

The Dynamics of Agricultural Land Management System in Bangladesh: The Challenges for Sustainable Development

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Abstract Bangladesh is a densely populated country of 142.3 millions people where 964 person live per sq. km. It is located in the north-eastern part of South Asia. Although it is predominantly an agriculture dependent country, it has the lowest land man ratio in the world and it accounts fro 0.06 hactres per person. Every year around 18-20 lacs people are born to soar the existing overpopulation. In addition, 47.3% of the total labour forces of the the country are employed in agriculture and it provides 21% of Gross Domestic Product (GDP) of the country. To meet the multiple demands of the ever increasing population the scarce agricultueal lands of this country are being misused for non-agricultural purposes. Besides, excessive use of chemical fertilizers, insecticides and intensive cultivation of lands without necessary conservation practices gradually deteriorates the productive capacity of the agricultural lands. If the present trend of Agricultural land management system (ALMS) continues it may hamper the sustainable development of the country. This article examines the dynamics of ALMS in Bangladesh and investigates to indentify the key problems and challenges for promoting sustainable development in ALMS. Lastly, based on overall observations of the research, this article suggests several policy and administrative guidelines to promote sustainable development in agricultural land management in Bangladesh.

Keywords: *agricultural land management, sustainable development, food security, misuse of agricultural land, land quality*

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1. Introduction

Bangladesh is geographically located in the north-eastern part of South Asia between 20°30' and 26°38' north latitude and 88°01' east longitude with the total area of 147570 sq km [8]. The country is bordered by India on the west, north and northeastwhile Myanmar on the south-east and the Bay of Bengal on the south [8]. It is a densely populated country of 142.3 millions people where 964 person live per sq. km [39]. It is the fifth populous country in Asia and eighteenth in the world [26]. Huge population in comparism to small area places Bangladesh in the world with the lowest land man ratio, which is estimated to be 0.06 hectares (ha) per person [17].

Bangladesh is predominantly dependent on its agricultural economy. According to the Labour Force Survey 2010, 47.3% of total labour forces are employed in agriculture. Besides, agriculture sector provides around 21% of Gross Domestic Product (GDP) of the country and most of the rural labour force, either directly or indirectly are dependent on agriculture [12]. It is important to mention that the incidence of poverty among the landless people in

rural areas is as severe as 52.3% [9]. In a country like Bangladesh where employment opportunities in sectors other than agriculture are limited, any kind of mismanagement of this scarce land is likely to threaten the employment opportunities of most of its people [34].

However, the Agricultural Land Management System (ALMS) in a densely populated country, like Bangladesh is getting more complex. Achievement of sustainable development is getting more challenging due to indiscriminate misuse and unscrupulous exploitation of this valuable land resource to meet the multiple demands of the ever-increasing vast population. In fact, the ALMS has major and practical implications for interdependent economic, social and environmental dimensions of sustainable development. Therefore, the importance of proper land management in a predominantly agro-based country, like Bangladesh cannot be over emphasized, especially for the sake of its sustainable development. Indeed, the ALMS can serve as a major determinant for achievement and non-achievement of sustainable development. Yet, the practical understanding and academic research regarding ALMS are inadequate. In this context, this study focuses on the dynamics of ALMS and its implication for sustainable development of Bangladesh.



Graph 1. Source: Google, MAPS OF WORLD. [19] (<http://www.mapsofworld.com>)

At first this article attempts to analyze the dynamics of ALMS in Bangladesh and tries to find out its implications for sustainable development. After that it examines the misuses and over-exploitation of lands through the review of literature and direct field study. Then this article tries to explore the reasons acting behind the dynamics of gradual land degradation and its impact on sustainable development. Finally, this article recommends a series of policy and administrative guidelines to promote sustainable development in agricultural land management in Bangladesh.

2. Objective

To explore the current status of agricultural land management, and put forward some recommendations for improved agricultural land management as a means of sustainable development in Bangladesh.

3. Materials and Methods

3.1. Methodology

This study will primarily use a Qualitative Methodological Approach. In order to pursue the

forementioned objectives, this study conducts review of different secondary sources such as books, journal articles, reports, maps and archival materials. In addition, primary data have been collected through field observation and interviews. The interview questions is combined by both structured and unstructured ones. The target groups for my field interviews include land management officials at selected levels of administrative hierarchy, land owners and officials from local NGOs and peasant organizations. Group discussions have also been arranged with the selected respondents and senior land management officials. Furthermore, being a public service official, I have personal experience and insights on the subject. I hope to draw, therefore, on the tool of personal observation for the purpose of this research.

This study includes a field work in selected locations to examine the dynamics of agricultural land management and sustainable development. Therefore, this study has purposively selected one district that represents typical characteristics and common structures of ALMS in the country. The other factors of consideration are familiarity with the site, relative accessibility and availability of logistic support. Within the selected district one Upazilla and two Unions have been chosen randomly to conduct the empirical investigation.

Detailed questionnaires of 3 sets: one for farmers, one for NGOs and another for government officials were

developed for field research. All the questionnaires are semi-structured in nature. 24 experienced farmers have been selected from 4 villages of Srinagar Upazilla under the district of Munshigonj. Out of the 24 farmers, 16 are land owners and 8 were sharecroppers. One local land owner, who is known to the interviewer since before, has helped in selecting targeted respondents. Before taking interviews, the farmers were clearly explained about all the questions on the questionnaire. The high officials of nationally reputed 4 NGOs, having lots of experiences about different land related problems have been interviewed in Dhaka. 8 land officials working in Upazilla and union parishad (the lowest tier of local government), who have vivid field level experiences were interviewed. Besides, during the field study, 9 agriculture officers, having technical knowledge and practical experience on lands and their productivity were interviewed.

3.2. Scope of the Study

According to FAO (1993) [17], land is not only confined to the soil but also covers the land forms, climate, hydrology, vegetation and fauna. However, this study is confined within the purview of the management of soil and land forms and their impact on sustainable development. Management of certain land topics, such as: vested properties (Lands of Hindu community which were acquired by the previous Pakistani government during 1965-67), forest lands, salt affected coastal lands, management of submerged lands, lands of hilly regions and lands accreted from rivers and sea have been omitted from the scope of the study. Among the different types of land tenure, only the management of sharecropping has been elaborately studied. However, no laboratory test has been conducted to closely observe the deterioration of soil quality over the time. So, no precise observation about the fertility status of soil could be possible only by the interview. So, in case of quality deterioration of land, the scientific basis of its reason can not unambiguously be established only by qualitative field interview.

4. The Rationale of this Research

The major justifications and rationales of this research are as follows:

1. As the number of potential land claimants in Bangladesh is much larger than the supply of land that might be made available for redistribution, resolving the needs of the landless people through redistribution through land reform can, by no means, be economically viable for them [24]. Besides, owing to the social structure of rural Bangladesh, mostly dominated by the political influentials, the implementation of any agricultural reform is far reaching [21]. On the other hand, the existing land management system can be improved by exercising simply administrative will without affecting the power elites to a great extent [41].
2. Very limited research has been conducted in the area of my research interest as discussed in an initial review of literature.

3. This study will explore the deep relationship between agriculture and sustainable development and the findings of this study will have clear practical relevance for policy makers and practicing managers focusing on agricultural land management system for sustainable development.
4. The findings of this research can help develop broader understanding about the relationship between agricultural land management and sustainable development. Currently the level of understanding about this link is low and inadequate,
5. This research will help shift the thinking of policy makers and researchers from the conventional development approach of accelerating the growth rate in agriculture through providing subsidies and loans to the land management and its relationship with sustainable development. In the conventional approach of development, developing nations pursue the economic goal of increasing output and growth without taking into consideration the environmental externalities [35].
6. This research will provide policy guidelines for the policy makers in formulating policies regarding optimum use of scarce lands without hampering the ability of the future generation to meet their own needs from the lands. 'Land holdings in Bangladesh are smaller than almost all other rice producing countries in Asia and the pacific region' [23]. If any further misuse of our existing small amount of agricultural land per person occurs, it may pose threat to the food security for our ever increasing population in near future. Now it is the demand of the time to think the issue seriously.

5. Results

5.1. The Conversion of Agricultural Lands for Non-Agricultural Purposes

During the field study, it has been learnt from the NGOs that the amount of agricultural lands are shrinking gradually due to the indiscriminate use of agricultural lands for housing, industry and shrimp cultivation in an unplanned way, without taking into consideration of the consequences of such imprudent ventures. In shrimp farms in the coastal areas of Bangladesh, huge amount of agricultural lands are converted for shrimp cultivation where saline water is used and the saline water intrusion also occurs in the adjacent agricultural lands at the expense of our traditional food crops, where no crop except coconut tree can grow. However, during field study, the public servant officials acknowledged the indifference of the government to formulate relevant laws in congruence with the national Land Use Policy and lack of awareness among the people about the adverse impact of the current misuse of lands.

5.1.1. How to Stop Present Trends of Misuse of Agricultural Lands

The Paragraphy 16.1 of the National Land Use Policy denotes that agricultural lands as far as possible must be

used for agricultural purposes and without prior permission of the competent authority no change in the class or nature of the lands can be brought. In the field study, the NGOs and the public servant officials emphasized the need for formulating necessary laws and their proper implementation by the government to reduce the trend of misuse of agricultural land, to a great extent. The public servant officials also stressed for taking appropriate measures to implement the National Land Use policy.

During the field work, NGOs opined that government, in collaboration with the NGOs can build multistoried buildings, comprising many small flats in rural areas and sell them to the villagers through persuading them to buy those flats and providing loan facilities to them on easy terms. The concept of building multistoried buildings on non-agricultural lands is also reflected in the National Land Use Policy, 2001. [36]

To establish rational land use, BRAC, a local NGO opined that first of all, government has to identify and demarcate different types of lands, such as: farm land, forest land, hilly lands, land for fisheries and shrimp cultivation and non-agricultural land and formulate a detailed guidelines for its use, banning the changing of land use.

Whatever regulations and policies government formulate to promote sustainable development seem to be difficult to implement unless these are substantially comprehensible and acceptable to the majority of the people. In this connection, Siddiqui (1997) [41] states that public motivation and education must be geared up by the government, in collaboration with NGOs and local government bodies to ensure greater people's participation. While in field study, both the government officials and NGOs have emphasized the inevitability of the people's participation to combat the dismal picture of present land use in Bangladesh. Besides, NGOs opined that all kinds of information regarding land use must be reached to the people. This may be done through either door to door campaign or training or workshop by the government, NGOs or any other organization. When people can be made aware of the severe consequences of indiscriminate land use, they themselves will be reluctant to use fertile lands for building their houses. Then, they will try their utmost to take alternative measures.

5.2. Land Fragmentation

5.2.1. The Causes of Land Fragmentation

During field study, some farmers informed the interviewer that land fragmentation is caused not only due to the law of inheritance, but also due to the building of new houses, schools, roads and other infrastructures for the ever increasing population. Moreover, they opined that in many cases, conflicts among members of the same family cause one piece of land to be divided into several tiny pieces of land. Similarly, the NGOs, also blamed the break down of combined family into minuscule one for the fragmentation of land. They also opined that due to the growing intolerance and conflicts of opinions among one another, the members of the family, once lived jointly in one house, are inclined to live in separate houses at the expense of valuable agricultural lands, causing further land fragmentation.

5.2.2. The Consequences of Land Fragmentation

During field study, the farmers, NGOs expressed their deep frustration over the gradual fragmentation of land. Farmers opined that they experience difficulty to practice mechanized cultivation in fragmented small plots, due to the complication of free movement of tractor within those plots, wastage of a large portion of land, which is almost similar in size of a big piece of land, for digging ditches to supply irrigation water to the small plot, difficulty in application of optimum amount of irrigation water and fertilizers in a small plot and misuse of irrigation water and fertilizers. Moreover, it was learnt from the farmers that a big chunk of land is to be wasted during the building of demarcation boundaries around their fragmented multiple small plots.

5.2.3. How to Overcome the Adverse Impact of Land Fragmentation

During the field study, most of the farmers emphasized the need for cooperative farming among themselves to reduce ever deteriorating trends of land fragmentation. They opined that cooperative farming can be more productive and less expensive, where farmers can easily afford modern cultivation methods through united efforts. However, they expressed their pessimism that the prospect of cooperative farming may be unsuccessful due to the dominance and exploitation of influential and big land holding members over the small land holding and weaker members within the cooperative farm. Besides, huge disagreement may arise among the members over how to manage the cooperative farming. Similarly, all the NGOs opined for cooperative farming as a remedy for continuous land fragmentation.

On the other hand, BRAC, a renowned NGO of Bangladesh opined for bringing different small plots, ranging 2-3 hectares under the same management, where plot owners will bear the cost of inputs and get the yield in accordance with the share of their land area. Besides, it opined that there should be a system where the real ownership will be vested on the government; people can only sell the share, not the ownership of the plot to stop fragmentation, which will always be run under cooperatives. However, the opinions of BRAC are assumed to require massive land reforms, which may create adverse repercussion from the land owners who may be reluctant to relinquish their sovereignty over their most valuable assets, lands, specially the powerful elites of the society.

Most importantly, both NGOs and farmers emphasized for restoring the value of traditional combined family, where members of the family, without fragmenting their inherited share of land with demarcation boundary, can gain maximum benefit. However, without mutual trust, cooperation and judicious conscience, the prospect of ever waning combined family concept may fall flat.

Samata, an NGO, working on land management, opined for creation of alternative jobs for the farmers all the year round to prevent them from selling their valuable land resource at the time of severe hardship. So, in rural Bangladesh, government and NGOs can create various alternative income generating opportunities, along with the existing farming practice for the marginal farmers to

help them come out from the over-dependence on agriculture and provide various safety nets so that during the periods of severe hardship, the farmers are not compelled to sell a portion or the whole of their lands.

5.3. Land Degradation

5.3.1. The Causes of Land Degradation

While in field study, agriculture officials, having technical knowledge and practical experience over the land quality, claimed that in Bangladesh there is a tendency among the farmers to grow same crop year after year, especially the rice to maintain their subsistence, without practicing crop rotation. Each crop has a tendency to extract certain nutrient elements in higher doses than the others. So, intensive cropping of the same species constantly causes huge loss of certain nutrients, which may not be replenished by the subsequent release of those nutrients from the soil. Moreover, the farmers claimed that at present, they have to apply more fertilizers in their fields than before to harvest the same yield as before.

Besides, during field study, most of the farmers claimed that the application of excessive amount of fertilizers to the soil for several consecutive years deteriorates the fertility status of soil gradually and as a result, the yield of crops declines. Moreover, it was learnt from the farmers that they did not conduct any soil test to identify which nutrient elements were lacking in their soils. They opined that from their long observation they can assume that the application of certain amount of few fertilizers, depending on plot size, can increase their yields. One farmer claimed the excessive use of fertilizers makes the soil fragmented into minuscule particles and feel rough. Some farmers claimed that sometimes, the application of excessive amount of inorganic fertilizers makes the soil burnt.

In this connection, during field study, the agriculture officials viewed that the application of unbalanced doses of chemical fertilizers to the land is deteriorating the quality of land.

5.3.2. Soil Degradation and the Role of Government Officials

However, the present activities of concerned public servant officials in helping farmers to conserve their lands is rather frustrating, because during field study, all the farmers claimed that no agriculture officer even comes to their area, let alone give them technical knowledge about sustainable land use. Moreover, they claimed that if they face any technical trouble to cultivate their lands, they are given little attention or no attention when they go to their offices.

5.3.3. Impact of Indiscriminate Use of Pesticides

Most of the farmers commented that pesticides are very harmful for their lands and health. They also opined that pesticides deteriorate the fertility status of their lands and in case of spray, they cause respiratory illness. In addition, they opined that with the rainwater, pesticides are mixed with nearby water body, where fishes are severely affected by the toxicity of pesticides. Some farmers claimed that none had made them conscious about the adverse effects of pesticides on environment.

5.3.4. The Effects of Flood Water

During field study, farmers claimed that flood water severely affects their crop production as farmers can not plant the saplings and sow the seeds in due time, where already sown seeds can not germinate. The standing water also severely damages the existing crops. Besides, cereals of the standing crops are rotten due to the harmful impact of stagnated water. In addition, they apprised that flood water causes the erosion of the top soils and washes away fertilizers applied before.

5.4. Remedial Measures: Learnt from Field Study

5.4.1. Use of Organic Manure and Its Beneficial Effects

During field study, it was observed that farmers are more or less aware of the benefit of applying the organic manure to the lands for improving the land quality. All of the farmers viewed that organic manure increases the fertility of the lands and unlike the inorganic fertilizers, the effectiveness of organic manure continues for long time. Besides, some well experienced farmers opined that organic manure increases the water retention capacity of soil, while the drawback is it can not be useful immediately after mixing with the soil and take some time to come into benefit for soil. Similarly, the officials of the agriculture department gave the opinions that organic manures improve the structure of the soil and thus, improve the water retention, aeration and nutrient retention capacity of the soil. Besides, they opined that organic manure may help to improve the effectiveness of chemical fertilizers. There is almost no side effect of organic manure even it is applied in excessive amount..

However, all the farmers claimed that the preparation of organic manure is very time consuming and more expensive than inorganic fertilizers and the ingredients of organic manure are not always available. On the contrary, the relevant public servant officials opined that organic manure is less expensive, whereas the farmers claimed that it is more expensive. During field study, analyzing the views given by the farmers, we can say that even though farmers are aware of the necessity of organic manure, they are not interested to use organic manure on their lands because it takes long time to prepare it and the ingredients are not always available. The reason may be the farmers may not have appropriate technical knowledge how to prepare it inexpensively, which requires widespread training among the farmers.

More interestingly, during the field study, the farmers claimed that although their predecessors regularly used organic manure, most of them no longer use the organic manure.

5.4.2. The Impact of Crop Rotation

During field study, with a view to restoring fertility status of lands the agriculture officials highly emphasized the necessity of crop rotation in restoring soil nutrients at a satisfactory level, if leguminous crops are grown and later mixed into soil as green manure. Besides, they opined that this practice will also reduce soil erosion. Thus, the dependence on chemical fertilizers can be reduced through the practice of leguminous crops.

6. Discussions

6.1. The causes of Gradual Decline of Agricultural Lands

Bangladesh is one of the most densely populated countries of the world, where per capita cultivable land is 0.17 acres [28]. With a view to meeting up the demands of the ever increasing population and the expansion of numerous economic activities, the amount of agricultural land is gradually shrinking at an alarming rate. In this connection, Land Administration Manual (2003) [28], published by the Government of Bangladesh, illustrates that the trend of industrialization, urbanization, establishment of educational institutions, hospitals and building of other infrastructures are gradually expanding in a haphazard way in Bangladesh at the expense of scarce agricultural land.

However, the importance of proper land use planning and its efficient implementation can not be overlooked at any cost, in a land scarce country having predominantly agro-based economy, like Bangladesh with a view to meeting its present and future needs. Although there has been a National Land Use Policy in Bangladesh since 2001 [29], unfortunately, till now no step has been taken by the government to implement this policy [4].

6.1.1. The Conversion of Agricultural Land to Non-agricultural Purposes

To meet the multiple demands of the ever increasing population of Bangladesh, a large amount of agricultural lands are gradually being sacrificed by the injudicious people at the expense of their future needs. According to a statistics, provided by the Planning Commission of Bangladesh, in rural areas, during the 1980s, only 15 per cent of lands were used for housing and other non-agricultural purposes of the villagers, whereas, at present as much as 30 per cent of lands are being used for these purposes [28].

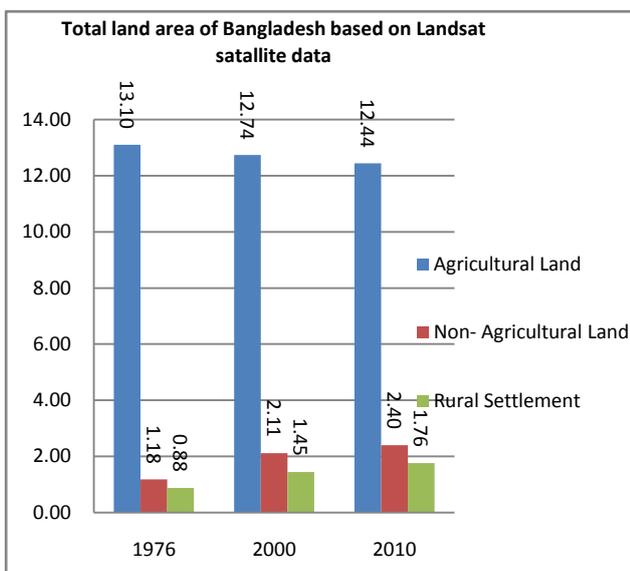


Figure 1. Gradual Decline of the Agricultural Lands

Source: Landsat satellite data (SRDI, 2013) [44]

This figure shows that agricultural lands in Bangladesh declined gradually from 13.10 million hactres in 1976 to 12.44 million hactres in 2010, while the total area of non-agricultural lands increased from 1.18 million hactres in 1976 to 2.40 million hactres in 2010. The total loss of agricultural land is 0.66 million hactres. It is a matter of concern that rural settlement increased drastically from 0.88 million hactres in 1976 to 1.76 million hactres in 2010. Another study conducted by Rahman (2010) shows that 0.1% cultivable land was annually transformed to housing, road and industrial infrastructures in the same period.

6.1.2. Unplanned Development Activities

In fact, the unplanned and ambitious development activities undertaken by both government and individuals to uplift the socio-economic condition of the people at the expense of scarce agricultural land resource are gradually plummeting agricultural lands disappointingly. In this regard, the statistics provided by the Ministry of Land, Bangladesh show that in Bangladesh, everyday on an average, 220 hectares of agricultural lands are being used for industrialization, urbanization, housing and building roads [4]. In fact, in Bangladesh, 'no permission from land revenue authorities is required for changing land use' [41]. So, lack of restriction on land use persuades people to seek lands which are purposeful for their non-agricultural activities, indiscriminate of its agricultural or non-agricultural nature.

6.1.3. Defective Valuation of the Costs of Lands

In a free market economy during the transaction of agricultural lands for non-agricultural purposes, as market mechanism does not take into consideration the cost of impairment done on agricultural productivity and the environment as well as its consequences on the future generation, it indirectly encourages people to be involved in misuse of agricultural lands. According to Siddiqui (1997) [41], 'the free operation of market forces has been much more important in the evolution of the present land use pattern in South Asia'. In Bangladesh, due to the existing profit driven free market economy, people may be motivated to convert their fertile agricultural lands to more profitable non-agricultural purposes.

6.1.4. Land Acquisition

To move the country to the next stage of development and reduce poverty, it is sometimes, inevitable to implement development projects through forcibly making acquisition of private lands from their possessions under a certain legal framework. According to Land Acquisition Manual 1997, government can make acquisition of private properties for public purposes except places used for public religious worship, graveyard and cremation ground [28]. In Bangladesh, land acquisition is administered by the law of 'The Land Acquisition and Requisition of Immovable Property Ordinance 1982' [1].

The compensation is determined under the directives of section 8 of the ordinance, by taking into consideration of the market value of the property, the damage caused to the standing crops, severing of property, effects on the other properties and earnings, change of residence and loss of

profits from the property. However, damage caused to the psychology of the displaced person by the rapid execution of acquisition, earning loss due to acquisition, decrease of the value of the adjacent property, affected by the acquisition and any increase of the value of property after serving of the notice do not come under the consideration of compensation. So, in case of land acquisition, it is hardly possible to make the person entitled to compensation better off or no longer worse off than his previous status.

It is commonly practiced by the requiring body in Bangladesh to send proposal for more lands than exact requirement for acquisition, even though there exists provision in 'the Immovable Property Acquisition Manual, 1997' of sending minimum requirement certificate with the proposal and this is why, many fertile lands remain unutilized [28]. It is also learnt from the Land Administration Manual (2003: 7) [28] that at present, almost 25% of agricultural lands, acquired at different times, are left unutilized or have already been illegally occupied by the land grabbers. Besides, although the Acquisition and Requisition of Immovable Property Ordinance, 1982 prohibits the use of acquired land for any other purposes except prior permission of the government, it is noticed that some agencies have a tendency to use acquired land for other purposes [41]. So, such negligence of acquiring excess land during acquisition causes huge misuse of agricultural land.

6.1.5. The Impact of Misuse of Agricultural Land on Sustainable Development

Although Bangladesh has achieved tremendous success in food production through adopting modern technology in agriculture, it has to import food grains from foreign countries to satisfy the food deficit. In Bangladesh, the number of population increases almost 2.5 million every year, where the amount of excess food grains required for these people are 4.5 lac tons [28]. Moreover, according to Islam (2002) [23], 'Land holdings in Bangladesh are smaller than almost all other rice producing countries in the region'. These statistics indicate that the pressing need before Bangladesh is to ensure efficient use of the scarce agricultural land resource to protect future food security. However, due to the unplanned or indiscriminate use of this resource, the productive capacity of it is gradually declining [28].

Moreover, in the world market, the price of food grains fluctuates from year to year. If there is a bad harvest in the principal food grains producing countries, the price of food grains may increase manifolds due to the increased demand. As a result, the food deficit poor countries like Bangladesh are likely to be worst affected by such increase in price of food grains. If present trend of misuse

of agricultural lands continues, in near future the food security in Bangladesh will fall under severe threat. This will severely undermine the ability of the future generation to produce as much food as necessary to meet their needs. Besides, huge foreign currency will have to be spent to import huge amount of food grains, compromising other development priorities of our future generation. So, the prospect of sustainable development of a land scarce country, like: Bangladesh may be severely affected if appropriate measures are not taken since now to prevent existing trend of misuse of lands.

6.2. Land Fragmentation and Economic Sustainability

6.2.1. The Causes of Fragmentation over the Years

Due to the ever increasing population, law of inheritance and the vulnerability of the marginal and small farmers against any sudden and adverse shocks, the scarce land resources are being gradually fragmented in Bangladesh. In this connection, Toufique (2001) [45] & Herbon (1994) [21] denote that the grounds of the gradual decline of the size of the farms in Bangladesh are due to the demographic pressure and the law of inheritance administered by religion. Moreover, according to Herbon (1994) [21], in Bangladesh, illness, hunger and arranging dowry during the marriage of a daughter compel a farmer to sell a segment of his land resource. In the market led economy of Bangladesh, as there is little or no restriction of buying and selling of land, a big farmer can acquire huge amount of land and on the other hand, there is no mechanism to protect the marginal and small farmers from selling a portion or whole of his small piece of land, when he is in acute financial hardship.

Table 1 depicts a comparative picture of land holdings in Bangladesh between the periods of 1960 and 1983-84. The average size of farms in each category has decreased over the period. However, the most striking change is noticed in the average size of small farm holdings. The declining trend of the size of farm holdings in each category demonstrates the deteriorating situation of land: farmer relationship, where most farms are too small to be hardly viable for cultivation. Nevertheless, in 1983-84, the large farms, amounting 6.0 per cent of total farms have command over almost 26 per cent of total area.

Table 2 clearly depicts how land fragmentation of different types of tenure occurs over the time from 1983-84 to 2005. The average size of farm holdings of all types of tenure- owner, owner-cum-tenants and tenants which was 2.27 acres in 1983-84 declined to 1.71 acres in 1996. The average size of farm holdings further declined to 1.01 acres in 2005.

Table 1. Size distribution of farm households in Bangladesh, 1960 and 1983-84

	Agriculture Census 1960				Agriculture Census 1983-84			
	Small	Medium	Large	Overall	Small	Medium	Large	Overall
Percentage of total number of farm holdings	51.6	37.7	10.7		70.3	24.7	6.0	
Percentage of area	16.2	45.7	38.1		29.0	45.1	25.9	
Average area of farm holding (acres)	1.4	4.3	12.0	3.5	0.9	4.1	11.9	2.3

Source: Bangladesh Bureau of Statistics: The Bangladesh Census of Agriculture and Livestock; 1983-84, Vol. 1 p. 32, and Statistical Year Book of 1979, p. 147. [12]

Table 2. Percentage distribution of farm holdings and area by type of tenure

Type of tenure	1983-84			1996			2005		
	% of farm holdings	% of area	Average size (acre)	% of farm holdings	% of area	Average size (acre)	% of farm holdings	% of area	Average size (acre)
Owner	62.78	58.76	2.13	61.66	58.51	1.61	69.76	73.32	1.06
Owner- cum –tenants	35.83	40.69	2.58	34.86	39.59	1.90	23.73	24.08	1.02
Tenants	1.39	0.55	0.86	3.48	1.90	0.88	6.51	2.60	0.40
ALL	100.00 (10196)	100.00 (23170)	2.27	100.00 (11797)	100.00 (20208)	1.71	100.00 (14536)	100.00 (23620)	1.01

Source : Agriculture Census Survey, 2005 [10].

6.2.3. The Consequence of Land Fragmentation

Although ‘mounting evidence from around the world that agricultural productivity is inversely related to farm size, on the grounds that small farms using family labor have significant advantages in reducing labor-related transaction costs and achieving higher intensity of work per hectare’, (Lipton, 1993) [31], the fragmentation of agricultural land into multiple plots seems to pose serious constraints on agricultural productivity in Bangladesh. In this connection, Mearns (1999) [32] states that the utilization of modern technology in agriculture has aborted the inverse relation between farm size and productivity and it is evident that better economies of scale can be achieved from the large farms than the small farms. The average size of small farm holdings in Bangladesh depicted in the Table 1 is so minuscule that it hardly seems to be economically viable to cultivate and the gradual fragmentation of farm holdings further aggravate the situation.

From the personal observation of field study, it seems to be more expensive to manage fragmented small piece of land than the big one. So, economies of scale can not be attained from the small piece of land. Besides, ‘high opportunity costs in cultivation are frequently ascribed to fragmentation’ [32]. That is to say, like big farms, cultivation of small plots also require irrigation, collection and application of seeds, fertilizers, bullocks, weeding and harvesting to get good yield. All of these tasks consume lots of time and energy of farmers, while these efforts could bring more benefit, if employed in other income generating activities. So, the opportunity cost of managing small farms is higher than that of big farms and other non-agricultural activities, provided that there is availability of alternative income generating opportunities. As small land holdings are economically less profitable than the big one, the land holders no longer can maintain

their subsistence and become gradually marginalized and even landless, which adversely affect the economic dimension of sustainable development.

6.3. Land Degradation and Its Impact on Sustainable Development

6.3.1. Key Types of Land Degradation in Bangladesh and Their Extent of Severity

As there is no alternative technique other than placing pressure on the scarce arable land of Bangladesh to ensure food security for its 138.6 million people [7], it is a daunting challenge for the country to maintain the productive capacity of its soil to meet the demands of the present as well as the future generations. There is no scope for Bangladesh to adopt the method of horizontal intensity in crop production, which can provide more fallow periods to allow the soil to regain its productive capacity. So, alternative conservation methods need to be innovated within the existing vertical intensity of crop production to maintain its land quality. According to Pieri et al (1995) [38]. ‘land quality refers to the condition or health of land, and specifically to its capacity for sustainable land use and environmental management and pressure upon land quality can lead to various forms of land degradation, such as soil erosion, soil fertility decline, and salinization of irrigated areas’. Land degradation has become one of the major ecological issues of the world which means the loss of the capacity of a given land to support growth of useful plants on a sustained basis [42]. Large-scale degradation of land resources has occurred in many parts of the world which ultimately has declined the productive capacity of these resources to a great extent [22]. Similarly, Bangladesh is not exception in facing threat of land degradation.

Table 3. Land degradation and their extent in Bangladesh

Type of Land Degradation	Area (million Ha.) affected by different degree of degradation			Total affected area (M.ha.)
	Light	Moderate	Strong	
Water erosion	0.1	0.3	1.3	1.7
Bank erosion		1.7		1.7
Soil fertility decline	3.8	4.2		8
Soil organic matter depletion	1.94	4.2		7.55
Water logging	0.69	0.008		0.7
Salinization	0.29	0.43	0.12	0.84
Pan formation		2.82		2.82
Acidification		0.06		0.06
Deforestation		0.3		0.3

Source:BARC, 1999 [5].

Key types of land degradation that occurs in Bangladesh as depicted in Table 3 are as follows: water erosion, bank erosion, soil fertility decline, soil organic matter depletion, water logging and salinization. Table 3 also shows that in Bangladesh the degree of degradation is strong for water erosion and salinization. However, total affected areas due to two types of land degradation: soil fertility decline and soil organic matter depletion are much higher than other types of land degradation in Bangladesh.

Correspondingly, removal of soil nutrients is a major threat to the agriculture which occurs through water erosion, bank erosion, water logging and intensive cultivation (Hasan & Alam, 2006) [20].

To keep pace with the present trend of population growth, Bangladesh will need twice the amount of rice produced currently to meet the demands of its population by 2020 [23]. Adoption of cropping intensity and modern technologies in rice production has helped Bangladesh to increase rice production substantially, coping with the population increase over the last two decades. However, dependence on technologies like pesticides and expensive inorganic fertilizers as well as intensive use of land for increasing production are believed to be causing environmental problems and still have offered no long term solutions to the food security [23]. In fact, in the context of prevailing reality, we are compelled to intensively use our land resources for our survival. However, the natural resources should be used carefully, so that their use does not exceed their possibility to sustain and reproduce [3].

6.3.2. Impact of Intensive Use of Land on Its Quality

Due to the over exploitation of small piece of land by multiple cropping to increase crop production without any fallow period, soil in many cases, can not replenish the depleted essential nutrient elements. However, 'the slow release of lost elements from the parent soil minerals in nature's own mechanism in maintaining balanced supply of nutrients for a long while, unless the rate of extraction overtakes the natural replenishment process' [23]. That is to say, the nutrients which plants uptake for its growth, are

released from the parent material of soil, composed of different minerals and organic matter. When the loss of nutrient elements due to the continuous uptake by plants exceeds the nutrient releasing capacity of soil, soil gradually loses its productive capacity. Pertinently, the average organic matter content of top soils (high land and medium high land situation) of Bangladesh has decreased from about 2% to 1% over the last 20 years due to intensive cultivation which seriously hampers the sustainability of agricultural production (Mia et al 1993) [33]. In this connection, Zaman (1987) [47] observed that after one rice harvest in the early 1980s, the average soil in Bangladesh contained only 57, 79 and 61 per cent of natural nutrient content in terms of nitrogen, phosphate and potash. However, artificial fertilizers, applied to the soil can not replenish the loss of nutrients from the soil [23].

Similarly, experiment regarding the nutrient loss of the soil, conducted by Bangladesh Rice Research Institute suggests that the total removal of nutrients per acre was around 40 kg (Zaman, 1987) [47], while the average rate of fertilizer application in Bangladesh was around 36 kg/acre [46]. In fact, according to Alauddin & Hossain (2001) [2], the increase in cropping intensity in Bangladesh has led to decline in soil fertility. Thus, there have been substantial removals of nutrients, which may not be replenished and will have some adverse effect on future crop productivity.

6.3.3. The Economic Impact of Land Degradation

Although large scale land degradation occurs in many parts of the world, the economic impact of land degradation is extremely severe in South Asia and Sub-Saharan Africa (Hasan & Alam, 2006) [20]. In South Asia, annual loss in productivity is estimated at 36 million tons of cereal which is equivalent to US\$4500 million due to water erosion and US\$1800 million due to wind erosion [14].

Frustratingly, due to different types of land degradation, a small and Least Developed Country like Bangladesh lose a substantial amount of production amounting hundreds of billion taka every year [5].

Table 4. Estimation of land degradation in Bangladesh

Nature of Degradation	Physical Quantity of Lost Output	Taka Equivalent / yr (Million)
Water Erosion	Cereal Production loss = 1.06 Mt/yr	6613.84
	Nutrient Loss = 1.44 Mt/yr	25576.46
Fertility Decline	Cereal Production Loss = 4.27 Mt/yr	26641.48
	Addl Inputs= 1.22 Mt/yr	21668.88
Salinization	Total Production Loss= 4.42 Mt/yr	27577.25
Acidification	Total Production Loss= 0.09 Mt/yr	561.51

Source: BARC, 1999 [5].

The Table 4 shows the amount of production/output loss and the equivalent financial loss in every year due to different types of land degradation in Bangladesh.

This claim was reflected in the observation of Pagiola (1995) [37] that application of increasing amount of fertilizers has been providing less than the proportionate increase of output or no increase at all and often the current levels of yield are maintained by the application of

very high doses of fertilizers. Pagiola, 1995 [37], in his research work, shows that such above mentioned response of crops to the fertilizers arises due to either diminishing return character of productivity in response to fertilizers or gradual increase in loss of nutrient elements through plant uptake from soil. That is to say, yield of crops increases in response to fertilizer application proportionately up to a certain level, while above that certain level, the rate of

increase of yield gradually declines disproportionately with each further addition of fertilizers or due to intensive cropping, the amount of nutrient elements absorbed by the plants in every year can not be replenished by both the release of nutrient elements from the soil and the application of inorganic fertilizers. So, to satisfy the nutrient needs of the subsequent crops, which can not only be fulfilled by already available nutrients of the soil, more fertilizers are required to maintain the same yield as before.

6.3.4. Impact of Excessive and Indiscriminate Use of Chemical Fertilizers

Without conducting any soil test and out of assumption from experience, many farmers in Bangladesh indiscriminately use excessive amount of few fertilizers, such as: urea (Nitrogen), potash (potassium), phosphate and sulfur almost in every place [2]. As a result, for instance, according to Brady (1990) [11], the application of excessive amount of inorganic nitrogen fertilizers to the soil increases the acidity in the soil solution, which is harmful for the functioning of certain soil microorganisms, who are sensitive to acidity. The uptake of excessive amount of inorganic fertilizers severely affects the metabolic functions of plants. For instance, excessive uptake of nitrogen by the plants acts as an antagonistic to the functioning of phosphorus, which is essential for flowering and the grain formation of plants [11].

Microorganisms promote nutrient replenishment in soil through decomposition of organic matter [25]. That is to say, nutrients released through the bio-chemical actions of soil microorganisms become readily available for plant uptake. In this regard, Alauddin & Hossain (2001) [2] & ESCAP (2002) [23] state that the indiscriminate and excessive use of chemical fertilizers in Bangladesh has significantly reduced soil quality. Indiscriminate and excessive use of chemical fertilizers not only harms the soil properties, but also involves wastage of a great amount of fertilizers. Thus, the application of fertilizers in inappropriate proportions and the costs involved for buying unnecessary amount of fertilizers may bring ill harvest and financial loss to the farmers, gradually leading him towards marginalization. Besides, the quality of underground water is gradually deteriorating due to the indiscriminate application of chemical fertilizers in the soil. In this connection, Alauddin & Hossain (2001) [2] illustrate that the quality of underground water of Bangladesh is gradually declining due to the leaching of nitrates into the underground water from chemical fertilizers used in crop production. Consequently, during irrigation, the lifting of underground water containing huge nitrate salts may adversely affect the crop production.

From the observations of field study and analysis of abovementioned research works about the fertilizer application trends of farmers, it can be found that if a farmer does not clearly know the exact amount of a particular nutrient deficiency of a soil, he is supposed to apply either over or under dozes of that nutrient element or the wrong nutrient element instead of the required one. If over dozes of any chemical fertilizer are applied to the soil, it may disturb the metabolic functions of plants, if absorbed in excessive amount. On the other hand, if less than the required amount is applied, it may not satisfy the needs of nutrient elements by growing plants.

Thus, the application of both over and under dozes of fertilizers adversely affect the growth of plants. Besides, when severe acidity arises in soil due to the excessive application nitrogen fertilizers, the release of nutrients from soil organic matter, soil minerals and the conversion of organic manure into organic matter, as mentioned earlier, may be hampered. Thus, the fertility of soil may decrease.

6.3.5. Effects of Indiscriminate Use of Pesticides

The use of pesticides which is supposed to be unfriendly to the environment may provide temporary relief from the pests but may gradually impoverish the soil quality. For instance, 'Research findings reveal that pesticide applied at the rate of one pound per acre deteriorated the top soil to a depth of a foot not only destroying the harmful insects, but also destroying useful microbes of top soils, which slowly retard the biological nutrient replenishment of the soil' (ESCAP, 2002: 3) [23]. If once soil loses its biological replenishment capacity, more chemical fertilizers will be required to ensure the growth of crops. Specific pesticide is effective against specific pests. However, in Bangladesh roughly 85-90 per cent of pesticides sprayed in the farms never reach the target organisms [23]. So, such kind of wrong targeting not only causes environmental impairment but also wastage of huge amount of money.

In reality, from the comments of farmers during field study, it can be found that even though most of the farmers are aware of the harmful effects of pesticides, many of them use pesticides to their lands. As farmers do not have any technical knowledge to adopt alternative environment friendly pest management methods, they are compelled to use pesticides to protect their crops from the attack of pests.

6.3.6. Nutrient Loss due to Flood and Rainfall

Although the importance of rainfall to meet the huge water requirement of plants is immense, heavy and incessant rainfall during the monsoon may adversely affect the quality of soil. Sometimes, heavy and incessant rainfall may cause flooding. Flood waters and rainfall create water logging and runoff of water and thus, erode the top soil. For instance, the impact of raindrop causes detachment of soil through the breakdown of the soil aggregates and the detached soil particles are subsequently transported by flowing water (Lal, 2001: p. 523) [27]. Through this process, naturally the top soil is largely affected.

As the top soil contains most of the essential nutrient elements (Brady: 1990) [11], any loss of the top soil will deteriorate soil quality and thus, the growth of plants will be adversely affected due to the deficiency in nutrient uptake from soil. In this connection, the observation of Lal (2001) [27] regarding the soil degradation, suggests that accelerated soil loss through rainfall has adverse economic and environmental impacts: yield reduction by soil loss, induced decline of soil quality and the pollution of natural water body. Besides, lots of essential nutrients are leached out with rain water from the soil surface to the downwards [11]. Thus, soil becomes deficient of essential nutrients, necessary for plant growth through both surface water runoff and percolation to the downwards with rain water.

Bangladesh is situated on the downstream in a geographically awkward position. Huge deluge from the upstream enters into Bangladesh through different rivers, causing frequent flooding. This flooding dilutes and washes away a huge quantity of inorganic fertilizers to the rivers, ponds and other water bodies. It incurs huge economic loss on the shoulders of farmers, as farmers have to reapply fertilizers to their lands and if farmers fail to reapply fertilizers due to financial hardship, they may harvest poor yield.

Analyzing the experiences of the farmers during field study about the flood waters, it can be understood that flooding causes colossal damages to their crop production. In fact, flood waters deteriorate soil structure by replacing the air from the soil micro-pores, which is essential for the respiration (exchange between oxygen and carbon dioxide) of plants and Microorganisms [11]. Plants and Microorganisms can not survive when their respiration system collapses. Moreover, soil erosion occurs when the top soils are dissolved in the flood water and the dissolved particles are subsequently transported by receding flood water. Thus, as stated earlier, plants lose lots of essential nutrient elements.

6.3.7. Organic Matter Depletion and Its Impact on Land Quality

Loss of soil organic matter under cropping systems is often considered one of the most serious forms of agriculturally induced soil degradation [18]. Organic matter is an important component of soil, which releases readily available nutrient elements for the uptake of plants through undergoing decomposition by the action of microorganisms. Organic matter can be replenished through the mixing of crop residues, organic manures, green manuring and cow dung with the soil, which through undergoing decomposition are transformed into organic matter.

In Bangladesh, the organic matter content of soil has declined by about half during the last two decades, where more than 60 per cent of cultivable soils contain organic matter less than 1.5 per cent of soil mass instead of required amount of 5 percent, and the consequence of such a low content of organic matter is stagnation of yield of many crops [13]. Moreover, the structure of soil deteriorates, due to the low content of organic matter [11]. As organic matter acts as cementing agent [11], it prevents the soil from being broken down into minuscule pieces by the external forces like impact rain drops, flooding and wind as well as protects the top soils from being washed away with the receding flood or rain water.

During field study, the officials of the agriculture department gave the opinions that organic manures improve the structure of the soil and thus, improve the water retention, aeration and nutrient retention capacity of the soil. Besides, they opined that organic manure may help to improve the effectiveness of chemical fertilizers. There is almost no side effect of organic manure even it is applied in excessive amount.

Analyzing the views given by the farmers, we can say that even though farmers are aware of the necessity of organic manure, they are not interested to use organic manure on their lands because it takes long time to prepare it and the ingredients are not always available.

7. Recommendations for Remedial Measures

7.1. Strong Institutional Capacity and Market Friendly Intervention of the Government

In an existing free market environment of Bangladesh, to correct the market failure of taking into account the cost of impairment inflicted on lands due to the change in land use and stopping the conversion of agricultural land into non-agricultural purposes through favouring its indiscriminate transaction, market friendly intervention can be executed. For this, the institutional capacity of the government requires to be strengthened to formulate up-to-date policy and ensure proper implementation of them to introduce a sound land use mechanism. For instance, government can impose heavy conversion tax on the change in land use to discourage its misuse. Besides, government can raise the revenue tax manifolds on lands used for non-agricultural purposes, depending on the pattern of non agricultural activities. Although in Bangladesh, there is a variation in land development tax on the basis of agricultural, industrial, commercial and housing land and location of land [30], the amount of tax levied on non-agricultural lands is not adequate. So, the existing revenues imposed on the lands can hardly discourage the present trend of conversion of agricultural lands into non-agricultural lands.

The question may appear in mind, whether it is possible to attain sustainable development. In fact, there is no conflict between development and maintenance of the stocks of natural capital at viable levels [46]. With strong institutional capacity, government can remove inappropriate policy incentives that cause indiscreet resource exploitation, strengthen regulatory framework to correct market failure through market friendly intervention, provide income-generating opportunities to the poor, ensure greater access by the poor to the resources and invest in human development to reduce concentration of the poor on marginal land and thus, can prevent problems of land degradation [46].

For instance, in case of lands, if government has strong institutional capacity, it can efficiently allocate subsidies and other incentives for improving the quality of lands, while it can intervene in any misuse of lands so that along with the increase of production of food grains, the quality of lands does not deteriorate. Government can persuade farmers to adopt conservation practices such as: using organic manure to improve soil fertility. Moreover, government can provide alternative job opportunities to the poor people to combat over-dependence on lands and its intensive use without conservation practices; government can impose conservation tax on consumers to correct market failure.

7.2. Land Zoning

Government can formulate a zoning law with a zoning map after detailed study of the distinct characteristics of different lands, situated in each district to ensure efficient implementation of the National Land Use Policy. After the completion of Zoning of lands, government can easily

take necessary steps to prevent changing of land use. The Ministry of Land, Bangladesh has already taken some initiatives to zone the lands of coastal areas [4]. However, wide-ranging zoning of lands all over the country, followed by a stringent zoning law has yet to be initiated.

7.3. Land Acquisition not More than the Minimum Requirement

To keep misuse of land due to the land acquisition minimal, the minimum requirement certificate provided by the requiring body needs to be properly scrutinized by the District Land Allotment Committee of the government. If the certificate giving officer is found guilty of demanding more lands than actual requirement, he should be brought under disciplinary action. Moreover, the unutilized and illegally occupied portions of the acquired lands have to be restored from the grabbers through applying the existing law. However, 'there has not so far been a single case where unused acquired land has been resumed by the Deputy Commissioner' [41]. Government can resume the restored lands as state land and bring necessary amendment in the relevant laws to ensure multilateral use of these acquired lands (National Land Use policy, 2001) [36]. So, in a land scarce country, acquiring more lands than minimum requirement and subsequently, keeping them idle, should severely be dealt with to prevent further misuse in future acquisition.

7.4. Vertical Expansion of Infrastructures

Instead of horizontal enlargement of housing, commercial shops, educational institutions, hospitals and other infrastructures in rural areas, vertical enlargement of these infrastructures in non-agricultural lands can reduce ever-increasing pressure on lands. For instance, at first, government itself can take this initiative, while building school, hospitals, government offices and cluster villages for landless people with minimum utilization of lands.

7.5. Application of fertilizers in Balanced Amount

To diagnose the appropriate amount and kind of essential nutrient deficiency of soil and the specific requirements of nutrients for different crops, soils of different ecological zones should properly be tested before any application of chemical fertilizers to minimize their misuse and harmful impact on environment. With this regard, Dent (2004) [13] state that balanced and efficient application of chemical fertilizers is essential to replenish the nutrient deficiency of soil, removed by the intensive cropping practices. That is to say, application of fertilizers should be in appropriate amount, so that the uptake of excessive amount of one fertilizer does not hamper the effectiveness of another fertilizer.

Application only 2-3 fertilizers without diagnosing the appropriate requirement of nutrient elements of specific plants and the nutrient deficiency of soil of specific place, cannot bring any efficacy in attaining higher yield and improving soil quality. For instance, according to Dent (2004) [13], in Bangladesh, the severe deficiency of two nutrient elements, sulphur and zinc are found in a wide

range of cultivated lands, amounting 3.9 and 175 million hectares respectively. If inorganic fertilizers like, Nitrogen, potash phosphorus and sulphur, without knowing the appropriate requirement of the specific soils and plants are indiscriminately used in these soils, neglecting the zinc, it will not be balanced application and the yield may not be satisfactory.

7.6. Application of Organic Manure

Analyzing the views given by the farmers about the application of organic manures, we can say that even though farmers are aware of the necessity of organic manure, they are not interested to use organic manure on their lands because it takes long time to prepare it and the ingredients are not always available. The reason may be the farmers may not have appropriate technical knowledge how to prepare it inexpensively, which requires widespread training among the farmers.

7.7. Adoption of Crop Rotation

Adoption of crop rotation helps to improve soil quality in several ways. Crop rotation may protect the soil nutrients, as mentioned earlier in this article, from being over exploited by the continuous cultivation of the same crops on a piece of land year after year. Besides, in the crop rotation, if leguminous crops and cereal crops are grown on a piece of land by turns and the leguminous crops are mixed with the soil while in green, they will add green manure and fix atmospheric nitrogen to the soil through their nodules [11].

7.8. Adoption of IPM Method

Adoption of IPM can prevent farmers substantially from being dependent on pesticides and insecticides to control pests and diseases and protect the the soil and agricultural products from toxicity. "Integrating Pest Management system, which embodies a combination of many environmentally friendly techniques of managing healthy crops, conservation of biological control agents by avoiding or reducing the use of toxic pesticides, augmentation of biological control agents, and use of pest tolerant crop varieties, was considered a suitable strategy in reducing crop losses due to pests, leading to sustainable agriculture" [23]. Thus, In the IPM system the emphasis has been given to the environment friendly biological control of pests, while the use of toxic pesticides has been kept at minimum level.

7.9. Technical Support for Conservation

Government can provide technical support to the farmers with technical know-how and modern equipment through Bangladesh Rural Development Board (BRDB) and agriculture department, so that they can be able to optimize their output and conserve their lands. Moreover, as land is thought to be the most valuable asset to the farmers, they can easily be persuaded to invest in land conservation through making them aware of the severe consequences of land degradation and the misuse of their lands in near future. The concerted efforts of government,

local elites, politicians and NGOs can bring efficacious change in making people knowledgeable to adopt sustainable land use techniques.

Government appointed one Sub-Assistant Agriculture Officer for each Union Parishad (Lower unit of local government body), to provide field to field service to at the doorstep of the farmers. However, analyzing the views expressed by the farmers during field study, it can be assumed that the relevant public servant officials at union and upazilla level level are somewhat negligent to their responsibilities towards farmers. So, the activities of the relevant public servant officials should be monitored and brought under accountability to fully engage them in promoting sustainable development in agricultural land management.

7.10. Government's Financial Supports in Agriculture and Its Efficient Management

The existing financial support provided by government to the agriculture requires to be reshuffled, so that along with the present target of increasing the yield, the issues of soil conservation are given proper attention. Government of Bangladesh has made allocation of subsidies amounting almost 280 million dollar for the agriculture sector for the year 2006-07, where almost \$160 dollars have been allocated for chemical fertilizers [16]. However, in this allocation there is no incentive for adopting organic manure or Integrated Pest Management programmes or soil conservation. Unless financial supports are extended to the soil conservation, it will be difficult to protect the soil from further degradation and such unsustainable practices in agriculture, supported by government's incentives may render the soil less fertile to meet the needs of the next generation.

8. Conclusion

The existing ALMS in Bangladesh has not yet been able to achieve its objectives of improving the socio-economic aspirations of the rural people, to whom land is one of the most valuable assets for their subsistence. In Bangladesh, where the livelihoods and food security of majority of the people are revolved around the agricultural lands, the amount of per head cultivable land is frustratingly low which is 0.17 acre per person [28]. It seems to be very difficult to maintain the subsistence and food security of a vast number of ever increasing people, with such frustratingly small amount of per head lands, unless an efficient ALMS can be ensured. The present indiscriminate misuse of agricultural lands for non-agricultural purposes and the gradual deterioration of land quality due to the intensive cultivation and excessive and indiscriminate use of inorganic fertilizers and pesticides without adopting conservation practices may severely affect the livelihoods and food security of the future generation.

In Bangladesh, indiscriminate misuse of agricultural lands for non-agricultural purposes is likely to jeopardize the prospects of future food security for its ever-increasing population. Although there has been National Land Use

Policy since 2001, it has not yet been implemented due to lack strong political commitment. Besides, the existing free market economy, driven by the spirit of profit maximization is also alluring many people to indiscriminately change the nature of agricultural lands for numerous non-agricultural purposes at the expense of subsistence of a great number of people and vital food security of future generation, as there is no restriction on the transaction of scarce agricultural lands, irrespective of its purpose and future use. If the present trend of misuse of agricultural lands continues, it may severely hamper the ability of the future generation to meet their own needs from this scarce land resource.

In an agro-based and industrially backward country like Bangladesh, the existing haphazard land management system is likely to bring massive sufferings to the majority of its people. If we cannot correct the anomalies in the existing ALMS and change the traditional mindsets of profit maximization without considering the far reaching future consequences of present misuses of our scarce agricultural land resource, our future generation may pay the price of our present mistakes, which in no way can be ethically supported. So, it is incumbent on the government as well as all the conscientious people and the agricultural land owners to take all the necessary measures to correct the anomalies in the present ALMS with a view to promoting an efficient, effective and improved ALMS for us and our next generation.

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