Resource-Poor Farmers' Constraints regarding Integrated Soil Fertility and Nutrient Management for Sustainable Crop Production: A farm level study in Bangladesh

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Abstract

For sustainable crop production, it is essential to identify the constraints that most of the farmers in a community face about practicing improved crop production technologies. Integrated soil fertility and nutrient management is an advanced crop production system that seeks to both increase agricultural production and safeguard the environment for future generations. The main focus of the study was to determine the constraints faced by the resource-poor farmers (about 76% of a farming community in Bangladesh) about integrated soil fertility (ISF) and nutrient management (NM) system for crop production. Field work was conducted in eight villages of four districts in Bangladesh and data were collected from 92 resource-poor farmers through group discussions and personal interviews. Four point-summated rating scales were used to determine farmers' constraints while five point Likert-type response scales were used to measure the opinions provided by them to improve the existing situation. Constraint Index (CI) was used to measure the constraints faced by the respondents along with frequency distribution. Findings indicated that landless and marginal categories of resource-poor farmers comparatively faced more constraints than small categories of resource-poor farmers. The top three constraints were the 'lack of knowledge about ISF and NM system' (CI= 271), 'financial inability to buy fertilizers in time' (CI= 267) and 'unavailability and unstable market price of fertilizers during crop seasons' (CI=262). Develop facilities for easy way of getting agricultural loan prior to crop seasons, ensure the availability of chemical fertilizers during crop seasons, supply of electricity/gas with reasonable price, and organize training programs on appropriate methods of soil fertility and nutrient management were the matters mostly opined by the resource-poor farmers to improve the situation.

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Introduction

Throughout the developing world, resource-poor farmers (about 1.4 billion people) located in risk prone, marginal environments; remain untouched by modern agricultural technology. A new approach to crop production is essential so that it can be tailored and adapted to highly variable and diverse farm conditions typical of resource poor farmers (Altieri, 2002). Agriculture has always relied on the human management of soil, plant

nutrients and other natural resources. A healthy resource base is essential to agriculture and the sector's ability to drive household and national economy and spur-based development. In the coming years, most of the increase in population will occur in developing world and will account for about 85 percent of the increase in demand for cereals and meat. Providing enough food for rapidly increasing population in developing countries like Bangladesh is a continuing challenge. Limited availability of additional land for crop production, along with declining yield growth for major food crops, has heightened concerns about agriculture's ability to feed its teeming population. The scope for expansion of arable land to meet increased demand from a burgeoning population is very limited. Therefore, to meet its increasing food needs, this country will have to produce more food largely from the existing farmlands. This can be done only by increasing crop yields and stepping up cropping intensity (Doos, 1994 and Alexandratos, 1995). In this regard, adoption of integrated soil fertility and nutrient management practices may help farmers to enhance crop production and to conserve natural resources (FAO, 2003).

Over exploitation of vegetation and soil resources and adoption of inappropriate farming practices have resulted in land degradation such as soil erosion, nutrient mining, and depletion of soil carbon, accelerated soil acidification, soil salinization and desertification limiting crop production in Bangladesh (Chalk et al, 2002). Since nearly 75 percent of the rural population in Bangladesh depends either directly or indirectly on agriculture, which generates 63 percent of total national employment and around 25 percent GDP (about 71 percent of which is derived from crop production), so this sector's performance strongly affects Bangladesh's malnutrition and poverty levels (ADB, 2004). This sector provides home and livelihood to the majority of the country's poor; therefore, improving agriculture and natural resources is critical to any effort for achieving food security as well as reducing poverty. However, meeting agricultural production and sustainable intensification goals over the short-and long-term, plant nutrients and soils need to be managed properly. Improved management of soil and nutrient resources will directly benefit the poor farm households by increasing on-farm production, diversifying production options and increasing farm incomes (Dayal, 2003).

Most of the world's hunger and poverty occur in rural areas. Since Bangladesh is a country of rural areas, it is possible to reduce rural poverty and raise the living standard of common people by establishing agriculture as a profitable sector. It is, therefore, necessary to reorganize and develop the agricultural production system into a more dynamic and sustainable one. Resource-poor farmers constitute a significant proportion (76%) of farming community in Bangladesh having own cultivated land up to 1 (one) ha, directly involved with crop production related activities. According to BBS (2004), they are classified into three categories: i) landless resource-poor farmers (having own cultivated land up to 0.2ha); ii)

marginal resource-poor farmers (having own cultivated land ranging from 0.21ha to 0.6ha); and iii) small resource-poor farmer (having own cultivated land ranging from 0.61ha to 1.0 ha). The development of the agriculture sector and improvement of the living standards of resource-poor farmers is a major challenging task for the Government of Bangladesh. In addition, deficiencies of nutrients both macro and micro, along with imbalances in soil nutrient situation, pose a threat to yield sustainability due to illogical fertilizer management by the farmers. Maintaining soil, water, nutrients and other natural resources in a healthy state requires careful management. Mismanagement of these resources threats the human population's access to food, fiber and other necessities.

Theoretical framework

With increasing population densities, food production needs to be increased and increased agricultural sustainability is essential to improve rural people's livelihoods. Since Bangladesh is an agricultural country, practice of improved crop production system by the farmers may play an important role to reduce their poverty and raise their living standards by obtaining better yields of different crops. Gruhn et al (2000) mentioned integrated soil fertility and nutrient management as an improved system of crop production and safeguard the environment for future generations. However, Resource-poor farmers constitute a significant (76%) proportion of farming community in Bangladesh who are directly or indirectly involve themselves with crop production and other agricultural activities for their livings.

For continuing practice of a new technology by the farmers needs their interest and adequate knowledge to use it properly so that maximum benefit can be obtained. It is observed that in many cases farmers don't continue to practice even an improved technology due to lack of technical support, unavailability of inputs and other limitations. The Department of Agricultural Extension (DAE) in Bangladesh took an initiative in 2002 to disseminate integrated soil fertility and nutrient management approach among the farmers. The DAE Report (2004) mentioned a good number of farmers are still not practicing or discontinuing this advanced system of crop production and soil fertility management. This tendency is more frequent among the resource-poor farmers than resource rich farmers. Ugwoke (2005) argued that some of the personal related constraints seriously affect the implementation of the crop production technology program which includes poor financial outlay and too many personal commitments. FAO (1998) pointed out that high transportation cost, lack of adequate quality seed, problems of irrigation, pests and diseases are the important ones regarding rice production in Bangladesh. To date, there is no research has been conducted in Bangladesh involving resource-poor farmers' constraints about integrated soil fertility and nutrient management system for crop production. Considering the above facts, the researchers deemed it to undertake the present study with the following objectives:

i) to identify resource-poor farmers' constraints regarding practicing integrated soil fertility and nutrient management system; and
ii) to ascertain the opinions given by the farmers to improve the exiting situation concerning integrated soil fertility and nutrient management system for sustainable crop production.

Material and Methods

1. Study area and data collection

Eight villages from four districts namely, Mymesingh, Jamalpur, Sherpur and Netokona previously known as greater Mymnesingh of Bangladesh were selected as the study area for this research. The major reasons for selecting these areas were: i) low agricultural productivity (BBS, 2004); and ii) gradual declination of soil fertility (BARC, 1999). A total of 342 resource-poor farm families were selected as the units of survey and the same of number of family heads (the principal decision maker of a family) from the eight villages were considered as the population of the study. About twenty seven percent of total population i.e. 92 resource-poor farm families (39 landless, 34 marginal, 19 small categories; the proportion was selected based on national average) from the total farm families were selected using random sampling method which constituted the sample of the study. Data were collected from those family heads (92) using structured interview schedule. The schedule was prepared accordingly so that the main objectives of the study could be fulfilled with the information collected by it. A face-to face interviewing procedure was followed in this survey and data were collected during December 2005-January 2006.

2. Selection and Measurement of the items concerning ISF and NM system

For selecting the constraints the resource-poor farmers face about soil fertility and nutrient management for crop production, eight (8) group discussions were organized with the help of extension agents of the respective areas. Twenty persons from different categories of resource-poor farmers constituted a group and they were encouraged to list down the constraints about the said issues. Considering their responses, fourteen (14) constraints were selected and the farmers were asked to indicate their constraints as 'high', 'medium', 'low' and 'no constraint' and weights assigned for these responses were 3, 2, 1 and 0 respectively. Thus, scores of the respondents for fourteen items could range from 0 to 42. The reliability of this section was estimated by calculating Cronbach's alpha coefficient which was .84. Constraints faced by the farmers in practicing soil fertility and nutrient management system for crop production were measured and examined in two ways: i) firstly, according to the percentage of different categories of resource-poor farmers by frequency distribution; and ii) secondly, according to total score obtained by a respondent in all fourteen items. For clearer understanding of the constraints faced by the resource-poor farmers, Constraint Index (CI) was developed to arrange the items in rank order by using the following formula.

Constraint Index (CI) = Php x 3+Pmp x 2+Plp x 1+Pnp x 0

Where, Php = Percentage of resource-poor farmers with facing high constraints

Pmp = Percentage of resource-poor farmers with facing medium constraints

Plp = Percentage of resource-poor farmers with facing low constraints

Pnp = Percentage of resource-poor farmers with facing no constraints

Constraint Index (CI) in respect of any item could rage from 0 to 300; 0 indicating no constrain while 300 indicating high constraint. In addition, resource-poor farmers' opinions were sought in terms of developing statements for improving the existing situation using group discussions and personal interviews. The opinion and suggestions obtained from the respondents were arranged in rank order based on their priority. The reliability of this section was estimated by calculating Cronbach's alpha coefficient which was .89.

3. Data analysis and presentation:

Descriptive statistics such as frequency distribution, mean, percentage, standard deviation and rank order were employed to analyze the data and the Statistical Package for Social Sciences (SPSS) was used in this regard. All the data collected was grouped, summarized and presented in tabular form.

RESULTS AND DISCUSSIONS

1. Some basic information of the study areas

Some general information of the study areas comparing the rural Bangladesh is presented in Table 1. Data in Table 1 indicates that average household size of the study areas was 6.5 persons which were higher than national average (5.0 persons). A big difference was found between the literacy rate of people in the study areas and the average of rural Bangladesh. No significant difference, however, found between the percentage of male headed holdings in the study areas and the national average. The irrigated area was a bit higher in the study areas while comparing with average rural Bangladesh situation.

Table 1. Some general information of the study areas and rural Bangladesh

Indicator	Study area	Rural Bangladesh
Average family size (persons)	6.5	5.0
% literacy	42	58
% male headed holdings	98	97
% area irrigated	59	54
% single cropped area	21	31
% double cropped area	51	44

% triple cropped area	28	25
% cropping intensity	218	181

Source: Field survey 2005-2006 and BBS, 2004

The single cropped area was lower, while the double and triple cropped area and the cropping intensity of the study areas were higher. It indicates that farmers of the study areas use their cultivable lands intensively. Intensive cultivation requires higher amount of inputs, especially organic and inorganic nutrients to minimize the extraction of nutrients from soil through harvested crops and other processes.

2. Land holdings situation of resource-poor farmers

Land is the basic natural resource that provides habitat and sustenance for living organisms, as well as being a major focus of economic activities. In terms of food production, land is a critical resource that plays most significant role to attaining food security. Land ownership pattern is almost like pyramid structure, a few percentage of people owned a major proportion of land in Bangladesh. Data in Table 2 indicates that the percent of landless and marginal level of resource-poor farmers in the study area was comparatively higher than the national average. On the other hand, small categories of resource-poor farmers' percentage were lower than the national average. A significant portion, 21 percent, 26 percent and 22 percent land of total field crop area was run by the landless, marginal and small farmers respectively as share cropping.

Table 2. Land holdings and transactions of resource-poor farm families

Farmers' categories	Farmers (%)	Sharecropping (% of total FCA)		Mortgage (% of total FCA)		Lease (> 10 years) (% of total FCA)		Total (% of total FCA))	
		Received	Given	Received	Given	Received	Given	Taken	Given
Landless (<0.2 ha)	35 (30)	21	4	0	14	1	3	22	21
Marginal (0.2-0.6 ha)	34 (32)	26	7	6	16	2	4	34	27
Small (0.61-1ha)	13 (17)	22	11	14	15	4	7	40	33

Note: Figures in parentheses indicate the national average of land holdings/family; FCA: Field Crop Area

Source: Field survey: 2005-2006; BBS, 2004

When farmers need a good amount of money for their daughter's marriage or other emergency needs, they mortgage their lands to the rich farmers or the landlord of the village

with the condition of handing over the land to the original land owners after paying back by them. This system of land transaction was available among the landless, marginal and small farmers which represents 14%, 16% and 15% of the total field cropped area of the these three categories of farmers respectively in the study areas.

3. Livestock and poultry possession by the families of resource-poor farmers

In developing countries like Bangladesh in both wet and dry tropics livestock and poultry excreta are still an integral component of soil fertility management practices and it occupies a substantial share of monetary evaluation of livestock products. A major portion of the nutrients harvested in crops grown on a farm and feed of livestock, may be recycled back to crop fields in manure. Thus, manure nutrient management always has been and continues to be an important economic consideration on farms with livestock or poultry (CMEG, 2007).

Table 3: Livestock and poultry situation of resource-poor farm families

Farmers' categories	Average number of livestock and poultry in each family			
	Cow/bull	Goat	Sheep	Poultry
Landless	0.76	1.02	0.34	6.78
Marginal	1.34	1.56	0.52	6.81
Small	1.83	1.79	0.65	9.78

Data in Table 3 shows that each of the resource-poor landless families do not have at least one cow/bull, while the marginal and small categories of resource-poor farm families have more than one cow/bull. The situation of goat and sheep possession by the marginal and small categories of resource-poor farmers is also comparatively better than the landless categories. The bull/cow often serves as draft power for land preparation in Bangladesh and excreta from livestock use as good sources of organic manure. During field survey, it was observed that the resource-poor families in the study areas often use dry cow dung or a special kind of sticks produced by cow dung as bio-fuel. Although, there is no significant difference found between the landless and marginal categories of resource-poor farmers concerning poultry possession, the small categories of resource-poor farmers' situation is comparatively better than other two categories.

4. Situation of human capital, education and income of resource-poor farm families

After the land and livestock possession, active family members, their education and yearly income may consider as the important resources for a rural family in Bangladesh. Data in table 4 shows that the average number of active members is higher in case of landless families than marginal and small families. Small farm family's status of education and income is higher than the marginal and landless farm families in the study areas. This may be because of

more resource endowments by the small farmers than the others two categories have.

Table 4. Active members, education and yearly income of resource-poor farm families (in average/ family)

Farmers' categories	Active members (15-50 years)	Education	Income ('000' TK)
Landless	5.16	3.61	42.16
Marginal	4.35	4.52	58.31
Small	4.11	6.29	77.45

Note: i) According to the roles of Govt. of Peoples' Republic of Bangladesh, the individuals having age category between 15 and 50 years are active members.
ii) I US $= 68.5 TK

Human capital of a rural family, educational status of family members, and yearly family income play very important role to adopt a new technology and its continuation. These are the key determinants of agricultural production and household income after land possession and inputs availability (WB, 2004). Improvement of family education and income status particularly for the landless and marginal categories of farmers would be an important consideration among others for their continuation to practice integrated soil fertility and nutrient management system that requires more knowledge and cash along with human capital than the traditional system of crop production.

5. Highlights of Group Discussions

Almost all of the participants of the group discussions mentioned that they don't have proper knowledge and understanding about integrated soil fertility and nutrient management system for crop production. After clarifying this system by the researcher, majority (91%) of the participants showed their interest to practise this system, while remaining (9%) segment argued it as a 'complex system' of crop production. A significant proportion (87%) of the attendants claimed that agricultural loan system is very complex and many cases they failed to get it. As a consequence, they could not cultivate their lands in time and unable to apply agrochemicals when they need. In addition, they pointed out that unavailability of chemical fertilizers, their high prices during crop seasons and the ill-activities of dishonest agrochemical dealers made the situation more complex for them. They also argued that even standing in a line full day, they had to come back homes without fertilizers, and ticket system of fertilizer distribution often provides more advantage to the medium and large farmers than them.

However, majority (89%) of the participants had various types of complaints against Govt. extension agents; on the contrary, a significant proportion (83%) was satisfied with the

activities of workers of NGOs especially BRAC (Bangladesh Rural Advancement Committee), Grameen Bank, ASA (Association for Social Advancement), and CARE-Bangladesh (Cooperative for American Relief Everywhere- Bangladesh). They mentioned that only for vegetable cultivation around the homestead/small scale area they use organic waste, while they don't have sufficient amount of organic waste/farm yard manure to apply for field crop production. Almost all of the participants mentioned that soils are not productive as past time and are losing their fertility gradually, and no appropriate method/technique now in their hands to restore soil productivity and fertility. They expressed their willingness to practice such a crop production system that will help maintain soil fertility and increase crop productivity. Their opinions upon improving the existing situations bas been presented in Table 5.

6. Item wise constraints faced by the resource-poor farmers about practicing ISF and NM system

The productivity and stability of soil as medium for plant growth depend greatly on the proper management of its fertility by the farmers. On the other hand, a higher level of agricultural production requires an increased and/or more efficient use of plant nutrients from both the chemical and organic sources. The use of nutrients from both of these sources is, therefore, equally important to obtain better yields of agricultural crops (FAO, 1998). Data in Table 5 shows that the resource-poor farmers in the study areas face different kinds of constraints about practising integrated soil fertility (ISF) and nutrient management (NM) system. Based on constraint index (CI), the top three constraints were 'lack of knowledge about ISF and NM system' (CI=271), financial inability to buy fertilizers in time (CI=268) and 'unavailability and unstable market price of fertilizers during crop seasons (CI=262). And among the remaining 11 items of constraints, 9 items had the Constraint Index (CI) above 200 with a range of 0 to 300.

Table 5. Distribution of items concerning constraints about practicing ISF and NM system along with constraints index (CI) and rank order (N=92)

Statements of constrains	CI	RO
Lack of knowledge about ISF and NM system	271	1
Financial inability to buy fertilizers in time	267	2
Unavailability and unstable market price of fertilizers during crop seasons	262	3
Lack of knowledge about the beneficial aspect of combined use of organic manures and fertilizers	255	4
Limited initiative by the extension department to motivate farmers about use of ISF and NM system	250	5

Lack of technical knowledge in preparing organic manure and its role in maintaining soil fertility and enhancing crop productivity	239	6
Absence of training about appropriate techniques of soil fertility and nutrient management for crop production	230	7
Lack of knowledge about the beneficial aspects of crop rotational and crop residue management	225	8
Scarcity of lands for cultivating green manure crops	222	9
Use of cow dung and crop residues for cooking due to shortage of bio-fuel	215	10
Limited demonstration plots emphasizing balanced fertilization	209	11
Lack of commitment of extension workers and their biased role	206	12
Inability to understand the contents of printing materials due to shortage of education	191	13
Lack of knowledge about beneficial aspects of legume and cover crops	183	14

Note: 'CI' and 'RO' represents Constraints Index and Rank Order, respectively

Inadequate activities of the government extension department and often the negligence of the extension agents to work with the resource-poor farmers are the important weak points among others for disseminating agricultural technology in Bangladesh. The resource-poor farmers, therefore, often deprive to get the benefits of modern agricultural technology. With their own initiatives, they discuss with the advanced farmers of the locality to solve their major problems regarding crop production during critical moment. Although a soil fertility management project had been running in the study areas, the resource poor-farmers hardly receive benefits from the project activities. Some training, demonstration and other motivational activities offered by the project mainly include the medium and large farmers. As a result, resource-poor farmers know very few about proper way of soil and nutrient management.

The appropriate use of soil resources and plant nutrients (inorganic and organic) offers a viable path to achieving food security while safeguarding natural resources. The most available sources of inorganic nutrients are chemical fertilizers which are purchase inputs. Application of fertilizer in time with proper amount is one of the important prerequisites for obtaining better yields. Most of the fertilizer dealers in Bangladesh are selected based on their political affiliation. After getting selection, they often involve themselves in unlawful marketing which create artificial crisis of fertilizer during peak period of cropping seasons. As the resource-poor farmers are not financially solvent, they often do not afford to buy fertilizer in time with appropriate doses. Moreover, the unavailability of fertilizers and their unstable prices make this task more difficult for them.

7. Comparative constraints faced by the different categories of resource-poor farmers about plant nutrient management.

For getting a clear understanding about the comparativeness of constraints faced by the different categories of farmers in practicing ISF and NM system, Table 6 is prepared. Data in Table 5 indicated that an overwhelming majority of landless (90%) and marginal categories of resource-poor farmers (76%) faces a high level of constraints, while less than one-half (47%) of small farmers face high level of constraints followed by medium level (42%).

Table 6. Distribution of resource-poor farmers based on their constraints regarding ISF and NM system along with basic statistics

Farmers' categories	Level of Constraints faced (score)	Farmers		Possible range	Observed range	Mean	Standard deviation
		N	P				
Landless (39)	Medium (20-26)	4	10	0-42	20-36	32.56	3.42
	High (27-36)	35	90				
Marginal (34)	Medium (20-26)	8	24	0-42	20-35	27.31	3.19
	High (27-35)	26	76				
Small (19)	Low (15-19)	2	11	0-42	14-32	23.18	2.53
	Medium (20-26)	8	42				
	High (>27)	9	47				

Land holding is an important determinant among others which directly influence the social status and other physical facilities of people living in the rural areas of Bangladesh. As the small farmers are comparatively better off than the landless and marginal categories of resource-poor farmers, the farmers of latter categories are more vulnerable and face more problems. However, most of the items related to soil fertility and nutrient management require cash and labor. As the landless and marginal categories of resource-poor farmers mostly belong to medium and large family, they often don't face labor shortage problem like financial problems which frequently occurs. When small farmers face financial crisis, they can receive money from the money lenders of the society or from the agricultural bank facing less problems because of their resource possession than the landless and marginal groups. Thus, the landless and marginal categories of resource-poor farmers have to face more financial problems to afford to purchase inputs such as chemical fertilizers.

Initiative should be taken to increase their knowledge base about appropriate way of soil and nutrient management for these vulnerable groups. These will help them to think more carefully about utilization and management of soil and plant resources. In addition, creation

of income-generating avenues may be an important solution which helps these farmers groups to earn cash and use this to purchase essential inputs particularly chemical fertilizers. Furthermore, government should strictly control fertilizer distribution system with honest dealers.

8. Resource-poor farmers' opinions to improve the existing situation

As resource-poor farmers face different types of constraints regarding soil fertility and nutrient management for crop production, they know well about what initiatives taken by the government and non-government organizations might possibly help them to minimize their constraints. According to findings in Table 7, more than four-fifths of the respondents opined 'develop facilities for easy way of getting agricultural loan prior to crop seasons' and 'ensure the availability of chemical fertilizers during crop seasons with stable price' as effective measures to improve the situations.

Table 7. Farmers' opinions about probable measures to improve the situations

List of probable measures	% farmers	Rank order
Develop facilities for easy way of getting agricultural loan prior to crop seasons	82.3	1
Ensure the availability of chemical fertilizers during crop seasons with stable price	81.6	2
Supply of electricity/gas with reasonable price	78.3	3
Organize training programs on appropriate methods of soil fertility and nutrient management	76.9	4
Strengthening the activities of Govt. Extension Department and NGOs	67.2	5
Strengthening the activities of farmers' field school	58.7	6
Conduction of technical meeting relating to crop production fortnightly by establishing counseling clubs	56.3	7
Arrange training programs on improved crop production technologies regularly	54.6	8
Increase the number of field demonstrations	52.3	9
Organize adult literacy programs	50.8	10
Arrange motivational tours	47.3	11
Organize focus group discussion meetings in monthly basis	46.6	12

More than three-fourths of the respondents placed emphasis upon 'supply of electricity/gas with reasonable price' and 'organize training programs on appropriate

methods of soil fertility and nutrient management' as other important means to minimize the constraints. The government and NGOs should consider farmers' opinion to improve the existing situation which is essential to increase the crop yields and thereby improve the family income.

CONCLUSIONS

Among the three categories of resource-poor farmers, the magnitude of constraints faced by the landless and marginal categories of resource-poor farmers concerning soil fertility and nutrient management system was a bit higher than the small category of farmers. The resource possession of small categories of farmers may provide some more facilities to them than the other two categories do. Butterworth et al (2003) found that marginal farmers face comparatively less problems than small farmers in appropriate ways of soil fertility management at Andhra Pradesh in India. This may be an effect of soil fertility management project involving marginal farmers. However, lack of knowledge about ISF and NM system, financial inability to buy fertilizers in time and unavailability and unstable market price of fertilizers during crop seasons were the top three constraints in rank order and their constraint indices (CIs) were 271, 268 and 262, respectively. Chuma et al (2000) concluded that scarcity of inputs, labor and capital are the main constraints faced by the farmers in Zimbabwe while practice of soil fertility and nutrient management means. This may be because of some initiatives by the extension department to increase the knowledge base of farmers about improved crop production technologies.

However, easy access to credit, make available of chemical fertilizers, and supply of electricity/gas with reasonable price and organize training programs on appropriate methods of soil fertility and nutrient management would are the matters strongly opined by the resource-poor farmers to improve the existing situation. The agricultural policy planners may consider these findings while developing strategies for maintaining and/improving soil fertility status and proper way of managing plant nutrients by the poor farmers for sustainable crop production in Bangladesh. It is essential to minimize the constraints the resource-poor farmers face while practicing ISF and NM system for sustainable crop production and conserve soil as a productive natural resource for future generations as well. Since they constitute a significant proportion of farming community, improvement of their financial ability and knowledge base about ISF and NM system might be important considerations among others not only for sustainable crop production but also for overall agricultural development in Bangladesh.

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