

Agricultural Research Priority : Vision- 2030 and beyond

Sub-sector :Agricultural Economics and Rural Sociology

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Executive Summary

In recent years agriculture in Bangladesh is growing at an annual rate of around of four per cent against the country's GDP growth of six per cent. Population of the country is rising by about 1.4 per cent leading to per capita income rise of over four per cent. The increase in population and higher income needs larger domestic production of foods. It is estimated that in 2020 and 2030 Bangladesh will have a population of 169 and 191 million respectively i.e. an increase by 17 and 32 per cent over the current population of 144.2 million (2008). Production of food should thus, be raised at least by this rate, if not more; ignoring the increased demand due to newly added poverty free households and higher income induced effect on the consumption of fruits, vegetables, milk, meat, eggs etc. The increasing amount of food is to be produced from the same amount of land or less, as farm land is reportedly declining by about one per cent a year. The only way out to the production increase is to adopt new high yielding technologies but that demand sophisticated management practices where farmers and traders are to be more efficient and skilled. In such production programmes and supplying them to urban consumers both the research institutes and the extension organizations need to be more committed.

To achieve the required increased production, special policy attentions are however, due to the constraints that are quite likely in future. They are:

- i) dominance of small size farms and their weak financial and technical capacity to the adoption of knowledge-intensive technologies;
- ii) deterioration of land quality due to intensive cropping and nutrition depletion;
- iii) declining availability of surface and ground water for irrigation;
- iv) high degree of pollution of river water;
- v) higher cost of domestic production and global competition; and
- vi) inadequate institutional supports at both the farm and the traders' level.

The researchers are expected to remain always conscious of the above mentioned problems and undertake both short and long-term researches. The current and future issues for research in Agricultural Economics will thus, be quite diverse from crop productions to consumptions and ensure minimum level of food security to the nation specially the hard-core poor people (40% of total population). The research issues will obviously include the investigation into the factors affecting the adoption of new

technologies and minimize the yield gaps at present noticed between farmers' field and experimental stations towards higher production of foods e.g. rice, wheat, pulses, oilseeds, fish, milk, meat, eggs etc. There prevailing price environment and investment opportunities are to be studied first in all agro-ecologies of the country with a priority to potentially more favourable regions and farmers' preferences. This should also look into soil quality, waterlogging, saline intrusion and genetic erosion towards enhancement of environmental base and suggest institutional supports needed in making the production environment more congenial and profitable to the farming community.

It is understood that new improved technologies available at present for storage, transports, processing and different other market services in crops, vegetables, fruits, fish, milk etc. are few. We should look into the existing marketing functions and the middlemen's behaviour and identify the areas of inefficiency specially in the price spread between farmers and consumers towards improvement of market competitions, public-private participation in organizational development, infrastructure build-up and institutional reforms.

Beyond domestic production and marketing of farm products attentions are due to the international trade specially Bangladesh's imports of different food items and farm inputs e.g. fertilizer, seeds, cattle and fish feeds, and their impact on production and price stability in the country. Private sector involvement and NGO participations in this regard also need to be under constant investigation.

Agricultural Economics being a broad-based subject its studies should also prioritize the natural resource management and environment protection with due emphasis on the efficiency of land and water use. Public policies like pricing and subsidy on farm inputs e.g. fertilizer, irrigation, animal feeds etc. towards increased production and fair retail prices need to be regularly researched. Mechanisms and the levels of participation by local government in agricultural development and the rehabilitations of the victims after disasters may also be studied keeping in view the short and long-run objectives.

1. Introduction

1.1 Background of the Study

With the passage of time the demand for food is rising due to population growth and rise in income. Increasing agricultural production is thus, essential. This is more so, in developing countries where substantial number of people is still under-nourished and also suffer from malnutrition. To feed them properly domestic production of food should be raised and their prices are to be kept within their reach. This is not enough as there are hard-core poor people who cannot even afford their costs; for whom the safety net programme is a must as practised in Bangladesh. Under the circumstances, both the costs of production and marketing of farm products should be kept lower suggesting that their efficiency levels need to be substantially raised where special care is necessary in all marketing services.

Higher levels of efficiency are far more important for the poor urban consumers who are far away from the producing areas. There all marketing functions in the supply chains are to be accomplished more cost effectively. The intermediaries involved in the marketing services are also expected to be judicious in their behaviour and their profit margins should be kept normal keeping the quality of farm products specially those of perishable products standard.

1.2 Marketing Facilities

Overtime because of faster growth in urbanization and concentration of higher income households there, the demand for improved marketing services is rising. The costs of such services are but higher particularly in case of perishable products like fruits, vegetables, fish, milk, meat, eggs etc. as they need careful packaging and cooling vans for safe transportation. The costs of wholesaling and retailing of these perishable products are thus, higher. Actually farmers' shares to urban consumers' prices often go below 40%. The shares decline further in the off-seasons due to extra costs of specialized storage and other post-harvest services needed. Farmers are therefore, deprived of due shares in their prices. Their shares could however, be raised if the farming community could be directly involved in the distribution of farm products to consumers. We are unfortunately not aware of the levels of such benefits due to producers as well as consumers as few studies are available in this regard.

Seasonal nature of farm productions is encouraging the growth of food processing industries in Bangladesh, specially noticeable in fruits and bakery industries. Some of the processed products are allegedly adulterated. Nutrient and vitamin contents as written in container levels, sometimes are not found true. Constant quality checking of the processed products is thus, essential. Inadequate testing facilities in terms of the laboratories and trained manpower constraint such regular testing operations of the government.

Further, with respect to the prevalence of market competition, there are allegations of collusions among the traders and thus, the farmers are deprived of fair prices of their produces. Existing market information services there are of little use. Actually poor bargaining power on the part of growers, is the main bottleneck there; although no such specific study has been undertaken in this regard.

Oligopolistic behaviour by the importers of fertilizers, seeds, sugar, soybean, onions, pulses, spares of machineries etc. are also evidenced in critical periods of productions and consumptions. To avoid such unusual situations, minimum levels of domestic production are necessary. This is possible in our country through intensive extension services and price support programmes where state interventions are imperative. Systematic studies are needed indicating weaknesses in supply chain of marketing of farm products, price competitions prevailing and farmers' shares to consumers' prices etc.(Ministry of Agriculture, 2006).

It is worthwhile to report that Bangladesh in the last decade exported some primary products including frozen fish specially shrimps, fresh vegetables and fruits valuing of over US\$ 800 millions annually (Ministry of Finance, 2009). Such exports are but limited to the ethnic markets of Asia and Europe. The country's exporters face stiff competitions in the export markets besides confronting problems related to air-freight and quality of products. In recent years there is quality regulation imposed by the European countries for adoption of sanitary and phyto-sanitary measures for vegetables and fruits. Lack of adequate awareness on the part of growers and insufficient laboratory facilities in the countryside are constraining their exports (Yunus, 2009) and thus, both the exporters and the farmers are deprived of fair shares of export prices. Some special studies with regard to existing public policies and infrastructural facilities could indicate the areas of improved mechanism of increasing

exports. Such studies could also be initiated towards exploitation of the country's export potentials in global market may be, in collaboration with the country's Chambers' of Commerce, the Export Promotion Bureau, the Commercial Banks and even with the private companies interested. Incidentally it may be noted that private sector participation could help faster expansion of export markets in jute yarn as already experienced by the Jute Exporters' Association.

1.3 Production Situations

The discussions above have been kept limited to the marketing services available as if there is no problem in increasing country's agricultural production. Actually increasing production is also quite difficult due to varieties of problems such as (a) excessive number of small size farms (below 2.0 acres), (b) fragmented plots, (c) low land productivity, (d) farmers' poor financial capacity etc. Attaining higher productivity in land is the principal mechanism of increasing production in Bangladesh. There we find substantial yield gaps between the research results and the farmers' harvests and also among the farmers in the same locality and the regions of the country. Particular attention is therefore, needed to harness the potential yields that require applications of proper farm practices as recommended by the scientists. It may be noted that there are some non-rice crops like jute, cotton, pulses etc, vegetables, spices, fruits etc. where adequate suitable HYVs are not yet available; and those which are available with the research institutes have not yet widely adopted at the farm level; may be, due to inadequate supplies of seeds, low profitability and/or lack of proper extension services. The farming communities are also unable to adopt all those recommended practices due to variety of factors. Here farmers' participation in research projects may be useful; at least to identify the factors to overcome the yield gaps existing in different agro-ecologies (BARC, 2000). This needs careful investigation keeping in view the agro-ecology variations, plant varieties released, farmers' resource base, price fluctuations of inputs and outputs, institutional supports available etc. Here capacity building of the farming community in harnessing production opportunities, diversification of farm enterprises, procurement of quality inputs, processing opportunities etc. is a pre-requisite. In-depth researches are required in all these areas with special emphasis on adoption of new technologies, their productivity and profitability.

Increased productions achieved in rice and wheat are mainly due to expansion of HYVs and Hybrids which demand improved crop practices and intensive use of inputs. The resource poor farmers cannot afford such input intensive cropping. Scientists in this regard are continuing in developing low input using HYVs as well as varieties that are adoptable in stress conditions (drought, water submergence, salinity etc). More attention is also due to scientific researches in pulses, oilseeds, onion, garlic, vegetables, fruits and their processing activities.

In Bangladesh both the institutes and the scientists are few in livestock, fisheries and forestry as is evident from the number of scientists engaged and the amount of research fund allocated. Extension services beyond the upazilla level are almost absent in these sub-sectors as no technically trained people are appointed there. It may be mentioned that in the late nineties there had been faster growth in dairy and poultry farms but the momentum could not be maintained, reportedly due to sharp fall in prices of milk and poultry meat contrary to price inflation in animal feeds and veterinary medicines. The spread of Bird Flu also caused huge losses to the small-scale layer and broiler farm owners (BLRI, 2008). Consequently a large amount of bank loan is remaining unpaid. All these areas need extensive studies in identifying suitable preventive and curative measures.

Fish farming in Bangladesh is growing slowly. Its faster growth is constrained by disease infestation, poor feeding practices and in-breeding. Most alarming situation is noted in open water fishing due to rapid depletion of fish stock where some new methods of fish culture are needed. Socio-economic studies with emphasis on fishermen communities and their practices may help formulate appropriate policy actions. Their livelihoods seem to be threatened soon by the effects of climate change. Immediate attention is due to the adoption of innovative survival strategies.

Agriculture in Bangladesh is still of subsistence nature although there is wide-scale adoption of HYVs in rice, wheat, potato etc. The remaining other crops have limited expansions and thus, commercialization is not progressing fast. May be, production and price environment are not favourable to their expansions and the private sector participation is not encouraging. Immediate question therefore, is to see how far the farm producers are efficient

and what factors constraint the improvement in their efficiency levels and what institutional supports are required. To my evaluation, farming communities are not getting adequate institutional supports in terms of extension services to the adoption of new technologies where the weakness in the research-extension linkage is considered to be the main hurdle.

It may be noted that Bangladesh agriculture to some extent emerged as dynamic sector during the Green Revolution period. It now faces second generation problems. Intensive use of seed-fertilizer-irrigation technology resulted in increased agricultural production but caused decline in soil fertility due to nutrient mining and ground water depletion and also erosion of bio-diversity. Arsenic contamination of underground drinking water has appeared as a health hazard. Bangladesh agriculture now faces new challenges due to shrinking of farm land, farming in marginal and vulnerable areas and competition with global market. Research has to respond to the new challenges and becomes ready to face the competition ahead. Research focus should now be demand-driven, where market forces will dictate the portfolio. We now need strong institutions, modern facilities, higher scientific skills and more investments. The government therefore, should need to be more liberal in allocating larger amount of fund.

1.4 Main Objectives of the Study

The study has the following major objectives* :

- (i) To identify the priority research areas in socio-economic fields towards minimizing the yield gaps and increase agricultural productions,
- (ii) To select appropriate new technologies that would augment land and labour productivity, soil fertility, water use efficiency leading to conservation of natural resources,
- (iii) To report the need of intensifying research on market participation, processing and product diversification for value addition to increase farm household income and consumers' satisfaction, and
- (iv) To indicate the priority areas for research in response to the challenges, emerged from current scientific achievements, market liberalization and international competition.

* Based on the Terms of Reference (TOR) of the Group Leaders (Annexure-I)

1.5. Limitations of the Study

The study is based mainly on secondary information and the published articles and research reports available with the NARS Institutes, agricultural universities and different other development organizations. It also makes use of the papers prepared on the outcomes of the workshops on Agricultural Priority Setting held on January-February, 2010 in the selected regional centres of Bangladesh. Detailed discussions and consultations were also carried out with the agricultural scientists, agricultural economists and policy makers. It is believed that the present study report will enable us to chalk out the future research plan in the fields of agricultural economics and marketing of farm products and production inputs. We should however, regularly keep track of the recent research achievements, global changes and the problems appeared at home and abroad and accordingly up-date the research agenda.

The report has five sections after Introduction. The second section has reviewed the literatures available with the agricultural research institutes and the relevant organizations and their recent scientific achievements indicating the research gaps existing at present. The next section mentions of the possible concerns to the future increase in agricultural productions and it is followed by the fourth section that details out the current and the future issues for research in Agricultural Economics. The fifth section identifies the specific areas of future research and their short and long-run priorities considering their importance to the national economy and agricultural development. The report ends with concluding views in sector VI.

II. Review of Researches Undertaken by the Research Institutes

Research is generally carried out in Bangladesh by different research institutes, public and private universities and other development organizations including the NGOs keeping in view both short and long-run objectives. There are also evaluation studies often done for the development projects undertaken by the government agencies and the private companies. Besides the impact evaluations, sometimes theoretical researches are also done, mostly by the public universities. Private universities of the country are rarely doing such researches as most of them are not yet well-equipped. Research findings are generally disseminated

through seminars, organized by them and the final outputs are presented in different forms e.g. research reports, monographs, occasional papers besides scientific articles, published in different journals at home and abroad.

The researches undertaken in agricultural sciences are highly concentrated in technical fields, at least applicable to NARS affiliated institutes. There are also rural academies which also do researches in Agricultural Economics in the context of rural development and household income as agriculture is one of the main components of income to rural families. Bangladesh Rural Development Board (BRDB) is the prime organization in this respect. They emphasize agricultural development research within the purview of institutional development, mainly cooperatives.

The country's ten NARS institutes are not equally equipped with trained manpower. Of the existing institutes only three institutes namely BARI, BIRRI and BLRI have Agricultural Economics Division. The remaining seven including the BFRI have not yet opened the Division. In the Economics Divisions the number of Agricultural Economists is fewer than that employed in other Divisions. Obviously research outputs are insignificant and thus, many researchable areas are still left unattended. Such gaps are also prominent in the case of public universities of the country and thus, the progress achieved in Agricultural Economics research is not satisfactory and many issues are still remaining unexamined.

In all the agricultural research institutes and the universities, the researchers and the teachers are unfortunately not well qualified and properly trained and substantial number of them is not Ph.D. holders. Foreign scholarships/fellowships offered to them are comparatively fewer. Foreign visits and research collaborations with the international organizations specially in USA and Europe are also rare. Further, annual allocation of research fund to socio-economic divisions is also poor with the understanding that such researches do not require to buy costly equipment and scientific apparatus. It is also claimed that the concerned authorities of the institutes prefer to engage the Agricultural Economists in a localized study covering one or two areas or sometimes in certain ecologies where certain technology adoption researches have been undertaken. Such conceptions may be correct, at least where the project impact of a specific technology adoption is evaluated. It is

however, not always true that the Rice Research Institute should always do research in rice. It may need to examine rice cultivation with the broader perspectives of other competitive crops and the price environments prevailing in the country. For national policy issues, the studies need to be broad-based covering all related agro-ecologies of the country as well as all possible stake holders having differential levels of access to physical and institutional facilities dependent upon the objectives of the study. Actually, widely covered studies help formulate appropriate policies and development actions.

It is furthermore, to be noted that the country's mono-crop institutes often direct all their researches in Agricultural Economics to their own subjects. For example, rice in Bangladesh Rice Research Institute (BRRI), Jute in Bangladesh Jute Research Institute (BJRI), Tea in Bangladesh Tea Research Institute (BTRI) and Sugarcane in Bangladesh Sugarcane Research Institute (BSRI) etc. This approach is good but not the best as there are many other competitive as well as supplementary crops/enterprises in the area. It may also be mentioned that the farmers may have different objectives of growing crops and adopting new technologies such as higher income or profit or the household consumptions. So, all adoptable technologies as recommended are expected to yield higher return or meeting growers' own family requirements and satisfactions. There they may need comparative enterprise/commodity studies. Overall, one should examine the efficiency of production and marketing of farm products; and that the efficiency may even be measured relative to every input use say fertilizer, irrigation etc. Let us now brief the recent research outputs in Agricultural Economics of a few selected main institutes such as BRRI, BARI, BLRI and the Bangladesh Agricultural University with the consideration that other organizations might have insignificant contributions. Actually it is not the number of research as carried out but the quality of research that matters most. In this regard Bangladesh Institute of Development Studies (BIDS) has a valuable contribution to agricultural development as apparent from the list of studies carried out (BIDS, 2009) and it has the dominant say in the policy decision of the government as its studies are quite broad based and well designed.

2.1. Bangladesh Rice Research Institute (BRRI)[†]

Bangladesh Rice Research Institute is the premier mono-crop research institute for rice, the staple food of Bangladesh. It covers over three-fourths of the country's cropped land and deserves maximum attention of the government for food security reason. It has the second highest allocation to total research development fund in agriculture. BRRI has a separate Division for socio-economic research in agriculture. It has at present three broad programme areas. They are:

- i) Production economics and technology adoption;
- ii) Rice marketing and price issues, and
- iii) Agricultural policy and development.

All these programme areas have strong linkages to rice production and marketing. Production practices there are very much related to the adoption of new technologies, already generated by the Institute. Most of these researches emphasize productivity rise of land and labour. It has not yet undertaken any studies related to rice imports, exports of fine rice, international trade in rice and other substitutable food crops.

Few research reports are found on regional rice production, marketed surplus, private trading and market integration, rice consumptions and its substitutions etc. Its collaborative research programme with the International Rice Research Institute (IRRI), Philippines is praise-worthy; but there the overwhelming involvement has been with the expatriate consultants. No study has been undertaken on (a) soil health management and rice culture; (b) uses of rice by-products; (c) rice farming systems and household income, (d) farm mechanization and credit support etc. May be, the Division has shortage of trained manpower and/or research fund to undertake all these researches. It has at present only nine Agricultural Economics graduates including four Ph.Ds. Actually BRRI's all technical Divisions should have adequate supports of Agricultural Economists to evaluate the impact of all research projects. The Division may also regularly publish research reports and organize seminars for dissemination of the research findings.

[†] Please see Different Internal Reviews, BRRI

2.2. Bangladesh Livestock Research Institute (BLRI)

Bangladesh Livestock Research Institute is the only research institute in Bangladesh for livestock. It has two out-stations for research at Sirajganj and Bandarban. The Institute has at present seven research Divisions such as (i) Animal Production, (ii) Poultry Production, (iii) Animal Health, (iv) Goat and Sheep Production, (v) Socio-economics, (vi) System Research, and (vii) Bio-technology. The socio-economics Division of the Institute is very much poorly equipped having only four Agricultural Economists against the total scientists of 45 there. Research fund allocation to this Division is also abnormally low. There are thus, few studies that have been carried out by this Division despite having wide scopes for research in Bangladesh.

The socio-economic studies undertaken so far are limited to (a) commercial dairy and poultry farms and their productions and (b) diseases and infestations occurred. Research reports have also been found in goat, sheep and duck farming. Very recently a very broad-based survey report has been presented on the impact of Avian Influenza of 2007 and 2008 on production and consumption of poultry meat and eggs. Similar studies were also carried out previously with the emphasis on the country's commercial poultry farms. Most of these study reports are related to costs and return and the problems faced by the farm owners. Very few studies are however, available on the adoption of new technologies, may be the Institute is lagging behind in releasing new technologies or that they could not yet generate adequate number of suitable technologies owing to shortage of qualified scientists..

Policy studies are almost absent in the institute. There is no such specific research report that can indicate the policy actions to be undertaken towards the rapid expansion of dairy, poultry and meat farms in the country. Experience suggests that the organizations unfortunately lack qualified Economists in motivating the policy makers towards rapid policy actions, as suggested by the FAO sponsored review report of 2006. The government seems little responsive to the livestock development.

2.3. Bangladesh Agricultural Research Institute (BARI)[‡]

Bangladesh Agricultural Research Institute is the country's largest institute for carrying out researches in varieties of crops (other than rice, jute, sugarcane, tea), vegetables, fruits and flowers. It has several regional research stations for adoption studies of the technologies, already generated by the institute. Agricultural Economics Division of the institute focuses its current researches on the impact assessment of BARI released technologies including seeds, farm machines etc. In addition, the researchers are also found to study the price behaviour of BARI mandated crops as well as efficiency of input uses and policy analysis of selected crops.

In recent years Agricultural Economists of the institute have been found to undertake studies on economics of production of wheat, potato, pulses, tomatoes, and spices like onion, zinger etc. In such adoption researches attention has also been given to the country's agro-ecologies specially the unfavourable ones e.g. the saline and the hill tracts. Marketing aspects of some fruits and vegetables have also been studied. Issues related to food security has also been examined in terms of wheat and potato production which is definitely partial. Further, they did not look into the import market for wheat, pulses, edible oils, spices etc. and also no research paper has been prepared related to availability and prices of production inputs such as fertilizer, pesticides, diesel, pesticides etc. The Economics Division is silent about the export potentials of fruits, vegetables and flowers. There the impact of WTO rules and regulations on our existing situations need to be carefully evaluated. Non-availability of relevant specialists in the Division appears to be the limiting factor.

Very little attention has also been paid by the Institute to farm mechanization, agro-business, food processing and their impact on national economy. Research is also due on the prospects of food industries, commercialization of farming and bottlenecks to the progress of industrialization process. Studies on the details of the farming systems practised in different agro-ecologies of the country and their impact on farm income and consumptions need to be updated. Private sector participation in contract farming in potato, fruits, maize, their

[‡] BARI, Annual Research Report (Different Issues)

marketing and processing may also be studied towards their expansion programmes indicating their effect on farm income and consumers' price.

2.4. Bangladesh Agricultural University (BAU)[§]

Bangladesh Agricultural University has six faculties, of which one of them is Agricultural Economics and Rural Sociology (AERS). The AERS consists of five departments namely (i) Agricultural Economics, (ii) Agricultural Finance, (iii) Agricultural Statistics, (iv) Agribusiness and Cooperatives, and (v) Rural Sociology. All the teachers of the faculty besides teaching also undertake researches in different fields of agricultural development of the country. The research projects are funded by both national and international organizations. There are also collaborative research projects. Their studies have covered different fields of agricultural development such as (a) Farm Management (b) Economics of New Technologies, (c) Agricultural Credit & Financial Management; (d) Rural Institutions, (e) Pricing and Marketing of Farm Products; (f) Irrigation and Water Resources etc.

The research projects completed by the AERS in the last decade are understandably quite useful. The main areas of the study completed so far include (a) Food Security, (b) Poverty Alleviation, (c) Farm Mechanization and Irrigation, (d) Poultry and Dairy Farming, (e) Marine Fisheries and Aquaculture, (f) Arsenic Contamination, (g) Impact Assessment of Action Plans on Pulses, Oilseeds and Spices etc. Areas left out of research at present appear to be (a) International Trade and Export of Farm Products, (b) Import of Farm Inputs and Agricultural Production, (c) Conservation of Natural resources and the Efficiency of their Uses, (d) Protection of Natural Environment and Bio-diversity (e) Local government and its contributions to development, (f) River transportation and dry seasons water flow and navigation, (g) Pesticide use and quality of high value crops, (h) Climate change and its possible effects, (i) Agro-processing and its expansion prospects, (j) Resource transfer from agriculture to non-agriculture, (k) Irrigation and ground water aquifer etc. The main limitations to the research studies are considered to be (i) lack of research fund and (ii)

[§] Please see Bureau of Socio-economic Research and Training (BSERT), 2006 and 1994.

inadequate institutional supports to the participation of national and international seminars, and (iii) insufficient incentives to researchers etc.

III. Attentions Needed for Future Research in Agricultural Economics

Research is a continuous process and its outcome either positive or negative is difficult to measure; and whatever it may be, one should be careful enough in identifying the weaknesses and defects of the research projects. Research in Agricultural Economics Division of the NARS institutes is largely related to the estimation of costs and benefits of the technologies, generated by the research institutes and identification of the possible areas of adjustments, while adopting new technologies by the farm households. Also they evaluate the impact of different development projects of the government and public policies implemented and determine the factors affecting their performances. Researches are also expected to project or forecast future production situations and accordingly suggest appropriate measures following the econometric models developed, indicating the major scenarios or set of socio-economic conditions. Such forecasting of economic conditions are quite complex as the economic changes in future may be both normal and abnormal. Let us now try to indicate the future likely changes in the socio-economic fields of agricultural development in the next three decades and special attentions needed to face the adverse consequences if any.

The immediate future concern to the increased agricultural production in Bangladesh is to ensure minimum level of food security from the same or less amount of farm land as the country's population is rising fast. It is estimated that Bangladesh in 2020 will have a population of 169 million at an annual growth rate of 1.35% and in the year 2030 total population will increase to 191 million even at the reduced rate of 1.25 and 1.20 per cent in 2020 and 2025 respectively.** In such population growth there will be faster growth rate of over four per cent in urban population and it is assumed that their proportional shares to total people will be 35 and 40 per cent in those two years (2020 and 2030). Their demands for

** Also please see United Nations Department of Economic and Social Affairs/Population Division; 2005; where there are different estimates following high, medium and low variants relating to sex and age distribution. According to their estimates the population in 2030 will be 221.98, 205.64 and 189.76 million. It may however, be noted that in 2010 the low variant estimate stands at 153.43 against our current (2008) estimate of 144.2 million

high value food items such as fruits, vegetables, milk, meat, eggs etc. will be higher as their consumption patterns are a bit different from the rural patterns. Any way, to ensure minimum level of food security at least in terms of rice and wheat we need to produce 36 million tons of rice and another one million ton of wheat ignoring the income induced effect and its elasticity against the present production level of 29 million tons of rice and 0.8 million of wheat (in 2007/8). Reportedly, there will be per capita income growth of 4.0 per cent and the income elasticity for rice ranges between 0.6 and 0.7 and that for pulses, oilseeds, vegetables, fish, meat, eggs, milk etc. will be more than one. There will thus, be substantial increase in the demand for non-rice commodities specially livestock products. Overall, it can be safely said that grain production should be raised by 25% in 2020 and 30% in 2030 and in case of high value crops, and livestock products the rates of increase need to be by 35 to 40 per cent over the benchmark production of 2007/08 (Quasem, 2008). Such a high production increase is definitely a critical task as the country's farm land is declining, reportedly one per cent a year. The productivity increase of land is thus, the only way out for such high growth^{††} and this is possible through adoption of new technologies and sophisticated farm management practices as per research recommendations. This suggests that the farmers need to be more trained and technically skilled to apply such knowledge-intensive technologies. The existing research and extension organizations in this regard need to be more active and responsible. The public policies should also be made more favourable emphasizing human resource development and rural infrastructures build-up that consequently may lead to sustainable agricultural growth and increase in small farmers' income (ESCAP-2008). Some major constraints that however, need to be taken care of in future research are:

- i) Decline in country's farm land due to its diversion to non-agricultural uses;
- ii) Quality deterioration of land due to nutrient depletion and salinity rise;
- iv) Inadequate availability of irrigation water and the downing of ground water table;
- v) Substantial increase in the number of small farms, their small size of farms and the fragmentation;

^{††} The rate of accretion of new land in the mouths of the Meghna and other rivers in the coastal belt may not help increase rice production due to non-suitability for rice cultivation. Further, sea level rise may again sub-merge such lands besides increasing the salinity level there.

- vi) Weak resource base of the farmers in terms of technical knowledge and financial capacity;
- vii) Outflow of financial capital to non-agriculture due to lower rate of return from agriculture;
- viii) Stiff price competitions for farm products due to global free marketing system;
- ix) Weak market regulations and poor institutions to combat the corrupt market practices;
- x) Inadequate institutional supports to livestock and fish productions.

3.1. Declining Size of Farm

In agriculture we expect that the number of farm holdings will be falling at the rate of about one per cent a year against the present farm households of 57% to total rural holdings (BBS, 2009). At the same time their average size of farm will also decline from the existing size of around 1.20 acres (BBS, 2005) with the transfer of farm land to non-agriculture. It is afraid that it will come down to below one acre by 2020 which is quite small for survival of a family and to continue his farming occupation. This is definitely a serious concern for the landless and marginal farmers besides ensuring national food security to increasing population which is at present a top priority to the government of Bangladesh. This demands special policy attention to the threat, created by faster rate of conversion of farm land to non-agriculture of about one per cent of land a year (Quasem 2007).

3.2. Dominance of Small Size Farms and Their Weak Financial Capacity

In Bangladesh about 90% of the farm households are small (upto 2.5 acres) that may rise to 95% in the next two decades cultivating at least half of the country's land. Of these farmers, about half will be landless (upto 0.5 acre). Many of them are tenants. Overwhelming proportion of these small and marginal farmer groups do not have investible surplus for adoption of modern technologies towards higher productivity, the principal means of increasing agricultural production. Substantial number of small farmers is not literate and cannot be trained easily. Special attention is thus, due to their skill development where the Department of Agriculture Extension (DAE) must strengthen its efforts.

3.3. Transfer of Resources from Agriculture to Non-agriculture

Towards faster growth in agricultural production, agriculture needs to be modernized that demands mechanization and the adoption of new technologies. Production of high value crops and their exports further needs special care in terms of Sanitary and Phyto-Sanitary (SPS) measures. Establishment of poultry and dairy farms is also capital intensive and risky. In future more investment and a new class of entrepreneurs will be necessary for agricultural development. The existing conditions of agriculture are unfortunately not favourable to such new investments as agriculture in Bangladesh is more risky and also yields low rate of return and therefore, capital is flowing out of agriculture. This trend of outflow of resources must be reversed to make the agriculture more productive, profitable and competitive. The government should need to make the production environment in agriculture more encouraging to private sector participation. Some special studies relating to their participation may be initiated keeping in view the long-run interest of the country.

3.4. Degradation of Land Quality

It may be noted that overtime total farm area in the country will be declining due to new housing, urbanization and infrastructure building. In addition to such reduction of farm area, quality of soil is apprehended to be deteriorating because of intensive cropping, imbalanced use of chemical fertilizers. Already there is high degree of depletion of organic matter in soil resulting in reduced fertility and consequently low productivity. Along with such deteriorating situation, the coastal belt covering over 10% of the country's land has been experiencing increasing intensity of salinization. Such intensity will be rising fast in future due to sea level rise making the whole coastal belt and its adjoining areas more vulnerable; and therefore, agricultural production will fall, if no preventive measures are adopted well ahead of time. Immediate attention is due to devise appropriate action programmes to combat the adverse consequences of climate change on farming and people's level of living.

3.5. Stiff Market Competition and the Scientific Progress

Under open market economy imports of goods and services are free and accordingly Bangladesh has liberalized its market substantially and many farm products are being imported from its neighbouring countries. Such free imports sometimes compete out some of our own commodities from the market. Such practice in long-run may adversely affect the domestic production. We thus, need to be more efficient and prepare ourselves for such competitive situation by improving both production and marketing practices in the country.

It is sometimes claimed that due to favourable climatic production conditions or provisions of export subsidy and/or input subsidy in the exporting countries, sales prices of their products in the importing country may often be lower, as experienced in case of rice, wheat, pulses, onion and other spices, beef, eggs, fish and fruits like mangoes, oranges etc. in Bangladesh. We should immediately prepare research papers pointing out our weaknesses in scientific achievements to draw the attention of policy makers and the media.

Potential threats will be severe in future due to faster scientific achievements in generating new technologies outside Bangladesh leading to reduced cost of production and processing. Lower cost of production may also accrue due to large-scale production as experienced in USA, Australia, Germany, France etc. This is predominantly observed in processing of farm products which may deter our domestic industrial growth. Attractive packaging and quality maintenance of imported food sometimes restrict the entry of our produced foods to the cities' Departmental Stores and the urban consumers. The country should be ready to face such competitions by creating modern facilities including the laboratories. This is also necessary to export our farm products where WTO regulations are creating barriers. In this regard the experts in Agricultural Economics and Agricultural Engineering may jointly undertake studies indicating the preparatory measures to be adopted to the expansion of export markets.

3.6. Reduced Surface Water Resources

Another area of concern to the agriculture production is the reduced flow river water from the Himalyan Range and drying of surface water reserves owing to diversion of water by the neighbouring countries. We will thus, have lower amount of surface water for

irrigation and navigation. Tension is also being built up from the downing of ground water aquapher and shortage of tube well water in the Barind Tract. Deep water mining and continuous irrigation have resulted in Arsenic contamination of tube well water in may districts. Cost of irrigation is also rising. It is succinctly clear that in the 2020s there will be serious scarcity of irrigation water that demands for higher efficiency of water use at any cost.

3.7. Pollution of River Water

It is also reported that due to effluent discharges by the industries, river water in many areas is already polluted and its intensity will be rising in future causing damages to fish habitats. Pollution of sea water in the coast is also evident and its area is expanding and the sea fish habitats are being damaged. Fishermen therefore, are being compelled to go for deep sea fishing which is endangering their lives. An in-depth survey on fish reserves in the sea-coast is essential to the maintenance of sustainable stock of fishes.

3.8. Higher Costs of Production

The demand for higher agricultural production to feed the increasing population (1.3% per year) from the reduced farm area and its degraded land at higher cost of irrigation, increasing salinity and pollution of river water is a serious cause of concern to Bangladesh. Besides, there are also a high degree of threats from natural disasters like cyclones, floods and drought due to climate change. We therefore, need to prepare ourselves to face such adverse consequences in the immediate future and accordingly the details of precautionary measures and development practices needed for future agriculture are to be chalked out.

3.9. Inadequate Institutional Supports

In all researches of Agricultural Economics maximum attention needs to be paid to the methodologies to be followed and their analytical vigour, so that the conclusions derived become correct although there may remain some questions of debates. The studies related to policy issues should be broad-based and in-depth one. There the research budget should be higher but in most cases the institutes cannot afford and thus, external supports are sought. Such supports being limited sponsors' views on the TORs of the studies generally prevail.

The researchers however, need to remain careful to the proposed TORs and modify them if necessary, to the national interest and academic outputs.

Researchers in Bangladesh being low-paid professionals are often interested in higher-salaried consultancy jobs and thus, cannot devote to full-time professional research, as evidenced in case of some specialists in Agricultural Economics. Such specialists' services will be scarce in future with the private sector participation in research. To make their services available to some critical economic issues special public policies are needed remembering that consultants' reports are not always useful.

Another constraint to expertise services for research undertakings is inadequacy in interaction facilities particularly with the specialists working in developed nations. It is alleged that Agricultural Economists sometimes cannot join the seminars and discussion meetings held in USA, UK, Australia and in European countries due to lack of fund. It is also unfortunate to report that the libraries of the institutes are also not equipped with current journals, research monographs, books, articles etc. and thus, they are deprived of newly generated information and knowledge. Available internet services to link the entire NARS system with international library database to that end are considered to be quite useful (BARC, 2000). Such facilities should be expanded to cope with the scientific achievements outside the country besides providing sufficient amount of fund for visits abroad.

Some of the Agricultural Economists who have been working with the NARS institutes for quite sometime are reportedly not fully satisfied with the prevailing working environment and the service facilities provided to them. Their expertise seems to be under-utilized. Under the circumstances specialists in Agricultural Economics may feel deprived and try to leave the institutes which should be discouraged as human resource build-up is time-consuming and very expensive and perhaps may not be even possible in future as private universities and firms are employing them at higher salaries.

IV. Current and Future Issues for Research

Issues for research in Agricultural Economics are continuously changing due to changes in socio-economic conditions of the people and generation of new technologies. Faster changes are however, being noticed in the latter (technologies) as the scientists in developed countries are more responsive to people's demand and the private sector is pressurizing them to that end. There market competition is also an important factor. Public sector research in Bangladesh is also progressing but that is mostly related to generation of new knowledge; may be, for long-run interest of the people and the nations. Its researches may also be immediate problem-solving e.g. control of diseases in plants, animals and birds. Successful adoptions of the invented new technologies obviously need individual's participation along with community involvement in certain cases where suitable reform in the existing institutions may also be required. This needs socio-economic studies where Agricultural Economists can serve better.

4.1. Institutes' Own Research Projects

The immediate major issue for development of Bangladesh is poverty alleviation and to that end top priority is paid to the question of food security. This is achievable through faster increase in land productivity and its sustainability where continuous adoption of new technologies is a must. So, we should undertake in-depth investigation into the factors affecting the adoption of modern technologies in agriculture and the economic policies to be framed and implemented to this end. The present NARS institutes other than the Fisheries and the Forest Institutes have been executing such studies with particular emphasis on their own initiated technology projects and experiments. These studies should actually be a bit broad-based and extended to minor crops, vegetables, spices etc along with rice and wheat. Similar technology adoption studies are also must by all other research institutes. Besides their usual research topics, attention is also due to the newly introduced fortified food and GM Food and attempts may also be made to cover some new areas such as (a) establishment of IT centres and their contribution to technology dissemination, skill development etc; (b) wide publicity, based on scientific papers related to adverse effects of climate change and (c) campaign against land, water and air pollution etc. In this regard the country's Agricultural

Economists may be trained and also collaborate with international research institutes through some jointly undertaken research projects and the exchange programmes.

4.2. Higher Income to Households and Generation of Investible Surplus

Next to the institutes' own projects and programmes there should be an investigation into the mechanisms of ensuring fair prices to growers for their farm produces so that farm families and their women members can have higher income and consequently larger investible surplus for adoption of new technologies and farm enterprises/farms etc. In this regard suitable agri-business in horticultural crops specifically meant for women entrepreneurs may also be explored. As earlier mentioned, farming in future will be knowledge-intensive as well as capital intensive, so farmers must have larger surplus. Generation of such surplus is possible only when agriculture can be diversified and becomes profitable and attractive. In that case outflows of resources need to be stopped and instead, inflow of resources from non-agriculture and the urban centres should be encouraged. In the context of surplus generation, its use and determinants, some special studies may be initiated and continued in future.

It is also relevant to report that the faster growth in agriculture to a great extent is dependent on its commercialization where advancement of mechanization, expansion of food processing industries and provision of cooling facilities, essential for perishable products (milk, fish, fruits etc.) are to be made. All these establishments are costly and require liberal/subsidized bank credit. We however, do not know the exact levels of credit supports needed by different industries, their entrepreneurs and the incentive conditions to be fulfilled to this end. Further, it is afraid that in future many indebted farm families may fail to repay loan in time due to declining size of farms and higher cost of living. So, they will require supplementary income sources and this is possible through rapid growth of non-agricultural activities in rural areas; may be, by expanding commercial farms and agro-business and processing activities which need adequate government supports in infrastructural building and credit expansion and its interventions through market regulations.

4.3. Efficiency in Input Use and Farming System

In all production and marketing functions including processing we should have efficient uses of all resources – natural, human and technological. Such efficiency studies should go beyond the grain crops and include other minor crops plus livestock, fisheries and trees. Here sustainability of natural environment, its bio-diversity and aesthetic values and land, water and air pollution due to intensive farming operations etc. should also be kept under constant monitoring and disseminate them through meetings, research reports and occasional papers.

Beyond the input use efficiency we should also examine the enterprise combinations under different farming systems of the country where agro-ecology consideration is also important. This is but quite complex due to changes in price environment, farmers' own demand and their resource positions. Systematic studies keeping in view the major enterprise situations are therefore, necessary. Some modeling exercises in this respect may lead to the selection of the better farm enterprises and higher income to the entrepreneurs. We may also look into the prospects of food processing industries in Bangladesh as overtime with the increase of per capita income and urbanization, the demand for ready foods and restaurant services will be rising. To ensure quality service, testing facilities for food and production inputs need to be strengthened and accordingly adequate manpower to be recruited and trained.

4.4. World Market Studies

Along with the domestic marketing studies, both the import and export markets in selected few commodities need to be monitored closely; and depending on their price situations indicative import plan for rice, wheat, fertilizer, seeds, animal feeds, chicks etc. and export plan for surplus farm products including fish, eggs etc. may be prepared for implementable policy decisions. The researchers in this respect are expected to make use of internet services of the global markets and accordingly occasional analytical papers may also be prepared. It is afraid that the scientists in Agricultural Economics at present are not well trained in this line and thus, they should be equipped with such knowledge of statistical and analytical methods and regularly interact with the relevant institutes may be through seminars and conferences held at home and abroad. The Chamber of Commerce and the Industries may collaborate in such research efforts at least by funding the project cost. The private

companies and firms may also come forward and participate in the studies to make themselves more competitive in the world market. Such world trade studies are to be continued along with the expansion of R&D facilities in the country.

4.5. Private Sector Participation

These days private sector participation in commercialization of agriculture is quite notice-worthy, specially in the establishment of small-scale poultry and dairy farms, pasteurization plants, HYV and Hybrid seed production and imports, production of organic fertilizer, manufacture of cattle and fish feeds, establishment of poultry and fish hatcheries etc. There are also companies and the NGOs who do contract farming in the production of potato, banana and other fruits. In future such possibilities will be expanding, may be because of weaker bargaining power of the individual farmers and inability to serve the urban consumers. Are their contract farmings environment friendly and sustainable? Are their farm practices over-exploitative of natural resources? How far are the farmers benefited? Do we need institutional reforms and local government participations in attaining faster growth of agriculture and poverty alleviation? Answers to all these questions require periodic local as well as national studies by the competent scholars, may be working with the NARS Institutes.

To encourage private sector participation in agricultural development foreign investment is sometimes required at least for the purchase of machineries and different other imported inputs. Bangladesh being to a certain extent aid dependent, requires substantial amount of research fund for setting up of modern laboratories in all the central and the regional stations and awarding fellowships/scholarship to the researchers. It also uses foreign aid in paying expatriate consultants while implementing agricultural development projects. Is the foreign aid useful to agricultural growth? If yes, which are the potential areas for such foreign assistance and at what costs and benefits? The details of terms and conditions of foreign aid and the benefits accrued to different sub-sectors of agriculture need to be studied regularly. Agricultural research institutes may initiate all such research projects and invite the private companies.

4.6. Marketing Margins and Consumers' Price

Another important area needs to be studied regularly is the demand and supply situations of farm products to urban consumers. This requires investigation into existing marketing channels and value added at different levels of marketing including marketing margins shared by the market intermediaries. This should pin-point the areas of in-efficiency and suggests the possible remedial measures towards improvement in market competitions and also identify the areas of state interventions in ensuring fair price to growers and maintenance of price stability as usually practised in Bangladesh (Procurement of rice and wheat from growers and open market sales, price supports etc). That means, close monitoring of the cost of marketing, degree of competitions, storage practices, price behaviour etc. need to be done where active cooperation of importers and other traders is essential. Such cooperation may also be extended towards free access to urban markets and proper implementation of market regulations. Action research appears to be more useful in this regard. Some NARS research institutes may be assigned with the tasks of monitoring market regulations relating to stocks, prices, quality of inputs and outputs etc. The Department of Agricultural Marketing (DAM) after necessary reorganizations may also do the jobs, provided they are equipped properly with manpower and budget. The Trading Corporation of Bangladesh (TCB) may also cooperate in this regard.

4.7. Unfavourable Agro-ecologies

According to our conventional view Bangladesh has some unfavourable agro-ecologies at least for crop cultivation but may be potentially rich for production of non-rice minor crops and non-crop agriculture eg. fruits, spices, fish, milk, meat etc. These potentials are to be exploited in future to feed our growing population. There the new technologies already generated and disseminated towards increasing agricultural production are not equally applicable to all agro-ecologies of the country. The coastal belt, the low-basin haor areas as well as the char and the hill tracts are of different natural characteristics and the families living there have also different socio-economic backgrounds. All these area characteristics and people's capacity need to be carefully examined while disseminating new technologies and farm enterprises for adoptions. The research institutes should have study reports on such basic characteristics and need to continue such studies keeping in view the

different changes that have been taking place overtime there. Success in those unfavourable agro-ecologies is perhaps dependent on the provision of specialized credit supports and input supplies besides undertaking suitable institutional reform, required there. In the implementation of different agricultural projects there local people's participation may be encouraged. The mechanism of such participation needs to be developed by the Economists of the Institutes assigned with the tasks.

4.8. Climate Change

It is well recognized that Bangladesh is going to be the worst victim of climate change due to possibility of (i) submersion of over 10% of its land, (ii) salinity rise in the coastal belt and its expansion to the adjoining areas, (iii) higher frequency of natural hazards e.g. cyclones, floods, drought etc. The research institutes may undertake a study to estimate the amount of damages apprehended in the next decades and their effects on household income, consumptions and poverty situation in the possible affected areas. It should also suggest measures to combat such adverse consequences; may be, in terms of infrastructures to be built, the level of interventions by the government, the private sector involvement required to rehabilitate them, and training to be offered to the affected residents for their livelihood improvement. It is understood that the country's research institutes are already in touch with different national and international organizations, and trying to recommend suitable preventive as well as remedial measures during and after the calamities. To combat with likely adverse effects of climate change the research institutes and other relevant organizations should prepare themselves and the government may provide adequate resources to them. Agricultural Economists may also design a separate research project to this end.

4.9. Research Facilities to be Created and Expanded

It is already recognized that overtime the research needs will be expanding due to intensification of disasters and deteriorating situation in land and water at higher levels of technology adoptions and agricultural development. Designing appropriate technological solutions will also be both difficult and costlier in future. The existing laboratories need to be regularly modernized and equipped for advance research. We therefore, need more dedicated

and well qualified scientists. We unfortunately lost many of our qualified researchers and such exodus in future may jeopardize the whole research system if the present service provisions remain unchanged. It is already known that some of the research institutes like BFRI, BFI, BTRI do not have any Economist at present and thus, no socio-economic studies are being undertaken in their executed research projects. The absence of Agricultural Economics Division will aggravate the technological research in future due to global market competition, already recorded in production inputs, food products and consumers' services.

V. Specific Areas of Future Research

Research areas in Agricultural Economics are very wide from local to international level. Issues are also diverse from production at farm level to marketing including processing and consumptions of people in the country and outside. It is thus, difficult to limit and determine the priority study areas. The main factors that usually limit the research areas in Agricultural Economics by the institutes are (a) allocation of research fund, and (b) availability of required trained manpower and specialists in the Division. Sometimes restrictions may also be imposed by the authorities concerned, depending on their own objectives of evaluating their generated technologies and the national programmes. Any way, in the present context the broad subject areas for future research by the NARS institutes are indicated below. Priority research topics may however, be seen in Annexure-II.

5.1. Production Environment

- i) Natural Resource Management and Sustainability;
- ii) Industrialization and Effluent Discharges: The Extent of Water and Land Pollution;
- iiia) One House-One Farm: An Investigation into the Success Stories;
- iiib) Production Potentials of Pulses, Oilseeds, Onion and Zinger etc: Areas to be Investigated;
- iii) Organic Farming and Agricultural Production and Sustainability;
- iiia) Reserve Forests: Conservation Principles and the State Laws;
- iiib) Social Afforestations: Costs and Benefits;
- iv) Establishment of Brick Fields and Changes in the Land Use and Food Production;
- v) Use of Poultry Litters and Compost Making: The Productivity Rise in Agriculture;

- vi) Expansion of Bio-gas Plant and the Use of Cow-dung as Manure: The Increase in Farm Productivity;
- vii) Vulnerable Agro-ecologies (Coastal, Haor, Hill Areas) and Harnessing their Production Potentials;
- viii) Agricultural Productions Under Stress Conditions (Salinity, Flooding and Drought): The Technologies Generated and Disseminated;
- ix) Adoption of Knowledge- Intensive Technologies: Reforms Needed in the Department of Agricultural Extension Services;
- x) Dairy Farming and Extension of Veterinary Services by the Department of Livestock Services (DLS);
- xi) Shortage of Cattle Feeds and Production of Fodder Crops: The Level of State Subsidy Needed.

5.2. Efficiency in Farm Production

- i) Productivity of Land, Labour and Capital in Agricultural Production;
- ii) Input Prices, their Intensity of Uses and Profitability;
- iii) Farm Mechanization and Productivity;
- iv) Milk Production and Grass Cultivation: An Integrated Approach;
- v) Farming System and Household Income: The Agro-ecological Variations;
- vi) An integrated Farming: The Study of Profitable Enterprise Combinations;
- vii) Fertilizer Prices and Their Intensity of Uses by Farmers in Different Minor Crops, Vegetables and Fruits.
- viii) Fish Culture and Profitability by Type of Fishes and the Regions of the Country.

5.3. Food Security

- i) Food Baskets: Their Calorie and Protein Intake by the People;
- ii) Consumption of Foods: Their Supplies and Prices;
- iii) Fortified/GM Food and Their Effects on Health;
- iv) Food Adulteration, Their Consumption and the Spread of Disease;
- v) Food Intake by the Poverty Stricken Households and the Growth of Their Children;
- vi) ICM and Crop Protection Against Diseases;
- vii) Intra-family Consumption of Foods: The Hard-Core Poor Households.
- viii) Prices of Foods: The Differential Impact on Rural and Urban Consumers.

5.4. National Policies

- i) Subsidy on Inputs (Fertilizer and Water) and Price Supports to Farm Products in the Harvest Seasons;
- ii) Allocation of Development Fund and Agricultural Research Achievements;
- iii) Service Facilities to the Scientists and the Award Systems;
- iv) Financial Institutions and Credit Supports to Farm Households;
- v) Land and Water Use Policies and Their Impact on Agricultural Productions;
- vi) Identification of Production Potential Areas for Minor Crops, Spices, Fruits, Livestock Products and Fishes and Their Constraints;
- vii) Physical and Institutional Infrastructures: Impact of Growth Centre;
- viii) State Regulation in Pricing and Quality of Food, Cattle Feeds and Veterinary Medicines.
- ix) Veterinary and Animal Husbandry Services: The Experience of Commercial Farming in Dairy and Poultry;
- x) Open Water Fishing and Its Future; and
- xi) Commercial Farming and the Insurance Policies of the Government.

5.5. Domestic and International Trade

- i) Marketing Margins in Horticultural Crops and Identification of Areas for Reduction;
- ii) Farmers' Direct Participations to City Markets: Institutional Reform Needed;
- iii) Public Procurement of Food grains: Access to Farmers;
- iv) Departmental Stores and Their Procurement of Farm Products: Who Gains – Producers or Consumers?
- v) Import of Non-Urea Fertilizers (TSP, MOP etc), Cost of Financing and Their Marketing Margins;
- vi) Private Import of Foodgrains, Their Price Fluctuations and Cost to the Government;
- vii) Export of Horticultural Crops: Their Potentials and Constraints;
- viii) Export of Vegetables and Fruits: Who are the Gainers?
- viii a) Middlemen in Agricultural Marketing: Are Their Services Useful?
- ix) Marketing of Milk, Eggs and Broilers: Price Fluctuations and the Pricing by Market Intermediaries;
- x) Marketing Channels, Price Fluctuations and State Interventions towards Price Stability;
- xi) Import of Seeds: Costs and Return in Different Crops and Vegetables.

5.6. Institutional Capacity Building and Reorganizations

- i) Strengthening of Research and Extension Linkages and Institutional Reorganizations;
- ii) Biotechnology Research and its Modernization: Establishment of Testing Laboratories;
- iii) Agricultural Extension Services: Access to Farmers and Adoption of Modern Technologies;
- iv) Private Sector Research and Public Supports Needed;
- v) Quality Testing of Production Inputs (Fertilizer, Cattle Feeds, Fish Feeds etc): The BSTI Services;
- vi) Quality of Education Rendered by the Agricultural Training Institutes and the Agricultural Universities.

5.7. Private Sector Participation and the NGOs

- i) Import of Fertilizers, Pesticides and Machineries: Their Distribution and Pricing;
- ii) Quality of Locally Manufactured Inputs Specially Fertilizers and Their Effect on Productivity;
- iii) Dissemination of New Technologies by the Private Firms and Their Impact on Productivity;
- iv) Agricultural Training Institutes: Quality of Education Offered by them;
- v) Production of High Value Crops, Their Processing and Domestic Markets;
- vi) Small-scale Commercial Broiler and Layer Farms: Impact on Poverty Alleviation;
- vii) Poultry and Fish Hatcheries: Prices of Chicks and Fish Fries;
- viii) Profitability of Farm Production, Farmers' Income and Investment;
- ix) Seed Production, Imports and Marketing by Companies: Who are Beneficiaries?
- x) Contract Farming: Who are Beneficiaries?

5.8. Climate Change, Natural Calamities and Disaster Management

- i) Identification of Possible Severely Affected Localities and People's Living: The Effects of Climate Change;
- ii) Disaster Preparedness and Rehabilitation of the Victims;
- iii) Institutional Supports and the Mitigation of Adverse Consequences of Climate Change.

5.9. Others

- i) Sea Fishing: The Levels of Exploitation and the Future Stocks;
- ii) Sea Fishing: The Level of Living of Fishermen;
- iii) Culture Fishing: The Constraints to its Expansion;

- iv) Open Water Fishing and Damages to Fish Habitats and the Fates of Indigenous Fishermen;
- v) Plant Nurseries and Their Contribution to National Afforestations;
- vi) BADC's Seed Production Programmes: Limits and Constraints;
- vii) Establishment of IT Centres and Adoption of New Technologies;
- viii) IT Centres and Marketing of Farm Products;
- ix) Outflow of Resources from Agriculture to Non-agriculture;
- x) Governance, Litigations in Rural Areas: Loss of Resources and Productions;
- xi) Promotion of Rural Non-farm Occupations, Skill Development and Access to Education;
- xii) Local Government: Its Involvement in Agricultural Development;
- xiii) Migration of Rural Households: Impact on the Labour Force.

VI. Concluding Views

Issues for research in Agricultural Economics are quite diverse from production to consumption of goods and services where socio-economic, technical and institutional questions are very much related. The studies may cover both short and long-run objectives including future projections or forecasts that however, need econometric/modelling exercises, based on hard data and information.

The NARS institutes as usual should continue the evaluation studies of their own generated technologies and management practices covering different agro-ecologies of the country and the socio-economic conditions prevailing there. The studies should also determine the factors affecting the adoption of the released technologies towards increasing land productivity for growing population. Beyond the technology adoption projects, the researchers should have broad studies on the existing institutions, level of infrastructure development in rural areas, linkages between agriculture and non-agriculture sector, price environment and producers' incentives that may affect project implementation and consequently farm income and agricultural investment.

Further, the selection of priority research project is although difficult, we may have a broad list of research issues as a guidance as there is a limitation of budget and

qualified manpower. It is thus, obvious that each specialized institute will have first research projects in their own mandated subjects. As a second priority, the subjects/farm enterprises closely linked to the on-going projects may be considered for research and one can go beyond the specific subject issue when national agricultural policies are taken into account. As a long-run objective, research topics may simply be the knowledge creation and training of the scientists and economists in the newly growing subjects and problems. Its importance is growing with the globalization of the economy and introduction of SPS by the WTO and patent rights claimed by the inventors in the western countries.

Overall, it may be concluded that the research in Agricultural Economics should prioritize the factors affecting the adoption of new technologies, their productivity, the efficiency of input uses with particular emphasis on scarce factors like land and water, household income and resource transfer from agriculture to non-agriculture. Next to it, priority may be given to the issues like market competition, domestic and international trade, price incentives to farmers, agro-business in horticultural crops and processing of farm products, rural non-farm sector and the national policies including subsidy and price supports to farm products. The third priority areas may be natural resource management and environment protection specially against water and air pollution, land degradation, women participation and the local government. Other studies may include private sector participation, marketing infrastructure build-up at least for perishable products, market regulation, quality testing of production inputs and farm products in terms of SPS indicators and the effects of climate change on level of living of people. Attention may also be given to the research related to the strengthening of agricultural extension services in both crop and non-crop agriculture, modernization of research laboratories and human resource development and the establishment of IT centres and their net-work throughout the country.

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Terms of Reference (ToR) of the Group Leaders for the Sectoral Study in the preparation of ‘Vision Document – 2030 and beyond’

1. Consultation and review of the documents related to agriculture and rural development. These are, but not limited to the followings. The accomplish the task the team may need to visit the concerned institutions:
 - Planning Commission Reports on five year plan, annual budgetary documents etc.
 - National Agriculture Policy
 - Poverty Reduction Strategy of the GoB
 - World Bank document on revitalizing agriculture and related others
 - Agricultural sector review/Actionable policy briefs of the FAO
 - Reports of the DFID, DANIDA and others on the performance of the agriculture sector in Bangladesh
 - National Food Policy
 - National land use Policy
 - National Livestock Policy
 - National Fisheries Policy
 - National Forestry Policy
 - Vision document – 2020 of BARC and Strategic plan of 1996
 - Land, Soil and management of natural resources
 - Reports on Food Security, quality and Safety
 - Reports on MDG
 - Master Plan & Annual Reports of ARIs
 - Websites of various agencies

(Source: BARC Library, P&E Division, BARC, Concerned Institutes, Websites of the concerned Ministry/Organization)

2. Through collection and collation of the information as stated in Sl. 1, work out the countries situation/issues by the sub-sector of agriculture. These are;
 1. Rice
 2. Cereals other than Rice, Sugarcane and Jute
 3. Horticultural crops (Potato, Fruits, Vegetables, Spices including Flowers
 4. Pulses and Oilseeds
 5. Soil and fertility management
 6. Forestry
 7. Livestock
 8. Fisheries
 9. Agricultural mechanization and water management
 10. ICT in agriculture

Annexure-I (Cont'd)

11. Agricultural economics, marketing and supply chain development
 12. Technology development, agro-processing post-harvest technology, food quality and human nutrition.
-
3. Sub-sectoral studies are expected to be in-depth and detailed in nature. This is cover all component's current trend in production, demand-supply and gap, opportunities, problems and constraints, required technological interventions and their analysis in the country's context. By the process determine the priority need of the concerned sector/area by the year 2030 and beyond.
 4. Population dynamics, reduction in land resource base and degradation, issues pertaining to climate change & sea level rise (SLR), economics of commodity and non-commodity related activities, income growth rate etc. all these to be taken into account in formulating th research priority.
 5. Undertake other related tasks as may be deemed necessary or evolved while performing this assignment
 6. Draft report of the teams to be presented in workshops to be organized by the Planning & Evaluation Division of BARC at a suitable dates.
 7. Draft final report incorporating the comments/opinion obtained from the workshops, different agencies/individuals to be submitted within 2 (Two) months from the date of assignment of the MD (P&E), Bangladesh Agricultural Research Council.

Priority Research Areas in Agricultural Economics and Rural Sociology

1. Research Area: Agricultural Economics and Rural Sociology.

2. Research Agenda/Thematic Area(s):

2.1 Research Agenda/Thematic Area-1

| Research Title/Key Words | Priority Ranking | Research Tenure | | |
|---|------------------|-----------------|--------|-------|
| | | Long | Medium | Short |
| A. Production Increase in Crops and Vegetables | | | | |
| i) Adoption of Newly Generated Technologies Towards Increased Productivity and the Factors affecting their Adoptions | Highest | | | _/_ |
| ii) Identification of Production Potential Areas for Pulses, Oilseeds and Spices and also for Fishes, Ducks, Goats etc. | Highest | | _/_ | |
| iii) An Integrated Farming System: The Study of Profitable Enterprise Combinations | Highest | | _/_ | |
| iv) Efficiency in the Uses of Inputs Specially Land and Water | Highest | | _/_ | |
| v) Transfer of Rice Land to High Value Crops: Limits and Constraints. | Highest | | _/_ | |
| vi) Constraints to the Expansion of Pulses and Oilseeds Productions. | Highest | | | _/_ |
| vii) Salinity Rise in the Coastal Belt and Changes in the Cropping Practices and Household Income. | Highest | | _/_ | |
| viii) Post-harvest Losses of Fruits: Prospects of Processing. | Medium | | _/_ | |
| ix) Food Security: Bangladesh Perspectives | Highest | | _/_ | |
| x) Soil Health Management: Identification of Priority Areas | Medium | _/_ | | |

Annexure-II (Cont'd)

| Research Title/Key Words | Priority Ranking | Research Tenure | | |
|--|------------------|-----------------|--------|-------|
| | | Long | Medium | Short |
| xi) Contract Farming by Private Sector: Problems and Prospects | Medium | | _/_ | |
| xii) Block-based Production Linking Credit, Inputs and Processing: An Innovative Approach | | | | |
| xiii) Improved Management Practices for Jhum Cultivation in the Hill Tracts | | | | |
| xiv) Indiscriminate Use of Chemicals on Farm Production and Preservation of Fruits and Vegetables. | | | | |
| B. Prices of Inputs and Farm Products and Marketing | | | | |
| xv) Subsidy on Inputs (Fertilizer and Irrigation) and Price Supports to Farm Products | Highest | | | _/_ |
| xvi) Marketing Channels, Price Fluctuations and State Interventions towards Price Stability of Farm Products including milk, eggs etc. | Highest | | | _/_ |
| xvii) Farmers' Direct Participation to the City Markets: Institutional Reforms Needed. | Highest | | _/_ | |
| xviii) BADC's Seed Production Programmes: Limits and Constraints. | Highest | | _/_ | |
| xix) Export of Fresh Vegetables: Benefits to Growers. | Highest | | _/_ | |
| xx) Studies on Agri-business in Horticultural crops | Highest | | _/_ | |
| C. Production of Livestock Products and Fishes | | | | |
| xxi) Veterinary and Animal Husbandry Services: Institutional Reforms | Highest | | | _/_ |
| xxii) Poultry and Fish Hatcheries: Quality and Retail Prices of Chicks and Fish Fries | Highest | | _/_ | |
| xxiii) Open Water Fishing and Conservation of its Habitats | Highest | _/_ | | |

Annexure-II (Cont'd)

| Research Title/Key Words | Priority Ranking | Research Tenure | | |
|--|------------------|-----------------|--------|-------|
| | | Long | Medium | Short |
| xxiv) Linking Small-Scale Livestock Producers to Markets | Highest | | _/_ | |
| xxv) Identification of the Causes for High Mortality of Calves Specially in case of Cross-bred Cattle and Buffaloes. | | | | |
| xxvi) Reduction of Water Bodies Leading to loss of Surface Water for Pisciculture and Irrigation | | | | |
| xxvii) Stock Assessment of Riverine Major Fish Species. | | | | |
| xxviii) Identification of Breeding Ground of Major Commercial Fish Species. | | | | |
| xxix) Cross-cutting Issues | | | | |
| xxx) Quality Testing of Production Inputs (Seeds, Fertilizer, Pesticides, Poultry, Cattle and Fish Feeds) | Highest | | | _/_ |
| xxxi) Local Government: Its Involvement in Agricultural Development. | Highest | | _/_ | |
| xxxii) Governance in Land Ownership Litigations in Rural Areas. | Highest | _/_ | | |
| xxxiii) Promotion of Non-farm Activities in Rural Areas: Credit Supports Needed. | Highest | _/_ | | |
| xxxiv) Identification of Severely Hit Prone Disaster Areas: The Effects of Climate Change | Highest | _/_ | | |
| xxxv) Rural Infrastructures: The Growth of Agriculture | Highest | _/_ | | |
| xxxvi) Environment Protection: Reforms in Public Laws. | Highest | | _/_ | |
| xxxvii) Import of Major Farm Inputs: Their Pricing and Stock Management in the Domestic Markets | Highest | _/_ | | |
| xxxviii) Find out the Ways for Preserving Agricultural Land for Crops, Pisciculture and Livestocks Raring. | | | | |

Annexure-II (Cont'd)

| Research Title/Key Words | Priority Ranking | Research Tenure | | |
|--|-------------------------|------------------------|--------|-------|
| | | Long | Medium | Short |
| xxxx) Establishment of IT Network to the Agricultural Technology Dissemination. | | | | |
| E. Research, Extension and Education | | | | |
| xxxxi) Agricultural Extension Services: Access to Farmers and Improvement in Farm Productivity | Highest | | | _/ |
| xxxxii) Strengthening of Research-Extension Linkages: Mechanism of Institutional Coordination for Crop Protection | Highest | | | _/ |
| xxxxiii) Agricultural Training Institutes: Quality of Education Offered. | Highest | _/ | | |
| xxxxiv) Quality of Agricultural Extension Services Rendered and their Priority Areas: Changes Needed | | | | |
| xxxxv) Existing Facilities in the Research Institutes: Budget Allocation for Expansion and Creation of New Laboratories. | Highest | _/ | | |
| xxxxvi) Farm Mechanization and Domestic Production Possibilities | Medium | | _/ | |