

**Agriculture Sector Development Strategy: background paper for preparation of 7<sup>th</sup> Five Year Plan**

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## Acronyms

AWD	Alternate Wetting and Drying
BADC	Bangladesh Agricultural Development Corporation
BARC	Bangladesh Agricultural Research Council
BCCSAP	Bangladesh Climate Change Strategy and Adaptation Plan
BER	Bangladesh Economic Review
BFRI	Bangladesh Fisheries Research Institute
BIHS	Bangladesh Integrated Household Survey
BINA	Bangladesh Institute of Nuclear Agriculture
BLRI	Bangladesh Livestock Research Institute
BRRI	Bangladesh Rice Research Institute
CDMP	Comprehensive Disaster Management Programme
CIP	Country Investment Plan
CPWF	Challenge Program on Water and Food
DAE	Department of Agricultural Extension
DAM	Department of Agricultural Marketing
DAP	Diammonium Phosphate
DLS	Department of Livestock Services
DoF	Department of Fisheries
FPMU	Food Planning Monitoring Unit
FYP	Five Year Plan
GAP	Good Agricultural Practices
GDP	Gross Domestic Product
GED	General Economics Division
GoB	Government of Bangladesh
HIES	Household Income Expenditure Survey
HIV/AIDS	Acquired Immune Deficiency Syndrome
HORTEX	Horticulture Export Development Foundation
HYV	High Yielding Variety
ICT	Information and Communications Technology
IPM	Integrated Pest Management
IRRI	International Rice Research Institute
KGF	Krishi Gobeshona Foundation
MDG	Millennium Development Goal
MoA	Ministry of Agriculture
MoP	Muriate of Potash
MT	Metric Tonne
NAEP	New Agricultural Extension Policy
NAP	National Agriculture Policy
NAPA	National Adaptation Programme of Action
NARS	National Agricultural Research System
NATP	National Agricultural Technology Project
NFP	National Food Policy
NFP PoA	National Food Policy Plan of Action
NGO	Non-Government Organization
NSDS	National Sustainable Development Strategy

OMS	Open Market Sale
PPR	Peste Des Petits Ruminants
RMG	Ready-Made Garments
SAAO	Sub-Assistant Agriculture Officer
SDGs	SAARC Development Goals
SFYP	Sixth Five Year Plan
SPGR	Sponsored Public Goods Research
SPS	Sanitary and Phyto-sanitary Standards
TFP	Total Factor Productivity
TK	Taka
TSP	Triple Super Phosphate
UGC	Urea-Gelation/Co-Precipitation
VDG	Vulnerable Group Development
VGf	Vulnerable Group Feeding
WHO	World Health Organization
WUE	Water Use Efficiency

# Chapter 1

## Introduction

Although Bangladesh is on course for Middle Income Country status by 2021, agriculture remains the largest employer in the country by far; and 47.5% of the population is directly employed in agriculture and around 70% depends on agriculture in one form or another for their livelihood. Agriculture is the source of food for people through crops, livestock, fisheries; the source of raw materials for industry, of timber for construction; and a generator of foreign exchange for the country through the export of agricultural commodities, whether raw or processed. It is the motor of the development of the agro-industrial sector including food processing, input production and marketing, and related services. As main source of economic linkages in rural areas, it plays a fundamental role in reducing poverty, which remains a predominantly rural phenomenon. The role of agriculture is also fundamental in promoting nutritious diets, especially in the countryside where production and consumption patterns are closely linked. According to the HIES (2010) 35.2% and 21.1% of the population in rural areas lives below upper and lower poverty line respectively. It also plays a fundamental role in the sustainable valorization and preservation of natural resources and in preserving and promoting the resilience to natural calamities and climate change of rural communities and agro ecological systems. However, as Bangladesh develops, and other sectors grow (such as readymade garments), the share of agriculture in Gross Domestic Product (GDP) has naturally declined. During the fiscal year 2012-13, the broad agriculture sector<sup>1</sup> contributed 16.77% to the total GDP. The contributions of crop, fishery, livestock and forestry subsectors in GDP were 9.49%, 3.68%, 1.84% and 1.76% respectively. The provisional estimates show that contribution of the broad agriculture sector to GDP in 2013-14 would be 16.33% (BER 2014). Nearly three fifth of the agricultural GDP comes from the crop sub-sector; the other contributors in order of magnitude are fishery, livestock and forestry.

## Performance of Bangladesh Agriculture

Following independence in 1971, agricultural production in Bangladesh increased at around the rate of 2% per year. The growth rate accelerated during the 1990s and early 2000s to around 4% per year. The Sixth Five Year Plan sought to build on the success of such rapid agricultural growth, targeting average growth of 4.5 % during the plan period (6<sup>th</sup> FYP Mid-Term Report, 2014), and a remarkable 5.1% growth was achieved in 2010-11. However, this momentum could not be sustained subsequently and the growth rate fell sharply in 2011-12 to 2.7%, and weakened further to only 2.2% in 2012-13. The drop in performance was largely due to slower growth of the crop sub-sector. One simple explanation may be that most of the easily accessible productivity gains have already been captured, so that future growth in

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<sup>1</sup> The broad agriculture sector includes crop (including horticulture), livestock, fishery and forestry subsectors.

productivity requires new major breakthrough in the technological front. This is especially the case for the intensification of traditional crops, while important GDP gains can and should be obtained by promoting increasing diversification of crop and non-crop agricultural production toward higher value and more nutritious foods.

It is worth noting that livestock did better than the crop sector but equally could not sustain the momentum it had gained during 2005-2010. This is an area in which special efforts should be made to ensure that public services (veterinary, extension, insemination, etc.) are developed to the level required to realize the full potential of the sector. In 2012-13, fisheries alone managed to perform in line with targets, with a GDP growth rate (6.2%) at a time when the subsector has been marked by a radical structural transformation with the spread of organized and commercially-oriented aquaculture.

For achieving the goals of MDG and post MDG, and turning Bangladesh into a middle income country by 2021, the GDP has to grow at a minimum rate of 7% per year. To attain this GDP growth rate and to keep pace with the population growth, agriculture should grow at a constant rate of 4-4.5% per year. There will be serious gap between demand and supply from domestic source if the current rate of productivity and production is not augmented.

Improvement in agricultural productivity is a precondition for sustainable development, as productivity gains would allow resources such as labour to be diverted to expand the non-agricultural sectors, including agro-food industry. Total factor productivity (TFP) indices capture the effect of improvements in technology as well as investments in rural infrastructures. Empirical evidence showed that TFP of Bangladesh crop agriculture grew at an annual rate of 0.57% over the long past years from 1948 to 2008 (Rahman and Salim 2013).<sup>2</sup>

Regarding the drivers of TFP growth, Rahman and Salim (2013) found that farm size, crop specialization, investment in research and extension positively influenced TFP growth, whereas literacy rate influenced TFP growth negatively, reflecting exodus of educated people from agriculture. Their policy implications included encouraging investment in research and extension, increasing average farm size and promoting crop diversification.

## **Key Challenges**

The major challenges for Bangladesh agriculture are to: raise productivity and profitability, increase diversification of production in line with consumption diversification to promote nutrition and minimize trade imbalances, reduce instability of production, increase resource use efficiency, reduce loss of arable land, minimize yield gap, maintain food safety and quality, expand irrigation and farm mechanization and develop resilience to climate change impacts.

As Bangladesh develops, structure of demand for food exhibits changes. The successive HIES

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<sup>2</sup> This estimate of growth was higher than the estimate of 0.32% (Pray and Ahmed 1991), but lower than the estimate of 0.90% (Rahman 2007).

Reports show that considerable consumption diversification has taken place, with lesser per capita consumption of rice and increased consumption of high value food items such as meat, fish, milk and edible oil (HIES 2005 and 2010). However, macro level indicator shows that there has been negligible change in the share of rice value added in the total food value added (a change from 41.9% in 2011-12 to 41.1% in 2012-13), reflecting slower pace of production diversification (FPMU 2014).

One of the causes of relatively poor performance of agriculture is the relatively poor rate of take up of new technologies. Public services such as research, education and extension are important to bring improvement in this area, obviously supported by the private sector input supply (seed, fertilizer, credit, etc). The challenge is to establish effective linkages between these public services and farmers who have to play a major role in testing and adapting technologies based on their local knowledge.

Another challenge is to sustain and further develop the capacity of agriculture to effectively respond to market signals – to ensure that what is grown can be sold at remunerative prices, both to maximize rural income generating opportunities and optimize the use of limited natural resources. The small and marginal farmers need to be supported in producing diversified crop suitable for both markets and household consumption to improve their nutritional status. They also need to be supported in selling their products at remunerative prices by developing linkages with domestic and international markets. Strengthening the institutional capacity to address the complex production and marketing constraints with advanced knowledge and technological know-how will be an important task in the 7<sup>th</sup> Five Year Plan.

Sustaining agricultural production and developing resilience to climate change is a formidable challenge. The Comprehensive Disaster Management Programme (CDMP) and other analyses done at the Climate Change Cell of the Department of Environment suggest that 10-15% land of the country will be inundated due to sea level rise of 45 cm by 2050. Effective implementation of the Bangladesh Climate Change Strategy and Adaptation Plan (BCCSAP) 2009 will have to be a priority issue.

The purpose of this paper is to (i) make an objective assessment of the nature of performance of the agriculture sector during the 6<sup>th</sup> Plan period, (ii) identify the factors contributing to the nature of performance, (iii) identify the opportunities and challenges for the future, especially for the 7<sup>th</sup> Plan period and (iv) propose policies and strategies to address the challenges and opportunities.



## Chapter 2

### Review of the 6<sup>th</sup> Five Year Plan: Achievement of Objectives and Targets

The 6<sup>th</sup> Five Year Plan identified many important national issues, but all of those could not be addressed within the timescale of the Plan. Although there are significant achievements in terms of attaining rice self-sufficiency, as well as expansion of aquaculture and vegetables with reasonable levels of commercialization in farming practices, progress in other programmes have been less than targeted, or at best mixed.

The mid-term implementation review of the 6<sup>th</sup> FYP summarized the broad objectives related to the agriculture sector as follows (GED 2014):

- Achieve an average of 4.5% real growth in agricultural sector over the 6<sup>th</sup> FYP period;
- Raise farm productivity and real income of farm families in rural areas on a sustainable basis;
- Attain self-sufficiency in foodgrain production along with crop diversification within cereal as well as toward horticultural crops;
- Expand application of technology and mechanized cultivation;
- Ensure sustained agricultural growth through more efficient and balanced utilization of land, water and other resources;
- Encourage research in adaptation to change and proper use of genetically modified technology in agriculture; and
- Promote non-crop agricultural activities related to forestry, livestock and fisheries.

#### Achievement of Objectives and Targets

Table A1 (in the annex) presents a detailed list of objectives/targets with respect to crop and non-crop sectors with their status of achievements during the 6<sup>th</sup> FYP period. For most of the objectives the targets were partially achieved and for some those were not achieved. As for achieving self-sufficiency, available data suggest that Bangladesh has achieved self-sufficiency in rice production in years of normal climatic environment. Progress in diversification has been slow and has at best been achieved in selected project areas. Limited progress has been made on the land reform agenda. Some progress has been made in research, but yield gap still remains a matter of major concern.

Attempt has been made in this section to examine the results-based monitoring of progress with respect to selected indicators corresponding to the objectives under the 6<sup>th</sup> FYP. In this context, the paper has drawn heavily from the successive National Food Policy Plan of Action (NFP PoA) and the Country Investment Plan (CIP) Monitoring Reports prepared at Food Planning Monitoring Unit (FPMU), Ministry of Food. The results achieved with respect to the indicators

over the past five years are presented in Tables 2.1 through 2.7 as detailed below.

The results presented in Table 2.1 represent progress with respect to growth in agricultural GDP and the status of self-sufficiency in rice production. The growth rate of agricultural GDP was 5.24% in 2009-10. Since then it started declining and remained well below the 6<sup>th</sup> FYP target of 4.5%. During the fiscal year 2013-14, the declining trend in agricultural GDP growth rate for consecutive previous three years was reversed; but still it remained lower than that of the beginning of the plan period and the average target rate set for the plan period. The mid-term implementation review of the 6<sup>th</sup> FYP observed this to be the outcome of the structural weakness in the agricultural sector, particularly weakness in crop sector.

The non-crop agricultural sectors performed better than the crop sector during the 6<sup>th</sup> FYP period. The provisional estimates using 2005-06 base year showed that in 2013-14 growth rate for fisheries, forestry, livestock and crop subsectors were 6.19%, 5.05%, 2.83% and 1.91% respectively. The crop sector's poor performance compared to other sub-sectors, suggest changing pattern in composition of agricultural GDP and diversification from crop (particularly rice) based agriculture. The sharp decline in rice import dependency from 3.31% in 2009-10 to only 0.94% in 2013-14 indicate that the country is in line with the policy of attaining self-sufficiency in rice production (Table 2.1). In 2012-13, only 0.1% of total rice availability (net production plus import) was imported, compared to 1.66% in 2011/12 (FPMU 2013 and 2014). The decreasing trend in the share of rice value added in total food value added since 2011-12 (though marginal), is another indication of positive trend in diversification (Table 2.1).

**Table 2.1: Selected performance indicators related to agricultural growth and rice production**

SFYP output proxy indicators	2009-10	2010-11	2011-12	2012-13	2013-14
Rate of growth in agricultural GDP in constant prices 2005-06	5.24%	4.34%	2.69%	2.17%	3.15%
Rice import dependency (3-year moving average)*	3.31%	2.53%	2.37%	2.29%	0.94%
Share of rice value added in total food value added in current price	42.17%	42.57%	41.86%	41.05%	na
Share of rice in total cropped land	78.5%	77.0%	76.5%	76.0%	na
HYV rice area as % total rice area (including <i>boro</i> hybrid)	79.4%	81.5%	82.4%	82.8%	78.4%

Note: \*Imports/ (net production+ imports – exports)

Source: FPMU 2013, 2014 and 2015

The mid-term implementation review of the 6<sup>th</sup> FYP observed that the agriculture sector's export performance also weakened sharply, except for tea. In FY 13, the sector contributed 4.9% of total exports, compared to 7% in FY 10. The contribution of agriculture sector sharply declined due to rising contribution of Ready-Made Garments (RMG) and other sectors.

Between 2007-08 and 2012-13 period, area under wheat, maize, oilseeds spices, potato and vegetables increased, though area under sugarcane and fruits decreased. In 2012-13, share of rice area in total cropped area dropped. In FY 13, the share of rice in total agricultural value year-on-year basis also decreased by 0.8% points, while shares of fisheries and livestock sectors rose by 0.7% and 0.2% points respectively. However, the pace of diversification was quite slow compared to that in other countries like India, Pakistan, South Korea etc. (Mid-term Review of the 6<sup>th</sup> FYP). The declining trend in area under rice is an indication of increasing crop diversification. In 2009-10, the share of rice area in total cropped area was 78.5% which declined to 76.0% in 2012-13 (Table 2.1). The share of High Yielding Variety (HYV) rice area in total rice area, after remaining at around 82% during the preceding three years, dropped to 78% in 2013-14 which may be a matter of concern for raising productivity and production of rice over the coming years.

**Table 2.2: Annual change in major crop production and change in crop yields (3 year moving average)**

Crops	2009-10		2010-11		2011-12		2012-13		2013-14	
	Production change (%)	Yield change (%)	Production change (%)	Yield change (%)	Production change (%)	Yield change (%)	Production change (%)	Yield change (%)	Production change (%)	Yield change (%)
Rice	2.1	3.8	4.9	2.1	1.0	3.0	-0.2	1.7	1.6	2.3
Wheat	6.1	9.6	7.9	6.3	2.4	5.1	26.1	7.7	3.8	6.3
Maize	21.6	-0.7	14.8	0.9	27.5	5.0	14.4	4.3	4.1	4.4
Potato	50.5	9.3	5.0	5.5	-1.5	1.8	4.8	2.0	4.0	3.3
Pulses	12.5	3.7	3.9	0.5	4.7	3.6	10.7	0.6	-40.7	9.8
Brinjal	1.1	0.8	-0.4	1.0	3.9	2.2	4.8	3.7	20.7	10.4
Edible oilseeds*	11.9	2.3	5.2	1.4	2.7	4.0	5.4	0.7	16.1	3.5
Mango	1.7	0.0	5.5	8.9	6.3	4.5	1.3	6.3	3.7	-2.9
Banana	-2.1	-3.9	-2.1	-2.7	-6.8	-3.7	3.8	1.9	-0.5	4.2
Jackfruit	3.1	2.3	-4.4	-2.1	-3.6	-1.6	3.0	1.1	5.0	7.9

Note: \* Includes til, rape & mustard, groundnut and soya bean

Source: FPMU 2013, 2014 and 2015

A picture of annual change in productivity and production of rice and other crops (3 year moving average) is presented in Table 2.2. Production of all the crops except pulses and banana increased. Following marginal decrease in 2012-13, rice production increased by 1.6% in 2013-14. Sharp increasing trend in production is observed for brinjal and edible oilseeds. Except banana and jackfruit, all the crops maintained almost steady increasing trend in production since

2009-10. Change in rice yield was positive even in the year 2012-13, when the production decreased marginally. The trend in changing yield pattern can be taken as an indication of yield gap minimization for rice and other crops also.

The 6<sup>th</sup> FYP prioritized the importance of research and extension for agricultural intensification, diversification and resilience to climate change. Since 2009-10, the Government of Bangladesh (GoB) agencies developed 23 new rice varieties (Table 2.3). Of these, some important ones are: saline tolerant rice variety BRRI Dhan 61, the world's first zinc-enriched rice variety BRRI dhan 62, submergence tolerant BINA Dhan-11 and 12, water logging resistant BINA Dhan-14, BINA Dhan-13, three new stress tolerant rice varieties (BRRI Dhan 55, 56 and 57) and one short duration (BRRI Dhan 58) rice variety. The released varieties are expected to address adverse climatic conditions, particularly in the south and northern regions of the country. For non-rice crops, 5 new varieties were developed for vegetables, while no new varieties were released for maize and potato in 2013-14 (Table 2.3).

**Table 2.3: Technological innovations in varietal development and irrigation coverage**

SFYP output proxy indicators		2009-10	2010-11	2011-12	2012-13	2013-14
No. of improved new rice varieties developed by GoB agencies		5	2	5	3	8
No. of new non-rice varieties developed	Wheat	2	0	2	1	2
	Maize	0	0	0	1	0
	Potato	2	2	11	13	na
	Pulses	1	5	0	4	2
	Vegetables	3	11	7	5	5
	Edible oilseeds*	1	7	0	4	4
	Fruits	10	4	3	4	2
% of cropped area under irrigation		45.3%	45.8%	46.8%	47.4%	na
Surface water irrigation area as % of total irrigation area		22.0%	21.3%	21.3%	20.9%	21%
No. of farmers trained on sustainable agriculture practices by DAE (lakh)		13.34	12.78	12.77	12.83	na

Source: FPMU 2013, 2014 and 2015

The 6<sup>th</sup> FYP emphasized the importance of increasing irrigated area, particularly for the southern region. Special importance was attached to reduce dependency on ground water by expanding area under surface water irrigation. The share of cropped area under irrigation increased since 2009-10, though the growth rate in 2012-13 was lower than that of 2011-12. Share of surface water irrigation area in total irrigated area decreased marginally in 2010-11 and remained at around 21% during the past four years, indicating that despite policy commitment it has not been possible to reduce dependency on ground water irrigation.

Training is an inseparable part of technology transfer process. Farmers' training is crucial for

better research-extension linkage and minimization of yield gap. The number of farmers trained by Department of Agricultural Extension (DAE) increased slightly in 2012-13 to 12.83 lakh compared to 12.78 lakh in 2011-12. The highest number of farmers receiving training from DAE was 13.34 lakh in the year 2009-10 (Table 2.3).

**Table 2.4: Improved seed supply (BADC, DAE and private companies) as % agronomic requirements**

Crop	2009-10	2010-11	2011-12	2012-13	2013-14
Rice	44.5%	57.9%	58.8%	52.4%	33%
Wheat	67.0%	55.1%	71.5%	56.5%	55%
Maize	84.2%	100.0%	95.9%	74.4%	28%
Potato	3.3%	4.2%	11.8%	9.5%	6%
Pulses	2.8%	4.7%	11.8%	14.8%	8%
Vegetables	32.1%	32.7%	19.8%	20.3%	76%
Edible oilseeds*	4.4%	8.1%	11.5%	13.6%	5%

Note: \* Includes til, rape & mustard, groundnut and soya bean

Source: FPMU 2013, 2014 and 2015

Ensuring supply of quality seeds and controlling marketing of adulterated seeds was stressed in the 6<sup>th</sup> FYP. The supply of improved seeds from Bangladesh Agricultural Development Corporation (BADC), DAE and private companies continued decreasing for the consecutive two fiscal years for all the crops except vegetables (Table 2.4).

**Table 2.5: Use and availability of different agricultural inputs**

SFYP output proxy indicators	2009-10	2010-11	2011-12	2012-13	2013-14	
Use of urea (000 MT)	2409	2652	2296	2247	na	
Use of TSP (000 MT)	420	564	678	654	na	
Use of MoP (000 MT)	263	482	613	571	na	
Subsidies (billion taka)						
Urea	19.79 (-53.7%)	25.71 (29.9%)	23.28 (-9.5%)	48.24 (107.2%)	na	
Non Urea	20.99 (162.0%)	29.71 (41.5%)	46.24 (55.6%)	71.00 (53.5%)	na	
Total	40.78 (-19.6%)	55.42 (35.9%)	69.52 (25.4%)	119.0 (71.2%)	na	
Agricultural credit disbursement	billion taka	111.17	212.84	131.32	146.67	160.37
	% of target	97%	97%	95%	104%	110%

Source: FPMU 2013, 2014 and 2015 & BER (2014)

Note: Figures in parentheses indicate change from previous fiscal year

As part of government policy to promote balanced use of different fertilizers by reducing use of urea and increasing use of non-urea fertilizers, the Government drastically reduced prices of non-

urea fertilizers (TSP, MoP and DAP) while the price of urea was raised since 2008-09. The price of urea reached 16 tk/kg in 2013-14, from 6 tk/kg in 2008-09. For non-urea fertilizers prices in 2013-14 was at least one-fifth of the price in 2009-10. Compared to 2009-10, subsidy on urea and non-urea in 2012-13 was raised by nearly 2.44 and 3.38 times respectively. The process of rebalancing subsidy among different fertilizers started since 2007-08. The share of the subsidy to urea reduced from 89% in 2007-08 to 40% in 2012-13 (FPMU 2014). In line with the Government policy, urea use decreased while TSP and MoP use increased, though use in 2012-13 was marginally lower than that in 2011-12 (Table 2.5).

During the plan period, agricultural credit disbursement steadily increased. During the last two fiscal years, disbursement was more than target whereas in other years it was almost close to the targets (Table 2.5). Recovery of agricultural credit increased by 16% to 143.62 billion taka in 2012/13 from 123.6 billion taka in 2011/12 (Bangladesh Bank 2013).

**Table 2.6: Development in the fisheries subsectors towards achieving 6<sup>th</sup> FYP targets**

SFYP output proxy indicators		2009-10	2010-11	2011-12	2012-13	2013-14
GDP from fishery sector as % of agricultural GDP (excluding forest, at constant price 2005-06)		22.50%	24.18	23.60%	24.53%	25.3%
Annual change in quantity of fish production		7.33%	5.66%	6.50%	4.54% (P)	na
Annual change of fingerling production (finfish)		2.4%	na	21.7%	-9.7% (P)	na
Number of new fish varieties developed		3 (2008/09)	0	0	0	na
Fishery exports	as % of total exports	2.7%	na	2.5%	2.0%	na
	of which shrimp share, %	66%	na	57%	84%	na

Source: FPMU 2013, 2014 and 2015 & BER (2014)

Among all the agricultural sub-sectors, the fisheries sub-sector performed better than others. Share of fisheries in agricultural GDP rose for the consecutive three years. During the period fish production increased at a decreasing rate except in 2011-12. But fingerling production decreased by 9.7% in 2012-13 after sharp increase of 21.7% in 2011-12. Since 2009-10, no new fish varieties were developed by Bangladesh Fisheries Research Institute (BFRI). During 2012-13, the World Fish Center in collaboration with the Challenge Program on Water and Food (CPWF) developed one saline tolerant *Tengra* fish species (FPMU 2014). The share of fisheries in total export showed a declining trend during the 6<sup>th</sup> FYP period. From about 2.7% in 2009/10 share of fisheries export to total export decreased to 2.0% in 2012/13. Share of shrimp in total fisheries export however, rose to 84% in 2012-13 from 57% in 2011-12 (Table 2.6).

The 6<sup>th</sup> FYP focused on improving poultry and dairy sectors for sustainable improvements in production of milk, meat and egg including processing and value addition. Private sector participation and investments in livestock production, livestock services, development and export of livestock products and by-products are necessary in this regard. Livestock's share in agricultural GDP is gradually increasing since 2011-12. The rate of increase in 2013-14 (1.78%) was much higher than that in 2012-13 (0.1%). Production of egg, milk and meat also increased. Annual change in artificial insemination was substantially higher in 2009-10, though the rate decreased in 2012-13 by about 2.7% points compared to 2011/12, indicating moderate deceleration in the growth rate. Death in poultry due to avian influenza (HPAI) reduced significantly. The outbreak of the disease was a major concern in the poultry sector, particularly in years between 2007-08 and 2010-11. The situation has significantly improved since 2011-12 (Table 2.7).

**Table 2.7: Development in the livestock subsectors towards achieving 6<sup>th</sup> FYP targets**

SFYP output proxy indicators		2009-10	2010-11	2011-12	2012-13	2013-14
GDP from livestock sector as % of agricultural GDP (excluding forest, at constant price 2005-06)		12.4%	14.1%	12.2%	12.3%	14.08%
Total production of	Egg (millions)	5,742.4	6078.5	7,304	7,617	10168
	Milk (millions MT)	2.37	2.97	3.47	5.07	6.9
	Meat (million MT)	1.26	1.99	2.33	3.62	4.52
Annual change in artificial insemination		15.25%	7.67%	10.11%	7.40%	na
Annual change in number of poultry deaths due to avian flu		274%	231%	-75.4%	-95.1%	na

Source: FPMU 2013, 2014 and 2015 & BER (2014)

It may be pertinent here to review the pattern of public investment in agriculture over the past five years falling within the implementation period of the 6<sup>th</sup> FYP. Table 2.8 shows a picture of national budget allocation to the broad agriculture sector, disaggregated by the relevant subsectors. In absolute term, allocation to broad agriculture increased substantially from 2010-11 to 2012-13. Allocation decreased substantially from 2012-13 to 2013-14. In the provisional budget allocation for FY 2014-15, allocations increased marginally from the preceding fiscal year, but still fell short of allocations in the FY 2012-13. Although allocation of development budget for the Ministry of Agriculture increased marginally over the successive years from 2011-12 to 2014-15, it virtually decreased for the Ministry of Fisheries and Livestock.

Allocation to agriculture as percent of national budget reveals even a worse picture. Table 2.8 shows that while allocation for broad agriculture (including forestry) as percent of national budget increased from 8.8% in 2010-11 to 10.65% in 2012-13, it decreased significantly to 7.2% in 2013-14. In the provisional budget for 2014-15, it decreased further to 6.2%. Since agriculture

still contributes largely to the national economy and provides employment for a large section of rural population, increased share of agriculture in the public expenditure deserves special consideration.

**Table 2.8: Public expenditure pattern for agriculture sector (Amount in Crore Taka)**

Ministry	2014-15 (Proposed)	2013-14	2012-13	2011-12	2010-11
Agriculture (Total)	12390 (5.23)	12279 (6.23)	14822 (9.52)	9760 (7.19)	8438 (7.17)
Development	1524	1332	1111	997	1025
Fishery & Animal Resources (Total)	1344 (0.57)	1066 (0.54)	901 (0.58)	933 (0.69)	774 (0.66)
Development	402	460	363	411	280
<b>Agriculture without Forestry (Total)</b>	<b>13734 (5.79)</b>	<b>13345 (6.77)</b>	<b>15723 (10.10)</b>	<b>10693 (7.88)</b>	<b>9212 (7.83)</b>
Development	1926	1792	1474	1408	1305
Environment & Forest (Total)	911 (0.38)	878 (0.45)	862 (0.55)	1235 (0.91)	1116 (0.95)
Development	413	387	221	278	171
<b>Agriculture with Forestry (Total)</b>	<b>14645 (6.18)</b>	<b>14223 (7.22)</b>	<b>16585 (10.65)</b>	<b>11928 (8.79)</b>	<b>10328 (8.77)</b>
Development	2339	2179	1695	1686	1476

Note: Figures in parentheses are percentage of total development & non-development expenditure.

## Overall Outcome of Agriculture under the 6th FYP and Review of Strategies

### Overall outcome

The overall performance of the agriculture sector during the 6<sup>th</sup> FYP reveals that the growth of agricultural GDP fell short of targets set in the Plan. After showing a remarkable achievement (5.24%) in 2009-10, the growth rate decelerated to reach 2.17% in 2012-13. The provisional estimate for 2013-14 however showed some improvement (3.15%). The slower growth of agricultural GDP was due to less than expected performance of the crop sub-sector, though fishery and forestry sub-sectors performed better. The most important achievement in the crop sub-sector during the 6<sup>th</sup> Plan period was reaching the level of self-sufficiency in rice production. Overall, production and yield of most of major crops maintained positive changes. A good number of new rice varieties have been developed, but none have so far proved to be promising enough to replace BRRI Dhan 28 and 29 in terms of farm level yield and adoption rate. Also, for most of the adopted crop varieties, high yield gap remains a matter of major concern. Success in genetic improvement for other non-rice crops, or for fisheries and livestock, is also not encouraging.



Some increase has been observed in diversification, as indicated by the small downward trend in the share of rice value added in total food value added. The shares of fishery and livestock sectors in the agricultural GDP also increased during the 6<sup>th</sup> Plan period. However, the rate of overall diversification is less than satisfactory, particularly when compared with other neighboring countries. Export performance of different agricultural products during the Plan period was not satisfactory, except for tea.

Concerns remain with farm level use of quality seeds. Share of improved seed from institutional sources (BADC, DAE and private companies) in the total seed requirement has decreased for most of the crops except vegetables. Area under irrigation increased, but the share of surface water irrigated area in total irrigated area did not increase over the past years, which is likely to impair sustainability of water use for irrigation. The ground water table declined from 3.7 meters in 1981 to 6 meters in 2013 in the northern districts. This situation may aggravate further if water level in the rivers servicing northern districts is not maintained at higher level than at present.

The Government policy of rebalancing fertilizer subsidy for encouraging balanced use of different chemical fertilizers has shown some success as indicated by more use of non-urea fertilizers after rebalancing of fertilizer subsidy. Success has also been observed in agricultural credit distribution which has shown fairly increasing trend over the 6<sup>th</sup> Plan period.

## **Review of strategies**

In reviewing the achievements of the targets of the 6<sup>th</sup> FYP, the strategies formulated seem to have been highly relevant, but some were inadequately explained or promoted, and achievement was limited. Some were not well understood within the implementing agencies. The strategies for adoption of technologies were not fully developed by the research institutes, nor were these fully considered by extension agencies. The strategies in the plan are quite brief and indicative.

One tool for managing investment across the whole diverse food production system in Bangladesh during the period of the 6<sup>th</sup> FYP has been the Country Investment Plan (CIP). The CIP provides a strategic and coherent set of twelve investment programmes to improve food and nutrition security in an integrated way, coinciding with the term of the 6<sup>th</sup> FYP. These are based on the three pillars of food security: (i) adequate and stable supply of safe and nutritious food, (ii) increased purchasing power of people and (iii) adequate nutrition for all individuals.

Adequate and stable supply can be ensured if production is sufficient, and supply chains operate effectively and efficiently. The latter in particular cannot be taken for granted in some parts of Bangladesh and/or all year round. People living in the hilly/forest/haor areas neither have easy access to technology to produce in unfavourable ecosystems, nor do they always

have good communication and transport infrastructure to be able to obtain supply of food from elsewhere.

The declining share of agriculture in the public expenditure in the face of deceleration of the agricultural GDP growth remains a matter of major concern. Allocation of public expenditure to agriculture needs to be enhanced, particularly for strengthening research and extension in all the subsectors of agriculture.

With regard to cropping in the northern regions, strategies could be: (a) promoting Alternate Wetting and Drying (AWD) method of irrigation backed by appropriate irrigation pricing strategies, (b) covering the districts with buried pipe to reduce water conveyance loss, (c) exploring the possibility of Managed Aquifer Recharge and taking up programmes to raise ground water level, (d) providing incentives to grow high value crops and also crops that require less water, and (e) encouraging use of conservation agriculture and similar forms of crop management that increase crop water productivity for both Boro and Rabi crops when effectively managed.

Southern districts have plenty of surface water, although one million hectares of land is affected by seasonal or permanent salinity. De-silting and deepening of existing canals together with use of energy efficient pumping system (e.g. axial flow pumps) can increase opportunities. Since these districts are vulnerable to cyclone, the risk of crop failure is high. From that perspective, northern districts are relatively safe and production in these districts could be seen as a form of national 'safety net'. However, water resources are less plentiful in the north, and suitability considerations would suggest that crops other than rice should ideally be grown. Increased efforts to de-risk farmers' investment in surface water irrigation and intensification are urgently needed in the South.

Irrigation and watershed management in the hilly areas, through constructing small dams over rivulets, can ensure irrigation to non-rice crop in higher altitudes, and fish and duck production in artificially-made small lakes year round. In drought-prone and char areas, seepage loss can be minimized if polythene pipes are encouraged for wider use. Polythene pipes are not new interventions, but should be popularized for large scale use to ensure Water Use Efficiency (WUE) in terms of reducing conveyance loss.

Coping with flood and river erosion is another issue. Flood on a large scale cannot be controlled, rather 'normal' flooding is a part of life in Bangladesh. There is therefore a need to develop technology and strategies to live with it. Bangladesh Rice Research Institute (BRRI) has developed submergence tolerant rice varieties which can withstand 10-15 days submergence, and up to three episodes of submergence. Inundation of homesteads leads to loss of seeds. In addition to immediate rehabilitation, farmers can be helped to preserve seeds even under inundation, whether through household silos (as in the southern coastal zone through the current Modern Food Storage Programme), or through approaches such as International Rice Research Institute's (IRRI) so called "super bag" with specially designed multiple layered polythene sheets.

Drainage remains a sensitive topic especially in certain parts of the country such as the south west. Drainage problem arises from silting up of the river system and also from man-made deliberate conversion of land for shrimp and fish farming by influential local individuals. Maintenance of drainage ditches may also be lacking. Coordination is urgently needed, as this is becoming a regular problem. New institutional arrangements may need to be found to get the necessary collaboration.

In addition to the drainage problems, salinity is a serious problem in many areas of the south and it is anticipated that the problem will be aggravated by sea level rise and reduced water flow through major rivers during dry months. Preserving rain water through community approach could be used for drinking and irrigation to various crops. In such cases, participation of local people, local leaders and government department will be needed.

With regard to access to food through purchasing power, there is a need for opportunities for income generation if food security and nutrition for “all” is to be ensured. A key priority should therefore be to identify income generating activities for rural people living in both plain land and disadvantaged ecosystems. Strengthening social provision of food through different safety net programmes will have to be a matter for major attention. However, in designing safety net programmes, special attention needs to be given to productive safety nets so that peoples’ economic empowerment can be strengthened.

With regard to nutrition, although diets are changing in Bangladesh, 60-70% of dietary energy supply comes from carbohydrates, and the average diet is generally not diverse. Production and consumption levels of eggs, milk, fish and meat remain well below the World Health Organization (WHO) recommended daily intake levels, while fruit and vegetable consumption may have stalled in response to public concern over food safety which has seriously aggravated over the recent past years. Residues of agrochemicals, due to their inappropriate use, are frequently found in surveys and testing campaigns; these apply particularly to fruits and vegetables. Cases have also been seen of toxic residues of insecticides in dried fish. Bacterial contamination is also a problem due to poor food handling practices. Proper washing/peeling is an essential prerequisite for food safety. Other forms of post-harvest handling such as new forms of packaging, or the use of safe preservatives - are also the basic requirements.

## Chapter 3

# Review of Policies related to Development of the Agriculture Sector

### Review of Policies

Development of the agriculture sector is generally governed by a number of related national policies. National Agriculture Policy (NAP) 2013 is obviously the key guiding document for implementation of development agenda for the sector. The other related policy documents are New Agricultural Extension Policy (NAEP) 1996, National Food Policy (NFP) 2006, National Fisheries Policy 1996, National Livestock Policy 2007, National Water Policy 1999, National Forestry Policy 1994, National Integrated Pest Management Policy 2002, National Poultry Development Policy 2008 and the overarching National Sustainable Development Strategy (NSDS) 2013.

The prime objective formulated by the **National Agriculture Policy (NAP 2013)** was to ensure food and nutrition security for all and to improve the quality of life of the rural people through increased productivity and agricultural diversification. In mentioning specific objectives, the document emphasized sustainability and profitability in agricultural production; research and extension; increasing productivity; employment and income generation; competitive farming through commercialization, adaptability to climate change, developing market, agro-processing and agro-based industries, and promoting export of agricultural products.

For promoting agricultural research, the policy document emphasized urgency of ensuring sufficient budgetary provisions and coordination among different public-private research entities. The bottom-up approach was suggested for identifying research needs and setting research priorities. Similar strategies were suggested for agricultural extension. The plan stressed the need for innovative improvement for e-agriculture and use of Information and Communications Technology (ICT) in agricultural extension. To ensure farm level supply of quality seeds, the policy encouraged participation of private sector along with public sector in seed production and marketing. The quality issue of seed and fertilizer were sufficiently emphasized in the document. Use of organic fertilizers, Urea-Gelation/Co-Precipitation (UGC) urea and Integrated Pest Management (IPM) technology were encouraged.

For judicious use of water resources in farming, the policy emphasized enhancing water use efficiency. It encouraged use of surface water and solar energy for irrigation, wherever possible. For water scarce areas it suggested using force mode pump instead of suction mode pump. In case of agricultural machinery, the policy suggested to continue import subsidy and encourage innovation of climate sensitive technologies.

The NAP 2013 duly emphasized developing agricultural marketing system through improving infrastructure and establishing uninterrupted value chain between producers and consumers. The policy suggested establishing local level storage facilities and agro-processing industries. The document also mentioned the importance of women involvement in different agricultural activities, particularly in homestead gardening, seed production, bee rearing, food processing and storage etc. It also suggested for elimination of wage discrimination between men and women in agriculture.

The NAP 2013 recognized several weaknesses and threats which may hinder successful implementation of different programmes. The constraints include less developed market infrastructure, lack of diversification, high volume of post harvest loss, financial constraints, limited availability of agricultural credit from formal sources, inadequacy of climate sensitive agricultural technologies and inadequate use of ICT technologies. The development of the sector is also threatened by factors like: environmental hazards, deteriorating soil quality, continued reduction of arable land and water, loss of agricultural bio-diversity, excessive and unbalanced use of pesticides and inadequate budgetary allocation especially for agricultural research.

The **New Agricultural Extension Policy (NAEP) 1996** was developed for effective functioning of national extension system. The goal of the policy was to ‘encourage the various partners and agencies within the national agricultural extension system to provide efficient and effective services which complement and reinforce each other, in an effort to increase the efficiency and productivity of agriculture in Bangladesh.’ The key components identified to achieve the goal are: efficient extension support to all categories of farmers; decentralisation; demand-led extension; working with groups of all kinds; strengthened extension-research linkage; training of extension personnel; appropriate extension methodology; integrated extension support to farmers; coordinated extension activities; and integrated environmental support. For efficient extension service, the policy mentioned the importance of training, skill development, institutional strengthening and logistic support. It also emphasized effective coordination among all the government, non-government and private extension organizations. It argued for decentralized and demand-led extension planning taking into consideration different farm household and community level factors, resource availability along with agro-ecological conditions. Finally, the policy suggested several strategies for successful implementation of different programmes.

**The National Food Policy (NFP) 2006** provides strategic guidance to address the key challenges facing Bangladesh in achieving food security in all its dimensions. The three major objectives of NFP are: (i) adequate and stable supply of safe and nutritious food, (ii) increased purchasing power and access to food of people, and (iii) adequate nutrition for all individuals. Several activities and strategies were suggested for achieving the objectives. The NFP has taken into cognizance core development policies in its preparation, implementation and monitoring. To implement the objectives of the National Food Policy, a **Plan of Action (2008-**

2015) was developed along with 26 strategic areas of intervention and more than 300 action items to be undertaken in short, medium and long term over the period 2008-2015. It also provided a set of guidelines for inter-ministerial coordination, sectoral planning and budgeting with a view to promoting implementation effectiveness. To this end, the **Country Investment Plan (CIP)** for Agriculture, Food Security and Nutrition laid out a coherent set of 12 priority programmes that have been anchored in the policy, programmatic and investment framework of Bangladesh. The CIP also detailed out a strong monitoring framework for effective implementation of food policy agenda in the country.

The **National Fisheries Policy** approved in 1998 developed the policy framework for directing the management and growth of the fisheries sector. The objectives of the policy are: (a) enhancement of the fisheries resources and production; (b) poverty alleviation through creating self-employment and improvement of socioeconomic conditions of the fishers; (c) meet the demand for animal protein; (d) achieve economic growth and earn foreign currency by exporting fish and fisheries products; and (e) maintain ecological balance, conserve biodiversity and improve public health. In 2006 formal fisheries strategies were formulated for implementation of national fisheries policies. The policy considered fisheries resources from four broad dimensions: open water fisheries; fish culture and management in closed freshwater bodies; shrimp culture in coastal regions; and exploitation, conservation and management of marine fisheries resources. In addition, the policy mentioned the importance of establishing hygienic fish landing centers; transportation and marketing; processing and quality control; development of export market of shrimp and other fish products. Proper coordination among different government, autonomous, private and voluntary organizations working in the fisheries sector was emphasized in the policy.

The **National Livestock Development Policy 2007** was developed with an objective to explore full potential of the livestock sub-sector to accelerate economic growth by reducing rural poverty. Sustainable improvement in productivity of milk, meat and egg production including processing and value addition was the major objective of the policy. For achieving the objectives, the policy emphasized increased participation of the private sector as the key player, where the public sector would play the supportive role. The policy mentioned the importance and strategies for export promotion of different livestock product and by-products.

Another related policy is the **National Water Policy 1999**. Water is viewed as an economic resource in the policy and it should be priced to convey its scarcity value to all users and provide motivation for its conservation. It prioritized the importance of increasing irrigation water use efficiency through various measures including drainage-water recycling, rotational irrigation, adoption of water conserving crop technology where feasible, and conjunctive use of groundwater and surface water. The policy promised to continue support for private development of groundwater irrigation with simultaneous development of surface water irrigation where feasible. The policy expressed serious concerns regarding water pollution

through residues of fertilizer and pesticides that are either leached to the groundwater or washed off the fields to rivers and lakes.

The **National Forestry Policy 1994** set the target to bring about 20% of the country's land under afforestation programmes of the government and private sector by year 2015 for achieving self reliance in forest products and maintaining ecological balance. To do so, it underscored the importance of coordinated efforts between the government and NGOs and active participation of the people. Due to limited availability of forest land, the policy emphasized afforestation in rural areas, in the newly accreted char in the coastal areas and in the denuded Unclassed State Forest areas of Chittagong Hill Tract and northern zone of the country including the Barind tract. The policy sought private initiatives for tree plantation and afforestation on fallow and hinterland, bank of ponds and homestead lands under private ownership. The importance of increasing efficiency and modernizing the technology to reduce wastage for extracting forest resources was emphasized in the policy. Finally, the policy suggested continuation of ban on export of logs and restricted use of state-owned reserved forest for non-forestry purposes.

The **National Sustainable Development Strategy (NSDS) 2013** has developed strategies to meet the challenges of economic, social and environmental sustainability of the economy. It also represents the effort of the Government to meet its international obligation to pursue the global sustainable development agenda. The strategy is based on the long term development vision of the Government, consistent with the 6<sup>th</sup> FYP, the Perspective Plan (2010-2021) and other sectoral plans, policies and strategies of the Government. The implementation period of the NSDS is 2010-2021 which exactly coincides with the National Perspective Plan period. With respect to agricultural development, the NSDS formulated a number of relevant strategies such as: (i) arresting conversion of good agricultural land into non-agricultural purposes, (ii) reversing the trend of nutrient mining and depletion of soil organic matter, (iii) providing location-specific production packages and technologies, (iv) reducing yield gap and ensuring large scale adoption of proven technologies, and (v) developing marketing and storage facilities, and mobilizing farmers' groups.

The strategy identified in the NSDS will be implemented through different projects/programmes by the concerned ministries/divisions/agencies during the remaining period of the 6<sup>th</sup> FYP. It has rightly been mentioned in the 'preamble' of the NSDS document that the main burden of the implementation of the strategies will fall on 7<sup>th</sup> Five Year Plan (2016-2020) (GED 2013).

## **Review of Policy Outcomes**

The major success in line with the objectives and targets of the NFP 2006 and NAP 2013 is reduced poverty rate and improved food security status. Increased agricultural production, particularly rice, has more recently been accompanied by increased agricultural diversification

supporting the diversification of consumption toward improved nutrition. Wage in agriculture has increased in real terms, but gender disparity prominently exists in agricultural wage rates. The decreasing availability of arable land and increasing degradation of soil quality pose serious threats to sustainable agricultural production.

The structure of incentives arising out of agricultural pricing and trade policies is found to vary according to the types of crops/products, technology and ecosystems under which production occurs. Result of a recent study has shown that for most of the crops, farmers were getting marginally negative protection. The value of the Nominal Protection Coefficient (NPC) of output indicated that except for HYV Boro produced in the medium high land of the northern region and mustard in the central region, farmers were getting negative protection, although the NPC values were close to one. The NPC values of inputs were less than one for all crops, suggesting that farmers were purchasing inputs at prices lower than the true opportunity costs of the inputs. Thus farmers were receiving positive protection from the existing input pricing policies in the country (Kazal et al. 2013). The results of the study also indicated that Bangladesh had comparative advantage in the production of rice, wheat, maize and lentils, and that aromatic rice and jute could profitably be produced in the country for export.

On the issue of input subsidy, there has been substantial increase in the share of fertilizer subsidy in the national budget. The share increased from 4.1% in 2007-08 to 5.3% in 2012-13. This is mainly due to increase of fertilizer prices in the international market, against the relatively stable prices in the domestic market, the difference being covered by public finance. However, the distribution of subsidy among different fertilizers has been substantially rebalanced, with the share of subsidy for urea reducing from 89% in 2007-08 to 40% in 2012-13 (FPMU 2014). The rebalancing of fertilizer subsidy has yielded positive results in the form of relatively balanced use of fertilizers. As has been observed in Table 2.5 of section 2, use of TSP and MoP fertilizers dramatically increased and urea use moderately decreased over the past years. For improving and maintaining growth in agricultural production, the need for maintaining input subsidies cannot be overemphasized. However, the important issue would be to target subsidies to the small and marginal farmers. Appropriate means would have to be devised to ensure that small and marginal farmers get greater share of the subsidy benefits.<sup>3</sup>

To address the issue of inadequate resource allocations, particularly for agricultural research, some additional research funds have been made available under the National Agricultural Technology Project (NATP) project through Sponsored Public Goods Research (SPGR) and Krishi Gobeshona Foundation (KGF). For human development, the project made some provision for scholarships for higher studies and training. Innovations of some climate sensitive agricultural technologies and technologies to meet local demand are aligned with the NAP 2013. The NATP project initiated group based extension approach through establishing crop, livestock and fisheries farmers' groups, but the public extension service has made limited

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<sup>3</sup> Diesel subsidy in the form of differential cash grants and incentives provided for increasing Aus production are some of the innovative attempts taken in the past.



progress in that direction. No real change has been made in conventional extension approach to move towards demand-led extension service. Use of ICT in extension has increased, but innovative ideas in this area are still lacking. Incentives can be given to researchers, extension agency people, elite farmers, agro-processing initiator etc. in the form of cash, medal, certificate of recognition etc. Such incentives may help in new research findings and extension approaches. In line with the NAEP objectives, coordination among researchers and extension agents needs to be strengthened by forming committees and conducting workshops at decentralized levels.

Supply of quality seed from institutional sources (BADC, DAE and private company) to total seed requirement has reduced in recent years. Farmers' training facilities for producing and identifying seeds with high germination rate has increased. Success in market monitoring for controlling seed and fertilizer adulteration has so far been limited. There has been some improvement in the use of organic manure, UGC urea and technologies like leaf chart.

Farmers' incomes are supported through domestic procurement of rice and wheat. However, in order to maximize benefits to be captured by farmers, procurement prices should be announced in advance, fixed at levels adequate to cover production costs without excessive divergence from market prices. It should also be ensured that all agents will be allowed to deliver directly to the procurement centers the desired amounts of rice or paddy at the price fixed by the procurement agency.

The NAP 2013 suggested for some incentives for mechanization in terms of exemption of import taxes, but in practice machinery importers continue to complain about heavy tax as a barrier for nationwide use of agricultural machineries. The policy indicated promotion of mechanization through cash incentives for selected machineries at producer, manufacturer and farmer levels. In practice, this does not seem to have happened in any appreciable scale.

The Policy emphasized the need for both long and short term programmes to cope with the impacts of climate change. Flood and cyclone affected farmers are helped with seeds, seedling and fertilizers. The policy anticipates that measures would be taken to protect crops in the coastal, haor, beel and char areas keeping harmony with other sub-sectors' production. Awareness is there about climate change, and some strategies are also in place. The Government has prepared a document named National Plan for Disaster Management 2010-2015, which describes strategies for disaster management from national to union level.

The Policy indicated considering crop insurance which is yet to be put in place – private sector would be an important partner to implement it. Unfortunately, insurance against frequently occurring events would tend to carry very high premiums. There is also concern about 'moral hazard' – crop insurance schemes could be seen as paying farmers not to farm, while the governance of such schemes may also prove challenging. Insurance scheme that are financially sustainable may be piloted with the commercial agricultural subsectors, including specific areas of livestock and fisheries sub-sectors.

## Chapter 4

### Current and Future Challenges

In crop agriculture, significant progress has been made in the production of rice, potato, maize and vegetables. The major problem faced by potato and vegetable production is the volatility in prices; increasing production has been followed by financial loss for many. It will be difficult to sustain the growth of production of high-value and labour-intensive crops unless investment is made in the post harvest management (a 10% reduction of post harvest loss would add 10% additional food for the nation), processing and storage to facilitate marketing of the crops throughout the year to match with the demand that remains stable across the season. It is also important to exploit international markets with investment in packaging, and meeting Sanitary and Phyto-sanitary Standards (SPS), and Good Agricultural Practices (GAP).

The production of other crops including pulses, oilseeds, jute and sugarcane has either remained stagnant or declined over time. The production of oilseeds and jute has picked up in recent years due to favorable markets, availability of high yielding varieties, and favorable agro-ecological environment. Major drivers of crop production have been the development and diffusion of improved crop varieties, and more effective on-farm water management, particularly expansion of irrigation infrastructure (mostly shallow tube well based groundwater irrigation). Use of non urea fertilizer has been increased because of government's rebalancing of subsidy that brings more efficient fertilizer management in the field. However, yield gap between potential and actual yield of a crop variety realized by farmers, still remains high.

Technological progress has been supported by public and private investment for irrigation, flood control and drainage, and farm mechanization, especially expansion of power tiller for land tilling, power threshing and processing as well as milling. The optimum exploitation of the yield potential of improved varieties depends on good irrigation-water management, farm mechanization, transportation and marketing. Recent developments have contributed to transform the subsistence farming into semi commercial agriculture. Now emphasis will have to be given to transform agriculture into commercial venture for which more investment is needed. Application of GAP for safe food production, farm mechanization, post harvest management, agro-processing, market development will have to get priority.

### Major Challenges

**Increasing agricultural production through sustainable use of resources:** Agricultural production has to be increased by making judicious use of scarce resources. The strategy will have to be to increase production by making lesser use of critical inputs land and water, and greater use of technologies. Under conditions of constrained optimization, agricultural production in future will have to be pursued under conditions of declining availability of land,

water and overall climatic endowments. The other issue is that in some cases increased production occurs at the expense of degradation of soil and water quality which pose a threat to the sustainability of agricultural production. Thus, increasing production by maintaining the quality of land, water and the overall environment will be a major challenge for the future.

**Promoting agricultural research for enhancing productivity:** It has been evident through analysis in the paper that Bangladesh agriculture has been suffering from low productivity both in the crop and non-crop sectors. Farm level productivity gain can be achieved through technical change, minimization of yield gap through effective extension services. Promotion of agricultural research is being constrained due to low budgetary allocations for research facilities and inadequate financial and other incentives for the scientists. This largely resulted in the ‘brain drain’ of trained professionals who migrated to research centers overseas. This trend needs to be reversed by increasing budgetary allocations for research and extension, and providing adequate incentives for the agricultural scientists.

**Commercialization of agriculture:** Agriculture has been transformed from subsistence mode in the past to semi commercial level at the current stage. In the wave of globalization, small holders need to be enabled to integrate in the markets to effectively contribute to the production high value crops such as meat, fish, vegetables and fruits. To this effect, they need better access to credit, insurance schemes and other agricultural services - such as extension, information and local market infrastructures and services.

**Sustaining self-sufficiency in rice production:** Bangladesh has attained self-sufficiency in rice production, resulting from stimulating production growth over the past years. As has been evident, rice production in future will have to be pursued with decreasing availability of the critical inputs land and water, and under conditions of overarching negative impacts of climate change. As is well known, production performance of rice over the last two decades is attributable to two stimulating rice varieties BRRI Dhan 28 and 29 which may be reduced as they succumb to pests or diseases over the coming years. Although BRRI has developed quite a good number of rice varieties over the recent past years, some with special traits, none have so far demonstrated to be promising enough to replace BRRI Dhan 28 and 29. Thus in absence of major technological breakthrough with development and diffusion of extra high yield augmenting new varieties, sustaining rice self-sufficiency will be under challenge.

**Diversification toward high value crops:** High-value crops, including traditional fruits and vegetables have a potential comparative advantage. The future of non-rice crops will depend on the removal of a number of constraints that currently inhibit their expansion, including lack of appropriate technology and inadequacies of market infrastructure and services. Minimization of risks to production and associated with prices are also important considerations in this context.

**Agro-processing:** Food processing including canning of fruits and vegetables, mushroom growing and dried food production has considerable potential, provided quality control can be ensured. For realizing the full potential of their production, domestic marketing and export, the

government needs to continue its current commitment in providing fiscal and budgetary support, and investing in manufacturing and infrastructure.

**Farm mechanization:** Rapid expansion of mechanization is needed to compensate the shortage of draft power, farm labor and the declining interest of young people to stay in agriculture. Farm mechanization can help in improving productivity, reducing cost of production, increasing input use efficiency (water, seed, fertilizer, land and labour) and achieving timeliness of crop production operations. Agricultural mechanization is also required to reduce the turn-over time. There is a need for development of more efficient and less costly equipment so that farmers can benefit. Selective mechanization based on traditional devices can provide one cost-effective option. In the context of market economy, emphasis will have to be given to the collaborative role of public and private sectors in technology development and diffusion.

**Minimizing yield gap:** The difference between farm level yield and yield at research stations of crops has remained an issue of concern for many years. It is generally recognized that the actual yield of crops fall short of potential yield by about 30%. Farmers' acceptance of a technology does not necessarily depend on the objective attributes of a technology, but on a range of socioeconomic factors associated with adoption of a technology. Overcoming the socioeconomic constraints to the dissemination of new technologies is a major challenge.

**Managing open water fisheries:** In the fisheries sub-sector, the key challenge for sustainable development is better management of open water fisheries. The key elements of strategies are to enhance the current good practices of open water fisheries management such as replenishing stock, preserving fish sanctuaries, banning fish catch during certain periods and ensuring community based fisheries management. Implementation of these measures is fraught with a lot of difficulties, but limited examples of good practice show a way forward.

**Sustainable development of shrimp farming:** Expansion of shrimp farming in the coastal region is alleged to be at the cost of encroaching rice lands and areas under mangrove forests. Also, intrusion of saline water in the shrimp Gher seriously affect the neighbouring crop lands and other homestead cultures, causing serious conflict of land use. Expansion of shrimp culture while resolving these conflicts will be a formidable but pressing need, especially in South West Bangladesh.

**Conserving marine fishery resources and expanding marine fishing zone:** It is frequently asserted that the marine fishery resources are being over exploited, although reliable marine stock assessment data is unavailable. Indiscriminate catch due to inappropriate net gears is a matter of major concern. Bangladesh has recently gained rights to a greatly increased sea area in the Bay of Bengal. Establishing use right in the sea area and developing technologies for harnessing fishery resources will be a major challenge for the country.

**Developing and preserving improved breeds of livestock:** The genetic potentials of local breeds are generally poor and cross breeding with exotic breeds has long been pursued.

Sustainability of performance from cross bred animals and birds are often questioned. Another issue is conserving some native breeds of some animals (for example Black Bengal goat) for their unique attributes.

**Conservation of forest resources:** Forest cover is already at less than desirable level in the country. Only 8.4% of total land area is under forest cover (Akhteruzzaman 2006). Indiscriminate harvest from the forest has been posing threat to our environment, flora and fauna. Plantation in the hill areas is seriously constrained due to jhum cultivation. Only 26,000 hectares was planted in the hill areas against the target plantation of 250,000 hectares during the 6<sup>th</sup> Five Year Plan. The traditional forest management has failed to protect forest from deforestation. Social forestry is considered as a viable alternative. The Government has amended the Social Forestry Rules 2004 (MoEF 2011) which made provision for private investment with changed benefit sharing mechanism. Forestry and social forestry activities with co-management through participation of local people is a great challenge.

**Meeting the challenge of climate change impacts:** There is a growing recognition among national and international experts that Bangladesh is at the forefront of adverse climate change impacts. As a result of sea level rise, a significant part of the coastal area may be permanently inundated, displacing large number of people and spreading salinity deeper and wider. Low rainfall will continue to cause drought, desertification of Barind area and inadequate ground water replenishment in the northern part of the country. Although Bangladesh contributes little to the global green house gas emission, the country is the worst victim of climate change impacts. Since mitigation of the climate change phenomena is beyond the control of Bangladesh, developing adaptation and resilience measures will be the real challenge for the country.

## Chapter 5

### Linking production with Domestic and International Markets

#### 5.1 Constraints to Respond to Market Signals

Although small holders dominate Bangladesh agriculture, they do tend to respond to market signals through price responses in most sub-sectors. Their responses are however not obvious and immediate, and these are conditioned by many biophysical and policy constraints. Some of the major factors are as follows:

**Time lag:** Market responses are time lagged due to the seasonality of production – this natural delay is amplified by the imperfect functioning of the market so that supply and demand for many commodities operate on a 3 or 4 year cycle. Typically, low production correlates with high prices; this encourages producers (and new entrants) to increase their investment in a particular commodity in subsequent seasons, production rises and prices fall with eventual oversupply in the market, leading to disincentives for farmers to invest in the next season/period. Such a cycle can be seen in many horticultural products, and was seen most recently to operate in the crash of potato prices in Bangladesh early in 2014. This lagged response to market signals is a function of the production cycle and seasonality of growing period (e.g. crops, vegetables, fruits and flowers). The other constraints limiting timing of expected response include lack of free flow of market information in a timely fashion, operating capital, availability of technology, risk insurance especially for perishables.

From government side, this situation can be addressed in a number of ways. Based on data on stocks and production, government may adjust incentives which may be tending to accentuate this cycle of shortage and glut. Government may offer other incentives or make specific investments in agro processing to absorb produce at seasonal peaks. Government may also encourage private sector investment in cold storage, and popularize and/or promote warehouse receipt systems to dampen the price volatility.

**Dominance of cereal tradition in the selection of crops:** Adherence to known practice of rice cultivation and major government technology, and the fiscal support being channeled for rice production, can deter genuine options for diversification to more profitable crops and enterprises (e.g. maize, vegetables, fruits, flowers, fish). Here, government needs investment in extension to demonstrate, and test technologies at community level. Attention should also be given to market development; rice marketing systems are well established but for new, higher value crops marketing arrangements need to be fostered.

**Lack of realistic demand assessment:** Production targets are set by lead departments on an ad-hoc basis assuming some linear trend of growth in recent years, without considerations of quantity already in storage, quantity to be imported or exported, information about global production situation and supply chain of products. As a result, the classic farm management

question – of how much to produce - remains in a vacuum, and the price to be received becomes something of a chance. In this case government needs to improve its approaches of estimating production and forecasting demand, and tailor its investment and subsidy programmes accordingly.

**Insufficient transport and market infrastructure:** These include poor road conditions (indeed with extended road network), storage and warehouse facilities, and refrigerated truck and cool chain for perishables (e.g. flowers, milk, fish), which directly or indirectly discourage farmers to grow otherwise profitable enterprises. The other formidable constraint is the various forms of coercive acts and harassment in the movement of goods resulting in increasing cost of doing business. Government funding is in place for rural infrastructure development. The cool chain for higher value crops is largely a private sector matter, but government may facilitate import of required equipment by adjusting tax and import duties. With regard to coercion associated with transport of goods, this is a matter to be taken up by the appropriate ministry, and addressed by local law enforcement agencies.

**Agro-processing at nascent stage:** Any failure of Bangladeshi farmers to respond to market signals is also translated into lack of facilities for creation of product utility in the form of place, time and form utility. Remaining helplessly with excess produce at a time of market glut (e.g. at times potato, vegetables, milk, jute) is just one prominent symptom of supply-demand mismatch. Investment in agro-processing is one response to such surpluses, though again this is essentially one for the private sector to address. Government may invest in pilot or demonstration scale agro-processing, in association with private sector partners, and can facilitate investment by private companies through creating well-equipped (well-connected) industrial processing parks or similar zones with reliable power supply and other facilities.

**Poor bargaining strength of farmers:** Millions of smallholders with small scattered individual production do not have any network or bargaining platform to negotiate for better prices, nor are they able to retain their own production to increase time utility. Farmers' associations do not have a good record of success in Bangladesh – many have been created through projects but few have survived; organisations rapidly become politicized or dominated by small numbers of rural elites. It may now be timely for government to consider a special programme for targeted support to farmers' marketing organisations.

It is hardly recognized that the local traders i.e. Faria, Beparis and Aratders, are essential for the efficient functioning of the market. They assemble small quantities from and around the primary markets, incurring extra costs, time and efforts. Virtual neglect of these potential market actors, most of whom are also small producers, further depresses local response to market incentives. Recognition of these actors as key marketing agents - together with credit, technology and business advisory support - can improve competition; government can also play a market supervision role to prevent some of the worst excesses of profit making, and/or to encourage competition in the wholesale market.

**Lack of effective trade related mechanism to assess foreign market signals:** This includes lack of up to date information about taste and preferences of foreign consumers for Bangladeshi agricultural products (e.g. food products), absence of sufficient skills to understand requirements of export market, business correspondence, SPS standards and quality assurance (e.g. EuropGAP). Government can support a general push for export promotion, with collection and publication of market information. It is well known that export of many of the eligible commodities is seriously constrained by various trade and non-trade barriers.<sup>4</sup> Government can also ensure that export facilitation measures (e.g. trade fair) are in place to ensure trade finance, and that appropriate levels of credible certification services are available.

## **5.2 Prospects of Exporting Agro-based Products including Poultry, Livestock, Forestry and Fisheries Products**

Increased cultivation of vegetables, spices and tropical fruits in Bangladesh could supply raw materials to local agro processing industries for both domestic and export markets. Progressive agricultural practices, improved marketing techniques and modern processing facilities would enable the agro processing industry to improve its quality and expand production levels significantly. Strengthening national standards and ensuring strict adherence to the standards for domestic consumers will help developing confidence of the foreign buyers.

### **Crop sub-sector**

Export market faces global competition for some agricultural commodities like rice, jute, sugar, fruits and vegetables. In spite of that Bangladesh has a growing track record in export. More than 100 fruits and vegetables are exported from Bangladesh. Export of fresh fruits and vegetables from Bangladesh significantly increased from \$ 9.5 million in 1993-94 to \$182.2 million in 2012-13. Exports of fruits and vegetables are targeted mainly for the ethnic market (of Bangladeshis living abroad).

Jute has traditionally been an important export item from Bangladesh for many years. New technologies are becoming available on diversified use of jute towards value addition, and for making high grade value added pulp from inferior quality of jute (SMR jute, jute cutting). Such pulp is better than imported conifer pulp. This pulp has good potential for export for making currency paper, document paper, cigarette paper etc. The export potential of such pulp can be explored through Bangladesh missions in different countries. However, a mill would still need to be established to utilize new jute pulping technologies.

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<sup>4</sup> A recent empirical study estimated that Bangladesh and India can together save minimum about 24% of their current trade cost by improving trade infrastructure and services (CUTS 2014).



**Table 5.1: Export performance of fresh fruits and vegetables in Bangladesh**

Fiscal Year	Quantity exported (MT)	Export Value (Million US\$)	Export growth
2004-2005	29100	46.41	--
2005-2006	19460	39.59	-14.69
2006-2007	19805	40.53	+2.37
2007-2008	33626	69.12	+70.54
2008-2009	24670	50.71	-26.63
2009-2010	29370	64.21	+26.62
2010-2011	48428	109.41	+70.39
2011-2012	59573*	134.59	+23.01
2012-2013	80660*	182.23	+35.39

\*Quantity estimated by HORTEX Foundation as per export value @ US\$2259/MT on FY2010-2011 due to unavailability of data on export quantity.

**Prospect of rice export:** Exporting rice in years of surplus production is an option to provide incentives to farmers. Since rice production in the country enjoys substantial amount of direct and indirect subsidies<sup>5</sup>, the benefits of the subsidies would partly accrue to the foreign buyers of exported rice. The Government can lift ban on export of rice up to certain limit so that the farmers are not induced to produce rice beyond domestic consumption requirements, drawing on public financial and natural resources. The alternative option is to scale up domestic procurement to preserve farmers' interest during surplus production and accumulate stock to be distributed in the following year with possible price hike. This will require expansion of improved storage facilities for preserving grains for more than one year (FPMU 2014). The recent Government initiative to expand modern storage facilities by building grain silos in strategic locations is a right move in this direction.

### **Fisheries sub-sector**

After liberation Bangladesh started exporting fish and fisheries products in the international market. Initially it was exporting fresh fish or chilled fish in neighboring countries and gradually entered the international market with value added products with frozen fish (shrimp/prawn) and dried fish. Currently Bangladesh is exporting several items of fish and fisheries product to EU, US, Russia, Asian and African markets. The exported fisheries commodities are shown in Table 5.2.

<sup>5</sup> While fertilizer prices include a good amount of direct subsidy, free extension services fall within the category of indirect subsidy in agricultural production.

**Table 5.2 Export markets for different types of fish and fish products**

<b>Commodity</b>	<b>Main Market</b>	<b>Major type/ species</b>
Frozen Shrimp & Prawn	EU, USA, Japan, Russia, Asia	Golda, Bagda and Misc. shrimp & prawn
Value added shrimp & prawn		
Chilled and Iced (fresh) Fish	India, Singapore, Hongkong, Middle East	Hilsa, Carp, Catfish, eel and Misc
Frozen Fish ( Fresh Water)	EU, USA, Africa, Middle East, Asia	Carp, catfish, Misc
Frozen Fish (Salt Water)		Seabass, Perch, eel, Misc
Dried fisheries product	EU, USA, Middle East	Misc fresh and marine water
Salted and dehydrated fish	Asia (China, Hongkong, Singapore)	Carp
Live Crab and Fish		Mud crab and eel
Fish Scale and Crustacean Shell	China	Shrimp/prawn carapace, crab shell and fish scale

Table 5.3 shows changes in the values of total fisheries exports disaggregated by types of products. The total value of fisheries export from Bangladesh increased from Taka 1812 crore in 1999-00 to Taka 4160 crore in 2012-13, which was more than two fold increase. During 2011-12, Bangladesh earned Taka 4703.96 crore from fisheries export. The decline occurred due to decrease in shrimp and frozen fish export. Shrimp occupies the lion's share of fisheries export. In 2012-13, frozen shrimp/prawn contributed 81.16% of total earnings from fisheries export. Export earnings from frozen and chilled fish increased from Taka 137.19 crore in 1999-00 to Taka 916.92 crore in 2011-12, but reduced to Taka 563.22 crore in 2011-12. Export of other fisheries items (e.g. dry fish, salted/dehydrated fish, crab/eel and shark fin/fish maws) are not of any substantial magnitudes.

**Table 5.3: Year-wise annual value of export (in crore taka) of fish and fish products from Bangladesh**

Year	Frozen shrimp	Frozen fish	Dry fish	Salted fish	Crab/ Eel	Shark fin/ Fish maws	Others	Total
1999-00	1612.2	137.19	3.65	25.96	1.44	31.17		1811.61
2000-01	1885.2	94.89	2.02	27.73	2.33	20.63		2032.8
2001-02	1447.8	137.39	8.32	9.53	7.07	27.07		1637.18
2002-03	1719.9	158.64	7.02	19.12	14.58	22.35		1941.61
2003-04	2152.8	202.24	4.16	1.38	1.39	1.53		2363.5
2004-05	2281.6	256.2	3.71	28.97	0.86	0.39		2571.73
2005-06	2698.4	294.14	2.19	19.84	12.95	0.8	1.57	3029.89
2006-07	2992.3	325.9	1.34	12.8	15.48	4.11	0.93	3352.86
2007-08	2863.9	495.46	2.67	26.97	4.88	1.82	0.56	3396.26
2008-09	2744.1	450.89	11.99	3.92	11.98	1.77	18.736	3243.386
2009-10	2885.2	458.11	25.06	0	10.41	12.66	17.07	3408.51
2010-11	3568.2	911.05	5.57	30.86	54.11	0	34.015	4603.805
2011-12	3640.2	916.92	9.43	27.46	95.77	0	14.18	4703.96
2012-13	3376.2	563.22	36.03	0	169.49	0.9	13.93	4159.77

Source: Fisheries Resources Survey System (FRSS) 2014, Department of Fisheries.

A big challenge for fisheries exports is establishment of systems for traceability, production of safe food for the consumers in a socially responsive and environment-friendly manner. The primary infrastructure for processing and quality assurance has been developed in the country (and in fact shrimp processing plants are working well below full capacity). Now, the challenge is vertical up-lift of production and introduction of value added product and branding of products.

**Exploiting the prospect of Tilapia and Pangus (catfish) export:** Bangladesh is now producing around 0.5 million MT Tilapia and Pangus annually in both fresh water and brackish water aquaculture system. The production is gradually increasing but the farmers are not making particularly impressive profits as the production costs have gone up but the market price remains low. There is a market for Tilapia and Pangus fillet in USA and other western countries provided contamination-free products can be guaranteed. Recently several private entrepreneurs have initiated the establishment of Tilapia/Pangus fillet processing plant. If Government patronizes the effort with all necessary support – in terms of certification and testing - the export market could expand considerably.

**Value added fisheries product export:** Bangladesh can take a position in the world market with value added fisheries products such as fish flingers, fish fillet and fish ball. Cost of production in

Bangladesh should be competitive. Value added product development and its export can be encouraged with joint (public-private) venture initially, and gradually local entrepreneurs can take up the trade confidently. In this case the quality and safety would be an issue which can be mitigated in an integrated effort with participation of stakeholders.

### **Forestry sub-sector**

The country has limited scope for export of forest products. There is however some potential in exporting agar wood and agar oil, decorative products with wood and bamboo and herbal medicine, etc.

**Agar wood** is one of the most expensive non-timber wood products of the world. Bangladesh is producing three major products namely agar-wood, agar-oil and agar dust/powder in agar sector. The wood has multidimensional uses in the production of perfume, cosmetics and medicine. Major buyers of agar wood and oil are the Middle Eastern countries (UAE, KSA and other Arabian countries) and North East Asian countries (Taiwan, Japan and Korean Republic). International market price of Agar wood chips is up to US \$ 6,000 per kilogram based on its quality. Distilled agar oil is valued as high as US\$ 30,000 per kilogram and the wood itself is valued up to US\$ 10,000 per kilogram. There are about 100 enterprises producing agar wood and agar-oil in Bangladesh, mainly based at Baralekha upzila of Mouvlibazar district.

**Decorative items** from wood and bamboo have high demand in developed countries. Bamboo based plywood is used to make floor and wall tiles and other furnitures.

**Herbal medicine** is another product that can be an exportable item, which is now imported as raw material. Ayurbedi companies are major consumers of medicinal plants. Local production is limited to wild collection, mostly from homesteads. There is a potential of exporting herbal medicine abroad. The pharmaceutical companies like Square, Jayson, ACME also use the medicinal plants for exportable medicines. So, there is a large potential to grow medicinal plants in degraded forest land, marginal strip land and homestead.

### **Livestock sub-sector**

Bangladesh is currently a significant importer of livestock products; this sub-sector is not so organized to be able to enter export markets except perhaps for hides and skins. With the establishment of facilities for PPR vaccine production at Bangladesh Livestock Research Institute (BLRI), there may be some scope for increasing export of small ruminants.

## Chapter 6

### Factors Influencing Development in Crop, Livestock, Fisheries and Forestry

#### Subsectors

During the first three decades of independence, agriculture was the major contributor in Bangladesh's economy. With increasing GDP volume and growth in other sectors, share of agriculture in GDP has been declining. But still it is the major source of employment and livelihood for the rural people. Generally the growth of different agricultural subsectors depends on: good quality inputs including good practices and know how; management of costs to ensure economic return/profitability; and minimization of externalities (such as environmental degradation) to ensure that production is sustainable.

#### Crops

Expansion of crop area was the major source of agricultural growth in Bangladesh until 1980s (Husain *et al.* 2001). The wide spread adoption of the green revolution technology including modern seed varieties, chemical fertilizer and pesticides, ground water irrigation and farm mechanization helped the country to convert its status from a food-deficit to self-sufficient one at least in rice production. Government policy supports mainly in the forms of input subsidy, price support through procurement, import subsidy for machineries, tax exemption on income from agriculture, credit facilities for farmers and agro-based industries, export support in the form of cash incentives etc. have helped the growth of the sector.

Among different farm level production inputs, land is the most dominant to influence farm production. Literature concerning Bangladesh agriculture particularly crop agriculture found notably higher output elasticity of land compared to output elasticity of other inputs (Wadud & White 2000; Rahman 2003; Selim 2010). In general, land elasticity is found relatively high in land scarce countries (e.g. Bangladesh) and low in the land-rich countries (e.g. Syria) (Cornia 1985). Quantity of agricultural land in the country is decreasing in an increasing trend due to increasing use of land for housing, industrial and commercial establishments and transport infrastructure. Land availability is also shrinking due to river erosion and intrusion of saline water in the coastal areas. It has been estimated that during the first decade of this century (2000-2010) the annual average loss of agricultural land in Bangladesh was 0.416%; whereas the annual average rate of decline during 1976-2000 was 0.175% (Hasan *et al.* 2013).

Food production, therefore has to be increased by increasing productivity of land and other inputs. Increasing productivity is even crucial in Bangladesh as there exists huge yield gap. Table 6.1 shows yield gap in Bangladesh for some selected crops. Two most likely options for Bangladesh for increasing productivity and minimizing yield gap are conversion of area under

local to modern varieties and efficient use of different production inputs. The scope for the former seems nearly exhausted as Bangladesh approaches near to the ceiling adoption level (Bera & Kelly 1990; Baffes & Gautam 2001). As has been already shown in Table 2.1 (Chapter 2), the share of HYV rice area in total rice area, after remaining at around 82% during the preceding three years, dropped to 78% in 2013-14. Any drastic increase from this level is quite unlikely; as Baffes and Gautam (2001) set the upper bound of conversion to modern rice varieties at 85% for Bangladesh assuming a minor increase in gross rice area. The assumption here is quite plausible, as in Bangladesh rice area has remained almost stagnant. Hence the issue of efficient use of different production inputs including seed, fertilizer, irrigation, pesticides, labour and knowhow become crucial. Ensuring these inputs at suitable quality to farmers requires:

- Seed and fertilizer testing, to ensure no mixing or adulteration
- Timely access to irrigation and other inputs
- Credit availability that matches farmers' needs (in terms of collateral, repayment schedule, transaction cost etc)
- Knowhow, which comes from several sources – from neighbouring farmers, input dealers, extension or research – and may include choice of crop, timing of planting/transplanting, pest management strategies specific to the particular crop/locality.

**Table 6.1: Yield levels and yield gaps for different crops**

<b>Crops</b>	<b>Potential yield (MT/ha)</b>	<b>Farmers' average Yield (MT/ha)</b>	<b>Yield gap (%)</b>
Boro rice	5.32	4.07	23.50
MV Aman	5.5	2.2	60.00
MV Aus	3.6	2	44.44
Wheat	2.56	1.87	26.95
Jute	2	1.62	19.00
Mustard	1.37	0.89	35.04
Groundnut	1.5	1.1	26.67
Sesame	0.9	0.6	33.33
Potato	19.37	10.69	44.81
Lentil	1.02	0.79	22.55
Chickpea	1.05	0.72	31.43
Tomato	51.5	32.61	36.68
Radish	14.45	8.63	40.28

Source: Mondal (2011)

Real rural wage has increased which is contributing to poverty reduction and equity but it has increased labour cost which is supposed to induce mechanization. But that is not really happening. Hence there can be the argument for subsidized mechanization, but subsidy has

played limited role to promote mechanization in the past. The limiting factor in this case may be small scale production unit with fragmented land, partial dependence on hired labour and animal power and high unit cost of mechanical power.

Input market has an important role here. Timely delivery of quality inputs at lowest possible transaction cost is much demanding. Productivity and/or efficiency, are also affected indirectly by different farm and community level factors. Factors like farmers' education, age, gender, farm category, extension service, access to market, income sources, tenancy type, soil quality etc. may affect production through influence on farmers' efficiency.

But it should also be remembered that simple productivity increase is not an end in itself. The development of sustainable marketing links and value chain development of products will ensure income generation and make agriculture more remunerative for ensuring food and nutrition security through access to food.

With regard to costs, farmers can manage these in a number of ways. They can reduce overuse of inputs, though in some cases this can be difficult to achieve with regard to some inputs such as fertilizer. Many farmers have a simple view that more is better, although adjustment of subsidy to fertilizer prices led to better combination of urea and non-urea fertilizer use. Overuse or inappropriate use of pesticides costs money, but it also reduces the quality of the end product and induces negative externalities.

Farmers can also improve their returns by cutting time from harvest to replanting by using power tillers and other equipment for land preparation and post-harvest operations (e.g. threshing and drying). Reduction of post harvest losses is also a factor in improving productivity. One other factor to consider is the market price. For a number of commodities, prices fluctuate from year to year – as farmers see, for example, a high price of potato due to under-supply in one year, they plant more in successive seasons, which results in over-supply and a fall in prices.

The third main factor influencing development of the crop sector is the sustainability of the production system. Here, the concern is to cope with natural resource degradation, problems such as salinity or reduced availability of ground water, as well as the impact of environment. A key element in the sustainability of the cropping system is the suitability of specific crops for the particular agro-ecological zone. If water availability becomes an issue, farmers may ultimately need to switch from rice to less 'water-loving' crops. In this context, high yielding varieties tolerant to the stresses in the production system (such as periodic water shortage, temperature ranges or salinity) are needed.

Other technologies have been developed which may help, but have not yet proved as popular as expected for adoption by farmers; one example is urea deep placement of 'super granules' which is found to be laborious. Integrated Pest Management (IPM) is another technology which has not always had the success it deserves because it is seen by farmers as both time consuming, and more risky than spraying of insecticide.

## **Livestock**

Production of different livestock products in the country is increasing. Introduction and farm level mass adoption of modern breeds particularly poultry breeds, genetic improvement, increased availability of feed and veterinary services, improvement in management practices and increasing demand for livestock products boosted the growth of the sector. But still the country is far below self-sufficiency level for most of the animal products. In addition, current levels of consumption are considerably below the recommended levels for good nutrition. Hence there is a huge potential for animal food in Bangladesh, particularly considering income growth which will lead to further diversity in food consumption.

Productivity levels are currently low in the livestock sector. For instance, total milk production per lactation in Bangladesh is around 25% lower than neighbouring countries such as India or Thailand. One of the elements affecting the productivity of stall fed cattle is feed. There is a need to ensure balanced and safe feed.

The incidence of animal diseases or pest infestations may reduce productivity, hence there is urgent need for expanding vaccination and de-worming facilities by community based animal health services. Productivity may be enhanced by using improved breeds and by managing the milk production cycle with artificial insemination. Another main factor affecting the development of the sector in Bangladesh is space. Livestock keeping – whether cattle, chickens, goats or ducks – requires space for housing, grazing, production of feed, etc. However, even within this constraint there are significant opportunities for improvement of the sector in the country.

A final major issue for the development of the sector is handling and processing of livestock products which are often perishable. Milk, for instance, is subject to considerable post-production losses, which can be minimized through development of cool chain storage and transportation system. Some private sector organizations are already active in this area, while the government managed cooperative like MilkVita still has the significant market share. But with large number of smallholders involved, this presents real challenges for both safety and quality. Community level organizations have a role to play in this regard.

With regard to poultry, the development of the sector is affected by some of these same issues – feed, disease, safety and quality in the value chain. The sector's development has been hampered by highly pathogenic avian influenza, though much effort has been invested in improving the standards and practices of live bird markets in the country. Serious consideration needs to be given for introducing insurance scheme in the sector.



For development of the livestock sector, attention needs to be given to the following issues:

- Quality of inputs such as animal feed, day old chicks need to be ensured. Farmers' skill needs to be developed for moving beyond backyard poultry into small scale commercial/semi commercial production. Easy access to credit is a critical factor in this context.
- Cost management – practical issues related to improving productivity, using cost-effective treatments, minimizing post-production losses would all be needed to boost the development of the sector.
- Sustainability – in many countries the livestock sector is regarded as one with very high environmental impact due to solid, liquid and gas wastes produced. In Bangladesh, there have been some interesting demonstrations of biogas technology which, given almost all organized livestock keeping is based on housed animals (a prerequisite for biogas), could be scaled up more widely.

## **Fisheries**

Among the agricultural sub-sectors, fisheries has been the best performer during the 6<sup>th</sup> FYP. The importance of fisheries to national food security is crucial; fish is estimated to provide 60% of animal protein, while 11% of the total population of the country directly, or indirectly, maintain their livelihood through fisheries related activities. The fisheries sector contributes around 2% of national foreign currency earning; while the growth rate of fish production during last five year has been 5.9% (DoF 2014). Fish and fish product exports have increased, but there is also demand for fish meal for livestock (poultry, cattle farming). The closed water fisheries or aquaculture played the major role behind this sector's growth.

In the open water inland fishery, the major issues for further development are conservation of stocks (in terms of quantity and diversity), and sustainable management. Water pollution is an issue in some areas due to other forms of land use or discharge of untreated effluent. Co-management arrangements where communities take responsibility for a water body, as a group, which are based on long term leasing arrangements, have seen some successes in parts of the country.

For the marine fishery, stocks are again an issue; in this case stock assessment is needed, and measures need to be taken to police the waters controlled by Bangladesh. With accretion of more sea area in the Bay of Bengal, expansion of fishing zone and developing technologies for harvest from deep sea area would be critical challenge.

For closed water systems or aquaculture, the major contributors are introduction of modern fish varieties, genetic improvement, improvement of management through intensification and development in market infrastructure. Although there has been significant expansion of fish hatcheries, indiscriminate breeding with low quality brood stock, often from same parental origin is causing supply of low quality fish seeds which needs to be addressed seriously.

## Forestry

Forest contributes to the national economy by providing timber, fuel wood, food like honey, wax, medicine, fodder, industrial raw materials, etc. Forestry faces slightly different challenges among the three subsectors. Forests serve a vital function in providing some of the ecosystem services which others depend upon – such as water conservation, watershed protection, air quality improvement, or recreational benefits in support of tourism or leisure. Unfortunately, given the land pressure in the country for other forms of land use such as housing, construction and urbanization, the value of these ecosystem services is often overlooked. One result of deforestation is that the dense forest cover in the Chittagong Hill Tracts fell from 15.2% in 2003 to 5.9% in 2008.

The traditional forest management system has failed to protect forest from deforestation, although social forestry has created an alternate source of income. However, government has amended its Social Forestry Rules 2004 (MoEF 2011) which made provision for private investment (investment by the communities) with changed benefit sharing mechanism (75% of final harvest for the communities). This approach will motivate people to become vocal opponent to any destruction or illegal felling.

Jhum cultivation is the most common form of farming practice by the tribal people for growing food in the hilly areas. It involves clearing of areas of light tree cover in rotations of 3-5 years by burning, and planting of mixed crops, usually including upland rice. One consequence of farming on steep slopes is that top soil can be lost; research and extension are now strongly recommending agro-forestry solutions for the steeper slopes with value added trees and crops, viz, coffee, agar, litchi, orange, malta, mango, jackfruit etc.

Tree cover in the coastal region plays a vital role in maintaining the safety belt for human life and properties in the face of storm surges and cyclones from the Bay of Bengal. Creation of a 500 m wide permanent green belt along the coast was the original target, but this was not met due to land dispute or non-availability of the land and interference by the community. Instead, patch planting along the coast was done. The Strategic Plan for Sundarbans needs to be implemented. Some deforestation has been motivated by the commercial value of the logs, others by a desire to exploit the land for other purposes, while in some cases obtaining large quantities of wood for burning in the brick field was the driver.

The real challenge is to identify sustainable livelihoods options within the forests. For instance, one option could be replacement of undergrowth by fodder plantation for dairy industry in a planned way linking with marketing channel as a source of income of local people, including sharing of income from Sal forest.

Co-management of reserve forest has been promoted with a view to involving the people who have encroached into the forest land. They are allowed to remain and earn their livelihood with alternative income generating activities including agro forestry. Co-management can be a

blessing if the people are effectively utilized in the social forestry and agroforestry activities, but this must be supported by legal provisions and policy directives.

Another sustainable livelihood option is herbal medicine. There is a large potential to grow medicinal plants in degraded forestland, marginal strip land, homestead land, private hilly waste land, and surplus lands in tea gardens.

## **Research and Extension**

### **Research**

The National Agricultural Research System (NARS) in Bangladesh has built up a very positive public image the way it has delivered technologies to increase production and productivity that made the country significantly less dependent on food imports. Till 1990s the main focus of agricultural research was increasing cereal production. More recently climate smart approaches, value addition and quality food in the food system are getting more and more importance in research. Funding of the NARS has been low over the decades, rising from 0.22 percent of the agricultural GDP during the early 1990s, to 0.30 in 2003 and reaching 0.40 percent recently.

The NARS has a complex system consisting of 12 Agricultural Research Institutes under five government ministries having almost 1700 scientific staff. These institutes have a network of regional research stations and substations (more than 130) located in most of the agro-ecological zones. Most of the institutes are under the control of MoA, whereas some others are autonomous or government departments, falling under a number of different Ministries. Such duality in institutional arrangements is problematic for proper coordination. Additionally, the apex body Bangladesh Agricultural Research Council (BARC) faces difficulties to carry much influence with those institutions outside the direct control of the MoA. The past attempts to bring the agricultural research institutes under one system of governance were unsuccessful, partly due to the involvement of different ministries in administering the institutes.

The major areas that demand improvement in research delivery, as identified in past reviews, assessments and recommendations are: accountability of the research service delivery; ensuring research relevance through scientific tools of priority setting; developing human resources; improving quality of research through monitoring, review and evaluation; strengthening research, extension and education linkage; attracting merit in agriculture research; rewarding for performing professionals; and meaningful international collaboration. The implementation of the BARC Act (2012) supplementing the previous BARC Act 1996, may help in improving governance of the total research system.

A recent development in the institutional framework is the establishment of the Krishi Gobeshona Foundation (KGF) with an authority to frame its own rules and regulations to promote science and technological base in the country. The institutional innovation through KGF

has been to cater the need of the NARS for operational funds for research activities, provided directly to the NARS institutes.

### **Extension**

Over time, the role of agricultural extension in Bangladesh as a rural advisory and training service provider has changed significantly. Originally addressing production concerns of cereals (mainly rice) associated with the green revolution, extension now caters for a diversified demand for services, including a greater degree of advice on questions relating to high value crops, mechanization and value chains/marketing.

The main extension services provided by Department of Agricultural Extension (DAE), Department of Fisheries (DoF) and Department of Livestock Services (DLS) are mostly dependent on project funds. The major weaknesses of this project dependency are that certain areas seem to attract repeated projects whereas others get none; duplication of efforts, while similar approaches may be tried repeatedly without success; and the content of the extension may depend on the parameters set by the project rather than a consideration of local need. Interestingly, many important innovations which took place during project period, could not sustain when the project ended.

To address these shortcomings, a starting point would be to create a database of completed project records, to help identify future project directions. Overall, to improve the relevance of extension, it may be considered to revive the previous Upazila Agriculture Extension Coordination Committee and district committees etc. which were quite effective with bottom up planning approach with the participation of research and other extension departments, with support from funds allocated at district level.

The DAE has a network right up to village level, while DoF and DLS have staff operating only up to upazila level. Services of the Forest Department are concentrated in specific forest areas and hilly areas, with some limited general presence at district and upazila level for production of seedlings of medicinal and forest plants.

One way to compensate for lack of staff (and to boost efficiency) is use of modern ICT. Several initiatives under the heading “e-Agriculture” are underway. ICT use can also help in expediting credit delivery, avoiding losses under subsidy programmes by paying direct (through forms of “mobile money”) to beneficiaries, and in improving the efficiency of markets by making price information more widely available.

The most important task would be to make provision of operating funds through innovative way that allows location-specific extension to be available to a diverse group of users, including private sector, and provided by a diverse groups of actors. Such funds could come from Government’s budgetary allocation or it could be through some form of endowment funding arrangement by government and development partners. Additionally, regular funds are required

for the operating costs of extension activities – fuel, allowances, vehicles, etc – in support of promotional campaigns, training, open days, provision of inputs on a trial basis and follow ups.

Updating knowledge base of the extension service providers is very important task to be addressed. Appropriate design of training approaches involving relevant research institutes for the huge grass root workers (SAAO) will bring valued changes in the rural knowledge environment. Creating provision for in-country higher studies for extension agency staff is one way to improve the technical quality of extension work, while also linking extension to the education system.

### **Agricultural credit**

Agricultural credit is considered as a driving force for the modernization of agriculture and commercialization of rural economy. Initially agricultural credit was provided mainly through Bangladesh Krishi Bank. Over time, other financial institutions also emerged and expanded to cater to the needs of expanding credit requirement. At present, many institutions and agencies are involved directly or indirectly in the provision of agricultural credit. Bank and non-bank financial institutions (especially NGOs and Cooperatives) play a leading role in providing agricultural loans. The public sector banks that are currently involved in the disbursement of agricultural credit are: Bangladesh Bank (BB), Nationalized Commercial Banks (e.g. Sonali, Janata and Agrani) and National Specialized Banks (NSBs), such as Bangladesh Krishi Bank (BKB) and Rajshahi Krishi Unnayan Bank (RAKUB). Among the micro finance institutions (MFI), Grameen Bank (GB) extends loan to its members for agricultural production. Nearly half of GB's loan profile is aimed at direct agricultural credit.

Table 6.2 shows agricultural credit disbursement and recovery situation in Bangladesh. Disbursement increased, so also recovery. Overdue as percent of outstanding loan has been declining. Total amount of agricultural credit disbursed increased to Taka 14667 crore in 2012-13 from Taka 11117 crore in 2009-10. During the first six months of the fiscal year 2013-14, a total of Taka 8820 crore was disbursed. The rate of disbursement relative to the annual target in 2012-13 was 104%, compared to 95% in the previous year. Credit recovery has also accelerated from Taka 10113 crore in 2009-10 to Taka 14362 crore in 2012-13. Overdue as percent of outstanding declined to 16.77% in 2012-13 from 23.30% in the preceding year.

**Table 6.2: Agricultural credit disbursement and recovery**

	2013-14*	2012-13	2011-12	2010-11	2009-10
Credit disbursement (crore taka)	8820	14667	13132	12184	11117
Credit recovery (crore taka)	9828	14362	12359	12159	10113
Disbursement as % of target	na	104%	95%	97%	97%
Overdue as % of outstanding	na	16.77%	23.30%	26.43%	31.89%

Note: \* Up to January 2014

Source: Bangladesh Bank Annual Reports and Bangladesh Economic Review.

Because of the stringent requirement of collateral, bank's loan goes mostly to large and medium farmers. On the other hand, the loan portfolio of NGOs consists of predominantly non-farm activities with a lesser focus on crop activities. With a view to supporting the sharecroppers and marginal farmers, Bangladesh Bank has launched a special fund of Taka 500 crore to provide agricultural loans (specifically called crop loans). BRAC has been given the responsibility of distributing such credit under its group-based lending policies. The program started in December 2009 and so far has reached a vast number of sharecroppers throughout the country.

One recent study<sup>6</sup> has shown positive association between institutional credit and agricultural production. It is therefore recommended to expand the institutional credit disbursement for agriculture, particularly to the small farmers. Expansion of non-farm activities has been considered an essential strategy to promote growth, employment generation and poverty reduction. Thus a careful balance needs to be maintained between formal and quasi formal institutions in devising their credit portfolios.

### **Women Empowerment in Agriculture**

On average, 43% of agricultural laborers in developing countries are women (SOFA 2011). In Bangladesh, women constitute about 46% of the total farming population. Women participate in wide range of agricultural activities including crop cultivation, livestock and poultry rearing, homestead gardening and fisheries. One micro level study found that women carry out significant work around plantation activities in the home garden, including watering, fertilizing, weeding, and fencing. Women also spend most of their time in pre-harvesting activity with the average time in home gardening being 6-8 hours per week (Akhter *et al.* 2010).

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<sup>6</sup>Khondker, B. H. et al. (2013). The role of credit in food production and food security in Bangladesh, a research report commissioned by NFPCSP, FAO.

Using panel data from 62 villages of Bangladesh, Jaim and Hossain (2011) found that participation of women in agriculture remained almost the same in 1988 and 2000 (59% and 58% respectively); but participation increased to 66% in 2008. Women's participation was limited mostly to livestock and poultry rearing; their participation in crop farming was at limited level. Only 3.85% of the female workers participated in crop farming in 2008, compared to 53% participation by the male workers. Econometric analysis showed that women's participation in agriculture was negatively related with landholding, age after some limit, village level electricity, education of household head, distance of bus stop from village and wage rate in non-agriculture; but positively related with age of female workers, irrigated area of female workers' households, NGO membership of women, remoteness of village and agricultural wage rate in the village.

Results from Bangladesh Integrated Household Survey (BIHS) showed that education and income had positive relationship with empowerment in agriculture for both men and women. However, for both the variables the rate of increase in empowerment was higher for men than for women. The authors of the study concluded that with same level of higher education and higher income, women may still remain less empowered than men in respect of decision making in agriculture (Sraboni *et al.* 2013).

In the labour market, women are historically paid less than men for agricultural work. Evidence shows that the wage difference between men and women in agriculture is very high, at around 40% in 2012-13 (FPMU 2014). Another evidence showed that women earn an average of 21% less per hour than men. Controlling for differences in age, educational background, industry, occupation and geographic location yields an estimated gender wage gap of 15.9%, but including the effects of industrial and occupational segregation into the estimate yields an estimated wage gap of 23.1% (Kapsoss 2008).

Policies and programmes need to seriously address the issues of empowerment and wage differentials between men and women in agriculture. Analysis also needs to be done to examine the productivity differentials between men and women in agriculture.

### **The Overarching Influence of Climate Change**

Climate change will affect crop, livestock, fishery and forestry sub-sectors simultaneously. Some of the impacts of climate change have already started to be visible. The IPCC (2007) predicts 30% reduction in crop production in the current century due to different climate change impacts. In Bangladesh, rice and wheat production is predicted to fall by 8% and 32% respectively by the year 2050. Crop production will be affected in the northern region due to drought. In the southern region, sea level rise, intrusion of saline water and increasing manifestation of soil salinity will heavily affect crop, livestock, fishery and forestry.

Both short and long run adaptation and resilient measures are required to cope with the impacts of climate change. The Government has been implementing the short term measures through agricultural rehabilitation and safety net programmes. Some of the adaptation measures being

practiced are floating agriculture, cultivation of saline and submergence tolerant crop varieties and digging of mini ponds for rain water harvest.

The Government developed the National Adaptation Programme of Action (NAPA) in 2005 to address the adverse impacts of climate change. The Government also prepared the Bangladesh Climate Change Strategy and Adaptation Plan (BCCSAP) in 2009 with provisions to increase the resilience of vulnerable people through scaling up of community level adaptation, livelihood diversification and social protection measures. It also includes measures to support activities such as development and implementation of climate change resilient cropping, fisheries and livestock systems to ensure food security at national and household levels. The Plan is being implemented in the respective programme areas. Effective implementation will critically depend on allocation of adequate resources and proper monitoring of activities under the Plan.



## **Chapter 7**

### **Development Vision, Goals, Objectives and Targets for Agriculture in the 7<sup>th</sup> FYP**

#### **Vision**

In the context of agriculture, the development vision under the 7<sup>th</sup> Five Year Plan would be to ensure food and nutritional security, through sustainable intensification and diversification of climate resilient agricultural systems that are better integrated in local and global market in order to enhance the livelihood of rural women, men and communities.

#### **Goals**

In the context of agriculture sector development, the overall goal under the 7<sup>th</sup> Five Year Plan would be to sustainably intensify and diversify agricultural production to meet the nutritional needs of the increasing population in the country. The strategic goals in this regard would be to:

- Intensify production as needed to address the caloric requirements of an increasing population, diversify production as needed to ensure balanced nutrition for all and maximize rural incomes;
- Promote sustainability of natural resources use for sustainable agricultural growth;
- Promote adaptation to climate change of agro-food systems to enhance resilience of agriculture based livelihood systems. .

#### **Objectives**

Sustainability of high yield and environmental protection remain major concerns with respect to agricultural development in the country. Loss of soil fertility, linked to unbalanced use of chemical fertilizers, lack of adequate quantity of water in some areas, coupled with poor practices in the conservation and use of these natural resources are major factors in the difference between potential and actual output of major agricultural commodities. To address this, the major objectives of the 7<sup>th</sup> FYP as prioritized by the Ministry of Agriculture (MoA), would be to:

- Establish need-based decentralized research and extension system to cater to the local as well as national needs and to address the emerging issues;
- Sustain self-sufficiency in rice production along with increased production of other nutritious and high value food crops/products;
- Increase productivity and real income of farm families in rural areas on a

sustainable basis;

- Encourage export of agricultural commodities - particularly vegetables, fruits and the fisheries sector - keeping in view domestic production and need;
- Promote commercialization of agriculture and ensure market price of produce for sustainable and profitable agriculture;
- Encourage research and adoption of modern agricultural practices for development of drought, submergence and saline prone agriculture considering water and time economy, adaptation to climate change, proper use of genetically modified technology in agriculture;
- Promote use of environment-friendly green technologies (e.g. IPM, INM, AWD, etc.) and climate-smart/resilient technologies; introduce salinity, submergence and other stress-tolerant varieties specially in the southern regions;
- Encourage more use of surface water and reduce pressure on groundwater for irrigation along with development and diffusion of appropriate water saving and efficient irrigation technologies;
- Encourage wider womens' participation in homestead based agricultural production, post harvest management, agro/food processing, marketing and decision making to support womens' empowerment in agriculture;
- Create opportunities for agricultural product processing by establishing agro-based industries and ensure easy marketing and fair price of agricultural commodities by strengthening agricultural market management system and creating/improving transport, storage and processing facilities; and
- Promote effective use of ICT in agriculture.

## **Targets**

With a view to enhancing agricultural production and ensuring food security, the target under the 7<sup>th</sup> FYP would be to attain and maintain self-sufficiency in staple food (rice) production and meet the nutritional requirement of the population through supply of an adequate and diverse range of foods. Food production targets depends on favourable weather conditions as production of most food items is susceptible to climate change and variability. Quality seeds, fertilizers, rainfall, weather, effectiveness of extension services positively contribute to higher food production.

Production and consumption diversification with high value crops including vegetables, fruits, fish and meat has to be the ideal target for good production in the country. Growth induced demand due to high income elasticity will mean a 3.1% increase in demand for food for every 7% growth in GDP. Rice production will have to increase by over 3 lakh tons annually to feed the additional population. Table 7.1 shows the projection of production of selected crops as has been used in the Perspective Plan of Bangladesh 2010-2021 (GED 2010).

**Table 7.1 Projection of production of selected crops up to 2021**

Crops	Production (million MT)		
	2011	2015	2021
Rice	33.54	35.39	36.81
	-	(28.8)*	(32.80)*
Wheat	0.97	1.16	1.40
Potato	8.33	8.76	10.34
Oilseeds	0.40	0.45	0.52
Pulses	0.23	0.26	0.31
Maize	-	1.63	1.85
Fish	-	3.67	4.14
	-	(3.54)*	(3.91)*

Source: Perspective Plan Projection (GED 2010)

Note: \* indicates projected demand (in the cases of rice and of fish).

The table shows that rice production is projected to reach 36.81 million tons in 2021 from 35.39 million tons in 2015. This seems to be a plausible target for rice production in view of the fact that in absence of any extra ordinary yield augmenting rice varieties and under conditions of declining availability of critical inputs land and water, and also under conditions of climate change impacts, rice production cannot be expected to increase at a higher rate. The table also shows that demand for rice is expected to be 32.8 million tons in 2021, which implies that rice self-sufficiency status will be maintained during the 7<sup>th</sup> Five Year Plan. It needs to be mentioned that the additional demand for rice will be generated (partly) through population growth. The successive HIES Reports have revealed that per capita rice consumption has decreased moderately over the past decades, resulting from income growth and rapid urbanization<sup>7</sup>. Among the other crops, except for potato and to some extent for fish, the projected production will fall short of requirement and the country will have to depend on imports of varying magnitudes to match supply with the demand.

As for the overall growth of agriculture during 7<sup>th</sup> FYP, it would be important to take into cognizance the agricultural GDP growth during the 6<sup>th</sup> FYP. It has been shown in Table 2.1 of Chapter 2 that after growing at a faster rate of 5.24% in 2009-10, there has been substantial deceleration in the agricultural growth over the past years. However, as has been mentioned, to maintain the average GDP growth rate of 7% per annum during the 7<sup>th</sup> Plan period, agriculture sector needs to grow at a rate of 4.5% per annum. This growth rate needs to be pursued through development and diffusion of appropriate technologies and pursuance of good management practices in all the subsectors of agriculture.

<sup>7</sup> This is consistent with the Engel's law phenomenon which says that the proportion of additional income spent on food decreases (logically more for staple food rice) with increase in the level of income. The other point is that with increasing mechanization of agricultural operations, heavy work for tillage and other intercultural operations are being replaced by relatively lighter types of works, requiring lesser calorie intake (from rice) for agricultural workers.

## Chapter 8

### Strategies for Sector Development

This chapter concludes the background paper by summarizing the main strategies to be proposed for the Seventh Five Year Plan

#### General Principles

1. Overall, the strategy for 7<sup>th</sup> FYP will be to accelerate the process of transformation from already existing semi-subsistence farming to commercialization of agriculture. This strategy will require achieving productivity gains, diversification and value addition commensurate with national environmental protection and climate change adaptation strategies.
2. Commercialization cannot be achieved without linking the farmers, particularly the smallholders with the domestic and international market. In this regard, agricultural marketing and agribusiness related research and interventions have to be strengthened to support the process of agricultural transformation, taking care of farmers' incentives (through enhancing farmers' bargaining capacity in the market, e.g. various forms of contract farming, reduced transaction cost, farmers' organizations and cooperative marketing where applicable). Strengthening DAM, DAE and other extension organizations would be crucial in this regard.
3. For export market signals, Bangladesh missions abroad will have to be equipped and motivated to communicate trade related information and articulate business negotiation to popularize Bangladeshi products abroad. Efforts are needed to reduce trade and non-trade related barriers.
4. Cross-cutting strategies are needed because of climate change imposed challenges, increased role for private sector involvement, rapid urbanization leading to increasing demand for high value food products, global opportunities for trade and technology transfer and trade-offs in land and other natural resource management. Increased attention will be given to developing agriculture in less favourable ecologies such as hill regions, haor, charland, the coastal zone and Barind areas.
5. In the context of shrinking average farm size and diseconomies of scale for marginal farmers, strategies will be to provide business support to commercially-oriented farms, social protection to subsistence farms and exit support to transition farms (e.g. promoting income diversity in rural non-farm sector and leasing-in land for commercial cops).<sup>8</sup>

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<sup>8</sup> Adapted from Hazel (2013)

6. Given the growing scarcity of land and water, home-based food production in line with family farming system will be encouraged. This may require new technologies such as new varieties of crops, different crop and animal husbandry practices, and integration of small scale productions with marketing channels.
7. Above all, development initiatives of various sub-sectors of agriculture will be boosted by a major effort at strengthening education-research-extension-farmer linkages, as proposed in previous chapters.
8. As has been discussed, women empowerment will have to play a significant role in agricultural development in Bangladesh over the coming years. Various subsidy schemes should be reviewed to make sure that they respond to the particular needs of women farmers; extra attention will be needed to ensure that technologies are gender neutral, and that they address all aspects of the production chain (not just field production but post harvest processing, etc).

## **Crop Sub-sector**

**Ensuring sustainable agriculture and green growth:** Sustainable agriculture will be built on current agricultural achievement by adopting sophisticated approach that can maintain high yields and farm profits without undermining the resource conservation on which agricultural system depends. Sustainability will be planned and implemented in such a way that it will be resource conserving, socially supportive, commercially competitive and environmentally sound. Integrated Pest Management (IPM) programme with more proactive role from DAE will be intensified and expanded in order to safeguard crops from environmental degradation due to pesticide uses. The successful implementation of this strategy requires combined actions from different government ministries and agencies including MoA, MoEF, Ministry of Land and Ministry of Water Resources. The NARS institutes and agricultural universities have to play big role in inventing relevant new technologies. The DAE will be responsible for farm level dissemination of the new technologies. The MoA has to play the leading role for proper coordination among different ministries.

**Promoting use of good quality agricultural inputs:** Currently BADC concentrates its efforts on the production of HYV seeds of paddy, wheat, potato and jute in the seed farms and also uses farmers to multiply seed on contract basis. Production programme of all other crops beyond foundation seed will be done by contract growers. With the introduction of seed policy, emphasis has been given to private sector involvement in research and development of hybrid and HYV seed. Emphasis will be given on creating facilities and infrastructure support for hybrid seed production and marketing. Through the field level extension agents, farmers will be given training and technical assistance to adopt improved methods of seed production, testing and storage. The unbalanced use of chemical fertilizers is causing land degradation and excessive mining of plant nutrients is causing decline of soil fertility and reduction in the

potential yield. Rebalancing of fertilizer subsidy for encouraging balanced use of fertilizers has given some results. The process will be monitored and necessary interventions will be made for improving the situation further. The Seed Certification Agency needs to be strengthened with more manpower and more regional laboratories to certify quality of locally produced and imported seeds. Similarly the SRDI and Plant Protection Department will be strengthened with more manpower and legal power for monitoring and taking immediate legal action against any adulteration of seeds, fertilizers and pesticides.

**Crop zoning and land use planning:** Historically, land use planning has largely been pursued on economic consideration. Focus will be given on comprehensive land use planning through integration of economic, ecological, social and cultural values in production programme in order to develop options so that informed choices can be made. In the 7<sup>th</sup> FYP, emphasis will be broadened to include soil and water conservation, land development, drainage and flood control, and reclamation programmes. The integrated and dynamic nature of people's livelihood strategies and their capacity to use and manage natural resource base will be an important consideration for land use planning. The planning is to be implemented through the Ministry of Land, where the technical support for planning will come from MoA (specifically DAE, SRDI and different research institutes under the NARS system), MoEF and Ministry of Water Resources.

**Ensuring optimal use of water resources:** Modern water management technology will be promoted to enhance irrigation efficiency and water productivity to ensure optimal use of available water resources. The practice of conjunctive use of surface and ground water for irrigation will be pursued to protect the ecological balance and reduce irrigation expenses. Ministry of Water Resources has the lead role to play here with DAE for local level implementation of the water efficient technology. More emphasis will be given for the implementation of the Master Plan for the Southern Region (MOA/FAO 2013). In northern region the Barind Multipurpose Development Authority (BMDA) will implement the plan.

**Promoting agricultural diversification:** Agricultural diversification will allow shifting from cereal-cereal cropping patterns to cereal and non-cereal based high value cropping patterns with value added products. Through diversification, food habit will be changed and nutritional security will be better achieved. In promoting agricultural diversification, the important consideration will be to support small and marginal farmers so that they can improve their consumption diversification from home-produced high value products for improving their nutritional status. Policy support will also be provided to small and marginal farmers in selling their surplus products at remunerative prices by linking them with domestic and international markets. The research institutes under the under NARS system will conduct research for developing non-rice crop varieties and improving cost-effective technologies. Through community based approach the DAE will ensure field level adoption of different technologies. The DAM will be strengthened so that it can play an effective role for enhancing farmers' market access.

**Introduction and popularization of good agricultural practices (GAP):** The new Agriculture Policy calls for development and implementation protocols for Good Agricultural Practices. The four pillars of GAP are: economic viability, environmental sustainability, social acceptability and food safety and quality. Research and extension system will work jointly to promote the process, i.e. the NARS institutes and DAE along with DAM will ensure popularization and adoption of GAP.

**Promoting farm mechanization:** Mechanization of agricultural operations improves work efficiency, enhances productivity and promotes commercial agriculture. Use of machinery reduces harvest and post-harvest losses, production costs, and drudgery of farm workers; ensures timely operation, higher precision and quality produce. The Government will play its pro-active role in popularizing the use of selected demand-led agricultural tools and machineries through field demonstration and imparting training to operators and mechanics for improving their technical know-how and skills in machinery operation, repair and maintenance. The BRRI and BARI will design appropriate machineries with proper ergonomic characteristics and cost effectiveness. DAE will pursue with manufacturers/engineering firms to fabricate relevant machineries with certification from BARI and BRRI. Bangladesh Machine Tools Factory could be one such organization for mass production of agricultural machinery.

**Value chain development:** The Government has been supporting value chain development of selected vegetables and fruits through development projects. The main thrust is to improve the efficiency of agricultural marketing to reduce market distortions and the cost of marketing, and to ensure that farmers get proper price for their produce and consumers get quality products. The 7<sup>th</sup> FYP will improve marketing services with a view to ensuring fair returns to the growers for their produces and adequate supply to the consumers at reasonable prices. The DAM will play a facilitating role here. In this regard, strengthening HORTEX (Horticulture Export Development Foundation), a private board for value chain promotion for high value commodities, is an important institutional development. In addition, the Seventh Plan will emphasize the importance of capacity building of government extension agencies and will take necessary steps to make further progress in the value chain development.

## **Livestock Sub-sector**

**Developing good quality breed and feed for poultry and dairy:** With regard to poultry, disease control and maintaining feed qualities are important strategies. Adoption of cross-breeding of local poultry with suitable exotic breeds will remain a priority. Food safety in poultry meat and eggs should be targeted through quality assurance of poultry feed stuff, hygienic processing of products and environmentally safe disposal of wastes. For small scale commercial poultry farms, strategies should ensure the supply of quality day-old chicks, training on appropriate feed mixture, vaccination and adherence to bio-security guidelines. Introduction of insurance schemes should also be an important consideration.

In dairy production, Bangladesh is far from being self-sufficient. The strategy should be to address the main determinants of production, namely ensuring that cattle are disease free; well fed with cost effective and balanced forms of animal feed, of an appropriate breed for high yielding dairy production; manage lactation process efficiently through artificial insemination; and maintaining a hygienic system for timely milk collection and processing. BLRI will provide breeding services at farmer's level and also for commercial entities. DLS may monitor and provide technical support to feed mills at regional and local level.

**Improving management in the production and marketing of livestock products:** Given the very limited scope for open grazing land, one strategy for raising improved breeds of cows will be to replicate successful home based dairy farming with few animals based on stall feeding with limited grazing of fodder. To ensure reasonable returns to investment, produced milk can be linked to local supply chain to school milk distribution programmes.

The broad strategies adopted for dairy animal development are largely applicable to meat animals as well. Additional interventions will be required to ensure meat quality through strict adherence to science based prescriptions for fattening animals, hygienic slaughter and marketing during peak demands. With technical support from DLS, DAM will work to facilitate farmers' market access.

## **Fisheries Sub-sector**

**Intensifying pond aquaculture and brackish water shrimp culture:** Further intensification of export-driven shrimp without compromise to quality (improved traceability for compliance) and also without causing permanent damage to land and water quality will continue. Strategies which are environmentally, socially and economically compatible will be pursued in order to minimize rice–fish conflicts, especially in the water logged areas, and ensure improved livelihoods of people engaged in production and marketing of shrimp and fish.

Intensification of pond aquaculture will be pursued for domestic consumption, for both nutritional benefit and livelihood reasons. Supply of quality fingerlings and fish feeds through private sector will remain an important strategy. Promoting small indigenous species in conjunction with pond carp culture will be an important strategy from the view point of nutrition for the poor. The BFRI will work for new variety and technology development, and provide technical support to DoF, who will do the field level dissemination.

**Sustainable management of open water fisheries:** Open water capture fisheries has been suffering from depletion of stock, encroachment of water bodies due to developmental works and pollution of water through a range of contaminants. The important strategies in this context will be replenishment of stocks and effective co-management of water bodies by involving community groups through provision of adequate incentives. With lead role from DoF, Ministry of Water Resources, Local Government and MOEF will ensure proper management.



## **Forestry Sub-sector**

**Expanding forest areas by controlling deforestation:** Community forest management, tripartite participatory management practices, social forestry, some of which are already in practice, will be intensified, as a key weapon against further deforestation.

Coastal forest management, along with polder and embankment management, will get special attention in the design of structures and allocation of funds. An important strategy will be to put in practice lessons learned from projects implemented so far. The MOEF will play the lead role here with technical support from Bangladesh Forest Research Institute (BFRI) and administrative support from Local Government and the Ministry of Land.

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## Annex

**Table A1. Brief information on the status of achieving targets under 6<sup>th</sup> FYP.**

Sl. No.	Target /strategies	Achieved	Not achieved
1	Achieving self-sufficiency in rice through intercropping	Self sufficiency achieved	Intercropping not followed as planned
2	Diversification using information of Agroecological zones with suitable crops	Diversification achieved in project areas with high value crops. Land suitability assessment for 12 selected crops map has been prepared	Crop zoning map has not been fully utilized; no targeted programme of incentives to encourage production based on suitability
3.	Crop intensification in coastal zone, Sylhet region and char areas	Crop intensification in coastal zone and some areas of char initiated	Sylhet region is yet to intensify
4	Non rice crop and stress tolerant rice varieties	Vegetables production round the year is now prominent. Submergence tolerant, salt tolerant and drought tolerant rice varieties, heat tolerant wheat varieties developed.	Emphasis on Aus paddy is yet to gain momentum. Stress tolerant varieties are being disseminated by IRRI through donor assistance.
5	Winter season to be covered more with non-rice crop to reduce dependence on ground water irrigation	More vegetables round the year are available, but rice area did not reduce significantly. DAE started motivating farmer for practicing AWD for water saving in irrigation	Water selling practices has to modify (by volume in a season, not by given area in a season)
6	Exploit potential of hybrid rice to increase yield	Hybrid rice varieties developed and seeds are produced by private sectors including some imported.	Grain quality of hybrid rice is yet to be addressed. Area under hybrid still low (8-10 %)
7	Use of USG, SRI, LCC and using the Agricultural Information Service as information provider	USG is being promoted more by IFDC than by DAE (funds not available outside of projects). AIS is providing regular information over media. Demonstration on yield gap is being continued with project support.	SRI is considered laborious, and did not prove to be superior to conventional transplanting. Yield gap demonstration should have covered entire country instead of project sites.
8	Jute seed production by DAE	Being implemented at a slow speed	Total needs could not be met, rather farmers should be trained to produce their own seed as a relay method in Aman rice field
9	Land reforms, such as ceiling of rents for fixed terms, restrictions conversion of agricultural land for non agricultural purpose, hourly rent for irrigation system,		Very limited progress on these targets and strategies. Shrimp policy restricts 30 acres ceiling of farm

10	ICT in agriculture	Media and NGOs are quite active in promoting use of new technologies in farming. Some project based initiatives taken	SPARRSO and other relevant government organizations have yet to be intensively engaged. Rural urban digital divide to reduce
11	Reliability of data	Harmonisation of approaches to rice crop estimation between BBS and DAE undertaken in 2012-14.	BBS and Extension agencies still have difference in data base for other crops
12	Reduction of middlemen from marketing chain		No apparent planned steps for systematic improvement
13	Utilization of Haor land in the north east	LGED has taken projects with the support of IFAD in the haor area	Some further planned activities are in pipeline
14	Conversion of single crop into double and double crop into triple crop	Some efforts through projects.	National cropping intensity figure at 2006 = 176%, 2011 = 191%
15	Replace prilled urea by Urea Super Granules (USG)	Only IFDC supported project areas could make it	Expected areas could not be covered because placement of USG is laborious
16	Farm mechanization	Project areas only were under mechanization. Private led initiatives are continuing.	A nationwide programme has not been made.
17	Vertical silos and bulk storage	Action has been initiated through modern food storage programme of Ministry of Food with support from World Bank	
18	Land reclamation in coastal areas and cultivation of salinity tolerant varieties. Protection of land from inundation river erosion.	Different salt-tolerant rice, maize and sunflower cultivation initiated through donor supported projects.	Sustainable scaling up of these projects has not yet occurred. Also, protection from river erosion and inundation are still problematic.
19	Increased use of quality seeds and stop trading of adulterated seeds	Attempt has always been made to provide quality seeds through public and private initiatives.	Sporadic news in media reflected some trading of adulterated seeds. The service of Seed Certification Agency was not fully utilized
20.	Support to disaster victimized small and marginal farmers	Cyclone recovery project (from Sidr and Aila) has helped around 200,000 farmers	Some of the infrastructure improvements post cyclone are still not totally repaired
21.	Equal wages of men and women labour		No much improvement
22	Measures to encourage surface irrigation	Vigorous attempt has been made for southern districts to promote surface water use.	Excavation or re-excavation of canals are yet to occur to full extent.
23	Popularize organic fertilizer	Sporadic attempts have been made through union parishad. Around 40 private companied registered for commercial selling	The selling of product is still not covered much area
24	Utilize underutilized Haor	Some steps have been taken, on a location by location basis.	
25	Cooperative of growers and construction of special growth centres for fair price	65 growth centres were constructed with NCDP, and others through SCDP.	NCDP growth centres are not currently functioning

26	Agricultural research including crops, livestock, fisheries, forestry and cross cutting issue	Research institutes have identified priority areas for strengthening. Research allocation enhanced. Attempts on enhancing institutional efficiency made. BARC Act approved	Infrastructure development, accountability, promotion and management by appropriately qualified and effective leadership have been given a low priority. Genuine innovative research is limited
27	Delegation of authority of extension from HQ		Not done
28	Field days and demonstration	Project based activities continuing	Limited to project supported areas only. Still to mainstream
29	Community seed production, storage and distribution		Not systematically organized
30	Use of ICT in extension	Substantial initiatives have been taken on a project basis, and by certain NGOs	Grass root level agents to be strengthened
31	Yield gap minimization with ICT	Electronic and print media have made efforts to disseminate technologies, including private TV channels.	This approach is not enough to create any impact, unless it is supported by a programme for participatory demonstration
32	Capacity building of extension personnel	Capacity building in terms of training has been done as per plan	Despite building knowhow, technology transfer is hampered due to lack of budget (other than where projects have been taken).
33	Importance of Forestry sub-sector has been adequately reflected, Social Forestry and Co-Management has been stressed upon		These targets have not been implemented substantially.
34	Forest inventory, GIS, MIS planned including training of Forest department people on remote sensing	Initial work just started on a new forest inventory and monitoring system	Remote sensing not initiated yet.
35	Afforestation in denuded hills and coastal forest.	Significant achievements, especially in the coastal area	Some of the hilly areas have not benefited; also agro-forestry was not a priority of the afforestation process.
36	Fodder production strategy was nicely discussed and planned.		Minimum efforts were made for large scale production of fodder
37	Adequate supply of vaccines to immunize livestock population of Bangladesh		Not achieved
38	Breed improvement through AI and policy formulation		No sufficient measures taken
39	Training of women on poultry and dairy animals		No worthwhile attempt is visible
40	Mechanized tilling to reduce dependence on animals for draught power.		Mechanization effort just start by DAE through project only
41	Efforts to increase milk and meat production of Black Bengal goat		Inbreeding cannot bring much improvement. Crosses with exotic breed might help

42	Barriers that constrain poor ownership of cattle need to be removed		No visible programme
43	Conservation of indigenous cattle and poultry, production of vaccines. Promotion of dairy farms in saline areas.	Conservation and vaccine production are in process	Fodder production technology is being disseminated through projects
44	Production of open water fishery is slow. Pond culture fishery in some cases exhausted		A policy is needed to take account of fishes released and fishes caught.
45	Shrimp culture and productivity increase	Substantial achievements in the shrimp sector	Shrimp farming is controlled by a small number of large producers; smallholders do not enjoy the benefits
46	Community based fishery to be encouraged	Fisheries management arrangements (including long duration leasing) have been implemented in several projects	Overall progress is slow, and depends on projects
47	Not to catch fish for sometime of the year	Seasonal fishing bans have begun to be applied for Hilsha and other carp fishes in Halda river	
48	Improving capacity of Bangladesh Fisheries Research Institute		No serious attention paid. Some buildings are unusable, no programme for Human resources development and recruitment of qualified manpower
49	Magistracy power to be delegated to Upazila level fishery officer		Not done
50	Credit to farmers	Ministry of Agriculture has made progress in this area	Scope for Ministry of Fisheries & Livestock, and others to adopt
51	Policies towards improving fish habitats, river channel dredging, conservation		Limited attempts in this area. Drainage from beels, ditches etc. is damaging conservation of fish species diversity



52	Livestock sector to be encouraged by greater mechanical cultivation, training veterinary staff, reducing kid mortality, promoting small holder livestock keeping	Little progress made	<p>No evident programmes for:</p> <ul style="list-style-type: none"> <li>• Processing and value addition</li> <li>• Training of veterinary staff to identify and treat common diseases, and to administer vaccines to prevent diseases</li> <li>• Encouraging mechanical cultivation to replace cattle as source of draft power, and increase proportion of cattle kept for meat and milk production .</li> <li>• Breeding program for improving production of meat (and milk) from Black Bengal goats while retaining their important traits like disease resistance, prolificacy, meat and skin quality</li> </ul>
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