

Effects of Socio-economic Status of Farmers upon Cropping Pattern and Productivity in Rangpur Division, Bangladesh

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Abstract

The study delved with the effects of socio-economic status (SES) of farmers upon the cropping pattern and productivity in the Rangpur division, one of the most physiographically and climatologically poverty-stricken regions of Bangladesh. The study investigated the SES of the farmers, land size and ownership, cropping pattern, and cultivation methods. A total of 300 farmers from the Rangpur division were selected as the respondents. The Primary data were collected through questionnaire survey as well as FGDs and KIs in the study area. Secondary data were collected from the relevant published national reports, research articles and books. The data were analysed and presented with SPSS software and GIS. The study found that conventional cropping pattern has been practiced by majority farmers, and they are reluctant about adopting to changing cropping pattern which is needed to acclimatize with the accelerating physiographic and climate change induced (CCI) hazards. Accordingly, low productivity, increased food demand, food insecurity, malnutrition, illiteracy, unemployment, as well as social and economic hazards has been increasing in the Rangpur division. As the SES of the farmers is directly connected to cropping pattern and productivity, the study focused upon the need to improve the SES of the farmers for ensuring the adaptation to alternative cropping patterns and thus increase crop yield. The study recommends to take the national initiatives to improve the SES of the farmers, which is anticipated to initiate a paradigm shift from Conventional to Comprehensive agriculture. This will ensure alternative cropping pattern, invention of high yielding and hazard tolerant crops varieties, development of modern granaries and cold-storages, as well as development of agro-based national and public industries. The study is expected to specify the needs to improve the SES of the farmers of Rangpur division to strengthen the agri-based economy of country.

Key words: Cropping Pattern, Crop Productivity, Land Size, Land Ownership, Socio-economic status

Introduction

The Rangpur district is one of the most agri-based economic regions of Bangladesh. Nevertheless, the poor socio-economic status (SES) along with the increased physiographic and climate change induced (CCI) hazards like river bank erosion, heavy rain accompanied by flash floods, sand siltation in the agricultural lands, char formation, scarcity of irrigation water, depletion of ground water, increasing nor'westers in the summer season, dense long enduring fog in the winter turned the agricultural sector of the region into both physiographically and socio-economically vulnerable. The study investigated the effects of the SES of the farmers, the land sizes and the land ownership to reveal the causes of sustaining to the existing cropping pattern. The study found that the farmers are reluctant about alternative cropping pattern due to their financial inadequacy and ignorance about the modern

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cropping patterns and technologies. These hazards have resulted into soil quality deterioration, decreased arable lands, damages of crops, decreased crop productivity, unemployment of agricultural labour force, financial insolvency, falling into debt, malnutrition and other health hazards, illiteracy, and social anomalies like loss of homesteads and agricultural lands.

Hence, the study recommends to improve the SES of the farmers to reform the agricultural sector of the study area, as this sector has a direct link with poverty alleviation, improved living standard, employment generation, health, and nutrition of the people in the northern Bangladesh.

Rationale

Agriculture is one of the most vital sectors contributing to the economy of Bangladesh in terms of providing food security, improved living standard, and generation of agro-based employment opportunities for the large population of the country. This sector alone contributes a major portion in the GDP (14.74 %) and employs about 40.62 % of the working force (Bangladesh Economic Review 2018). In the 7th Fiscal Year Plan (2016-2020), the contributions of crop, fishery, and livestock subsectors in GDP were 9.49%, 3.68%, and 1.84% respectively (GED 2015).

Despite the significant role of the agricultural sector in the economy of Bangladesh, the low SES of the farmers, along with the accelerating physiographic and CCI hazards was observed to increasingly affect the cropping pattern. The consequences were the declining crop productivity in the already poverty-stricken Rangpur division. The multiple cropping practice, over use of chemical fertilizers and pesticides, excessive extraction of groundwater, as well as increased soil salinity have been affecting the crop pattern and productivity in the study area. Hence, the study found its rationality to investigate the potentialities of alternative cropping pattern to increase crop productivity in the Rangpur division.

Literature Review

The norther region was once termed as the 'Monga' region due to extreme poverty, conventional cropping pattern, low crop productivity, as well as natural hazard vulnerabilities (Paul et al. 2013). The study found that, majority of the most vulnerable group were the agricultural wage labourers, landless and marginal farmers, who coped with the Monga situation by selling labour at cheap rate, borrowing money at high rate of interest, selling off lands and assets, and changing occupation. The vital findings of the study were the coping strategies of the poverty-stricken people, compromising with their level of education, and other socio-economic aspects. Paul et al. (2013) recommended maximum utilization of agricultural land, as well as proper credit support and agro-based industrialization in the northern Bangladesh.

However, from the agriculture production and diversification perspectives, Bangladesh has made remarkable progress throughout, with substantial growth in all subsectors of agriculture. Since independence to 2016, agricultural GDP has increased by 5.6 percent (Deb, 2016). The country reached food self-sufficiency milestone, and diversification of agricultural products added to nutritional improvement. Nevertheless, being still the largest employment sector in the economy, the share of agriculture in total GDP and total employment has been

declining, consisted with the national economic goal (Deb, 2016). According to BBS 2013, during the Fiscal Year (FY) 2013-2014, agriculture sector contributed around 18.70% of total the GDP of Bangladesh, with an annual growth rate of about 2.54% (BBS 2013). Total 15.18 million families who were closely connected to agriculture. Nevertheless, the cultivable land was only 850.52 million hectare and the crops intensity was 190%. This unequal ratio of farmers and agricultural land, as well as high crop intensity initiated the need to reform the agricultural system in Rangpur division, as the cropping pattern and crop productivity rate of the study area exert a direct impact upon the socio-economic status of the farmers.

Moreover, a 7% growth rate of Gross Domestic product (GDP) were to be achieved to achieve the Millennium Development Goal (MDG) during the study period. To achieve the targeted rate and to keep pace with the population growth, agricultural productivity growth rate had to reach a minimum percentage of 4-4.5 per year (7th FYP Year), which was quite achievable. In a developing country like Bangladesh, moving towards the SDG, agriculture will continue to play an important role in the overall goal of “accelerating growth, empowering citizens”, and the mainstay of ensuring food and nutrition security, as well as poverty reduction (Deb, 2016).

Hence, cost-effective, improved, environmentally-safe, as well as sustainable food system (UN Food system Pre-summit 2021) should be implemented to ensure food security, nutrition, and better-quality livelihood for the people of Bangladesh. Therefore, comprehensive agricultural development has been given the highest priority in Bangladesh to achieve independence in food sector. In the Pre-summit of the United Nations Food Systems Summit 2021 (26-28 July 2021), the Agricultural minister of Bangladesh mentioned that the country has been facing the contemporary challenges in agricultural sectors, such as climate change, growing demand for food, and the adverse effects of Covid situation in Bangladesh. The minister emphasized upon multilateral cooperation among the developing countries to ensure increase agricultural growth and transformation of agricultural system to achieve the Sustainable Development Goal (SDG) by 2030 (The Daily eSamakal, 28th July 2021).

The Pre-summit of the UN Food Summit (26-28 July 2021) mentioned that majority of the food system followed in the world are fragile, unexamined, and vulnerable to collapse. The pre-summit also indicated at the food crisis during the Covit-situation throughout the world. The participants mentioned about the chain reactions of collapsed food system into disordered education, health, economy, human rights, peace, and economy. The United Nations Food Systems Summit 2021 will connect the youth, farmers, indigenous peoples, civil society, researchers, private sector, policy leaders of agriculture, environment, health, nutrition, and finance (UN Food Pre-summit, 2021). The Food Summit will focus upon transforming the ‘Food System’ in scientific approach, as the UN revealed the system as the most powerful way to change the course of existing agricultural system, as well as the way to progress towards achieving the SDG by 2030 (UN Food Systems Summit 2021). Bangladesh is also a signatory of the SDG, and hence the country should emphasize upon reformation of the country’s agricultural system to progress towards the SDG achievement, as well as ensure improved socio-economic status, health, nutrition, and environment for the people.

Zaman et al. (2017) conducted an in-depth study in five districts of Rangpur division, namely Rangpur, Gaibandha, Nilphamanri, Lalmonirhat, and Kurigram. The study found that the Boro-T. Aman-Maize-Potato are the dominant cropping patterns of the study area. On the other hand, cropping pattern of the pulses and oil-seed crops were quite lower, ensuing into challenges to food and nutrition security. The study also stated that changes in the pattern is dependent upon diverse physical factors like soil type, temperature, rainfall, as well as upon the availability of irrigation facilities, implication of agricultural technology, transport facilities, and growth of agro-based industries.

Zaman et al. (2017) mentioned about the adverse impacts of floods, river erosion, surface and ground water scarcity, increased droughts, floods, and climate change induced (CCI) disasters as the altering forces of cropping pattern, crop diversity, as well as livelihood changes of the farmers. They emphasized upon the physical, historical, social, institutional, and economic factors of the arable land in determining the cropping pattern. Finally, they recommended to take measures to increase productivity of rice-based cropping pattern; initiation of Potato-Boro- T. Aman, and /or Mustard-Boro -T. Aman cropping systems; increased area for cultivation of oil-seed and mustard for nutrition and food security purpose; investigating the areas with environment suitable for unique cropping pattern; and establishment of potato based agro-food industries at local area.

During the 2020-2021 Rabi season, farmers produced 66,283 tons of wheat after completing its harvest, against the production of 65,955 tons from 18,726 hectares in all five districts of Rangpur agricultural region. The farmers received various assistance and incentives from the government, DAE and Bangladesh Agriculture Research Institute (BARI). Mostly farming less irrigation water consuming cereal crop of wheat and high yielding wheat using conservation agriculture (CA) – based technology, they had excellent production with lucrative prices. Another reason for improved yield is that in the past, wheat production was being affected by the adverse impacts of high temperature (Dhaka Tribune, 2021).

Rangpur division was once concentrated largely on production of tobacco. However, in the recent time, vast areas of tobacco cultivation have been declining in Rangpur. Regardless of the profitability of tobacco production, farmers have been realizing the negative impact on the health of the growers and the soil fertility. Many farmers have been cutting the area of tobacco crop to half, opting instead cultivate maize, potato and mustard on their land instead (Karmaker, 2018).

By 2019, many farmers in Rangpur took up vegetable cultivation after receiving great financial return, compared to the falling profits from paddy, jute and potatoes. A few factors in play are good weather, sandy loam soil like that in Gangachara upazila, the farmers being well-informed about the prices of vegetable, high prices especially of early-wield vegetables and distribution to capital and other markets across the country. They want to continue vegetable cultivation if the prices remain fair and they get support from Department of Agricultural Extension (DAE). Furthermore, many farmers are growing vegetables without using pesticides (The Business Standard, 2019).

The Department of Agriculture Extension (DAE) launched a motivational five-year project 'Production, Storage and Distribution of Quality Seeds of Pulses, Oils and Spices at Farmers Level' to encourage the farmers to grow spices (The Independent 7th July 2019). The production of spices was promoted in terms of training, technological assistance, providing quality seeds, and exhibiting model plots (The Independent 7th July 2019). The farmers have been getting the financial benefits through a steady growth in the production of over 1.69 lakh MT of onion, garlic, coriander, ginger, turmeric, Funnel flower, Kalojira, and chili yield from last 2013. The DAE has been extending their assistance for Rangpur region farmers for proper crop diversification, land management, and utilization of latest technologies for large-scale farming of spices.

Hassan et al. (2015) studied the production cost and profitability of the cash crop tobacco farmers in Rangpur district. Though the large farm size farmers got profits from growing tobacco, the medium farm size farmers confronted with the lower price, price fluctuation, shortage of capital, lack of good quality seeds, poor storage facility, higher price of inputs, and lack of marketing facilities during harvesting season. The researchers recommended appropriate measure from the Government to figure out the issue.

Afrin (2016) examined the impact of seasonal loan on the rice production in the Badarganj upazila of Rangpur division. The study found that the seasonal loan borrowers were more benefited than the loan non-borrowers. Afrin (2016) recommended more seasonal loan should be given to the rice farmers of the study area to increase the yield, as well as profit. Realizing the need to provide financial aids for the cropping seasons, Bangladesh Bank has announced targeted spending BDT 26,391 crore in the agricultural sector for the current fiscal year. With a growing demand for agricultural and rural loans, the target disbursement of agricultural and rural loans has been set at BDT 11,045 for state-owned commercial and specialized banks, and BDT 17, 336 for private and foreign commercial banks (Samakal Reporter July 2021).

Main Theme and Specific Objectives

The main theme of the study was to investigate the effects of socio-economic status of farmers upon cropping pattern and productivity in Rangpur Division, Bangladesh. The specific objectives were to:

- Identifying the socio-economic status of the farmers
- Categorizing the farmers by land size
- Exploring the Land Ownership pattern

Methods and Materials

The True Experimental Design (TED) developed by Campbell and Stanley (1963) was applied to determine the effects of SES of the respondent farmers upon cropping pattern and productivity. Firstly, a Piloting survey was conducted in the Study area to collect the bench mark data about the effects of SES of the respondent farmers of the Study area upon crop pattern and productivity. Secondly, another survey was conducted to reveal the above-mentioned impacts after the intervention. The comparison between the Bench mark data and post-intervention data were compared to assess the effects (Fig.1).

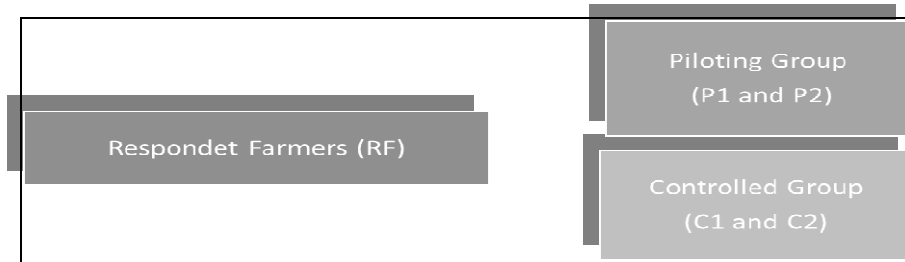


Fig.1: True Experimental Design for the Research

In the Fig.1, RF shows the respondent Farmers selected by 'Random Sampling' method; P1 shows the Bench mark data collected during the Piloting survey; P2 shows the Resultant data collected in post-intervention stage; C1 shows the Bench mark data collected during the Piloting survey; and C2 shows the Resultant data collected in post-intervention stage. The P1 and P2 were not intervened (Piloting group), while C1 and C2 experienced interventions (Controlled group).

According to the TED,

$$\begin{aligned}
 \text{Gross Outcome from Piloting group} & : P2 - P1 = \text{Effects of relevant factors} \\
 \text{Gross Outcome from Controlling group} & : C2 - C1 = \text{Effects of relevant factors} \\
 \text{Effects of Intervention} & = (P2 - P1) - (C2 - C1) \\
 & = (P2 - C2) - (P1 - C1) \\
 & = (P2 - C2)
 \end{aligned}$$

If, $P2 - C2$ is significant, then the effect is evident.

In the research, the effects of the interventions were significant and the effect is evident.

Data Sources

The study was conducted in 2017. Primary data were generated by surveying the sample farmer respondents from the selected mauzas/villages with different sets of structured and non-structured questionnaires with the statistically calculated sample size 300. In addition, a number of focus group discussion (FGDs) and key informant interviews (KIIs) were conducted in selected areas with the progressive farmers, farmer groups, extension officials, women's groups, businessmen, and NGO workers and the Survey instruments were used in the survey are Questionnaire for Crops Farmers, KII checklist and FGD checklist.

The secondary data were collected and cross-checked from various sources, such as the Bangladesh Bureau of Statistics (BBS), the Ministry of Agriculture, Government of Bangladesh, Upazila Head Quarters and relevant books, national reports, and journal articles.

The collected data were analyzed by SPSS software and the derived data were presented in tabular and graphical forms. The location map was prepared with GIS software.

Study Area and Sample Areas

The Rangpur division was selected as the study area, while four districts, namely the Nilphamanri, the Lalmonirhat, the Rangpur and the Kurigram were selected as the sample areas (Table 1 and Fig. 2). The study area is traversed by the rivers like the Brahmaputra, the Jamuna, the Punarbhaba, the Karatoya, the Atrai, the Tista, and the Mahananda (Banglapedia, 2015). The soil type is alluvial, average temperature is 24.3° C and annual rainfall is 2498 mm. Main natural disaster are floods, drought and river bank erosion (Banglapedia, 2015).

Results and Discussion

The basic SES indicators of the respondent farmers, such as the age-sex structure, education status, sources of income, land size and land ownership status of the Rangpur division. The cropping pattern, choice of crop cultivation practices, and the cultivation methods of the respondent farmers were also investigated to understand the existing cropping pattern and productivity in the study area.

Socio-economic Status (SES)

Age-Sex Structure

The age-sex structure of respondent farmers has been shown with a 'Constructive or Regressive' type of population pyramid (Fig.3). The exception has been observed at age groups of 20-24 and 25-29, as farmers of these two age-groups of 'both sexes' ranged from 2%-6%. The least percentage of male farmers are from age group of 80-84 (lesser than 1%), sharply decreasing from age-group of (70-74) reaching up to 2% of entire male farmer population. On the other hand, the least percentage (less than 1%) of female farmers are observed to be working even at the age group of (70-74). Involvement at farming even in these elderly age range depicts the poor SES of the study area. The mid age-groups are mostly engaged in farming in comparison to any other age-groups. The pyramid has the maximum extent (12%-20%) around the age-groups of (30-34), (35-39), (40-49), (50-54), while the age-group of (40-45) contains the highest percentage of farmers (20%) in both sexes. The overall situation of the age-gender pyramid illustrates that, majority (72%) of the farmers are of middle age and have a little difference in gender-ratio. The average family size is 4.5 persons per household but according to the census in 2011, average family size was 4.4 persons per household. Another notable thing is that gender inequality difference is only 3%, but the age-group constrains parallel such as male age group is (39-48) years and female age group is (29-38) years old.

Education Status

The general literacy rate of the population aged above 15 is 74.68 percent, while the literacy rate in the sample areas ranges from 37.72 percent in Kurigram to 98.3 percent in Nilphamari (Banglapedia, 2015). However, literacy rate of farmers has not yet been calculated in Bangladesh. Out of total 44, 3808 number of farmers, the maximum is literate (male 38.4 % and female 41%). The female literacy rate is higher than that of the male respondents, depicting an almost gender balanced ratio (Fig.2). The highest literacy rate of male and female (male 37.7 % and female 33.2 %) is found at the Primary School Certificate (PSC) level, while graduate level is holding

the lowest literacy rate (male 5.3% and female 4.3%) (Fig.4). The situation proves the advancement of female education in our country. The least percentage of male farmers is found to have Higher School Certificate (H.S.C.) level of education, whereas the least percentage of female farmers has passed H.S.C. level education (1.3%). The second level of educational qualification is found to have P.S.C. certificate where the sex-ratio is almost equal (33%). The farmers with JSC, SSC, HSC degrees diminish in percentage gradually. The education status depicts the weak knowledge strength of the farmers, which hinders the application of advanced agricultural tools and systems.

Sources of Income

In Bangladesh, 47.5% of the population were directly employed in agriculture and around 70% depended on agriculture in one form or another for their livelihood (GED 2015). In the study area, majority (92.3 %) respondent farmers make their livelihood directly from crop production (male 92.4% and female 91.5%). The farmers also have other sources of income, such as 2.4% in raising livestock (male 2.4% and female 4.1%), and only 0.8% in fishing (male 0.8 % and female 0.8%). On the other hand, only 0.4% of both sex respondent farmers are engaged in business sector, having a sex ratio of 4:3.2. Other economic activities were found among a little segment of the study area farmers (0.4%) (Table 2). Though crop production is the prime economic activity, the farmers has been observed to follow the conventional ways of cultivation, as well as the cropping pattern. Zaman et al, 2017 mentioned that the net cropped area (NCA) of Rangpur division was 696,420 ha, the annual crop area (the land occupied by crops round the year) was only 2% of the NCA.

Categories of Farmers by Land size

Ownership of large and medium size lands by the respondent farmers is very less (12%), while marginal type of farmer predominated (45%) during the study. In Fig.5, the farmers have been categorized into five types based on the size of lands owned by the farmers. According to the table, only 3.4% of total farmers has large farmlands, where male farmers exceed the number of female farmers (3.5:2.8). The majority of the farmers are of 'Marginal' type (41%) having a sex ratio of 40.8: 44.2. The medium types of farmers are lesser than the landless farmers (11.9 %) in comparison to landless 13.4 %). The scenario proves the uneven, and inequality of land distribution as well as land ownership pattern of study area.

Distribution of Land Ownership

A total of 40% farmers are land less (owned up to 0.22 acres), while 16.7 percent are Marginal farmers (owned 0.23 to 0.49 acres). The small size (0.5-2.49 acres) lands are owned by 32.7 percent farmers and medium size (Owned 2.5 – 7.49 acres) lands are owned by 9.6 percent. Only 0.9 percent farmers own large size (more than 7.5-acre) lands (Table 3). The percentage of landless, marginal and small farmers are the highest (89.4%). Inequal distribution of privately-owned land is one of the critical agrarian problems in rural Bangladesh. There is a huge inequality of land distribution of Bangladesh. The pie-chart (Fig. 6) depicts the inequality of land ownership of the crop farmers. A total of 90% of the farmers have their own agricultural land and 10%

are landless. Food production, therefore, has to be increased by enhancing the productivity of land and other management practices. Increasing productivity is even crucial in Bangladesh as there exist huge yield gap. So, land ownership inequality has to be reduced and proper land management has to be ensured.

Cropping Pattern

The cropping pattern has been analysed in terms of land ownership, land size, cropping pattern and productivity, cultivation choice, and cultivation method. In Bangladesh Rice, Wheat, Jute, Fruits, different Oil-seeds, Pulse and Vegetable are contemplated as the main food crops (7th FYP). In Bangladesh rice can be grown and harvested three times a year due to fertile land and sufficient water supply. After 1971, wheat has achieved greater importance and is now recognized as a traditional crop in Bangladesh.

Choice of Crop Cultivation Practices

Crop production depends mainly on the availability of production technology and the cultivation method practiced by the farmers. On the other hand, the profit of crop production depends on the cost of production, the type of crop produced, prices of the products and the government policies. In the study area five major crops grown are namely, rice, wheat, maize, pulses, oilseed, vegetable, fruits and others. The choices of crops for cultivation should be determined to formulate suitable guideline policy for crops production. Table 4 displays the choice of cultivation of different crops by the farmers. Rice is the first choice (96.6%) for cultivation whereas, Wheat and maize complies the second (11.7%) and third (10.1) choice of cultivation.

Cultivation Method

The farmers of the study area use three ways, individually or in a blended manner. Majority of the farmers (66.9%) use both manual and mechanized methods in a combined manner. The combined method is followed by the manual (12.5%) and mechanized (20.6%) consecutively (Fig.7).

Findings

The study found that, owing to economic insolvency, illiteracy, unawareness about the changing physiographic and climatic condition, unwillingness to acclimatize comprehensive cropping pattern and alternative cultivation systems was working behind the prolonged monga situation in the Rangpur division. The True Experimental Design for the research proved that, improvement of SES of the respondent farmers through financial support for advanced agricultural tools, machineries, healthy and high yielding seeds, better livelihood, education and health increased the knowledge, awareness, and inspirations to go through the paradigm shift from Conventional to Comprehensive agricultural systems. The literatures as well accentuated the findings of the research. The farmers started to cultivate other crops like potato, vegetables, and seasonal fruits like water melons in a small scale. The farmers were also using advanced tool and technologies provided by the national agricultural stakeholders like Bangladesh Agricultural Research Institute (BARI), Bangladesh Rice Research Institute (BRRI) and Department of Agriculture

(DAE). The seasonal loans to buy better quality seeds, inputs, irrigation, granaries, and cold storage facilities disbursed by the government has also been observed to provide financial support to the farmers.

Conclusion

This research has delved with the basic SES indicators of the respondent farmers, and found that around 40-45% farmers are of mid-age group, while exceptions has been found with the female farmers of age-group 70-74, which shows the poor SES of the study area. The low percentage (9.6 %) of graduates also indicate the constraints to avail higher education for the farmers in the Rangpur district. Further, inequal land ownership, landlessness, and small land size, illiteracy, financial inability and ignorance have been refraining the respondent farmers from choosing comprehensive and alternative cropping pattern to cope with the adverse impacts of physiographic and CCI hazards. In conclusion, the existing plans and policies has to be reformed as well as new policies has to be taken at national level for the improvement of the SES of the farmers with a view to enhance their knowledge, awareness, and skill to adopt with comprehensive agriculture in the agri-based poverty-stricken Rangpur division.

Recommendations

Based on the study following recommendations might be made.

- Paradigm shift from Conventional to Comprehensive agricultural systems has to be encouraged among farmers.
- New physiographic and CCI hazard tolerant crop varieties has to be invented as cropping patterns and productivity are being affected by the global climate change.
- Increased national and public initiatives such as financial support, interest free bank loans to buy agricultural equipment, seeds, and fertilizers has to be taken to improve the SES of the farmers through diverse assistance and incentives.
- Advanced granaries and cold storages should be developed and easy access to markets should be ensured.
- Development of agro-based small and medium industries in government and private sectors with flexible terms and conditions should be ensured to improve the crop yield.
- Multi-national cooperation has to be initiated to ensure natural flow in the rivers and sufficient supply of irrigation water.

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