellers, equipment owners, etc. prove that the hypothesis does not stand.

Hypothesis 1.5: It has led to increased farmers' welfare by reducing its prices

The field investigation shows that the equipment currently being sold on the market have a wide band of prices from as low as Tk. 7,700 to Tk. 25,000 depending on brand and capacity. However, lower price does not necessarily enhance farmers' welfare if the quality of the machine is not up the mark. According to the rating by both the sellers and users, the cheaper machines are either substandard or fake causing a lot of disservice to the users.

It is very difficult to conclude on the basis of the available information because, farmers are happy with the present level of price but they suffer because of the poor quality of the service rendered by these machines.

Therefore, the hypothesis remains inconclusive.

2. Related to Privatization of Distribution and Ownership of Equipment

Hypothesis 2.1: Private ownership of irrigation equipment has improved the availability and accessibility of irrigation services

The number of irrigation equipment has increased remarkably (Joypurhat) over time. The increased number of irrigation equipment including both STWs and DTWs has built up immense irrigation capacity in the rural areas. As a result, the accessibility of irrigation water has risen even to the distant plots. Farmers are now getting more water than before. Besides, the increased competition among the equipment owners has led to better irrigation service in the rural areas. However, the only roadblock to irrigation service is *kutcha* drains/furrows causing wastage of water in the field due to which farmers cannot get supplementary irrigation service in *aman* season.

However, as far as the dry season (*rabi* season) is concerned, the hypothesis seems to be valid, but its validity gets mostly eroded if the assessment extends beyond that season.

In Dehergati, the availability of irrigation service increased moderately, but it is increasingly becoming constrained for lack of water in silted-up canals and a large tract of land are still beyond the accessibility of irrigation service.

The hypothesis therefore stands rejected.

Hypothesis 2.2: It has promoted competition among the equipment owners leading to the reduction in irrigation charge

The increased number of irrigation equipment over the last 10-12 years is certain to have enkindled the competition among the equipment owners which is expected to have depressing effect on irrigation charge in the study villages. According to the non-poor farmers, irrigation charge has declined over time in the case of both STWs, DTWs and LLPs in both the study villages. Apart from irrigation charge, the irrigators have started getting the benefit of paying irrigation charge after the harvest instead of paying it before the harvest which used to hard hit the poor farmers, they maintained. However, the poor farmers of both the villages held that irrigation charge remained unchanged at a higher level. The census data also show that irrigation charge recorded a mild increase over time in the IIV and it remained unchanged in the MIV over the same time (Table 5.20).

The hypothesis is therefore rejected.

Hypothesis 2.3: The rescinding of the siting restriction has had a positive impact on the irrigation coverage

The elimination of the siting restriction gave way to the increased installation of the equipment in the village where groundwater is the main source of water. The requirement for forming the command area for each tubewell has gone with the rescinding of the said restriction. More tubewells have been drilled competing for the limited area resulting in small-scale command area for the operating tubewells. Although it has caused other problems such as underutilization of the capacity, social conflict, drawdowns of water table etc, the irrigation coverage has risen, however.

As far as the irrigation coverage is concerned, the hypothesis can therefore be accepted to be valid.

Hypothesis 2.4: The rescinding of the siting restriction has not led to the capacity underutilization of irrigation equipment

There has been an increase in build up of irrigation capacity over time in the IIV. The number of STWs and DTWs were installed indiscriminately in the village over time. As a result, the command areas of the operating tubewells shrank markedly and there occurred a mad scramble for expanding the command area by the equipment owners of the village which led to social conflicts and litigations among different irrigation groups. Capacity underutilization has become one of the emerging concerns among the tubewell owners in recent time because it has adversely affected their profitability.

As it is incongruous with the field evidences, the hypothesis is rejected.

Hypothesis 2.5: The private ownership of irrigation equipment has improved the quality of irrigation services

The farmers of both the villages were found satisfied with the quality of irrigation services facilitated by the increased capacity build-up and competition between the equipment owners.

The hypothesis cannot therefore be rejected

3. Related to Decontrol/Deregulation of Parastatals

Hypothesis 3.1: The deregulation of the parastatals dealing with irrigation has scaled down corruption, hassle, delay and institutional despotism

The farmers of Dehergati, Barisal was found more critical about BADC. But those of Sailgun, Joypurhat were found rather appreciative about BADC's mode of operation before. The farmers of Dehergati found difficulties in procuring the machines and spares from the stock of BADC before. The farmers could not get the machines easily repaired before. Fuel was controlled by BADC. Farmers could not exert pressure on them. BADC officials used to be unavailable when need arose. The farmers had to undergo hassle due to bad management of BADC. But nowadays, the farmers do not face those problems any longer. As the farmers are not required to deal with those parastatals now, they no longer face those problems. However, where there has not been any deregulation such as REB, the farmers continue to suffer hassle, corruption and other malpractices.

The available information gathered from the community level support the hypothesis, although all those acquisitions are strongly negated by the BADC informants.

Hypothesis 3.2: The marginalization of the parastatals has concomitantly developed the capacity of the private sector to provide the equipment owners with technical and non-technical support services

The field investigation indicates that technical capacity developed at the local level over time to provide repairing and drilling services to the equipment owners (Joypurhat). The equipment owners do not seem to face any major problem in this respect in both the areas. Workshops have been set up even at the local level to provide mechanical service. In the other area (Barisal) where irrigation has not developed so much, a strong pool of repairers and workshops are available at the district town level. Various drilling firms have also developed by now, although their technical capacity is still not up to the desired level. Retired and ex-BADC officials became the major source of all these technical service at the local level.

Therefore, the absence of the parastatal did not have that much disrupting effect on the service market at the local level. The field-level evidences therefore support the hypothesis.

4. Related to Power and Diesel Fuel

Hypothesis 4.1: It has ensured adequate supply of diesel fuel

Regarding the diesel fuel, the supply has improved even at the Union level. In Joypurhat area, improved motor way has immensely contributed to the better supplies of diesel during the dry season. Despite that the non-poor farmers of Sailgun, the main users of diesel, faced availability problem and ranked it as the number two problem on their priority order. Besides, the informants could provide no information about the construction of depot for diesel at the local level to counteract possible diesel crisis in the future. The farmers of Dehergati did not however make mention of any problem related to the supply of diesel there.

The hypothesis therefore cannot be accepted.

Hypothesis 4.2: It has ensured adequate power supply

The owners of electric-operated equipment are, however, faced with power failure and irrigation suffers as a result. The number of electric-powered equipment is rising in Joypurhat because of its various advantages. The farmers of Dehergati did not face any such problem because all the LLPs in operation there were diesel-powered.

Therefore, the hypothesis is rejected.

Hypothesis 4.3: The farmers have faced no problem about the quality of diesel

It was found to be one of the services problems facing irrigation in Dehergati. Adulterated diesel and lubricant have been on the local market. But this problem was not, however, identified by the farmers of Sailgun.

The hypothesis therefore does not stand.

5. Related to Existing and New Agricultural Infrastructure

Hypothesis 5.1: It has focused investments in areas suitable for major irrigation development

With vast potential from surface water-based irrigation, Barisal district represents one of the poorly irrigated districts in the country. The rivers and canals of the district have long been silted up causing low water flows in the channels. The efforts undertaken for canal/river development so far by the institutions such as BWDB, UP, etc are too marginal in impact. Inadequate water flow in canals is found to be the principal reason for underdeveloped minor irrigation in Barisal.

The hypothesis therefore does not stand.

Hypothesis 5.2: It has strengthened agricultural research and extension services

Extension service has improved marignally, although the farmers need it badly. Farmers' knowledge about the application of fertilizer is a case in point about which they are less informed and less knowledgeable. Agricultural research in breeding high yielding seeds (such as of jute) is very limited. As a result, the farmers have totally abandoned jute cultivation in the study areas and switched over the monocrop (eg *boro* paddy).

The field level experience therefore suggests that the hypothesis be rejected.

6. Related to Impacts

Hypothesis 6.1: Private ownership of irrigation equipment has had positive impact on poverty, income/assets inequality, gender-inequity, environmental degradation and social conflict.

These issues will be covered while discussing the crosscutting issues later.

Box 6.4.1 : Adulterated Fuel and Lubricant are Crippling Irrigation Equipment

Adulteration is gaining momentum and is invading fuel and lubricant market in the study areas. The problem has been rampant particularly in the country side where adulterated fuel and lubricant are being used in agricultural implements such as, STW, DTW, LLP and power tiller.

The problem is being extensively faced at the retailer level, the major sellers of the adulterated items in the countryside. The machine owners usually buy from them. In most cases, the retailers sell only adulterated items and the buyers therefore cannot differentiate between adulterated and real ones. They have no choice but to buy it. In the peak months of irrigation, farmers/pump owners are forced to buy those items under pressure of exigency. Being cheaper, farmers get encouraged to use it more and suffer its damaging consequences. Pump, crang shaft, nozel plunger, bearing, ball etc., all the key parts of irrigation equipment, get seriously damaged due to the use of adulterated fuel and lubricant.

Dishonest traders are usually involved in manufacturing and marketing the adulterated fuel (diesel) and lubricant. The way adulterated diesel and lubricant are manufactured also differ. In the case of diesel, used or thrown-out diesel is mixed with pure diesel. Sometimes kerosene and water are used as materials to adulterate diesel. For lubricants, thrown-out lubricant, kerosene and water are used to adulterate it. People involved in such an illicit activities also use sodium carbonate and chemicals in an attempt to treat used lubricant for adulteration purpose.

This sort of criminal activities has been rampant in both urban and rural areas for last seven years. The consequence of using the adulterated fuel and lubricant is damaging. It eat into the machine life and the irrigation pumps get damaged very rapidly. Fake/counterfeit irrigation equipment and spares also have further damaging effect on the capacity and life of the machine. As a result, irrigation is hampered due to frequent disorder and non-functioning during the peak season.

Source: Interview with irrigation equipment mechanics, SAPRI participatory component, March-May 2000

Box 6.4.2: Md. Ekramul is another victim of substandard STW

Ekramul is an enterprising young mechanic of Maria Union market, Kalai Upazila. He served as a trainee under the supervision of a veteran mechanic in Joypurhat town. After initial exposure and training he felt confident about the profession and decided to set up his own workshop at a nearby market of his home. He therefore set up a workshop at Matrai market in Matrai Union. He tried first to take loan from a local bank (Agrani Bank) but he could not. He therefore gave up the hope of bank loan. His father is a schoolteacher and he gave his hard-earned money to Ekramul to buy some equipment and tools for the workshop.

He bought a STW machine for Tk. 12,400 in February 2000 from a local seller named Ahmedia Hardware at Joypurhat town. He bought the machine not for irrigation purpose, but to use as a generator to produce electricity for his workshop. He has had various troubles with the machine within one month of its purchase. The specification of the machine is mentioned below:

1. Brand name of the STW : Chengcai
2. Manufacturing country : China
3. Nature of power used : Diesel operated
4. Capacity : 16 HP, 2200 RPM (ratio per minute)

Ekramul faces the following troubles with his STW machine

a. Disproportionately high lubricant consumption
b. Lubricant leaks out off the machine
c. Disproportionately high power consumption

As a mechanic he is surprised to observe such a high rate of fuel and lubricant consumption from the very inception of its operation. He repeatedly asks himself the following questions:

- Why does a new machine such as his consumes at such a high rate; and
- Why does a new machine have leakage problem at such an early stage as he has with his new one?

He informed the investigators of this study that it is very difficult to buy quality equipment and spares because of fraudulent business practices of unscrupulous traders involved in this line of business. By way of an example he mentioned that piston is an important spare of STW and 'Lucky', a brand name of piston, is very popular to the STW owners for its quality. But it is very difficult to get a pure one which costs Tk. 123 each in the market and the market is flooded by fake 'Lucy' which costs Tk. 75 each. This fake item is being manufactured at Bogra and its quality is very poor. Its durability is less and melts down shortly. Illiterate farmers cannot read even Bangla, let along English. How it is possible for them to distinguish between 'Lucky' and 'Lucy' when those two items are marketed in almost identical package with respect to colour, letter size, etc. This is how many buyers/farmers are being cheated by unscrupulous traders. He informed this while giving account of his vulnerability and frustration.

Source: Informal interview, SAPRI participatory component, March-May 2000.

Box 6.4.3: Ruhul Amin is a victim of substandard STW

Ruhul Amin is a farmer of village Matrai (north) of Kalai Upazila, Joypurhat. He and his brother Ali Ahmed bought a new STW for Tk. 8,800 in February 2000. They bought the equipment from Bogra. He bought it for irrigating their land. The machine started giving them a lot of troubles within one month from its purchase. The specification of the machine is furnished below:

1. Brand name of the STW : Chengcai
2. Manufacturing country : China
3. Nature of power used : Diesel operated
4. Capacity : 6 HP
5. Weight : 65 kg

The machine is troubling them in the following ways:

i. Major spares of the machine such as nayler, pyston, plunger, nozel ring have been worn out and they have also been replaced within the first month after the machine went into operation.
ii. Lubricant (mobil) leaks out.
iii. Lubricant consumption rate is very high.
iv. It is a poor-quality machine

Mr. Ruhul Amin is himself a good repairer and has gained technical knowledge about this STW from another STW he long operated earlier since 1985. They bought a STW first in 1985 for Tk. 22,000. Its name was Kubetac, 6HP and its manufacturer was a Japanese company. It gave them very good service for nearly 18 years. They however sold out their first machine 2 years back for Tk. 3,000.

Source: Informal interview, SAPRI participatory component, March-May 2000.

Box 6.4.4: An Emerging Rental Market for LLPs in Barisal District

Mr. Humayun Kabir, at Kalizira Bridge, Barisal, has been in the potential LLP rental market for last 5/7 years. He started the business with a fleet of 7 LLPs in the area and has been known to a large number of farmers and contractors in the district by now. Farmers and contractors are his regular clients. He usually charges very high compared to the rates offered by other organizations engaged in the same business. He rents LLPs according to the following terms and conditions. The following terms apply to one rental LLP from him:

1. Rent: Tk. 500/- for a day
   Tk. 4,000/- for a month
   Tk. 5,000/- for a season

   Fuel and lubricant cost : All costs to be borne by the borrowers
   Spares cost: To be borne by the borrowers
   Salary of driver: As above
   Repairing cost: As above

Other than Mr. Humayun Kabir, there are 5/6 traders in the same business. Besides, there are some equipment shops at the district town who are engaged in renting LLPs, usually for fishing trawlers.

Source: Field notes by Mr. Afzal Haque (PRA team member), March 2000

Box 6.4.5: Why Has the Barisal Irrigation Project (BIP) Failed?

The Barisal Irrigation Project (BIP), a much-vaunted irrigation project in the region, has been implemented by the Bangladesh Water Development Board (BWDB) in conjunction with other three public organizations, namely BADC, BRDB and DAE. The project, under Taka 646 million World Bank financed assistance, went into operation in 1975-76 covering seven Upazilas in Barisal.

The Project aimed at ensuring the availability of surface water in the perennial, semi-perennial and non-perennial canals in Barisal district for irrigation development in the area. The irrigation project used double-lifting system — lifting water from the perennial canals into other semi-perennial and non-perennial canals at the first stage and again lifting the water from those filled-in water bodies into agricultural fields at the second - as a new irrigation technique in the area. The project ran through several experimental phases-first as an experiment in double-lifting and thereafter in gravity - directed irrigation. Although the project survived all these experiments, the performance of the project has always been disastrously poor. With all the efforts by the concerned departments, the project encountered a series of failures. The concerned project authorities carried out several studies/reviews to diagnose problems with the project. While the project failed to take due cognizance of various socioeconomic factors critical to any agricultural project, the government policies with many of their roots in the SAP-related measures, have had crippling effect on the growth and performance of the project. For example, the project started with the deployment of LLPs by farmers under the then rental system of the BADC. But the rental system was subsequently abandoned under SAP measures in the late eighties (1988-89). Besides, the farmers started facing additional financial burden by meeting fuel/power charges since 1989-90 also due to SAP measures. These measures wreaked havoc on the project. An unpublished progress report on the BIP-3 has diagnosed the problems afflicting the project and identified the following underlying factors:

i. Lack of coordination among the participating agencies, namely BWDB, BADC, BRDB and DAE.
ii. Farmers did not have preference for LLP-based double-lifting system, rather they opted for gravity-based irrigation system.
iii. Cultivable land are mostly owned by absentee landlords in the area. But most of the farmers have been sharecroppers. Sharecroppers are left with an insignificant profit margin after having met all production cost, and giving out half of the produce to their landlords.
iv. The project farmers, most of whom are small and marginal ones, could not afford to buy adequate quantity of agri-inputs due to its high prices and also they could not buy irrigation equipment for lack of money as a result of the reform measures implemented by the government.
v. As HYV *boro* cultivation involves higher cost, sharecroppers/small and marginal farmers usually rely on rainwater for cultivating *aus* crop.
vi. Owners of irrigation equipment sell water at an exorbitant rate, presently equivalent to Tk.1,000 per acre or even more.

All these led to a precipitous fall in the trend in deploying LLPs by farmers in the area — 448 against the target of 3450 in 1993-94 reflecting a sheer failure on the part of the project to achieve its objective and goal.

Source: BIP (1996)

6.5 Chemical Fertilizer

> "The application of fertilizer has shown an increasing tendency. As the fertility of the soil has declined, all the farmers have stepped up the application of fertilizer in order to increase the yield."
>
> — Poor female farmers, Dehergati (M), Barisal

> "The quantum of doses has increased over time from say 10 kg to 20 kg of fertilizer, because soil fertility has declined. Fertilizer is not so effective now as it was before."
>
> — Non-poor farmers of Sailgun (SW), Joypurhat

> "Fertilizer can be procured easily now. Fertilizer shops are found everywhere. There are several fertilizer sellers even in the village. Anybody can procure it any time as much as needed if he/she has enough money to buy."
>
> — Poor female farmers of Dehergati (M), Barisal

> "The adulteration and fake practices in the fertilizer market has been rampant now. The moment the government control has been withdrawan, fraudulent practices have become more widespread. The quality of fertilizer is alright when the government exercises its control."
>
> — Non-poor farmers of Sailgun (SW), Joypurhat

> "The prices of fertilizer fluctuate more nowadays. Price stability for all sorts of fertilizer has declined over time".
>
> — Non-poor farmers of Dehergati (M), Barisal

Chemical fertilizer is a critical input of soil health and crop yield. With the accessibility of irrigation water and HYV seeds, the application of fertilizer is also rising in the country. Fertilizer sector came under the SAP and there has been wide-ranging changes in the sector as a result. Various stakeholders of the sector at various levels were consulted as part of the investigation to capture their views of the changes that took place and the effects and impacts that affected them over the last 10-12 years. The findings of the investigation based on the stakeholders' perspectives are presented below in the following order — at the community level, at the institution/organization level and at last at the market level.

6.5.1 At the Community Level[1]

Farmers' Perspectives

6.5.1.2 Constraints Diagnosis

Various aspects of chemical fertilizer affecting farmers were investigated and both the poor and non-poor farmers were asked the following questions:

- What are the major problems faced by the farmers?

[1] This section is based on the data generated through both FGDs and PRA exercises. The data relating to chemical fertilizer culled from FGDs are also analytically presented in Table 6.5.1.

- When did it emerge first?
- When did it aggravate?
- How frequently did it occur?
- To what extent did it spread?
- What were the causes of those problems?
- How to mitigate the problems?

Perspectives of the Poor Farmers

The poor farmers of the village Sailgun confronted the following major problems with chemical fertilizer in their area (Data Box 6.5.1).

i. Higher price of fertilizer
ii. Adulterated fertilizer
iii. Marketing of fertilizer in under-weighed bag

Those problems have been afflicting them for the last 4-5 years. However, the adulteration of fertilizer has been a fairly recent phenomenon (for last 2-3 years). They encountered an escalation of fertilizer price in 1995, although it always sold at a higher price in the area. The selling of fertilizer at higher price is attributable to its high demand. This price-related problem was not limited only to this particular location, rather its spread was wider. The poor farmers put forward the following measures to deal with those problems:

- The government must control the price
- The number of dealers to be increased
- Fertilizer dealers to be engaged at the village level
- Fertilizer to be distributed direct through the dealers.

The problem of adulteration, although has surfaced recently, has been widespread by now. The traders' disproportionate profit motive was mentioned by the poor farmers of Sailgun as a cause of this problem. The poor farmers pinned their confidence in the government and they recommended that the problem be controlled by the government. Regarding the fraudulent practices by fertilizer traders, such as selling fertilizer in under-weighed bag, the poor farmers also urged the government to play its supervisory role to ensure that fertilizer sell in proper weight.

The poor farmers of Dehergati were faced with the following problems with chemical fertilizer (Data Box 6.5.2).

i. Adulteration of fertilizer
ii. Unstable price and
iii. Lack of training/skill in respect of their knowledge about applying fertilizer in proper doses

Adulteration of fertilizer and its unstable price trend began to rise to the surface during the middle of the nineties and it had been widespread gradually. The farmers recommended to take the following measures to deal with the above-mentioned problems:

- Combat the adulteration practices and marketing of adulterated fertilizer
- The government should take quality-control measures
- Fertilizer prices to be lowered
- Impart training to the farmers

Perspectives of the Non-Poor Farmers

As viewed by the non-poor farmers of Sailgun, the following are the major fertilizer-related problems (Data Box 6.5.1):

i. Adulteration of fertilizer
ii. Higher price of fertilizer
iii. Fertilizer crisis
iv. Marketing of fertilizer in under-weighed bag
v. Farmers' ignorance [about cultivation]

The adulteration problem surfaced in 1999 and it occurred occasionally. The problem was viewed to be local in respect of its spread. Fertilizer traders had been mentioned to be the main culprits of this problem. The non-poor farmers demanded that the government must intervene to deal with the problem.

The higher price of fertilizer was viewed to be a post-BADC phenomenon and it was attributable to the increased demand due to the excessive application of fertilizer in the area. The farmers expected that the government keeps the farmers informed about the official prices.

Regarding the fertilizer crisis, the farmers held that it was caused through hoarding by fertilizer traders. They recommended that BADC should take measures for the smooth distribution of fertilizer.

As to the selling of fertilizer in under-weighed bag, the farmers demanded that weighing fertilizer bags be made mandatory while selling.

The non-poor farmers of Sailgun recommended that they should be imparted training to make them aware about the application of fertilizer in proper doses.

To the non-poor farmers of Dehergati, marketing of adulterated/substandard fertilizer was a major problem with chemical fertilizer. Fertilizer traders resorted to various unscrupulous practices for marketing a variety of poor-quality fertilizer on the local market. Urea, TSP, zinc and gypsum are cases in point. No specific measures were recommended by them to deal with this problem in the area.

6.5.1.2 Availability of Fertilizer

The poor farmers of both the villages perceived that the availability of fertilizer had increased. Necessary fertilizer was available on the market during cropping seasons round the year now. Farmers of Dehergati pointed out that there had been no problem with the availability of fertilizer before. With privatization, the availability of fertilizer increased accompanied by higher degree of adulteration. There would not have been various types of adulterated and fake fertilizer on the market, had there been government control.

The non-poor farmers of both the villages also held that Fertilizer were now adequately available on the local market during cropping season. The farmers of Dehergati held that both the supply and its stability of fertilizer had improved over the last 10-12 years but at the cost of its higher price and quality (adulteration/substandard).

The poor female farmers of Dehergati perceived that fertilizer could now be easily procured because fertilizer shops were found everywhere even in the village. They however pointed out that anybody could procure fertilizer as much as needed if one had enough money to buy.

The increased availability of fertilizer has also other corroborative evidences from PRA exercises. Reflecting the poor farmers' perspectives, Data Box 6.5.3 shows that the availability of all types of fertilizer increased overtime in both the study areas from 'very low'/'low' levels (1/2 points) to 'high'/'very high' levels (3/4 points) on 1-4 points rating scale.

6.5.1.3 Privatization of Fertilizer Distribution

According to the poor farmers of Sailgun, the privatization of fertilizer distribution benefited the farmers.

The non-poor farmers of Dehergati observed that privatization had caused competition among fertilizer traders and they sought to control the market through competition. The possibility of monopolizing the market is minimum. The non-poor farmers of Sailgun looked at the privatized fertilizer distribution system as a condition which led to rampant adulteration and fake practices in the market. The moment the government control ceased, fraudulent practices

havdbeen widespread. Previously they did not encounter any sort of quality problem as long as the government had its grip on the market.

6.5.1.4 Liberalization for Fertilizer Import

The poor farmers of Dehergati held that the import liberalization since 1992 did not have any palpable effect on the stability of fertilizer supply in the area.

The non-poor farmers of the same village however believed that the supply of fertilizer had increased and the market had been stable in the area because fertilizer traders could import fertilizer as and when need arose and farmers could procure fertilizer as much as they needed. However, they qualified this statement by saying that although the farmers could procure fertilizer at lower prices, the traders charged higher prices when its demand surged. As a result, poor farmers were more affected due to price fluctuation because they could not afford to buy fertilizer at a higher price for lack of capital.

6.5.1.5 Price and Subsidy

Price

As observed by the poor farmers of both the villages including female ones, the prices of fertilizer registered a moderately increasing trend during the cropping season (*rabi* season). The farmers of Dehergati had to pay an extra sum of Tk. 1 to Tk. 1.50 per kg of fertilizer during the cropping season. They pointed out that fertilizer never sold at reasonable/fair prices in the area.

According to the non-poor farmers of both the villages, fertilizer prices increased over time. The farmers of Dehergati observed that fertilizer could not be procured at a fair price and price fluctuation had been more prominent nowadays.

Subsidy

Both the categories of farmers maintained that subsidy had benefited all classes of farmers, namely large, medium, small and marginal ones. The non-poor farmers of Sailgun however pointed out that those who cultivated more, benefited more. Farmers of all classes benefited more particularly from the subsidized TSP and MP before.

6.5.1.6 Fraudulent and Illegal Practices

Marketing of Adulterated and Substandard Fertilizer

In view of the poor farmers, the quality of fertilizer had declined due to the marketing of adulterated and substandard fertilizer. They held that adulteration had been more severe nowadays. Mainly TSP had been subject to adulteration. It was very difficult to identify genuine TSP. Dust was mixed with SSP. Farmers could be certain only after its application. Fertilizer traders were involved in this fraudulent practice. Applying adulterated fertilizer damaged soil health and crops.

The non-poor farmers also reported that adulterated fertilizer was now being marketed by the traders. Salt and low priced Indian SSP (Tk. 300/50 kg) were used to adulterate urea and TSP (Tk. 700/50 kg) respectively which were more costly. Substandard SSP was also on the market. Applying adulterated fertilizer damaged the soil fertility. They further observed that there was no provision to curb this fraudulent practice nowadays. However, BADC used to control it. Adulteration and fake practices flared up under the private distribution system. The farmers demanded that the government check it by taking punitive measures.

The poor female farmers also observed that the adulteration of fertilizer had sprung up under the private marketing system and there had been no such a problem before. They noted that standard fertilizer were still on the market, but the buyer had to be careful while buying fertilizer.

Smuggling

The poor farmers of Sailgun observed that smuggling was not a new problem for the area. It happened before as well.

The non-poor farmers of Sailgun pointed out that phosphatic fertilizer (in powder form) was usually smuggled from India which cost much lower compared to the Bangladesh TSP selling at Tk. 600/50 kg. Smuggled TSP was substandard and farmers applying it had also suffered. In 1999, farmers of Sailgun lost potato who applied it.

Smuggling had never been a problem in Barisal area before but it took a sharp turn for the worse. The non-poor farmers of Dehergati observed that smuggling contributed to the adulteration in the area.

Artificial Crisis

According to the non-poor farmers of Dehergati, now and then big traders hoarded fertilizer after taking delivery from the fertilizer factories to sell them at higher prices in *boro* peak when demand for fertilizer mounted up.

6.5.1.7 Procurement and Application of Fertilizer

6.5.1.7.1 Procurement

As experienced by the poor farmers, the application of fertilizer had increased over time. They usually procured fertilizer at the local market up to the Union-level. They bought fertilizer both in cash and/or on credit.

The non-poor farmers also procured fertilizer at the local market which was controlled by the traders at the *Upazila* level. The farmers of Sailgun informed that they bought fertilizer mostly on credit but those in Dehergati bought it both in cash and/or on credit.

6.5.1.7.2 Application of Fertilizer

Types of Fertilizer Used

The poor farmers applied both chemical and organic fertilizer, although in varied proportions. According to the poor farmers' perspective, the share of chemical fertilizer in total volume of fertilizer used by them increased over time for both groups of the poor farmers (small/marginal and sharecroppers) in Sailgun compared to the share for the non-poor farmers (Data Box 6.5.4). In proportion of the total fertilizer applied, chemical fertilizer applied by the poor farmers increased from 70 percent to 75-85 percent over time. However, they perceived that the non-poor farmers continued to apply the same proportion of chemical fertilizer (80%) over the last 10-12 years.

At the disaggregated level, according to their own assessment, the poor farmers scaled up the use of urea from 30 percent to 35-40 percent during the period. The application of TSP by the poor farmers remained unchanged at 25 percent over time. The use of MP by them also remained more or less unchanged at around 15 percent. The application of organic manure by the poor farmers consequently dropped from 30 percent to 15-25 percent over the same time.

According to the assessment by the poor farmers of Dehergati, there had been a change in the composition of fertilizer used by them over time. Their assessment shows that the overwhelming proportion of fertilizer applied by them is accounted for by urea which increased from as high as 70 percent to 80 percent over time (Data Box 6.5.5). Although the share of

TSP, increased marginally, the use of MP remained unchanged in relative terms. The application of organic manure declined measurably from 17 percent to 5 percent over time.

The perspective of the non-poor farmers however, indicates that the proportion of chemical fertilizer applied by them increased from 50 percent of the total fertilizer used to 70 percent over time. They however confirmed that the poor farmers increased the application of chemical fertilizer by higher proportion during the period under report.

As assessed by themselves, the non-poor farmers stepped up the application of urea, TSP and MP in relative terms over time from 30, 15 and 5 percent to 40, 20 and 10 percent respectively during the reference period. As a result, the share of organic manure declined from 50 percent to 30 percent during the same time.

6.5.1.7.3 Trend in the Application of Chemical Fertilizer

Propensity of Fertilizer Application

According to their own assessment, the poor farmers scaled up fertilizer application over time. According to the poor farmers of Sailgun, they increased the application from the 'low' level (2 points on the 1-4 rating scales) to the 'high' level (3 points on the scale). Whereas the poor farmers of Dehergati increased the application from the 'low' to the 'very high' levels on the same rating scale (Data Box 6.5.6). The poor farmers of both the villages assessed the trend in the application by the non-poor farmers which shows that they increased fertilizer use from the 'low' level (2 points) to the 'very high' levels (4 points) on the same scale over time.

The perspectives of the non-poor farmers indicate that the similar trend. According to their own assessment, the non-poor farmers increased fertilizer use from the 'low' to the 'very high' levels during the reference period. Their assessment also indicates that fertilizer was also increasingly being applied by the poor farmers over time, although in varying degrees.

Intensity of Fertilizer Application

The farmers of both the categories — the poor and non-poor — intensified the application of fertilizer over a period of 15 years both across cropping seasons and crops. The poor farmers of Sailgun increased the dose of fertilizer per unit of cultivated land from a hypothetical 100 units before (the base) to 175 units now for cultivating HYV *boro* and potato in *rabi* season compared to 200 units by the non-poor farmers for the same crops in the *aman* season (Data Box 6.5.7). Although the non-poor farmers applied a bit higher dose of fertilizer for *rabi* crops, both the poor and the non-poor farmers increased the fertilizer application at the same rate from 100 units to 200 units for *aman* in *kharif* season over time.

The farmers applied higher doses of fertilizer for the purpose of getting higher yields. Moreover, they had been motivated to apply more due to the drop in the soil fertility over time.

The findings that fertilizer application was intensified by the farmers has also corroborative evidences from the household-level census conducted in both the study villages. The census results indicate that the overwhelming proportion of the farmers increased the application of fertilizer and this led to the increase in terms of both the total volume of fertilizer and its quantity per unit of land. Table 6.5.2 shows that the overwhelming (58 out of 73 users) proportion of the farmers of Dehergati increased the application of urea to high degree' while 40 out of 64 users of Sailgun increased its application 'moderately'. However, in the case of TSP and MP the farmers of both the villages scaled up their application 'moderately'. Another striking feature of their fertilizer use is that while the application of organic manure increased by a fairly large number of farmers (52 out of 59 users) in Sailgun, only negligible number of farmers (14 users) applied it in Dehergati.

Fertilizer Application Vis-à-vis their Perceived Level of Requirement

The farmers were asked whether they could apply fertilizer and other inputs of production up to the desired level of its requirement. As assessed by the non-poor farmers of Sailgun, they were currently applying fertilizer much lower compared to the dose required to be applied to get the best yield. On the basis of the farmers' estimate for the actual and derived level of fertilizer (kg) per unit of land (*bigha*), the shortfall of the application level ranged from 37 percent (actual: 25 kg vs required: 40 kg) for urea, 25 percent (actual: 15 kg vs required: 20 kg) for TSP, 33 percent (actual: 10 kg vs required: 15 kg) for MP and 67 percent (actual: 4 kg vs required: 12 kg) for organic manure (Data Box 6.5.8). As the non-poor farmers were in possession of large tracts of land, they could not apply the desired level of fertilizer.

According to the Focus Group Discussions with the poor farmers of Dehergati, the withdrawal of the subsidy had depressive effect on the application of fertilizer. Farmers keeped on applying fertilizer in increasingly higher quantity for getting higher yield despite price increase. As organic manure was not being applied now, farmers had to apply higher doses of chemical fertilizer to increase the yield. The poor farmers were applying smaller doses of certain types of fertilizer such as TSP and MP. Those who could afford to buy fertilizer were applying higher doses of fertilizer. As TSP was more costly, farmers tended to applied it less and apply urea more instead to make up the deficiency. If prices of other types of fertilizer (except for urea) had been lower, farmers would have applied them more. Farmers would have been adversely affected if the price of urea was higher. As reported by them, most of the farmers applied gypsum and sulphur except for a handful of them.

As perceived by the non-poor farmers of Dehergati in the FGDs with them, the use of fertilizer increased many fold [compared to the earlier days]. The well-off farmers applied fertilizer more including gypsum and zinc. As prices increased, farmers used less fertilizer [certain types of fertilizer]. In contrast to urea, the use of other types of fertilizer had been lower. With the current tendency to use higher dose of urea, lower price of urea gave farmers an extra fillip to apply it more. The higher urea price [if set in line with the international price level] would have left everything in a mess. Farmers would have been hard hit if the price of urea was set around the international price level.

According to the non-poor farmers of Sailgun, farmers mostly used phosphatic and potassic fertilizer. Gypsum was mostly used by tenant farmers. They believed that gypsum caused paddy yield to rise by extracting the vitality of the soil. It reduced soil fertility. Zinc was not applied by the farmers, although it contributes to the soil health.

6.5.1.8 Comparative Assessment of the Fertilizer Distribution Regimes by Farmers

6.5.1.8.1 Gainers and Losers of the Privatized Fertilizer Distribution System

Farmers were asked the following three questions in order to elicit their perception on the gainers and losers of the privatized fertilizer distribution system:

i. Who have been the gainers and losers of the present distribution system (privatized)?
ii. How have they been affected (positively/negatively)?
iii. How can its problems be dealt with?

In the eyes of the poor farmers of Sailgun, fertilizer traders and dealers gained from the private distribution system (Data Box 6.5.9). According to their assessment, they gained through various fraudulent practices such as adulteration of fertilizer and selling fertilizer in under-weighed fertilizer bag. To curb these fraudulent trade practices, the poor farmers demanded that the government take measures against those offenders.

According to the poor farmers of Sailgun, those who had been the losers of the private system include big farmers, small farmers and landowners. They sustained losses by way of yield decline and damages to soil health caused by adulterated fertilizer. They recommended that the government take stern measures against the offenders; to ensure that farmers can procure high-quality fertilizer, and appropriate measures be taken for forestalling traders' bid to sell fake fertilizer.

Fertilizer traders and fertilizer dealers [registered with BCIC] were identified by the non-poor farmers of both the villages as the gainers of the private system of fertilizer

distribution (Data Box 6.5.9). Under this system, they benefited by resorting to various unscrupulous practices: they usually hoard fertilizer to cause price hike; they re-bag and sell fertilizer in under-weighed bags; they adulterate by mixing substandard fertilizer; by re-bagging; they dye fertilizer for cheating farmers; they stamp forged trademark on fertilizer bags etc. The non-poor farmers, however, identified the losers of the private distribution system comprising all classes of farmers, namely big farmers; middle farmers; small farmers and marginal farmers because they had to suffer the consequences of adulteration, high price and fertilizer crisis. As recommended by them, the government must take measures to deal with those problems. They called upon the government to intervene and play supervisory role to combat all those fraudulent practices, and provide subsidy.

6.5.1.8.2 Comparison Between the Public and Private Systems of Fertilizer Distribution

Both the distribution systems have strengths and weaknesses. The strengths and weaknesses of the private and public systems are presented below (Data Box 6.5.10):

i. Poor Farmers' Perspective

a. The private Distribution System:

Strengths :

- Fertilizer are always available
- They are available everywhere including at the nearby shops
- Fertilizer can be procured on credit (Sailgun)
- Fertilizer can be procured as much as one needs (Sailgun)

Weakness :

- The adulteration of fertilizer has been rampant (Sailgun and Dehergati)
- Marketing of under-weighed bags of fertilizer (Sailgun)
- Prices are higher (Sailgun)

b. The Public Distribution System:

Strengths :

- The quality of fertilizer had been better (Sailgun)
- Fertilizer used to be marketed in properly weighed bag (Sailgun)
- There had been no adulteration (Dehergati)

Weakness :

- Fertilizer were not adequately available due to lower production (Sailgun)

- Farmers used to face hassle, harassment while procuring fertilizer (Sailgun and Dehergati)
- The officials were corrupt and involved in unscrupulous practices (they used to decline selling fertilizer despite enough stock) (Sailgun)
- The poor had been worse sufferers (Dehergati)

ii. The Non-poor's Perspective

a. The Private Distribution System:

Strengths :

- Fertilizer are always available (Sailgun)
- It is also available everywhere (Dehergati)
- Prices are lower because of the competition among the traders (Dehergati
- Supply abounds (Dehergati)

Weakness :

- The adulteration of fertilizer is rampant
- Marketing of fertilizer in under-weighed bag (Sailgun)
- Higher price (Sailgun)
- Hoarding is rising (Sailgun)

b. The Public Distribution System:

Strengths :

- Lower fertilizer prices (Sailgun and Dehergati)
- There was no problem with weight (Sailgun)
- There had been no adulteration (Sailgun and Dehergati)

Weakness :

- Fertilizer were not always available (Sailgun and Dehergati)
- There had been occasional fertilizer crisis (Sailgun)
- Fertilizer production was lower (Sailgun)

6.5.1.8.3 Participatory Assessment of the Two Distribution Systems by Farmers' Priority Matrix

Participatory assessment of the two fertilizer distribution systems — private and public — was conducted across the category of farmers and the villagers. Farmers' priority was measured in terms of eight criteria/indicators on 1-4 points rating scale with 1 for 'very

unhappy', 2 for 'unhappy', 3 for 'happy' and 4 for 'very happy' state of mind reflecting their level of satisfaction about the indicators.

Farmers' priority for the two distribution systems were proxied by two different time dimensions 'before SAP' and 'at present' representing the public distribution system and the private one respectively in terms of the following criteria/indicators:

i. Fertilizer are available in time
ii. It can be procured adequately
iii. It is easily available/procurement involves less hassle
iv. Its supply is stable
v. Its prices are less/reasonable
vi. The prices are stable
vii. High quality/dependable/effective
viii. Overall satisfaction

The details of the score against all the criteria/indicators assigned by the farmer groups of the two villages are presented in Data Boxes 6.5.11 and 6.5.12. The findings based on the priority matrices of the two farmers groups are sequentially presented below:

A. Poor farmers' assessment

Overall, the priority of the poor farmers indicates that they expressed a preference for the private distribution system to the public system in terms of their rating of the above-mentioned indicators on 1-4 points rating scale. In Sailgun, the total score for the private system stands at 26 compared to 21 for the public system out of a maximum of 32 (8 indicators @ 4 for the highest degree) (Data Box 6.5.11). The poor farmers of Dehergati similarly opted for the private system relative to the public one. Out of a maximum of 28 (here 7 indicators only), a total of 19 score was assigned by the poor farmers in favour of the private system in contrast to 17 for the public one.

Criteria-wise scoring indicates that out of eight/seven indicators the public system was given higher score over the private one in the case of only two indicators, namely price, and the quality of fertilizer in both the villages. In the case of the other indicators, the private distribution system was given score either higher than or equivalent to those for the public system.

B. Non-poor farmers' assessment

The assessment by the non-poor farmers of both the study villages suggests that they opted for the private distribution system. Based on the score assigned to the eight indicators rated on the 1-4 rating scale, out of 28, the private system has total score of 27 in Sailgun and 23 in Dehergati compared to 21 and 19 for the public system respectively (Data Box 6.5.12). The non-poor farmers of Sailgun rated three indicators highly — 'less price', 'stable price' and 'high quality' — in favour of the public system over the private one. In Dehergati, 'less price' and 'high quality' were assigned higher score in favour of the public system in preference to the private one. The private system has, however, higher score than the public one in the case of other indicators in both the villages.

6.5.2 At the Institutions/Organizations Level

Public Sector Institutions

The field investigation at the institution/organization level covers two government institutions/departments, namely Bangladesh Agriculture Development Corporation (BADC) and Department of Agriculture and Extension (DAE) where topic focused discussions were held. Senior executives of BADC at the head office level and agriculture extension workers of the DAE office at the block level in the study *Upazilas* have been the participants of those discussions. Fertilizer-related issues were discussed and the main findings coming out of the discussions are presented below.

Bangladesh Agricultural Development Corporation (BADC)

As a major parastatal, BADC had been charged with the procurement, storage, and distribution of fertilizer before the privatization of those activities. The senior BADC executives who participated in a topic focused discussion arranged for them upheld their position on the key aspects of the erstwhile fertilizer distribution regime under BADC; the present distribution system, and the achievement of the SAP. Their position on some of the related issues is highlighted below.

6.5.2.1 Key Aspects of the BADC's Fertilizer Distribution System

a. BADC had a highly decentralized distribution network with its enlisted dealers even at the Union and village level. They used to pay particular attention to the remote and inaccessible areas as well. Moreover, the dealers had been well-trained and they had to act according to the guidelines laid down for them.

b. BADC sought to attain the 'balanced dose' in respect of fertilizer application. In view of the present unbalanced dose of fertilizer that the farmers are used to, BADC used to take special measure such as push sale of those important fertilizer (e.g. TSP and MP) which are usually underdosed by the farmers through their dealers while selling urea that are usually overdosed.

c. Fertilizer used to be sold at uniform price throughout the country irrespective of distance and accessibility to the location for the benefit of the farmers.

d. The corruption charge which is repeatedly leveled against BADC officials was found baseless on closer investigation. Certain quarters who were very active before in maligning the image of BADC have been the principal beneficiaries of and party to the controlling authorities of the present distribution system.

The present distribution system, in total contradistinction to the BADC system, is extremely riddled with corruption down to the local administration level in the corruption process. The present system is quite callous about the above-mentioned issues which BADC had been concerned with before. Under the present private system, the responsibility of fertilizer procurement and distribution [up to the dealers level] has been assigned to BCIC, a parastal which is basically a manufacturing institution completely lacking in both procurement and distribution experiences. Although BADC has a long-drawn experiences in these fields, the responsibility has not been assigned to it.

Department of Agriculture and Extension (DEA)

The Block Supervisors of Kalai and Babuganj *Upazilas* expressed their viewpoints on various fertilizer-related issues. Seven out of 10 and 19 out of 20 Block Supervisors of the two *Upazilas* respectively participated in the data gathering process. Their perspectives were captured through two methods — topic focused discussions at the group level and interviews at the individual level. Their perceptions on a wide-ranging issues pertaining to fertilizer and its distribution are presented below.

6.5.2.2 Constraints Diagnosis of Fertilizer Distribution and its Related Issues in Kalai Upazila, Joypurhat

In response to the questions — 'what are the major fertilizer-related problems in the *Upazila* including a focus on those occurring during the last 10-12 years, and how to mitigate them?' — the Block Supervisors (BSs) of Kalai *Upazila* identified the following problems (Table 6.5.3):

i. Substandard fertilizer retails on the market
ii. DAE office has no instruments/tools for testing the quality of fertilizer
iii. Farmers cannot properly identify the quality of fertilizer
iv. Fertilizer is not available in time
v. Higher price
vi. Higher transportation cost and delayed supply of fertilizer for lack of fertilizer factory in the region
vii. Dealership is allowed only for the urban areas under the present system
viii. Inadequate farmers' knowledge about the application of fertilizer

Besides identifying those general problems, the participants diagnosed the following problems which cropped up during the last 10-12 years:

i. Marketing of substandard fertilizer (eg SSP) (until 1998-99)
ii. Apart from urea, the requirement for other types of fertilizer is still unmet
iii. Unavailability of fertilizer in time
iv. Higher price

The following measures have been recommended by the BSs to mitigate a wide range of fertilizer-related problems in the area:

i. Do not allow the import/marketing of substandard fertilizer
ii. Provide necessary instruments/tools/materials for testing the quality of fertilizer
iii. Ensure the supply of quality fertilizer
iv. Set up fertilizer factory in the area
v. Ensure increased supply and stable price
vi. Impart training to the farmers
vii. Engage smaller dealers in the rural area
viii. Ensure regular supply of fertilizer
ix. Form a high-powered committee to identify adulterated fertilizer
x. Strengthen extension services about the balanced use of fertilizer.

From the above discussion it appears that quality-related problems with fertilizer were highlighted by the BSs as the topmost growing concern for the area and therefore appropriate mitigating measures were suggested.

The options expressed by the BSs at the topic focused discussion also supplement the above constraints diagnosis (6.17(B)). They observed that being substandard, fertilizer was not producing desired result. They informed that fake fertilizer was also being manufactured in the country. Under the condition obtaining now, BSs considered themselves helpless and they are

unable to play any effective role without having necessary scientific instruments and tools to test fertilizer on the market. They therefore needed mini tool kit for the purpose.

Regarding the distribution of fertilizer, they held that the present distribution system had not been able to take care of the remote areas. Besides, the present *Upazila*-based dealership system was quite flawed and inadequate to meet the needs of the farmers. They therefore recommended to engage at least one dealer for each Union for the sake of smooth distribution of fertilizer.

6.5.2.3 Comparison between Various Fertilizer Distribution Systems

By and large the country passed through three distribution systems which may be specified by demarcating time as follows:

i. The present private system under limited control (since 1995);
ii. Uncontrolled private system (from 1988 to 1994/95); and
iii. The fertilizer distribution under BADC (until 1988)

Although, the third version of fertilizer distribution (mentioned above) had several variations until 1988, it was considered only one type for the sake of convenience and simplicity. The contrast between the above-mentioned distribution systems will be made by showing their relative strengths and weaknesses. There will be no location-specific description of the findings here in order to keep it simple. The interested reader is, however, referred to the related tables (Tables 6.5.4 and 6.5.5) for details.

i. <u>The Present Private System</u>

<u>Strengths</u> :

- Fertilizer have been accessible to the farmers
- Farmers can lift fertilizer from the traders directly
- They can regularly procure fertilizer
- The dealers remain alert to the possibility of cancellation of their dealership on account of their involvement in any fraudulent practice
- The administration is constantly informed by the dealers about lifting, distribution and stock of fertilizer
- There is less scope for black marketing by the dealers
- The dealers are now answerable to the local administration
- Proper monitoring has ensured fertilizer supply according to the requirement
- The government has total control [over fertilizer supply]

- Adulteration is on the wane
- Regulated private distribution is better

Weaknesses :

- Farmers are faced with irregular supply of fertilizer
- Farmers have to travel a long distance to collect fertilizer from sellers in urban areas
- Price is out of control
- Occasionally fertilizer traders charge higher price by creating [artificial] shortage
- Price fluctuation
- Farmers cannot buy fertilizer at the specified price/they have to buy at higher prices
- Marketing of adulterated fertilizer by unscrupulous traders, although occasionally
- Lack of control at the field level
- Dealers are required to invest more for taking delivery of the allotted fertilizer

ii. Uncontrolled Private System

Strengths :

- Fertilizer marketing was good
- The availability of fertilizer was good
- Fertilizer had been accessible to the farmers
- The farmers could procure fertilizer from the market directly
- Fertilizer reached the farmers quickly

Weaknesses :

- The dealers used to charge higher price/higher price due to lack of control
- Price used to soar because of unscrupulous traders
- There was no limit on fertilizer prices
- Marketing of adulterated and substandard fertilizer
- Smuggling in of adulterated fertilizer
- Hoarding of fertilizer by the traders
- Corruption by the dealers

iii. The Fertilizer Distribution Under BADC:

Strengths :

- Fertilizer were easily available

- Proper distribution among the farmers
- Distribution at the government office
- There had been a provision for stock
- Maintaining fertilizer supply in line with its demand through monitoring
- It was under proper control
- Prices were less
- The farmers could buy fertilizer at a uniform price
- Fertilizer was available at the official price
- There had been regulated price/dealers could not increase the price
- The quality of fertilizer was good/genuine/unadulterated fertilizer was available

Weaknesses :

- Availability was inadequate
- Farmers could not get fertilizer in time/season
- The farmers of distant places used to encounter difficulties due to administrative complexities
- Delinquency of BADC officials in distributing fertilizer
- BADC officials used to stock fertilizer for selling at the black market
- The BADC officials were dishonest/corrupt

6.5.2.4 In Quest of a Desired Fertilizer Distribution System: Proposed Outlines by Block Supervisors

The Block Supervisors were asked to make recommendations for designing a fertilizer distribution system that would best suit the need of the country. The BSs of the two study *Upazilas* opted for different distribution systems — the present private system under limited control was preferred by the BSs of Kalai *Upazila* and the public system under BADC by those of Babuganj *Upazila* — albeit with modifications. The BSs of Kalai *Upazila* put forward the following recommendations for modifying the existing distribution system (Table 6.6):

i. Engage at least one dealer in each Union under the controlled private system
ii. Make both the dealers and the local administration answerable
iii. Manage the present distribution system through proper supervision

They held that the controlled private system for fertilizer distribution was the best one.

The BSs of Babuganj *Upazila* put forward the following recommendations for designing a desired fertilizer distribution system which by and large conforms to the erstwhile BADC's distribution system (Table 6.5.7):

i. Entrust BADC with the responsibility of fertilizer distribution
ii. Make arrangement for fertilizer distribution at the block level/engage dealers at each block
iii. Set up a fertilizer distribution office at the *Upazila* level
iv. Provide subsidy
v. Lower fertilizer price
vi. Impart training to the farmers in the application of fertilizer
vii. The government should control the price
viii. Upgrade the morality of the officials
ix. Take punitive measures against those fertilizer traders who seek to earn super profit
x. Open up sale centres at the *Upazila* and Union levels
xi. The supply should be matched with the demand

Private Sector Organization

Bangladesh Fertilizer Association (BFA)

Bangladesh Fertilizer Association is the apex body of the fertilizer dealers of BCIC. The organization is increasingly playing an important role in articulating their voices, organizing the dealers of the country and negotiating with the government and other parastatals such as BCIC. A topic focussed discussion was organized for the central leaders of BFA where they upheld their position on various issues related to fertilizer trade. The following are the key points they underscored in the discussion.

6.5.2.5 Constraints Diagnosis by BFA Leaders

i. BFA demanded the re-introduction of the completely private distribution system which had been in force until 1995.

ii. BFA however, did not endorse the distribution principle — first come, first served — in force before which caused the fertilizer crisis in 1994/95.

iii. The current 'command area' concept is an anachronism in the broader economic policy of the government. Moreover, the geographical distribution under the different command areas are not even judiciously defined causing confusion, inconvenience and discontent among the dealers standing in the way of fertilizer trade in the country. They therefore demanded its abolition immediately.

iv. BCIC should set fertilizer price [urea] around the international price level for allowing the fertilizer traders to import fertilizer alongside BCIC.

v. The price differential between the factory and buffer prices are negatively affecting the incentive structure of the dealers affiliated to the buffer stocks. BFA demanded that fertilizer be sold at uniform price regardless of the factories or buffers.

vi. The present system of the answerability of the dealers to a host of authorities is hampering fertilizer trade. BFA demanded that the dealers be answerable to a single authority instead of many.

vii. Given the quality problem and under-weighed fertilizer bags at the buffer stocks, lifting of fertilizer from the buffer stocks should no longer be compulsory, rather it should be made optional under the present system.

viii. To combat the adulteration of fertilizer, and marketing of substandard fertilizer there should be adequate checks at the entry points. Pre-shipment inspection agencies should play their due rule in this regard.

6.5.3 At the Market Level

Local Fertilizer Market

6.5.3.1 Constraints Diagnosis

A consultation with the local fertilizer dealers was held in Barisal district. A topic-focused discussion was organized in Barisal for the fertilizer dealers. Out of 32 enlisted dealers of BCIC in Barisal, nine of them participated in the discussion. The dealers were asked only two questions:

i. What are the problems that afflict the local fertilizer trade in Barisal? and
ii. What measures need to be taken to solve those problems?

The fertilizer dealers pinpointed the following problems in the discussion (Table 6.5.8):

A. Delivery, Lifting and Shipment-related

i. Higher carriage due to a long distance between the concerned fertilizer factory and the command area.
ii. Higher risk of loss of/damage to in-shipment fertilizer during inclement monsoon weather.
iii. Fertilizer is not delivered in the same month of issuing delivery order.
iv. Fertilizer factory sometimes cannot supply adequately in the peak months of fertilizer demand.

v. The month-wise allotment of fertilizer is not that much consistent with the trend in local demand.

vi. The quantum of fertilizer allotted each time to each dealer is not that much economical with respect to its shipment which necessitates collaboration of the dealers.

vii. They have to incur an extra expenditure of Tk. 2.10 per bag because of the under-developed mode of delivery and loading for lack of the 'belt system' at the delivery point of the fertilizer factory.

viii. They have to incur a loss of fertilizer (one per 20 bags) due to poor handling of fertilizer bags while taking delivery at the port.

B. <u>Buffer Stock-related</u>

ix. The buffer stock run by the government cannot supply adequately in the peak months.

x. The quality of fertilizer lifted from the buffer stock is quite poor (sometimes nitrogen loss comes to 60%) due to using jute sacks and longer stock period.

xi. Fertilizer bags lifted from the buffer stock are found weighing less than it ought to be (45-46 kg instead of 50 kg per bag).

C. <u>Command Area-related</u>

xii. Difficulties are faced in lifting fertilizer from the concerned factory of the command area.

xiii. They lose a significant chunk of fertilizer market to the neighbouring command area under Zia Fertilizer Factory at Ghorasal due to their competitive price resulting from lower carriage there.

D. <u>Dealership</u>

xiv. The dealers are not consulted with by the authority concerned while projecting annual fertilizer demand for the district.

xv. The fertilizer demand is underestimated by the District Office, DAE.

E. <u>Supervision and Oversight by Local Administration-related</u>

xvi. Fertilizer cannot be sold instantly due to the government formalities and oversight.

F. <u>Dealership-related</u>

xvii. The present system of depositing Tk. 2 lakh as security money with BCIC is having financial strain on them against which they do not get any benefit.

G. <u>Credit-related</u>

xviii. Adequate bank credit is not available which causes delay in lifting allotted fertilizer.

H. Rent-seeking

xix. They fall victim to rent-seeking while getting delivery order for TSP from the local administration.

xx. The local administration charged with the task of allotting the under-supplied TSP, much costlier than urea, follows an allotment procedure (unequal share among the different dealers) quite different from that followed by BCIC in the case of urea (equal share among the dealers), which causes much resentment and confusion among the dealers.

The fertilizer dealers made the following recommendations to deal with the problems (Table 6.5.9).

i. Change the present command area alignment of the district for the switch over from Chittagong Fertilizer to Zia Fertilizer factory at Ghorasal.

ii. Abolish the 'command area' barrier

iii. Do away with the buffer stock system

iv. Government supervision should be minimum

v. Ensure the delivery of fertilizer in the same month of fertilizer allotment

vi. Maintain the present dealership system

vii. Keep the fertilizer price stable.

6.5.3.2 Fertilizer Trade Expanded

At the local level, fertilizer trade expanded over the last 10-12 years in both the study locations. Fertilizer is traded at three levels of the local market — village/adjacent market, Union market and *Upazila* market. The number of the traders including retailers and wholesalers increased at all the levels over the years (Table 6.5.10). The increased number of traders led to increased competition in fertilizer trade at the local level. This had positive impact on both the availability and price of fertilizer.

6.5.3.3 A wide range of options are now open to the farmers

The import liberalization has led to the spurt of fertilizer import since 1992. The same type of fertilizer manufactured in different countries are available on the local market requirement and affordability (6.5.11).

6.5.4 Discussion

On the basis of the collected information and the stakeholders' reflections, the preliminary conclusions on the hypotheses are indicated below.

1. Related to Import Liberalization

Hypothesis 1.1: It has improved the availability of a variety of fertilizer on the local market

The data collected through the field investigation (market visit) show that fertilizer trade expanded at every layer of the local market at the village/neighbouring market, Union market and *Upazila* Market. The number of fertilizer traders increased and the variety of fertilizer sold on the market widened during the last 10-12 years. The farmers have now several choices open to them in respect of both the sellers and variety of fertilizer.

The above hypothesis therefore cannot be rejected.

2. Related to Decontrol and Privatization of Fertilizer Distribution

Hypothesis 2.1: It has scaled up the private trade which has taken care of fertilizer supply throughout the country

The field visit to one of remote areas, namely Agarpur Union in Babuganj *Upazila* indicates that there has been no supply constraint even at that remote spot. A number of fertilizer sellers were found to sell a variety of fertilizer at that place.

Given the increased number of fertilizer traders, developed transport network and communication in the study areas, there is no strong evidence to reject the hypothesis.

Hypothesis 2.2: It has encouraged competition among fertilizer traders resulting in stable supply and price

There has been no noteworthy supply problem in the study areas since 1995. The 1994/95 fertilizer scam is always recalled by the farmers with trauma and it left a lasting imprint on their mind. It appears that the privatization of fertilizer distribution without supervisory or regulatory control by the government is more likely to cause occasional instability in the supply than it is without. Apart from the traders, most of the stakeholders were found to hold that the government needs to exercise its control so that the private distribution can work smoothly.

With this qualification, the hypothesis regarding the supply stability may be accepted.

Hypothesis 2.3: The increased competition has led to the stable price of fertilizers

Regarding fertilizer price, although there has been no precipitous trend during the last 10-12 years except for the supply disruption in 1994/95, farmers had to pay a bit higher price in the peak season almost every year compared to the official price. According to the poor farmers of the IIV and the agricultural extension workers of Babuganj, they faced unstable price trend

over time. As recommended by the farmers, the government control should continue to ensure price stability.

The hypothesis therefore rejected.

Hypothesis 2.4: It must have ensured the supply of quality fertilizer for the farmers

Out of the three major types of chemical fertilizers — urea, TSP and MP — the farmers did not have any untoward experiences with the quality of urea. The responsibility of the procurement, production and distribution presently rests with BCIC and the present way of dealing with urea totally crowds out the private participation. No noteworthy complaint has been lodged in respect of this fertilizer. However, with regard to TSP and MP fertilizer market is afflicted with adulteration and fake practices. Since 1992, the year of import liberalization, the procurement, storage and distribution of TSP and MP are in the hands of the private traders. Although the problem has recently improved markedly with the imposition of a ban on the SSP import, the overall problem persists till now.

All the evidences gathered from almost all the sources suffice to reject the hypothesis.

Hypothesis 2.5: There has been a significant reduction in corruption, hassle and delay faced by the farmers for the procurement of fertilizer

The farmers of both the study villages used to encounter all those problems in varying degrees before. They did not, however, have to face those problems under the private distribution over the years because they can now procure fertilizer from various sellers at different levels of the market.

The hypothesis therefore stands because of the existence of several corroborative evidences from the field.

3. Related to Subsidy Elimination

Hypothesis 3.1: Fertilizer price has been adjusted in line with the world market price

Except for urea, the prices of other major chemical fertilizer such as TSP and MP on the local market have been adjusted with the world prices through import liberalization with effect from 1992. The price of urea is determined administratively far below the price prevailing the international market. As the overwhelming proportion of urea consumed in the country is produced by the domestic factories, the price determined by BCIC rules the market. BCIC is both producer and procurer. Economic subsidy for urea has not been eliminated till now.

The hypothesis, therefore, does not stand.

Hypothesis 3.2: The elimination of the subsidy has not had adverse effects on the farmers' affordability and the use of fertilizer

With the elimination of economic subsidy, the prices of TSP and MP have measurably gone up. Given the liquidity problem at the farmers level, higher prices appear to have gone beyond the affordability of the poor farmers. This is reflected in the decelerated growth in the application of these types of fertilizer.

The use of fertilizer has also been affected in another way. The recommended dose ratio for the three major chemical fertilizers has been adversely affected. The farmers tend to apply more urea and less TSP and MP because of the price differentials. Urea is cheaper, and TSP and MP are dearer.

The field level evidences are found to contradict the hypothesis. The hypothesis can therefore be rejected.

6.6 Pesticides

Various issues pertaining to chemical pesticides were raised for discussion in the four Focus Group Discussions — two each for the poor farmers and non-poor farmers — held in the two study villages. Based on their perspectives, the findings in summarized form is set out below (Table 6.6.1).

6.6.1 Farmers' Perspectives

6.6.1.1 Availability of Pesticides

The farmers of both the categories of both the villages clearly pointed out that pesticides were not only available everywhere, its supply was also stable now. Farmers did not encountered any problem in the case of its availability at the local level.

6.6.1.2 Price

As experienced by both the groups of farmers, the prices of pesticides had considerably risen over time in both the areas. Pesticides sold not only at higher prices, the fluctuation of prices had also been more precipitous and disturbing over time.

6.6.1.3 Farmers' Knowledge about its Application

Farmers of both the categories by now learned considerably the skills about the mode of application of pesticides regardless of whether they had training in it or not. Therefore, they did not face any problem whatsoever in this respect.

6.6.1.4 Application and Intensity of Use

The farmers, regardless of the categories, have intensified its use particularly in *boro* crop over time. Pesticides are now intensively used because of the increased incidence of pest attack. Farmers did not have to apply it before because of less incidence of pest attack.

The large farmers, however, applied it more because they could afford it in contrast to the poor farmers who applied it less due to their limited affordability.

6.6.1.5 Quality and Adulteration

Based on their own experiences, farmers of both the categories pointed out that pesticides were not that much effective nowadays as it was before. It could not kill the predators and therefore its effectiveness was low.

As evidenced by them, adulterated and fake pesticides had been on the market which were not effective in killing pests.

More importantly, farmers could not differentiate between the genuine pesticides and adulterated or fake ones and therefore they fell victim to the cheating of unscrupulous pesticide traders. Numerous varieties of pesticides on the market additionally contributed to their inability to differentiate between them.

6.6.1.6 Impact

According to the assessment by both the poor and non-poor farmers, the fertility of the soil had declined over time due to the application of pesticides. The non-poor farmers of both the villages observed that the bio-diversity of the area had been adversely affected by pesticides as evidenced by the progressive extinction of frogs, snakes, fishes, etc. Fishes contracted diseases, and the incidence of its mortality increased over time. The air of the area had been polluted by it as well.

6.6.1.7 Perceived Solutions

According to the poor farmers of Sailgun, the government should provide subsidy to pesticides. Farmers across both the categories recommended that the government should take appropriate measures to curb the adulteration of pesticides, ban all types of harmful pesticides on the market, and impart training to the farmers.

6.6.2 Discussion

Hypothesis 1: Pesticides have been available on the local market

So far, the farmers did not have any untoward experiences with the supply-side problems with pesticides at the local level. They could procure pesticides on the market. As both the poor and non-poor farmers had had the same experiences, the hypothesis can be considered valid.

Hypothesis 2: Pesticides retail at a fairly stable price

Unlike its supply, pesticides prices showed upward trend and behaved erratically. As the farmers held a consensus view in this regard, the hypothesis does not stand.

Hypothesis 3: Farmers can apply pesticides properly

Regardless of their categories, farmers believed that they were capable of applying pesticides properly even though they did not have any training in its use. The hypothesis therefore cannot be rejected.

Hypothesis 4: The pesticides applied have been effective and there has been no problem with its quality

The use of pesticides increased over time, although poor farmers could not adequately apply it because of their limited affordability. This was due to the increased incidence of pest attack and the pesticides applied was found less effective. In addition to this, adulterated pesticides were being marketed at the local level. The farmers were deceived into buying fake and adulterated pesticides on the market.

This hypothesis therefore stands rejected.

6.7 Rural Finance From Public Sector Lending Institutions

> *"Credit from bank is neither available in time nor in required amount. However, only those having some land can get loan from bank if he/she offers a sizable amount of bribe to bank official. No bribe, no loan".*
>
> — Agricultural workers, Sailgun

> *"Bank loan has been inaccessible to the agricultural labourers. Borrowing from BKB necessitates one to offer bribe to the bank officials. In addition, the intending borrower has to undergo a lot of hassles and spend time for this purpose. Workers do not have enough time to waste at the bank premises. Getting to the bank means a worker has to lose wage employment that day. Workers cannot afford that time. Above all, they have no land required to be offered to the bank as security. That is why workers are denied bank loan. Bank loan is for those who have land and not for those who do not have it".*
>
> — Agricultural workers, Dehergati

As a non-material input, rural finance plays a vital role in rural development. Bank finance accounts for an overwhelming portion of the total flow of rural finance, although its share is likely to have been decreasing over time due to the growing share of micro finance from the member-based institutions (MBIs) such as Grameen Bank and NGOs. As SAP-led measures were exclusively targeted to the public sector institutions (PSIs), this investigation has therefore been limited to those institutions, namely agricultural banks (ADBs) and nationalized commercial banks (NCBs) working in the study areas. Information have been collected from the two major sources — from the primary sources such as various categories of farmers and workers, and from the secondary sources such as the banks working in the study areas. The thrust of the investigation has been geared towards understanding the role of the PSIs in both agricultural development and poverty alleviation in the study areas over the last 10-12 years. The primary information on the topic have been collected from different stakeholders/groups of rural population through various tools and techniques. The key findings of the field investigation have been organized under certain themes drawing from the different sources so as to give a triangulated picture, although maintaining specific stakeholder position thereon.

6.7.1 Bank Finance for Agricultural Development in Study Areas

6.7.1.1 The Role of the AGBs and NCBs

The performance of the agricultural banks (AGBs) in the study *Upazilas* is likely to ideally reflect the vibrancy of agricultural activities over time in these areas. Given an intensive irrigation in the *Upazila*, our *a priori* expectation is that the agricultural bank in Kalai *Upazila* (Rajshahi Krishi Unnayan Bank - RKUB) must have shown dynamism in its operations in terms of both the diversification of agricultural activities and volume of lending over the

monitoring period in Kalai *Upazila* compared to that in Babuganj *Upazila*, an area of lower irrigation coverage (Table 6.7.1 and 6.7.2). It is obvious from the tables that BKB in Babuganj *Upazila* plays a minor role compared to RKUB in Kalai. Overall, BKB/Babuganj provided credit amounting to as low as Tk. 6.5.7 million at the end of 1998/99 representing 24 percent of that for RKUB/Kalai. In terms of the number of borrower, BKB/Babuganj catered to the credit needs of 690 clients in 1998/99, showing only 33 percent of those served by RKUB/Kalai in the same time. The credit performance of the agricultural bank of Babuganj was found unsatisfactory not only in terms of the volume of lending but also diversification of lending operations over the period 1995 to 1999 relative to that of Kalai. More importantly, the range of activities has been much wider for RKUB/Kalai than that for BKB/Babuganj representing improved performance of the former compared to the latter. RKUB/Kalai extended sizeable amount of credit to their borrowers for the purchase of various modes of irrigation equipment and other agricultural implements. Besides, RKUB/Kalai also channeled fund to other non-crop sub-sectors such as livestock and fishery over the last 14 years. BKB/Babuganj appears to have made virtually no contribution to the development of irrigation in the *Upazila*. Its lending to other sub-sectors of the agriculture is not clear due to the lack of disaggregated data in the Table. The limited role of BKB/Babuganj in the agricultural development in the *Upazila* becomes more obvious in the context of the overall size of the study *Upazilas*. Babuganj was larger than Kalai in respect of both population and area (Table 6.3.1.1). But the scale of operation of BKB/Babuganj was smaller than that of RKUB/Kalai over the period (since 1994/95) that the data permit.

Farmers' Perspectives on Bank Loan and Other Related Issues (Table 6.7.3)

6.7.1.2 Demand for Credit

Trend: According to the poor farmers of both the study villages, farmers' demand for credit rose over time. The poor female farmers also confirmed this upward trend (Table 6.7.3). The increased demand for credit stemmed from two factors — production and consumption. Farmers needed credit to buy agri-inputs and also to use it for consumption purposes. The poor female farmers demanded credit for raising fowls and ducks, and for cultivating vegetables.

The non-poor farmers of both the villages also expressed the same opinion on the trend of demand over the same period. Similarly, they pointed out that the rise in demand was attributable to capital requirement for investing in irrigation equipment and other agricultural implements. Being capital intensive, the expansion of potato cultivation had recently contributed to the high demand for credit in Sailgun. The low returns to agricultural produces also furthered the demand for agricultural credit.

The hard data collected through the household-level village census show that farmers borrowed mainly for agriculture in general and cultivation in particular in both the villages. In Sailgun, out of 33 causes of borrowing, cultivation accounts for 17 for male borrowers last year compared to 23 out of 33 for male borrowers in Dehergati during the same time (Table 6.7.4). Women were also found to borrow mainly for cultivation (5 out of 9) over time in Dehergati.

6.7.1.3 Sources of Credit and Their Relative Importance

By and large, there had been three major sources of credit for the farmers of the study villages. They were banks, NGOs and rural moneylenders. The relative importance of these sources of credit however varied in terms of trend and volume of credit across different farmer groups such poor farmers, tenant farmers, and non-poor farmers across the study villages. Different data collection methods and techniques provided adequate information on this issue to cross-check and verify the findings.

The poor farmers' perspectives recorded at the FGDs indicate that the farmers of Sailgun got credit from all the three sources mentioned above, but those of Dehergati held that bank credit was not at all accessible to them, although their accessibility of credit from other sources such as NGOs increased over the last 10-12 years (Table 6.7.3). The PRA data reflecting poor farmers' perspective corroborate the FGD findings that the poor farmers as well as tenant farmers of Dehergati had no access to bank loan at present although an insignificant proportion of them (5%) did have it before (Data Box 6.7.1). However, the assessment by the non-poor farmers of Dehergati at PRA exercise indicates that the poor farmers had access to bank credit although its importance dwindled over time from 25 percent of them to 20 percent.

According to the non-poor farmers of Sailgun, the poor farmers were increasingly availing themselves of bank loan over time (from 40% to 50%) (Data Box 6.7.2). They also observed that the poor farmers were borrowing less from rural moneylenders (from 60% to 25%), although NGOs, a relatively new source of credit for them in Sailgun, also provided them with credit in the same coverage.

Regarding the accessibility of credit to the non-poor farmers, the assessment by the non-poor farmers of the study villages indicates that bank increasingly became the only source of credit for the non-poor in Sailgun (from 40% to 100%) and a major source of credit in Dehergati (from 60% to 80%) (Data Boxes 6.7.1 and 6.7.2) A minor proportion of the non-poor farmers of Dehergati also borrowed from their relatives, although its share declined over time. The reasons for their increasing dependence on bank are that they could borrow from bank because of their higher landholding accompanied by their increased transactions with banks and also higher demand caused by higher prices of fertilizers, fuel, seeds, etc.

The census data show that the villagers availed themselves of credit from diverse sources of public sector institutions such as banks (BKB and RKUB), nationalized commercial banks (Sonali, Rupali and Agrani) and various government departments (Department of Youth Development, Department of Social Services, and BRDB (Table 6.7.5). They also got credit from various member-based institutions such as Grameen Bank and NGOs (ASA, BRAC, Moushumi and PROSHIKA).

The census data also suggest that the overall accessibility of credit facilities markedly increased across a host of sources over the last 10-12 years in both the study villages. In Sailgun, out of 78 households the accessibility of credit rose from 13 households for male and 1 household for female beneficiaries to 26 households for male and 6 households for female beneficiaries respectively over the years. Similar is the case with Dehergati where out of 90 households, 33 households had male and 59 female borrowers last year, as against 14 and 31 households respectively 10-12 years before.

Some notable features stand out from the above trend. First, the two villages markedly differ in terms of the availability of credit — the overall accessibility was remarkably higher in Dehergati than that in Sailgun. Secondly, the accessibility more than doubled over time in both the villages. Thirdly, Dehergati had a preponderance of female borrowers (64% - 69%) while Sailgun had a negligible proportion of female beneficiaries (7% - 19%). Fourthly, as seen from Table 8.4, public sector institutions served as a major source of credit for the borrowers in Sailgun (from 93% before to 87% last year) than in Dehergati (from 20% before to 29% last year). Fifthly, the relative importance of the public sector institutions as the sources of rural credit was declining in Sailgun compared to its upward trend in Dehergati. Sixthly, the role of the member-based institutions such as GB and NGOs as credit providers was increasing in Sailgun (from 7% before to 12% last year) while it was declining in Dehergati (from 80% before to 72% last year). Seventhly, GB and NGOs played a dominant role in Dehergati than in Sailgun.

The hard data available through the village census show a precise picture of the accessibility of bank loan to the households in the study villages. In terms of number, the poor households of Sailgun accounts for 39 percent (11 out of 28 PSI borrowers) during the last year, as against 46 percent (6 out of 13 PSI borrowers) before (Table 6.7.5). In Dehergati, out of 27 PSI borrowers, only two poor households availed themselves of bank loan last year compared to the nil before.

The finding that the poor farmers' accessibility of credit increased over time in Sailgun, as observed by the non-poor farmers, could not be cross-checked due to the data gap. That is, there has been a missing of recording the poor farmers' own assessment of this issue. However,

other results from PRA exercises and the census data will cast some light on it which are presented in the following paragraphs.

6.7.1.4 Assessment of the Farmers' Accessibility of Credit by Farmers' Priority Matrix

The FGDs with both the poor and non-poor farmers of Dehergati indicate that their accessibility of credit from bank did not increase over time, although the poor farmers of Sailgun admitted that they borrowed from bank including other credit sources.

In order to precisely understand the farmers' accessibility of bank loan and other related issues, and its changes over time vis-à-vis other major lending sources, PRA exercises were conducted to assess farmers' priority matrices in terms of six criteria/indicators, namely

i. access to credit
ii. volume of credit
iii. availability in time
iv. hassle
v. interest rate
vi. bribe
vii. incidental expenses

All these indicators were measured/rated on 1-4 points rating scale with 1 for 'very low', 2 for 'low', 3 for 'high' and 4 for 'very high'. At the PRA exercises, the participants used dots (maximum 4 dots) to indicate the trend and to relatively measure the indicators/criteria used. Both the poor and non-poor farmers' priority matrices were constructed separately to understand their different viewpoints for the major credit providers in both the villages.

As assessed by the poor farmers, their access to bank loan increased from 'low' to 'high' over time in Sailgun but declined from 'high' to 'very low' in Dehergati (Data Boxes 6.7.3 and 6.7.4). In respect of 'volume of credit' and 'availability in time', bank was rated by the poor farmers of Sailgun highly — from 'very low' to 'very high' on the rating scale. The poor farmers of Dehergati assessed bank loan — badly from 'high' to 'very low', and from 'low' to 'very low' in terms of the 'volume of credit' and 'availability in time' respectively. However, as assessed by them, the hassle involved in bank lending has worsened in both the villages.

At the same PRA exercises, the poor farmers of Dehergati were highly appreciative of NGO lending in terms of all the indicators used except for 'interest rate', and 'incidental expenses'.

The assessment by the non-poor farmers of Sailgun shows that their 'access to bank loan', and 'volume of credit' availed increased over time from 'low' or 'very low' to 'very high'

(Data Box 6.7.3). They, however, made depreciatory assessment of bank loan in terms of other indicators, namely 'availability in time', 'hassle', 'interest rate', and 'bribe and incidental expenses'. The non-poor farmers of Dehergati, on the hand, observed no improvement in bank loan with regard to 'access', and 'availability' and these indicators were rated by them to be 'low' both before and at present. They also had poor rating for other indicators except for interest rate.

The perspective of female labourers of Sailgun also suggests that the accessibility of bank loan to small and marginal farmers increased over time during the *boro* season (Data Box 6.7.5). They however made depreciatory assessment of bank loan in terms of 'hassle', 'interest rate' , and 'bribe'.

As far as the accessibility of bank loan to the poor female farmers is concerned, the assessment by the non-poor farmers of Dehergati had very poor rating for bank in terms of all the indicators (Data Box 6.7.6). They had, however, highly favourable rating for NGOs in terms of all the indicators except for interest rate.

6.7.1.5 Lending Procedure

Lending procedure for bank loan remained unchanged, and the poor farmers faced those problems until now. The poor farmers usually faced the following problems while trying to get bank loan (Tables 6.7.3 and 6.7.7):

i. submission of various documents
ii. submission of title deed/land as security
iii. improperly maintained title deed
iv. submission of photograph
v. prior acquaintance with bank manager
vi. hassle
vii. loan is not available in time
viii. recommendation by a local elite
ix. enough money is required to offer bribe to bank officials
x. cooperation of a middleman
xi. uncertainty about getting loan

The perception of the non-poor farmers of Sailgun is that the lending procedure became more difficult (bureaucratic) over time because credit was not available in time and it was not provided adequately. The non-poor farmers of Dehergati also confirmed the persistence of complexities in the lending procedure of the bank.

6.7.1.6 Use of Credit

Credit was mainly used for production by both the poor and non-poor farmers, as is viewed by the poor farmers of Sailgun. As much as 100 percent of credit was now used by the non-poor farmers for production compared to 75 percent before (Data Box 6.7.7). The poor farmers of Sailgun also made use of credit for production to the extent of as high as 80 percent nowadays compared to 60 percent before.

The pattern of credit utilization was quite different in Dehergati where both the poor and non-poor farmers used it mainly for consumption purposes. As assessed by the non-poor farmers, their consumption accounts for as much as 75 percent both before and now (Data Box 6.7.8). The poor farmers of Dehergati also held that 70 percent of their credit was devoted to production now, as against 60 percent before. A strikingly higher proportion of the non-poor farmers' credit was used for buying land and for re-lending purposes.

Bank loan for the procurement of fertilizer: As held by the poor and non-poor farmers of both the study villages, they had no access to bank loan for this purpose (Data Boxes 6.7.9 and 6.7.10). Previously, the farmers of Dehergati had the credit facilities for it but no more now. But according to the non-poor farmers of Sailgun, traders were the main beneficiaries of this credit facilities. The poor farmers of the same village, on the other hand, held that big farmers are the main beneficiaries of these facilities.

Both the categories of farmers of both the villages held an identical view that no such credit facilities were now available for small and marginal farmers.

Bank loan for the procurement of irrigation equipment: According to the non-poor farmers of Sailgun, bank loan had been available for buying irrigation equipment before but no more now (Data Boxes 6.7.9 and 6.7.10). As perceived by the poor farmers of the same village, large and medium farmers could avail themselves of the credit facilities targeted to this purpose. But in Dehergati, both the farmer groups witnessed that nobody had ever availed of this credit mainly because of various constraints on the accessibility of bank loan.

6.7.1.7 Farmers' Dependence on Credit

By and large, all the categories of farmers of both the villages (only exception is non-poor farmers of Dehergati) believed that their dependence on credit had worsened over time, albeit in varying degrees (Data Boxes 6.7.11 and 6.7.12). According to the non-poor farmers of Sailgun, half of the non-poor households of the village had been dependent on credit compared to 40 percent before. The poor farmers' assessment also shows that fifty percent of them now depended on credit, as against 40 percent before in Sailgun. According to their own assessment,

60 percent of the poor farmers of Dehergati had now been dependent on credit compared to 25 percent before. The non-poor farmers of Dehergati perceived that their dependence on credit was not only at the lower level, their dependence on credit in relative terms remained unchanged at the level of 10 percent over time.

The non-poor farmers of Sailgun could avail themselves of credit facilities provided by bank because they believed that banking formalities had become easier now. As explained by the non-poor farmers of Dehergati, their dependence on credit did not worsen because they could afford to buy fertilizer out of their own capital. The increased dependence of the poor farmers of Dehergati on credit is attributable to higher price of fertilizers and the increased expansion of modern cultivation (HYV based) due to higher irrigation coverage in the area.

6.7.1.8 Corruption

The lending institutions under the public sector institutions were found amazingly riddled with growing corruption (Tables 6.7.3 and 6.7.7). The scale of corruption took not only a quantum leap, it was being perpetrated in an innovative way forming a vicious triangular process among the borrowers, informal intermediaries, and bank officials as illustrated in Box 8.1. Along with procedural complexities, bribe in depth and breadth had been rampant over time. As the demand for credit went up, intending clients had to approach the bank officials through informal middlemen known as *tout.* As a pre-condition for getting bank loan, intending bank clients had to offer bribe to bank officials and other concerned persons at the rate of Tk. 100 to 200 per loan of Tk. 1,000 in both the study areas representing 10–20 percent of the loan.

The farmers of all categories of both the villages provided evidences that bank loan involved not only bribe but its spread and intensity had been a cause of growing concern in both the study areas (Data Boxes 6.7.3, 6.7.4, 6.7.5 and 6.7.6).

6.7.2 Rural Finance against Poverty Alleviation in Study Areas

6.7.2.1 The Accessibility of PSI Finance to the Poor and the Very Poor: A Quantitative Exposition

The role of finance against poverty is well-recognized. It is expected that lending institutions and the public sector institutions must have played an important role by channeling fund for the poor and the very poor alike. The field-level investigation had generated both hard and soft data to conveniently look into the accessibility of bank finance to the poor. It has already been mentioned before that the accessibility of bank loan to the poor was not only meager but also proportionately declined over time in Sailgun. The bank finance for the poor was so negligible in Dehergati that it was not worth mentioning at all. Table 6.7.6 sheds light

by providing a detailed breakdown of the borrowers among the four categories of households, namely well-off, middle, moderate poor, and very poor across diverse credit sources. In Sailgun, out of 28 borrowers of the public sector institutions (AGBs, NCBs and other government departments), 10 from the moderate poor, and only one from the very poor category could avail themselves of credit facilities last year. The inaccessibility of institutional credit to the very poor was also at a frustratingly lower level 10-12 year before (only one out of 13). That is, the share of the very poor households of Sailgun in the total number of PSI borrowers declined from around eight percent to around four percent over time.

However, the accessibility of NGO credit to the very poor increased over time in Sailgun. Compared to the nil before, three very poor households benefited from micro credit programme of various NGOs out of a total of four NGO borrowers last year.

In Dehergati, the finance from PSI lending institutions could not reach the very poor as well and the inaccessibility of the institutional credit did not improved over time. It is seen from Table 6.7.6, out of 27 PSI borrowers of Dehergati, there had been only one very poor household benefiting from the institutional credit facilities last year, as against the absolutely nil before.

The inflow of NGO credit into Dehergati was found to have reached the increased number of the moderate and very poor households over time. The number of the households benefiting from NGO credit includes 33 moderate poor households (male = 2 and female =31) and 11 very poor households (male = 1 and female = 10) last year compared to 18 (male =2 female=16) and 3 (male = nil and female = 3) households respectively 10-12 years before.

6.7.2.2 Agricultural Labourers' Perspective on PSI Finance

At the FGDs, agricultural labourers expressed their experiences and viewpoints on bank loan which are set out as follows (Table 6.7.8).

6.7.2.2.1 <u>Demand for Credit</u>

According to their own assessment, agri-labourers' demand for credit rose over the last 10–12 years in terms of both the number of borrowers and volume of credit (Data Boxes 6.7.13 and 6.7.14). As many as 60/70 percent of the agricultural workers of Sailgun now needed credit, as against 40/50 percent 10–12 years before. The upward trend was also found in Dehergati where 40 percent of them had presently demand for credit compared to 15 percent before.

In terms of the volume of credit, the workers' demand also markedly increased over the years (Data Boxes 6.7.15 and 6.7.16). As assessed by the agricultural workers, their demand rose from a hypothetical 100 units to 200 units over time in Sailgun, compared to the upswing from a hypothetical level of 50 units to 80 units in Dehergati over the same time.

6.7.2.2.2 Cause of Borrowing

Workers, usually borrowed for buying food and for undertaking income generating activities. This was true for both the male and female workers. But the agricultural workers of Sailgun had three distinct patterns of causes of their demand (Data Box 6.7.17). The first pattern focuses the credit demand mainly on meeting expenditure for cultivation (65% of total demand), the second pattern is centered around the expenditure for social rituals (80%) and the third one mainly for the repayment of credit (70%). The demand for credit, as assessed by the agri-labourers of Dehergati, increased over time particularly for cultivation, and for meeting social obligations such as daughter's wedding (Data Box 6.7.18). Their demand for buying cattle declined because of increased tillage by power tiller in the village. Their demand for buying foodgrains also went down over time.

6.7.2.2.3 Sources of Credit

They borrowed mainly from various member-based institutions including Grameen Bank and other semi-formal institutions, namely ASA, PROSHIKA, BRAC, etc. They also took loan at a certain interest rate from local individuals who mainly had salaried job. According to their own assessment, the agricultural workers of Sailgun usually borrowed from four sources, namely moneylenders, banks, NGOs, and relatives/friends (Data Box 6.7.19). Moneylenders, and relatives had been the major sources of their credit 10–12 years before but relative importance had undergone changes over time. While the share of the rural moneylenders in total borrowers considerably increased over time (from 19% to 40%), the share of relatives/friends sharply declined from 80 percent to only 5 percent over the same time. Two major financiers — Bank and NGOs — emerged over the years for the workers of Sailgun whose present proportionate shares stood at 40 percent and 15 percent respectively compared to 19 percent and 1 percent before respectively. The increased access to bank credit by the workers of Sailgun is a notable phenomenon which may apparently be puzzling but the way the lending procedure evolved, the agricultural workers who could access banks credit seem to have been in the trap of further pauperization and destitution rather than escaping from it (Box 6.7.1). Only those who had enough land and could offer bribe availed themselves of bank loan.

The agricultural workers of Dehergati had no access to bank loan now and they did not have before either. NGOs became their principal financiers (Data Box 6.7.20). Their dependence on the moneylenders also declined over time mainly due to the increased access to NGO credit during the monitoring period. The accessibility of the credit sources in the two villages and the trend, thereof indicate that the upward trend in the contribution of the loan from bank and moneylenders appears to be consistent and worthy of interpretation. The way the bank loan was currently being provided for the workers of Sailgun ultimately became an instrument of further destitution rather than escaping from their poverty. They were therefore increasingly becoming dependent up the moneylenders for overcoming the debt problem and for the survival as well. This was not the case with the workers of Dehergati, where increasing access to NGO credit appears to have benefited them due to which they could progressively escape from the clutches of the moneylenders in Dehergati.

6.7.2.2.4 Accessibility of PSI Loan and Corruption

Bank loan had been inaccessible to the agricultural labourers. Borrowing from BKB necessitated one to offer bribe to the bank officials. In addition, the intending borrower had to undergo a lot of hassles and spend time for this purpose. Workers did not have enough time to waste at the bank premises. Getting to the bank means a worker had to lose wage employment that day. Workers could not afford that time. Above all, they had not have enough land required to be offered to the bank as security. That is why workers were denied bank loan. Bank loan was for those who had land and not for those who did not have it.

6.7.3 Discussion

In the light of the field findings, the decisions on the hypotheses formulated before stand as follows:

Hypothesis 1: It has simplified lending procedures and improved institutional shortcomings of the banking system

The evidences gathered from several stakeholders irrespective of economic status, gender and occupation, show that the lending procedure still remained not only cumbersome, bureaucratic and exclusionary, the bank loan had remarkably became worthless over time.

The hypothesis therefore stands rejected.

Hypothesis 2: It has expanded access to formal credit institutions by the assetless

The poor people's access to bank loan increased in absolute terms in Sailgun but it declined in relative terms over the years. However, there is sheer reservation as to whether the poor and assetless had in fact benefited from the bank loan because of the siphoning off of a handsome proportion of the loan by the loan broker and bank officials involved in the loan transaction. The poor and the assetless of the other village neither did before nor do have now access to bank loan whatsoever.

These evidences along with the conclusion drawn regarding the hypothesis number 1 provide enough reasons to reject the hypothesis.

Hypothesis 3: It has ensured the disbursement of adequate credit to creditworthy borrowers for the procurement of irrigation equipment

As far as the non-poor farmers are concerned, the hypothesis does stand, but it does not for the poor farmers because of various constraints on their accessibility of bank loan.

According to the decision rules, the hypothesis stands rejected.

Hypothesis 4: It has made credit available for fertilizer purchase

In the study villages both the poor and non-poor farmers informed that they could not avail themselves of bank loan for this purpose. However, the poor farmers of Sailgun apprised that the non-poor farmers had benefited from such loan. But as defined by the bank, the term 'creditworthy' amounts to the exclusion of a large number of the assetless and poor farmers who are otherwise creditworthy. The consensus view is that the poor and marginal farmers did not have access to loan for fertilizer purchase.

The hopothesis is therefore rejected.

Hypothesis 5: It has increased access to credit by the women

Bank loan was found totally inaccessible to the women of the study villages, because land was mostly owned by men. The evidences gathered suggest that the hypothesis be rejected.

Hypothesis 6: It has provided private traders with bank loan to build warehouse/storage facilities, and hold grain stocks and other produces

The information collected from the respective agricultural banks indicate that there has been no evidence of bank lending for warehouses in the study *Upazilas* .

Therefore, the hypothesis stands rejected.

Box 6.7.1: Poverty, Indebtedness and Corruption: An Innovation in Corrupt Practices in Rural Banking

Bank loan constitutes an important source of rural finance. So far, policy makers and others concerned with rural finance are found obsessed with one question: whether rural finance has been accessible to the rural people particularly the rural poor. The official statistics show that rural finance reached the rural people and the target group of villagers as well. But the participatory investigation in Sailgun village in Joypurhat district reveals that the above piece of information may be statistically valid but the fact is that it is partly valid at the most. A part of bank loan disbursed to the borrowers are being grabbed by a clique of bank officials and an emergent group of rural *touts*. No villagers can hardly expect to get bank loan bypassing the *touts*. It is a novel process of corruption and people and particularly poor people are increasingly being subjected to this corruption in the rural area. The process is illustrated below by way of a hypothetical example, and Matrai Branch of Agrani Bank is a case in point.

There are three persons involved in the lending process — X, Y and Z. X is an applicant for bank loan (mostly a poor and illiterate villager); Y is a *tout* (an informal marketing agent of the bank in the village) and Z is a dealing officer of the bank. X first approaches Y for the loan. Y assures X but proposes to X that the loan will be sanctioned but a part of it has to be 'sacrificed' for compensating the service of Y and Z. Y consoles X that he does not require to pay anything in advance because he is financially handicapped to pay it. Therefore, Y would be kind enough to conduct the negotiation needed for this purpose with the concerned bank official, Z. Therefore, Y needs to be duly rewarded and demands a part of the loan for the service Y would put in for this negotiation process. X agrees with Y, and an agreement between them is concluded at last. Y prepares an application for X and recommends and forwards it for consideration by the bank officer, Z. Another agreement is also reached between Y and Z to the effect that Z will be duly rewarded out of the bank loan. Thus the negotiation process is completed.

Very soon Z informs Y that the loan application has been approved by the bank manager and the proposed amount is ready for disbursement. Y subsequently informs X the good news. Y takes X at the bank premise one day for getting the loan. The sanctioned loan is, say, Tk. 10,000 and all papers are documented in that way. All documents will have to be signed by the borrower X against the figure mentioned on the document. Then X will be paid Tk. 8,000 in cash only, and the remaining Tk. 2,000 will be shared between Y and Z in the proportion agreed between them.

After few months or say one year X again approaches Y for bank loan. Y reminds X about the previous outstanding loan and advises him to repay the loan before proceeding further. But X is not in a position to pay it back. Y, kind enough, offers to X to lend him Tk. 10,000 for the onward repayment of the previous bank loan on the condition of service charge of Tk. 1,000 from X. X gives his consent and an agreement is reached between them. In the same way, Y drafts a loan application for X stating invariably for a higher amount of Tk. 12,000 this time. The lending process repeats and the loan is ready for disbursement at the end of the day. Accordingly, one day Y accompanies X at the bank and repays the previous loan and receives Tk. 12,000 from the bank on X's behalf. As stipulated before, Y keeps Tk. 11,000 (Tk. 10,000 for loan and Tk. 1,000 for service) and the rest Tk. 1,000 is handed over to X. The end result is that X's indebtedness has just gone up from Tk. 10,000 before to Tk. 12,000 at the benefit of Tk. 1,000 only.

Now the banker is happy because of his good performance (disbursement has increased) and personal gains. The *tout* is happy because of his gain in the mediation process. The poor is also happy at the moment because he has been able to stave off the imminent starvation.

Source: Informal interview with Mr Belal Uddin Sarkar, irrigation equipment owner, Sailgun (SW), Joypurhat.

6.8 Public Domestic Procurement

"Farmers can not sell their paddy at the procurement centre. Instead, they sell paddy at the open market to meet their urgent financial obligation."

— Poor farmers of Dehergati, Barisal

"Farmers cannot avail themselves of the benefit. They cannot sell their produces at the procurement centre because of the corruption of the officials of the purchase centre. Officials of the purchase centre are reluctant to buy from the farmers even though their produces are of higher quality. They buy from dealers [millers] instead, even their produces are not up to the mark."

—Non-poor farmers of Sailgun, Joypurhat

Public domestic procurement is a long-running public programme carried out by the government to achieve some objectives of national significance such as food security, maintaining incentive price for boosting agricultural production, price stability, poverty alleviation, etc. In view of its potentially important role in the agricultural development of the country, SAP-led measures have been geared towards the domestic procurement to provide incentive price for the growers, and build up adequate food reserve in the country. To better understand the performance of the programme, the field investigation was conducted both at the community level, and at the LSD level to find answers to the following questions/issues:

i. Who have been the major sellers/beneficiaries of the programme?
ii. Which produces and to what extent are sold at the purchase centres?
iii. Who are the major buyers of the foodgrains at the growers level, and what are the relative advantages and disadvantages of selling to them?
iv. What are the seasonal patterns of the major crops in terms of some selected indicators?
v. Participatory assessment of the public domestic procurement programme

6.8.1 At the Community Level: Farmers' Perspectives on Public Domestic Procurement

The field-level investigation into this topic was carried out mainly in Kalai *Upazila* because of the better experience of the farmers of the study village with the programme for a fairly longer time compared to those in Babuganj *Upazila*. Some pertinent issues were however covered in both the areas. The field findings are set out below.

6.8.1.1 Information Dissemination Channels Used for Informing the Farmers about the Programmes

Farmers of both the study villages were found adequately informed about the procurement programme in the locality (Table 6.8.1). They usually came to know about the

procurement schedule, price, etc from various sources such as local agriculture extension workers, public announcement through loudspeaker, and on the radio. The public announcement is made before the harvesting season starts.

6.8.1.2 Sale-consumption Pattern of the Farmers

In terms of sale and consumption, the farmers', disposal pattern for two major crops — HYV *boro* and HYV *aman* in the study villages — is found similar in both the villages. According to the assessment by the non-poor farmers of both the study villages, the farmers usually sold and consumed HYV *boro* and HYV *aman* in 50:50 ratio nowadays (Data Box 6.8.1). Farmers used to consume a higher proportion of *aman* (75% in Sailgun and 60% in Dehergati) 10-12 years before. Regarding *boro,* farmers of Sailgun did not use to consume it before and the whole amount of the produce used to be sold. Farmers of Dehergati used to consume *boro* in the same proportion as they do it now. The population pressure resulting in increased food demand has been mentioned by the farmers to be the main cause of the relatively increased consumption of *boro* [as perceived to be of inferior quality] and relatively decreased consumption of *aman* [as perceived to be better quality] over time.

6.8.1.3 Seasonal Pattern of Boro Cultivation and its Price and Sale Behaviour

Harvest:

HYV *boro* is usually harvested in two months — *Baishakh* (from mid-April to mid-May) to *Jaistha* (from mid-May to mid-June). During these two months, most of the paddy was harvested — a larger proportion is, however, harvested in *Baishakh* in Dehergati and in *Jaistha* in Sailgun (Data Boxes 6.8.3 and 6.8.4).

Price Behaviour:

The price of HYV *boro* was found lower in the harvesting months and it progressively keept on rising thereafter through *Ashwin* (from mid-September to mid-October) in both the study villages when it reaches its seasonal peak (Data Boxes 6.8.3 and 6.8.4).

Procurement versus Market Price

The procurement price was found higher compared to the market price in harvesting seasons but it gradually turns lower relative to market price as the time passes (Table 6.8.1).

The Farmers' Sale Behaviour

The sale behaviour was found to vary across farmer groups in both the villages. The poor farmers tended to sell most of their produces in harvesting months or just in the following month when *boro* price was at the bottom during its marketing period. This trend remained unchanged over the years (Data Boxes 6.8.2 and 6.8.3). The poor farmers had poor retention capacity and they had to sell all of their produces at the lowest price to meet their urgent obligations during the harvesting months. As a result they could not gain out of the increasingly higher price in the later months.

The non-poor farmers, on the other hand, could stave selling off in the low-price harvesting months because of their better solvency. They gained the full extent of profit margin out of the sale at higher price later on.

6.8.1.4 Buyers of Agricultural Produces at Farmers' Level

The major buyers of agricultural produces in Sailgun include open market, *faria* (local part-time traders), and the public procurement centre regardless of whether the farmers are poor or non-poor (Data Box 6.8.4). The farmers of both the categories mostly sold their produces at the open market. *Farias* had been the minor category of buyers of the produces of both the groups of farmers. In terms of the type of buyers and volume of sales, sale pattern for both the farmer groups does not seem to have changed over time except that the erstwhile participation by the non-poor farmers, albeit to a limited extent, in the public procurement through the purchase centre turned into complete non-participation at this time. Open market was found popular to the farmers because it was more convenient and the farmers could sell their produces at their own will.

6.8.1.5 Advantages and Disadvantages of Selling Farmers' Produces to Various Buyers

i. **Open market and *faria*:** It is a common advantage in selling produces to the buyers at the open market, and *farias* is that farmers can sell produces any time they want (Data Box 6.8.5). The farmers have however an additional advantage of cash sale in the case of selling at the open market and its disadvantage is that farmers have to sell at a lower price. On the other hand, it is advantageous to the farmers in selling produces to *farias* any time, but its disadvantage is that farmers have to face some hassles for getting sale proceeds.

ii. **Purchase centre:** The single advantage that the farmers gain from selling at the purchase centre is its higher price over market price. However, the farmers encountered several problems while selling at the purchase centre and they are:

a. Ordinary farmers are denied the opportunity of selling at the purchase centre
b. Selling at the purchase centre involves a complex procedure
c. Farmers cannot sell produces when they want to
d. They have to sustain some financial loss owing to deception in weight

6.8.1.6 Gainers of the Programme

The farmers could not sell their produces at the purchase centre, rather sold at the open market (Table 6.8.1). They could not sell at the centre because of corrupt practices of the officials. The officials of the purchase centre were reluctant to buy from the farmers even though their produces were of higher quality. They bought from the traders/millers even their produces were not up to the mark. Farmers would have benefited from the program if they could have sold produces there in harvesting season when market price was lower.

6.8.1.7 Participatory Assessment of the Public Procurement System

The public procurement system was assessed by the non-poor groups of farmers of Sailgun in terms of the following ten criteria/indicators. All the criteria were recast in positive sense for the convenience of rating on the scale.

i. Channels used by the authority for disseminating information about procurement price is effective
ii. Procurement price is announced at an appropriate time so that farmers get enough time for taking decision
iii. Procurement price is profitable compared to the cash cost of production
iv. Procurement price is profitable compared to the total cost of procurement
v. Less hassle at the procurement centre
vi. Small farmers have unhindered opportunity to sell produces at the procurement centre
vii. Sale formalities are non-existent
viii. Distance is not a problem
ix. *Farias*/large farmers/elites have no influence
x. Procurement centre is free from corruption

The above indicators were rated by the farmers on 1-4 points rating scale with 1 for 'very unhappy', 2 for 'unhappy', 3 for 'happy', and 4 for 'very happy'. Farmers used a maximum of four dots to rate the indicators used. The assessment of the purchase centre at Kalai *Upazila* was conducted by the farmers against two reference time periods — 'now' and 'before SAP'. Based on their experiences about the purchase centre, the assessment of the public procurement system by the non-poor farmers show that out of 10 indicators, eight were rated very poorly and

the farmers expressed their very unhappiness about their current performance (Data Box 6.8.6). In terms of total score, the farmers, however, expressed their happiness about only two indicators, namely the profitability of procurement price over both cash cost of production, and the total cost of production, and the profitability remained unaffected over time. The overall performance of the procurement centre in the area was found not only very poor, rather it deteriorated over time. The total score of the purchase centre comes to 14 (out of 40) at present, as against 18 before. As far as the above indicators are concerned, farmers' assessment indicates that the performance of the purchase centre deteriorated from bad to worse over time.

6.8.2 At the LSD Level: A Quantitative Exposition of Selling at the Local Purchase Centre

The LSD at Kalai had been active in implementing the procurement programme of the government for a fairly long time. Both the millers/traders and farmers had been taking part in the programme. The purchase centre procures foodgrains — paddy and wheat. Paddy, both in husked and unhusked form, is procured. The data on the procurement activities of the centre were collected from the centre for the last 11 years ranging from 1988-1989 through 1998-1999. For the convenience of analysis, the entire period was phased into three sub-periods — three years-long pre-SAP period (from 1988-89 to 1990-91) and 8 years long post-SAP period with two sub-periods of 4 years each (from 1991-92 to 1998-99). The performance of the purchase centre is discussed below.

6.8.2.1 Participation by the Sellers Across the Farmers and Traders in the Procurement Programme improved over time

One important positive development was observed regarding the broad-based participation by the farmers in the procurement programme of the purchase centre. The participation by the farmers in the programmes was completely nil before 1991-92. The traders/millers had taken the complete advantage of the procurement programme before 1991-92. As evident from Table 9.2, on an average, 34 traders/millers sold their produces to purchase centre every year during the pre-SAP period (1988-89 to 1990-91). However, the purchase centre started buying foodgrains from the local farmers since 1991-92. In terms of number, the participation by the farmers in the procurement programme progressively increased during the post-SAP period from an average of 56 during the early nineties (1991-92 to 1994-95) to 762 during the late nineties (from 1995-96 to 1998-99).

Regarding the participation by the traders/millers in the programme, their participation had also been increasing progressively from an annual average of 34 during the pre-SAP period through 57 and 66 during the early and late nineties respectively.

Despite the above positive improvement in the participation by the sellers (farmers and traders/millers) in terms of number, the question as to whether this improvement represents qualitative change was still remains unaddressed.

6.8.2.2 The Scale of the Purchase was far Below the Pre-SAP Period

Overall, the average volume of purchase per year at the centre had been too dismal during the post-SAP period compared to that before (Table 6.8.2). On an annual average basis, the total volume of foodgrain purchased at the centre stood at 2,330 metric tons during the post-SAP period, as against 8,024 MT before. However, the trend of the purchase shows a progressively upward tendency during the post SAP period from a very low level of 1,451 MT per year during the early nineties to 3,208 MT per year in the late nineties.

6.8.2.3 Produces were bought more from the Traders/Millers than the Farmers

As has been mentioned already that the traders/millers had become the only beneficiaries of this programme in the pre-SAP period. Although the sale from the farmers had been on increase during the post-SAP period, the traders/millers were still selling more at the centre compared to that by the farmers. Overall, the centre purchased 75 percent of the total foodgrains from the traders/millers during the period between 1991-92 and 1998-99 (Table 6.8.2). The purchases from the farmers, however, increased from as low as 17 percent of the total foodgrains in the early nineties to 29 percent during the late nineties.

6.8.2.4 The Purchase from the Farmers Grew Faster than that from the Traders/Millers

Although still lower, the purchase from the farmers was rising faster during the post-SAP period in contrast to that from the traders/millers (Table 6.8.3). The purchase from the farmers grew by more than three fold compared too less than two fold from the traders during the nineties.

6.8.2.5 The Average Size of Purchase per Farmer was Not Only Lower but also Declining

Overall, the average size of purchase per farmer had been 1.4 MT compared to the average of 28 MT from the traders during the post-SAP period (Table 6.8.3). The average purchase from the traders/millers had also been higher (236 MT) before the SAP. Notwithstanding the lower average purchase from the farmers, it is more disquiet to note that it markedly declined from 4.3 MT during the early nineties to 1.23 MT later.

6.8.2.6 Irregular Purchase at the Centre

The purchase programme seems to have been implemented irregularly in various cropping seasons. As is evident from the table, the purchase centre did not procure from the farmers — two years for *boro* , virtually six years for *aman* and virtually three years for wheat, during the last eight years (Table 6.8.2).

6.8.3 Discussion

The hypotheses developed for the inquiry into the public domestic procurement are discussed below in the light of the evidences gathered from the field.

Hypothesis 1: It has ensured that the procurement prices have been announced prior to harvesting seasons and the messages reach them in right time

It was found that the key messages announced by the government regarding the price and procurement reached the farmers prior to the harvesting seasons through a variety of channels. The farmers were found adequately informed about the programme.

The hypothesis can therefore be accepted to be valid.

Hypothesis 2: It has ensured that the farmers have received procurement prices

As reported by the farmers, their participation in the procurement programme sharply declined to almost nil over time. The farmers' sale pattern of *boro* paddy indicates that the poor farmers usually sold their paddy at the open market and to *faria* in the harvesting months when the price was at the bottom and therefore sustained loss. They could not sell at the procurement centre due to procedural complexities and corruption. The farmers at large cannot avail themselves of the benefit of this programme.

The information collected from the LSD at Kalai *Upazila* show that farmers' participation had been increasing in terms of both the number of farmers and the total volume of their sale at the LSD over the years. But the foodgrains purchased per farmer markedly declined over time (from 4.3 to 1.2 m. tons). Traders and millers were the main beneficiaries of the programme and they sold more than two-thirds of the total foodgrains procured during the last 10-12 years, although their share had declined over time (from 83% in the early nineties to 71% in the late nineties).

As the evidences do not substantiate the hypothesis, it stands rejected.