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Agriculture Development in a Village at Saturia, Manikganj: A Planning Perspective

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Abstract

Agriculture plays a foremost role in the stability and progression of the economy of Bangladesh and more than 3/4 of the total population in rural areas derive their livelihood from the agricultural sector (Hossain et.all, 2018, p.1-218). Densely populated country Bangladesh is facing a massive challenge to meet up the food demand of her ever-increasing population. Bangladesh is also a country having nearby sixty-eight thousand villages (banglapedia 2014). The overall economy and national development largely depend on the villages. Most of the villagers are engaged in agriculture and it is an important source of the rural economy. This sector has also a significant combination in the national economy of the country. GDP From Agriculture in Bangladesh increased to 10739.10 BDT Million in 2019 from 10468.80 BDT Million in 2018 (tradingeconomics, 2019). For the overall economic sustainability and growth, it is necessary to improvise the agricultural sector. The study pinpoints the problems of the agriculture sector in Bangladesh and provides some recommendations based on the analysis of the existing agriculture sector in the light of various agricultural plans, policies, and strategies for the sustainable development of the agricultural sector.

Keywords: Agriculture, Development, Technology, Farmers

Introduction

Bangladesh is called the "daughter of nature" due to the copious tremendous natural resources of her. Bangladesh is the country with a distinct agricultural setting. The geography, location, and topography of Bangladesh are very much suitable for agriculture. According to the World Bank (2018), the percentage of people living below the international extreme poverty line in Bangladesh's poverty rate fell from 82% (1972), to 18.5% (2010), to 13.8% (2016), and finally below 9% in 2018. Most of the rural poor are dependent on the agriculture sector of Bangladesh. According to the World Bank (2018), agricultural land in Bangladesh was reported at 70.63 % of total land area in 2015 and 39.07% of total employment in Bangladesh are employed in this sector. Agricultural land in Bangladesh refers to the share of land area that is arable, under permanent crops, and under permanent pastures. Almost 59.65% of the total land of Bangladesh is arable (trading economics, 2019). The resources are apposite and available to facilitate agriculture, in most villages agriculture is the main source of living. Yet, the agricultural condition is so poor and not so improvised. Janna village of Saturia Upazila, in Manikganj district, is a great example of an agricultural area, as almost 50% of the total agro-based production of overall Saturia Upazila is produced here (Saturia Agriculture

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Development Department, 2011). But the agriculture system is predated due to the lack of information and awareness. So it is indispensable to have a thorough study in the agriculture system of the area to find out problems related to this sector and provide possible solutions so that in other rural areas in Bangladesh.

Objectives and Methods

The principal aim of the study is to identify and analyze the existing condition of the agriculture sector from production to marketing and recommend suggestions for the development of the agriculture sector. The objectives are to identify the present scenario of the agriculture sector of the case study area, from production to manufacture; analyze the problems of the agricultural sector of the village, and to evaluate selective alternative solutions for the alleviation of problems related to this sector for the furtherance of the future. To understand the study area conditions and the problems of the existing agricultural process, it required consulting with farmers and agricultural officials of that area. A questionnaire survey was conducted to gather primary information. Other necessary information and data were collected from the related authorities and organizations dealing with Agriculture and rural development. Related journals, articles, thesis, and other publications were also reviewed to formulate the base methodology of the study. The objectives of the research are chronologically dependent on the next one. In the case of officials, the sampling error was not needed to identify. But in the case of the farmers survey the sample size was required more than 30 and within 20 -50 (Somekh & Lewin, 2005). So the sampling error is not high. In the case of collecting data, there was an observation survey, both structural and nonstructural survey, and a questionnaire survey toward related officials and farmers. The official's opinion survey was open-ended questions (Mannan & Merry, 2002). To identify the relationship of the farmers the group discussion was important. One family or more than one family was grouped for the interview (Somekh & Lewin, 2005). The farmer's survey was a mixed questioner as both open-ended and close-ended questions (Mannan & Merry, 2002).

Literature Review

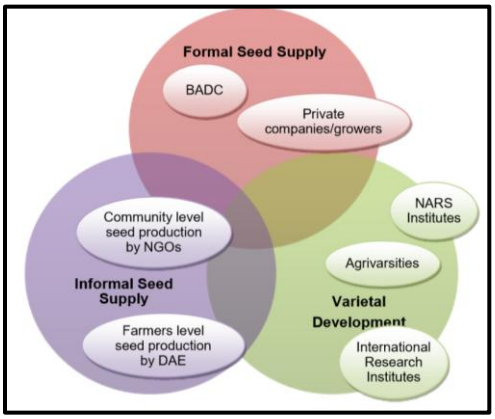
There is the dominant importance of agriculture and the rural sector in Bangladesh to meet its miscellaneous development challenges. The agriculture sector is the major contributor to sustained food, nutrition, and livelihood security of its population to achieve self-sufficiency in food security, reduce rural poverty, and foster sustainable economic development. Development of agriculture in Bangladesh is therefore accorded as high priority by the Government with special emphasis on agriculture-related policies, planning, and informed decision making (BBS, 2017, p. 1-53). Bangladesh has a comparative advantage of production (pulse, potato, onion, maize, vegetables, chili, and garlic) for both the owner-operators and sharecroppers due to its natural resources, geological and demographic condition. So, there is ample scope for crop diversification. According to Hossain et al (2011) the major challenges and suggested development options or interventions related to agriculture and food security in Bangladesh are below in the table.

Table 01: Major Challenges and Suggested Development Options or Interventions

Major Challenges	Suggested Development Options or Interventions
a) the curse of poverty, food insecurity, and malnutrition ; b) degradation of natural recourses; c) low agricultural productivity and limited modernization and/or diversification; d) weak research extension linkage and technology delivery; e) High post-harvest losses; f) Problems of market linkages and value chains; g) Scarcity of availability of agricultural labor; h) Farm mechanization; i) Food quality and safety problem; j) Inadequate institutional credit; k) Inadequate availability of quality seeds to the farmers, and l) Increased environmental shocks and livelihood risk.	a) Technology development and dissemination, b) Improved water resource management and irrigation, c) Crop diversification, d) Sustainable supply and use of improved quality of inputs, e) Farm mechanization, f) Improving market linkages and development of value chains, g) Livelihood improvement and food security, h) Interventions for climate change adaptation and i) Improved land management

Source: Hossain et al, 2011, p.1-218

Johnston and Mellor (1961) account explicitly for agriculture as an lively sector in the economy by improving the Lewis Model. In addition to labor and food supply, agriculture plays an active role in economic growth through significant production and consumption linkages. For example, agriculture can provide raw materials to nonagricultural production or demand inputs from the modern sector. On the consumption side, a advanced productivity in agriculture can increase the income of the rural population, thereby creating demand for domestically manufactured industrial output (Dethier & Effenberger, 2011, p.1-58).



Source: Hossain et all, 2018, p. 1-218

Fig 1: National Seed Supply of Bangladesh

There are so many problems with the better growth of this sector. The BADC servers seed in the Upazilas. There is also the NGO's, community level, and farmers' level seed production. Though there are both formal and informal seed suppliers in this country, the seed supply system is not enough for all over Bangladesh (Hossain et al, 2018, p.1-218). On the other hand, Bangladesh has the decreasing groundwater tables and water quality issues. It will be extremely difficult to reduced demand of water or exploit groundwater resources sustainably without an increase in Water Productivity. Some of the districts have already passed the sustainable thresholds of groundwater use (Mojid et al, 2019). Bangladesh has the fast shrinking agricultural land. The total land area of the country with classifications of agriculture and non-agriculture lands. The changes in agriculture land to other land use activities cause the shrinking of agricultural land (Miah et al, 2013). Increasing production through minimizing the yield gap is the only option left. 37.6 million tons of rice could be produce by the year 2021 from the existing rice area (Hossain et al, 2018, p.1-218). Agricultural growth is reliant on a very wide-scale switch to High-yielding variety (HYV) seed, but the quality of seed remains a major problem. Numerous related investments are needed to enhance the provision of adequate quantities and good quality seeds. Moreover, private-public partnerships should be explored for seed, marketing, and extension.

To meeting the demand for higher food production, thrust should be given to edge research including reduction of cultivation costs, genetic engineering, strengthening of the technology transfer linkage, and improvement of postharvest technology. Because public sector credit agencies are characterized by various impediments to access by farmers and especially women in the few government projects with a credit component. Private moneylenders dominate the credit market. Poor farmers have little choice. The total demand of credit for agriculture far outweighs its supply. This needs major reform. (Hossain et all, 2018, p.1-218).

Case Study Analysis

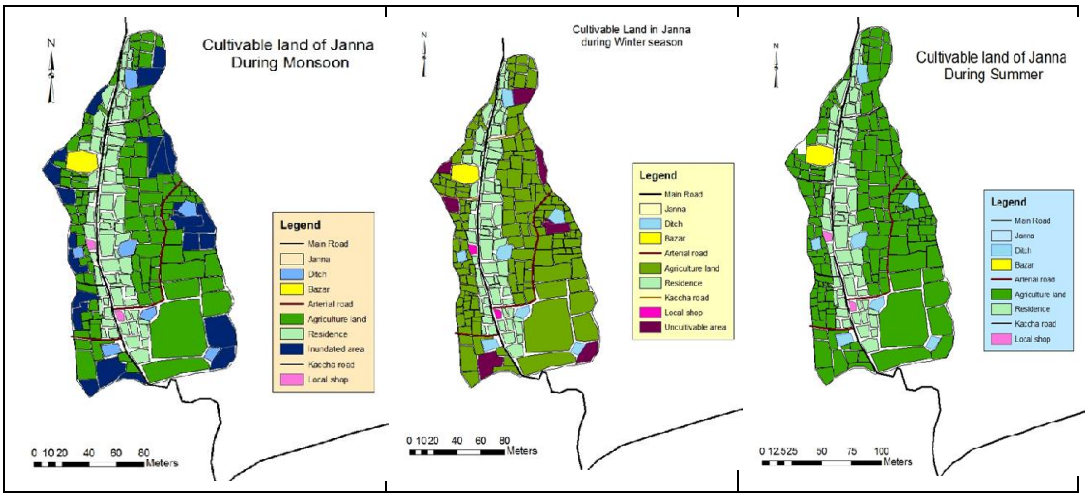
The study area Janna village is in the 5 no ward of Fukurhati union in Saturia Upazila, Manikganj. Agriculture is the main source of economy and is characterized by 1318.23 hectors cultivable land (Saturia Agriculture Development Department, 2011) in this area. The market value of the first-grade arable land is Take 30000 per 0.01 hectare. The main economy of this village depends on Agricultural mostly (which is 52.37%) and also on agricultural laborer (which is 20.14%) (Saturia Agriculture Development Department, 2011). The cultivable land of Janna village differs according to the seasonal change. In the rainy season, most of the land belongs underwater. About 77% of the land is cultivable in the monsoon, 100% in summer, and 92% in winter. Depending on the season, there are many types of crops are cultivated available here. But most dominant crops are given below.

Table 2: General information about the produced crops and the exportable Crops

Crops	Name of the crops
Main crops	Paddy, Jute, Wheat, Mustard, Sugarcane, Potato, Vegetables, Blackgran
Extinct or nearly extinct crops	Khesari, Kaun, Linseed, Sesame, Pea, Barley, Kalizira Rice, Buck Wheat, Castor
Main fruits	Mango, Jackfruit, Banana, Guava, Lemon, Lichi, Bar, Tarmaric, Olive
Main exports	Paddy, Jute, Potato, Pea, Barley, Mango, Jackfruit, Banana, Vegetables, Guava, Lemon Tomato

Source: Field Survey, 2018

The procedure of cultivation in the study area includes manufacturing, maintenance, and marketing. The **manufacturing** process includes preparing land and collection of seeds, fertilizers, pesticides from the concerned office or market. Then they sow seeds in the land. Irrigation is an important part of manufacturing. Farmers do this either through the natural way or by using modern equipment. Then, if needed, Farmers maintain cropland by using fertilizers and pesticides. **Maintenance** includes processing of crops from cutting in time to marketing. Crops are cut, cleaned, and processed for marketing. On the other hand, Paddy requires more time for processing as rice. At last, the crop is taken to the market through transportation mode. **Marketing** is the next step in preparing crops for sale. It is necessary to facilitate crops to the market. local retailers collect the crops and transport to the local market. There is more retailer in the Upazila level or district level than the local market.



Source: Saturia Agriculture Development Department and Author, 2011

Fig 3: Cultivable land of Janna in various seasons

Major Findings of the Research

In the study, information on chemical fertilizer such as urea, TSP, DAP, NPKS, Gypsum, etc is collected from the concerned office or organization. Natural fertilizers are made in

house by the farmers using cow-dung, leaves, scraps of foods, etc. Pesticides are collected from the Agricultural Development Department of the Saturia Upazila Office. Bangladesh Bank, Bangladesh Krishi Bank, Janata Bank, BRAC, etc. provide various agriculture loans. But the money lending procedure from concerned organizations is a prolonged process. It is also very difficult to lend money, as the rate is very high which is often difficult to repay by the poor farmers. In the study area, most of the land is cultivated in a year. There are about 1.33 Hectors land is used for a single crop, 57.19 Hectors is for the double land, and 74.48 Hectors for the Triple crop. The total crop production of Janna is approximately 736.42 metric tons per year. Among these, around 567.27 metric ton (77%) is marketed every year. So the remaining crops or production is nearby 169.15 metric tons (23%) which is consumed by the farmers.

The use of fertilizer is seen in the standard amount in Janna. The fertilizers are bought from the BICI dealers. But in the study area, the farmers use organic manure most. About 50% of the total used fertilizer is inorganic urea. From the field survey, it can be stated that the farmers use only 40% of organic fertilizer and the rest is inorganic. On the other hand, 12% of pesticides are natural and the rest of the other is chemical.

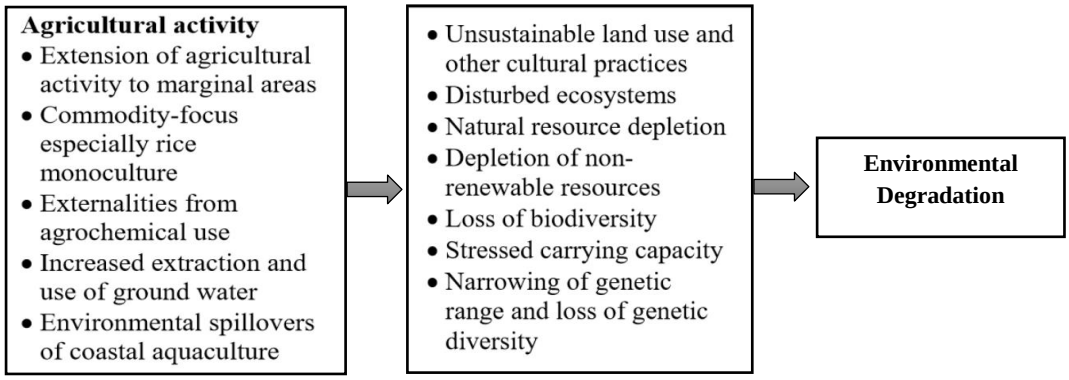
The farmers of the study area use various kinds of technology for increasing the crop production with the help of the Agricultural Development Department. The technologies are Supplementary irrigation, Community seedbed, Dram seeder, Use of mixed fertilizer, Production, and preservation of seed, Production of the crop without cultivation, Vegetable production and cultivation in the residential area, New cereal crop, Production and use of organic manure, Muri sugarcane, Shathi crop, and Ropa sugarcane. Regrettably, the last steps were taken in the year 2005-06 and no new technologies are added yet. According to field survey, about 27% farmer uses technology for a cash crop, 24% for grain cereal, 23% for vegetables, and 23% organic manure (Saturia Agriculture Development Department, 2005-06). The Agriculture Development Department organizes training for farmers to introduce and update them about new technologies of crop production. For the T Amon, Amon, and Boro Amon crop training session was arranged in the Fukurhati Union for the village of Janna and others. In 2003-04, the number of total trainees 25.

There is three types of costs in the production process of the crop. The field survey stated the total cost of the crop production to marketing is 60% for manufacturing cost, 25% maintaining cost, and 15% Marketing cost. The manufacturing costs include labor cost (33%), seeds, pesticides, fertilizer (30%), irrigation, transportation, technology, equipment, and plaguing the land. Maintenance costs include irrigation, labor cost (42%), fertilizer, pesticides, and weeding. The marketing cost starts with cutting (50%), labor, cleaning, preparing, and transportation. The field survey also stated that the total cost is about 65% and the profit is about 35%. About 24% of farmers lend money from formal and informal sectors. The loan provider is about 32% of the government and the rest are NGOs and other informal sectors. Janna village is the part of the Janna block of Saturia. The service of the agriculture office for the Janna Block is satisfactory. The Janna village contributes about 41.27% of the total land of the Janna Block (Saturia Agriculture Development Department, 2005-06 and Field Survey, 2011)

The study area is highly productive but there are some problems.

- The **cropping intensity** is 2.45% (See Appendix 3) in the study are but as a highly productive land area, the crop intensity should be increased.
- The **PH** of the northern side of the connecting road is about 7 and on the other side are about 8. On the northern side of the study area, there are no linkages with the river. Due to the use of the various organic and inorganic manures, PH is 7 here. But on the other side, the PH is 8 because there are linkages of water flow so that the CaCo3 (calcium Carbonate) helps to increase the PH.
- The **soil** quality of the study is positive for the cropping but the farmers are not concern about the production gap between the cropping to increase or balance the fertility of the land.
- The need for **water** in the village for cropping is well adjusted but due to the use of the pesticides, the water bodies are being polluted. The pollution rate is increasing day by day. On the other hand, because of the availability of water during irrigation, there is no production gap. So that the land will be less productive in the long run.
- **Resource allocation** from the agriculture development department for the Janna village is not satisfactory. The Janna block is too large to manage by one agriculturist.
- On the other hand, the **loan provider organizations** provide loans at a very high rate. The money lending procedure is also very much lengthy from banks or the formal sectors. The informal sectors (like the person to person loan) loan has to provide at a very high rate for the 6 or 8 month or a year. In the study area about 12% of farmers take loans every year, 17% farmers, sometimes as a need, 42% rear, and rest never take the loan. Most of the cases, to repay the loan the lenders have to sell all the crops in a season or mortgage his land. This process discourages the farmers to grow agricultural products and encourages them to be daily labor in cities. The poor farmers are becoming poorer because of the loan system.
- The **cost and profit ratio** is not suitable for the labor or the landowner (13:7), which discourages the local people or farmers to grow crops. On the other hand, the production and marketing system includes 2 and more buyers. So that the price of the product increase 2 to 10 times. But the labor or the marginal farmers never get the extra profit.
- The field survey stated that most of the farmers are not aware of the **cropping gap**. Growing more crops hamper the environment as well in the long run.
- The **number of agriculturists** is not enough for the study area. An agriculturalist for a large block is not enough to provide proper training and other updated information to the farmers.
- The farmers are not well **educated** to solve their agriculture-related problems or using the internet. They usually use ancient solutions for various agricultural problems. Though the agriculturist for the farmers is not enough the farmers may not solve all problems.
- Natural resource are very much handy to the people of the village. On the other hand, the people are not aware about the minimized use of the resources. Lack of

proper knowledge, awareness and use of **natural resources** haphazardly causes the environmental degradation long run.



Source: Alauddin 2004, p.1-14 and Author, 2018

Fig 4: Environmental Degradation Process through Agricultural Process

Recommendations

To improvise the present situation of agriculture and to lessen the problems of existing agricultural practice, there is needed to take some initiatives. These initiatives are to be taken in some specific sectors related to agriculture. Some recommended options to achieve sustainability in agriculture are being below.

Development of Economy related to Agriculture: The long term objective of this section is to create an economy friendly environment to facilitate the marketing, processing of goods, increase profitability and insurance of farmers. The recommendations are:

- Ensure proper guidance and direction of the agriculture development office
- Increase public awareness
- Assistance to a small farmer in farming co-operatives which can- enhance productivity
- Provide loans in a low-interest rate to the farmers
- Facilitation of access to markets and promote efficient marketing system

Increase Manpower: This initiative should be taken to improvise the farmers' quality in the long term. For this the short term objectives are

- Training and education for the farmers
- Increase skill development
- Provision of a periodical meeting for all farmers

Provision of Education and Training: To create opportunities to develop the skills through training and innovative education. To fulfill this the short term objectives are

- Provision of training for both traditional and nontraditional farming
- Increase awareness

- Ensure the development of the capabilities of women and unemployed youths to contribute more to agricultural activities.

Technology Development and Dissemination: To increase agricultural productivity and diversity sustainably requires research and technology development in support of enhance production in different ecosystems. To fulfill this the short-term objectives are

- Short maturing Aus and Aman rice, new HYVs, biotechnology as the varietals improvement needed to build on respective experiences of private and public sectors;
- fertilizer, cropping patterns, cultural practices for char land, hill and coastal areas are needed to manage properly and
- water and soil conservation;

Facilitate Marketing and Communication: It aims at the cooperative approaches for both farmers and consumers in the market. To fulfill this the short term objectives are

- Improve transport network
- Provide loans in a low-interest rate to the farmers
- Making and development of agricultural infrastructure and cold storage

Provision and Implementation of Agriculture Policy, Planning, Legislation: The main aim of this recommendation phase is to ensure the incorporation of agriculture in the overall planning process to ensure overall development. The short-term objectives are

- The responsibilities and advantages of government authorities should be decentralized so that, relatively low severe problems can be handled by the local authority
- Proper allocation of different responsibilities to the concerned authority
- The responsibilities should be clearly defined
- Provision of suitable land use
- Awareness-raising for balanced fertilizer application
- Popularization of more efficient fertilizer application techniques and
- Improve pricing policy

Those can help preserve soil quality, raise output, lower costs of production, and save the government budget huge amounts of money. The above-discussed recommendation should be implanted based on importance. So it should be treated according to their impact on agriculture and should be implemented on a priority basis. According to their importance and impact in agriculture, these are classified in some classes through the implementation ranking in table 3.

Table 3: Implementation Matrix by Priority Ranking

Priority level	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Priority level 1						
Responsibilities and advantages of government authorities should be decentralized						
Ensure proper guidance and direction of the agriculture development office						
Improve transport network						
Facilitation of access to markets and promote efficient marketing system						
Proper allocation of different responsibilities to concerned authority						
Making and development of agricultural infrastructure and cold storage						
Priority level 2						
Increase public awareness						
Provide loans in a low interest rate to the farmers						
Provision of labor development						
Training and education for the farmers						
Provision of suitable land use						
Increase skill development						
Provision of proper verification and enquiry						
Priority level 3						
Facilitation of access to markets and promotion efficient marketing system						
Provision of a periodical meeting for all farmers						
Ensure the development of the capabilities of women and unemployed youths to contribute more to agricultural activities.						

Source: Author, 2017

Aziz & Miah (2009, p. 9) stated that, Bangladesh Rice Research Institute conducted experiments during the T. Aman season which resulted that the performance of flora on the growth and yield of wetland rice (combinations are T1= Control (No-fertilizer), T2= Flora @ 3ml/lit. of water, T3= Soil Test Based (STB) dose and T4= T3 + Flora @ 3ml/lit. of water) was suitable for all over Bangladesh. This treatment could be taken in the study

area to keep the better quality of the study area as much as possible. On the other hand, the Agronomy Field Laboratory (BAU, Mymensingh), conducted a researh in the period from December 2004 to May 2005 to determine the most effective kind of trellis for the rice-cum-vegetable production system (combinations viz. C0: rice alone i.e. control, C1: rice + bottle gourd, C2: rice + white gourd, C3: rice + snake gourd and C4: rice + bitter gourd, and four levels of trellises viz. T1: flat trellis, T2: T-trellis (180 cm breadth), T3: T-trellis (240 cm breadth), and T4: X-trellis (cross trellis)). This experiment resulted that Boro rice along with vegetable and rice equivalent yields varied significantly due to crop combination their interactions, and nature of trellis. (Hasan & Islam 2009, p. 14). These types of experiments are also very effective to know and keep the conditions of the study area. Mollah, Bhuiya & Kabir (2009, p. 26) explained with an experiment of BRRI (Bangladesh Rice Research Institute) Gazipur during Rabi season to determine the effects of bed width, plant row number bed-1 and seed rate on the agro-economic productivity of wheat under bed planting in the rice-wheat cropping system. This experiment resulted that in the conventional method the sterility percentage was lower in bed, which saved 41-48 % of irrigation water. Though the experimental crops are very much common to the study area, so for the positive future effect on the land the local farmers with the help of the agriculture officer should follow those experiments.

From the field survey, it is learned that the farmers of all levels do not get enough water for irrigation. According to Ali (2010), in 1950 investments took two main forms:

- Enhancement of flood control and drainage.
- Development of supplemental irrigation during monsoon season.

For the study area, these investments of 1950 could be done again for those two works. Because the study area is being affected by the flood and not having enough water for irrigation during the dry season. So according to Ram (2097), the wide gap between the potential created and its utilization was to be bridged by developing a suitable water convenience system, consisting of field channels and other necessary OFD works, so that water could be made available to each every field.

In the study area, enough technical instrument is being used but they are not updated. According to Eicher & Staatz, (2006), an attempt to develop a model of agricultural development in which technical change is treated as indigenous to the development process, rather than as an exogenous factor, that operates independently of other development processes; must start with the recognition that there are multiple paths of technological development. Therefore, for the development process of the study area of agriculture, it is being very much important to involve various updated techniques in various steps of the agricultural production, processing crops, and marketing them.

Labor also is more intensively used per unit of output in agriculture, as confirmed by the high share of the economically active population that depends on agriculture, relative to the sector's contribution to national product (Rager, 2000). So if the people are being very much poor and being inactive then the agriculture production will be reduced. So there can be formed a group for the development of the people.

Quddus (1996) stated that the SFDP framework laid down the following basic premises for initiating the field action program (FAP) for the low income disadvantaged rural poor:

- The FAP is meant specifically for the socio-economic development of the rural poor.
- The FAP seeks to build the 'receiving system' by the rural poor to help them to have their own grassroots level mechanism for the purpose.
- The FAP attempts to introduce in the delivery system some special measures that would promote and protect the interest of the rural poor.
- The FAP will build a base for them. Through field action. The poorer segment would be able to participate in an integrated rural development program.

Within four years of the FAP operation, the following achievements were recorded These types of programs can be implemented in the study area.:

- The FAP demonstrated a sound methodology to identify, reach, and bring the poorer section of the rural population into some kind of rural organizations.
- The rural poor are bankable and can raise their income.
- The delivery mechanism can and are adjustable to directly support the rural poor.

According to Asaduzzaman and Westergaard (1993), as the output of a crop is the product of area under the crop multiplied by average yield, the discussion on output estimates may be divided into estimates of area and estimates of yield. In the study area, the farmers do not have enough land and they are having a small piece of land.

According to Hossain (1988), interested persons are asked to form groups of five likeminded people of similar economic standing who enjoy mutual trust and confidence. These groups may be created among the farmers. It will be helpful for the poor farmers of the study area.

Conclusion

In the Janna Village, the agricultural condition is being better than the other villages of the Janna block. The cropping intensity of this village is very high here. But if the process is being continued like this way then in the future the cropping intensity will be reduced and the agricultural production will be hampered. So the steps should be taken as fast as possible to increase the present condition of organic materials in the soil. The farmers are very much hard-working. The government should take initial steps for its improvement in agricultural conditions and livelihood. There should be proper implementation of the various plans taken by the government and other organizations. The marketing system should be easier and helpful for farmers. Agriculture is the most important sector to ensure the overall development and economy of the rural sector in Bangladesh. So this sector should be treated with great importance by the government of Bangladesh and concerned authority.

Reference

Agricultural Development Department, 2006, Development Activity and Technical Planning for the Saturia Upazila 2005-06, Saturia

Alauddin, M. Hossain, M 2001, Environment and Agriculture in a Developing Economy: Problems and Prospect for Bangladesh, Edward Elger Publishing Ltd, UK: Cheltenham

Alauddin, M. 2004, Recent Developments in the Bangladesh Economy, p. 1-14, ASARC Working Paper 2004/13

Ali, M. 2010, Fundameltal of Irrigation and On Farm Water Management, Volume 1, Springer Science + Business Media, USA: New York-10013

Answers, 2011, Cropping pattern and cropping intensity, 2011, viewed on 31 October, 2011 <http://wiki.answers.com/Q/What_is_cropping_pattern_cropping_intensity>

Asaduzzaman, M. and Westergaard, K 1993, Growth and Development in Rural Bangladesh: A critical review, The University press limited, Dhaka – 1000: Motijheel commercial area

Aziz, MA & Miah, MAM 2009, "Effect of "Flora" on the Growth and Yield of Wetland Rice", Journal of Agriculture & Rural Development, volume 7, no. 2, pp. 9-13

Baker, SAM 2009, "Rural Development and its Various Aspects", Journal of BRAC University, volume 4, no. 6, pp. 214-221

banglapedia, 2014, Village, <http://en.banglapedia.org/index.php?title=Village> Retrivr on 29 September 2014

BBS 2017, BANGLADESH STRATEGIC PLAN ON AGRICULTURAL AND RURAL STATISTICS (2016-2030), June 2017, Bangladesh Bureau of Statistics (BBS) Statistics and Informatics Division (SID) Ministry of Planning, p 1-53

Dethier, J. Effenberger, A. 2011, Agriculture and Development: A Brief Review of the Literature, The World Bank Development Economics Research Support Unit, Policy Research Working Paper 5553, p.1-58

encyclo, 2011, Definition of cropping intensity, 2011, viewed on 31 October, 2011 <http://www.encyclo.co.uk/define/Cropping%20intensity>

expertglossary, 2011, Definition of cropping pattern, 2011, viewed on 31 October, 2011 <http://www.expertglossary.com/water/definition/cropping-pattern>

Eicher, Carl and Staatz, John 2006, International Agricultural Development, 3rd edition, The Johns Hapkins press Ltd., London

Hasan, MA, Hasan, SM & Islam, N 2009, "Effect of Nature of Trellis on the Performance of Boro Rice and Vegetable Crops Grown in the Ails of Boro Rice Field", Journal of Agriculture & Rural Development, volume 7, no. 3, pp. 15-21

Hossain, M. Bayes, A, Islam, SM. F. 2018, A Diagnostic Study on Bangladesh Agriculture, Agricultural Economics, BRAC, Supported by UK Department for International Development DFID), p.1-218

Hossain, M. 1988, Credit for Alleviation of Rural Poverty: The Gr ameen Bank in Bangladesh, International Food Policy Research Institute (IFPRI)

Mannan,A.M. and Merry,K.S (2002), "Social Research and Introduce Statistics (in Bangla)", Protic Publicatios, banglabazar, Dhaka-1100

Miah, 2013, Md. Danesh Miah, M. Shahadat Hossain, Memon Abdul Bari, M. R. Islam, "Agronomic and genetic improvement of waterlogging tolerance in mungbean (Vigna radiata L. Wilczek)" January 2013, Soil Resource Development Institute (SRDI), Ministry of Agriculture.

MIU Mollah, MIU, Bhuiya, MSU & Kabi, MS 2009, "Bed Planting – A New Crop Establishment Method for Wheat in Rice-Wheat Cropping System", Journal of Agriculture & Rural Development, volume 7, no. 4, pp. 23-31

Mojid et al, 2013, Mohammad A. Mojid, Mohammad F. Parvez, Mohammed Mainuddin, and Geoff Hodgson, "Water Table Trend—A Sustainability Status of Groundwater Development in North- West Bangladesh" water MDPI, 6 June 2019

Somekh, B. and Lewin, C. (Editors) (2005), Research Methods in Social Science, Vistare Publications, New Delhi

Quddus, Md. 1996, Rural Development in Bangladesh: strategies and Experiences, 2nd edition, Bangladesh Academy for Rural Development (BERD), comilla: kotbari

Ram, Raza 1997, Agricultural Development, 1st edition, Abhinav publications, India: New Delhi 110016

Roger, Norton 2000, Agricultural development policy: concept and experiences, New York Press Ltd.,New York

Tradingeconomics, 2019, Agricultural Land Percent of Land Area, <https://tradingeconomics.com/bangladesh/agricultural-land-percent-of- land-area-wb-data.html> Retrieved 11 April 2018

Tradingeconomics, 2019, Gdp From Agriculture, <https://tradingeconomics.com/bangladesh/ gdp-from- agriculture2019> Retrieved 11 April 2020

World Bank 2018, *"Bangladesh Continues to Reduce Poverty But at Slower Pace"*. World Bank, Retrieved 11 April 2018

Annexure 1: Questionnaire Sample

Personal Information

Name of the respondents: Age: Sex: Male/Female Occupation: a) Service (government / non government) b) Business Income (In Year): Expenditure (in year):	Educational Qualification: a) Totally illitarae b) Under graduate c) S.S.C. d) H.S.C. e) Graduation f) Post Graduation **g)** More than post graduate

Subjective Information

1. How long have you been here? [Please (√) your choice]
   a. Under 5 years
   b. 5-10 years
   c. 10-15 years
   d. Above 15 years
2. Do you have own agricultural land? Yes/No

   If yes

Type of land	Amount of land	Nature of the land (1 Pakhi = …..decimal)
House hold land		
Agricultural land		
Forest land		
Wet land or pond		
Useless land		
Total land		

3. Land use

Land use category	Area(acre)

4. Cropping pattern in the agricultural land

Cropping pattern	Area (Decimal) (Decimal)	use
Single crop land		
Double crop land		
Triple crop land		
Forth crop land		
Fifth crop land		

5. Name of the crop cultivated in the land according to the season

Name of the season	Area (Decimal) (Decimal)	Name of the crop
Monsoon		
Summer		
Winter		

6. Collecting seed

Name of the crop	Amount of seed	Source to collect seed (From govt./from NGO/personal/if other than mansion)	Cost (Taka) of seed (in taka)	Distance to go to collect seed	Cost (Taka) of going the distance (in taka)	Total Cost (Taka) for collecting seed in the season

7. Collecting pesticides

Name of the crop	types of the pesticides (Chemical / Natural)	Name of the pesticides	Amount of pesticides	Cost (Taka) of pesticides (in taka)	Source of the fertilizer	Distance to go to collect pesticides	Cost (Taka) of going the distance (in taka)	Total Cost (Taka) for collecting pesticides in the season

8. Collecting fertilizer

Name of the crop	types of the fertilizer (Chomical/ Natural)	Name of the fertilizer	Amount of fertilizer	Cost (Taka) of fertilizer (in taka)	Source of the fertilizer	Distance to go to collect fertilizer	Cost (Taka) of going the distance (in taka)	Total Cost (Taka) for collecting fertilizer in the season

9. Production

Name of the crop	Total land (acre)	Total Production

10. Problems to produce in the crop:

11. Harvesting cost

12. Using technology

Using traditional technology……..

Using modern technology…….....

13. Marketing procedure
14. Marketing facility
15. Marketing facilities

Vehicles

Structure

Others

16. Problems in manufacturing the produced goods:
17. Possible solution:
18. Income comparing

Income this year:

Income last year:

19. Activities for agricultural development

Activities	Names	Related authority	Involvement (yes/no)	Effectiveness (yes/no)
Training programs				
Government programs/ projects				
NGO programs/ projects				

20. Projects for agricultural development

Name of the project	Name of the Responsible organization	Type of the organization (GO/NGO)	Name of the crops	Time period	Total land Area (Decimal) (Decimal)	Profit

21. Provision for agricultural loan

Name of the loan (general/agricultural/ if other than mentioned)	Name of the loan given organization	Loan given organization type (GO/NGO/ if other than mentioned)	Amount of loan	Time period to back the loan

22. Problems and solutions

Problems	Possible solutions
Agricultural sectors	
Produce in the crop	
Marketing the produced goods	

Annexure 2: Technologies used for agriculture development

Table 5.2: Technologies used for agriculture development

Name of the technology	Description
Supplementary irrigation	The rain water is being preserved in a low land surrounding by the mud wall. This water is being used in later when needed.
Community seed bed	The farmers who want to produced same crop make together a better seed bed.
Dram Seeder	A modern machine for seeding in land
Use of mixed fertilizer	Using mixed fertilizer which is homemade having NPKS. The grade of NPKS are Urea, TSP, SSP, MP
Production of crop without cultivation	In the hill it is used. In the plane land for the production of blackgran and mastered type crop it can be used. It has three types as below. • Dibbling(By making hole) • Fairing (By destroying the unnecessary crop part by fair) • In Deep water Production (Amon Crop)
Muri sugarcane	New type of sugarcane.
Shathi crop	Using land by produce tow crop together. (Sugarcane is main crop and Tomato is the Shathi crop)
Ropa sugercane	Seeding by the transplanting process.

Source: Saturia Agriculture Development Department, 2011

Annexure 3: Calculations of cropping intensity

In our study area there are about

1% Single Crop Land, so 1*1=1

43% Double Crop Land, so 43*2=86

56% Triple crop land, so 56*3=168

So total, 1+86+168=245

So the cropping intensity is 245/100=2.45%

So the total cropping area of Janna Village= 133*2.45% = 325.85 hector