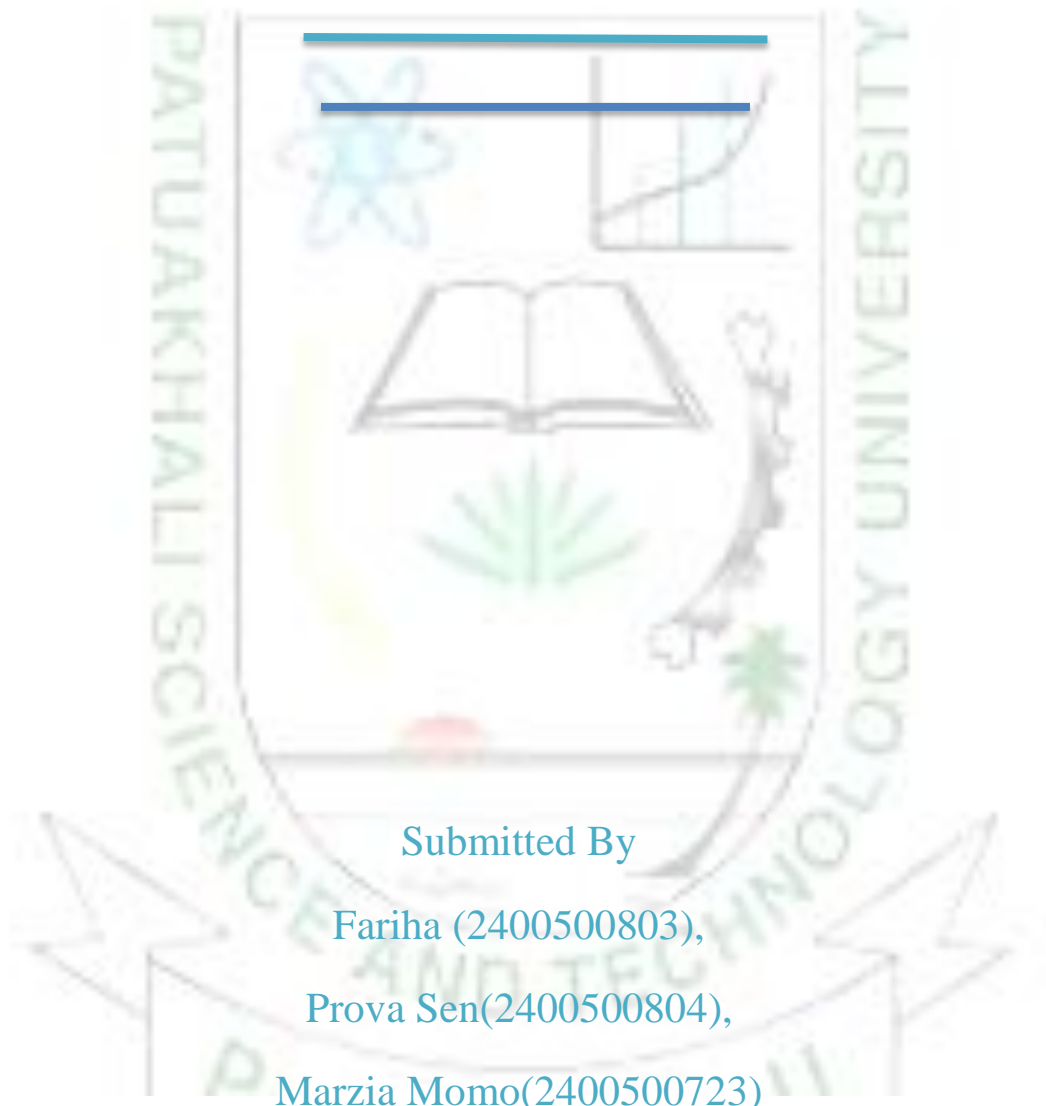

Economic Analysis of Sustainable Agricultural Practices

{Bangladesh}



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Abstract

The sustainability of conventional agriculture in Bangladesh is under threat from the continuous degradation of land and water resources and from declining yields due to indiscriminate use of agro-chemicals. An NGO is pursuing efforts to promote ecological agriculture with emphasis on better use of on-farm resources and the reduction of external inputs. This paper examines the sustainability of two production systems in terms of their environmental soundness, economic viability and social acceptability based on empirical data collected through a household survey, soil sample analysis, observations and discussions with key informants. Twelve indicators were selected to evaluate sustainability. Significant differences were found between the two systems in crop diversification, soil fertility management, pests and diseases management, and use of agro-chemicals. However, no significant variations were found in other indicators such as land-use pattern, crop yield and stability, risk and uncertainties, and food security. Although crop yield and financial return were found to be slightly higher in the conventional system, the economic return and value addition per unit of land did not show any difference. The findings suggest that ecological agriculture has a tendency towards becoming ecologically, economically and socially more sound than conventional agriculture, as it requires considerably less agro-chemicals, adds more organic matter to the soil, provides balanced food, and requires higher local inputs without markedly compromising output and financial benefits. Broad-policy measures, including the creation of mass awareness of adverse health effects of agrochemical-based products, are outlined for the promotion of ecological agriculture.



Fig. Data analysis of sustainable agriculture and economic development

Introduction

Agriculture provides livelihoods to more than two-thirds of the rural population in Bangladesh (FFYP, 1998). Being one of the most densely populated countries in the world (865 persons/km²), Bangladesh has one of the lowest land/person ratios; in 1995 this was only 0.09 ha (Ali, 1995, UNDP (United Nations Development Program), 1995). The high population growth (around 2% annually) further reduces the availability of land for agriculture by creating increased demand for land for settlements, roads, industry, and other

non-agricultural uses (Ali, 1995, Rahman and Thapa, 1999, FAO (Food and Agriculture Organization), 2000).

In view of the scarcity of land, emphasis has been given to increasing food production by intensifying the use of land, chemical fertilizers, pesticides and water. Subsidies are provided for chemical fertilizers, pesticides and irrigation equipment to enable farmers to adopt these technologies for increasing crop yields (Hossain, 1988). This has caused major changes in cropping patterns, uses of agricultural inputs, and management of soil fertility. Likewise, cropping intensity and the area under irrigation and HYV paddy have all increased considerably. Use of chemical fertilizers increased six-fold between 1970 and 1990, and the use of pesticides increased about three-fold in just one decade, from 1982 to 1992 (Osmani and Quasem, 1990, Rahman and Thapa, 1999).

On the other hand, the area under pulses, oilseeds, fodder and natural inland fisheries is declining rapidly (FFYP, 1998). Likewise traditional cropping practices, such as mixed cropping, crop rotation, and intercropping, are gradually disappearing (Hossain and Kashem, 1997). This has led to mono-cropping and higher dependency on external inputs such as irrigation, chemical fertilizers and pesticides. Mono-cropping, along with imbalanced use of chemical fertilizers, pesticides, and intensive use of land without application of organic fertilizers, has led to the deterioration of both soil quality and fertility (Task Forbes Report, 1991, Hossain and Kashem, 1997, Rahman and Thapa, 1999). More than 65% of the total agricultural area is suffering from declining soil fertility, and about 85% of the net cultivable area has less organic matter than the minimum requirement for maintaining soil productivity (Hossain, 1990, Task Forbes Report, 1991). As a result, crop yields are decreasing¹ steadily, despite increased use of agricultural inputs (Ali, 1995, Pagiola, 1995, Hossain and Kashem, 1997, Ahmad and Hasanuzzaman, 1998, Rahman and Thapa, 1999). Realizing the adverse impact of mono-cropping, the government had implemented a crop diversification project during the late 1980s involving concerned agencies. This failed to achieve its objective due to inadequate coordination among the implementing agencies, weak extension services, inadequate support services including the provision of seed, fertilizers and credit, and poor marketing facilities (Majumder and Shivakoti, 2001, Shipar, 1995).

The increased use of chemical fertilizers, insecticides and pesticides has led to the contamination of water bodies and the spread of diseases, which have adversely affected aquatic life, livestock and people's health (Hossain et al., 1994, Asaduzzaman, 1995, Hossain and Kashem, 1997, Rahman and Thapa, 1999). Likewise, excessive use of groundwater is suspected to be the cause of the presence of high levels of arsenic in groundwater in northern and northwestern parts of Bangladesh (Siddique et al., 1998, Ullah, 1998). Given the present state of declining soil fertility, decreasing yields, increased and imbalanced use of chemical fertilizers and pesticides, how to produce food and fibre on a sustainable basis for the growing population has become a serious challenge for Bangladesh.

In view of the problems arising from conventional agriculture in Bangladesh,² a number of NGOs, namely, *UBINIG* (Policy Research for Development Alternatives), Proshika, and CARE Bangladesh have launched initiatives in different parts of the country to promote alternative agriculture that emphasizes reduced use of external inputs, including agro-chemicals, and increased use of local and on-farm resources in order to make the system both environmentally and economically sustainable (Akter, 1997). Having recently been introduced, such initiatives are confined to certain pockets of the country. However, they are gaining importance gradually, as there is increasing awareness of the adverse health and environmental impact of conventional agriculture. *UBINIG* is among a few pioneer agencies

devoted to the promotion of what is locally called *naya krishi andolon* or new agricultural movement, in some parts of Bangladesh. This type of agriculture emphasizes more use of on-farm resources, including organic fertilizers, cropping diversification, mixed cropping, reduced use of chemical fertilizers, and no use of pesticides. Characteristically, this system is similar to what is normally known as ecological agriculture,³ and thus hereafter is referred to as ecological agriculture. *UBINIG* started its activities in *Delduar* sub-district of *Tangail* district of Bangladesh in 1990. By June 1997, its program had expanded to 15 districts, and about 20,000 farm households were practising ecological farming (Akter, 1997, Gain, 1998).

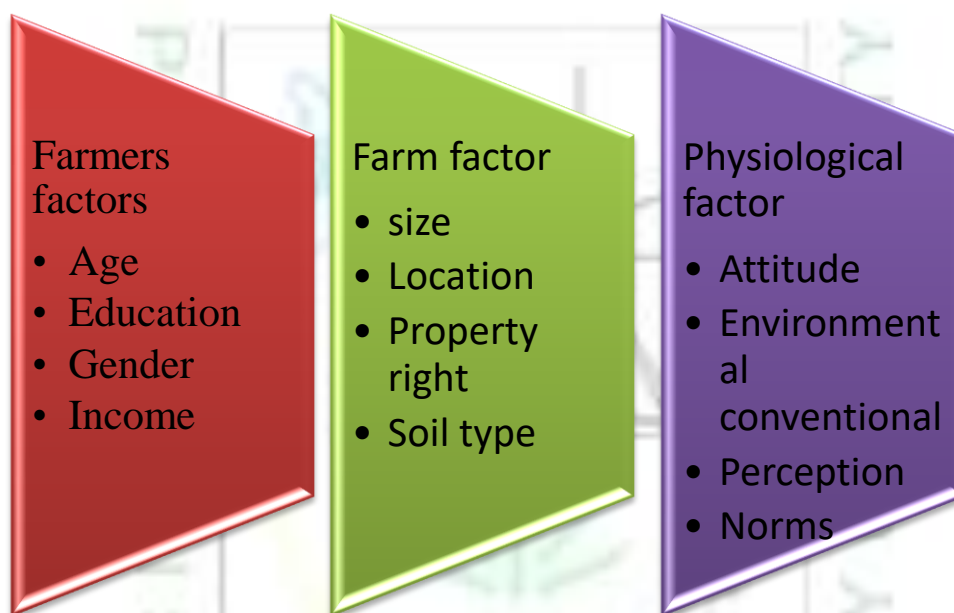


Fig. Factor affecting the adaptation of sustainable agriculture

Akter (1997) reported that ecological farming promoted by *UBINIG* is environmentally more friendly than conventional farming. Based on rapid appraisal, that study did not evaluate the economic performance of the system, overlooking the fact that economic performance is an equally important determinant of agricultural sustainability. As farmers are increasingly confronting declining per capita returns, caused by ever-decreasing land holdings as a result of the steadily-growing population, they are required to make additional efforts to increase agricultural production. They will thus adopt an agricultural system only when it is both environmentally and economically suitable. For small farmers such as those in Bangladesh, who are struggling to secure just enough food, current needs are more important than future needs. Even profit-seeking large farmers would not venture into ecological agriculture unless it provides a satisfactory income. In view of these concerns, this study compares the ecological agriculture being promoted by *UBINIG* and conventional agriculture from environmental, economic and social perspectives. However, it does not venture into the vigorously-debated yet unresolved issue of measuring sustainability. Agricultural sustainability is not precisely measurable, primarily because externalities of any agricultural system are very difficult to measure (Pretty, 1995). With the growing emphasis on ecological agriculture, we have made an attempt to assess whether such agriculture is showing

symptoms of sustainability according to the three criteria mentioned above, by comparing it with conventional agriculture. This is the major contribution of this study, which is envisaged to be conducive to the formulation of policies for sustainable agriculture development. It also provides a framework for assessment of the sustainability of different types of agricultural systems.

Sustainable agriculture: a conceptual framework

Excessive and unbalanced use of agro-chemicals has led to increased production costs and dependence on external inputs and energy, decline in soil productivity, contamination of surface and ground water, and adverse effects on human and animal health (Edwards, 1989, Conway, 1985, Biswas, 1994). Therefore, there is growing emphasis on sustainable agriculture in response to concerns about the adverse environmental and economic impacts of conventional agriculture (Hansen, 1996). In contrast,

Selection of indicators of agricultural sustainability

For any study on sustainable agriculture, the question arises as to how agricultural sustainability can be assessed. Some argue that the concept of sustainability has yet to be made operational (Webster, 1997). Although precise measurement of sustainable agriculture is not possible, “when specific parameters or criteria are selected, it is possible to say whether certain trends are steady, going up or going down” (Pretty, 1995:11).

Table 1: Percentage Share of Major Economic Sectors and Employment

	GDP (%)			Employment(%)		
Year	Agriculture	Industry	Other Economic Sectors	Agriculture	Industry	Other Economic Sectors
1973-74	59.4	6.3	34.3	78.7	4.8	16.5
1980-81	46.7	10.1	43.2	72.7	9.3	18.0
1990-91	30.4	15.8	53.8	66.4	12.5	21.1
2000-01	24.1	18.0	57.9	51.2	10.3	38.5
2004-08	19.1	20.3	60.6	48.1	11.2	40.7
2011-12	17.3	28.6	54.1	45.0	30.0	25.0
2015-16	14.8	28.6	56.6	45.1	20.8	34.1

Source: BBS of different years

Land use pattern

Field crop production is the dominant type of land use in both farming systems. Nearly 90% of the agricultural land in both systems has been utilized for crop production. The remaining area is utilized as homestead, orchard and fishpond, without significant variation between the two farming systems. However, the average number of trees grown per households was found to be significantly higher ($P<0.10$) in the ecological system (25) than in the conventional system (17).

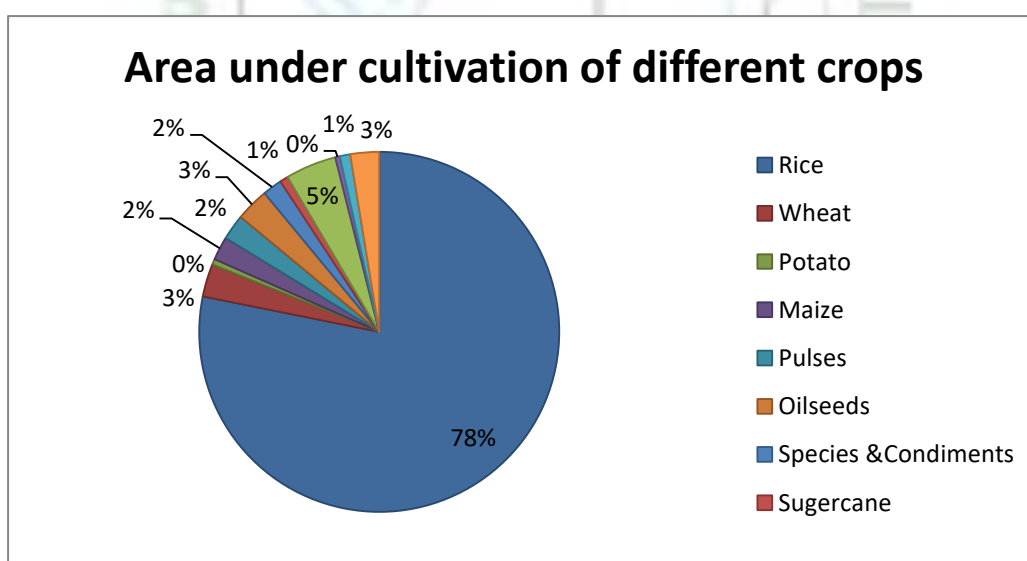


Fig. Area under cultivation of different crops in Bangladesh during 2018-2019

Conclusions

The green revolution or conventional agricultural system is pervasive in Bangladesh, and efforts are being pursued to promote this technology to cope with the evergrowing demand for food grain. Scientific research findings on conventional agriculture have revealed that this type of agriculture has enabled farmers to fulfil their immediate needs at the cost of environmental degradation, thereby threatening the sustainability of agriculture itself as well as the health of people consuming . (Ali, 2004)

References

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