Nature Farming in Myanmar

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Abstract

Present agricultural systems in Myanmar follow the traditional methods which utilize the available natural resources combined with improved cultural practices. Although the use of synthetic chemicals such as fertilizers and pesticides have been well established in Myanmar's agriculture, the quantity actually used is much lower than the recommended optimum rates. Hence, there is no evidence so far that the use of such synthetic compounds in Myanmar have caused any serious disruption of natural ecosystems or environmental pollution.

However, because of increasing costs of agricultural chemicals and their uncertain availability, research is urgently needed to develop productive, profitable, and sustainable agricultural systems without the use of costly and hazardous synthetic agricultural chemicals.

Introduction

The use of natural resources for agricultural production has long been a traditional practice of farmers in Myanmar. Prior to the introduction of chemical fertilizers in the late 1960s, agricultural production was solely dependent on the use of farmyard manure (FYM) and locally available organic manures. The type and quantity of the organic manures used at different locations varied greatly, depending upon their availability.

When chemical fertilizers were introduced in the late 1900s, there were dramatic increases in crop yields. Introduction of high yielding varieties also helped to improve crop yields. Since fertilizer use by farmers has been considerably less than recommended, and because of the nutrient requirements of high yielding varieties, there has been a substantial depletion of plant nutrients from soils. This has resulted in a critical decline in soil fertility and productivity.

Farmers are beginning to recognize the problem of declining soil fertility when crops do not yield as much as expected. However, the restoration of soil fertility in most cases has not been achieved. And the increasing cost and uncertain availability of chemical fertilizers in the developing countries has led to higher production costs.

Under such circumstances, efforts to increase agricultural production, with decreased dependence on expensive and even hazardous chemical inputs, should be made. More effective ways and means of using natural resources would undoubtedly help to improve agricultural production in Myanmar.

Present Agricultural Systems in Myanmar

Agriculture is the mainstay of Myanmar's economy. Over 65 percent of the foreign exchange earnings come from agriculture. As such, future economic development will also be based upon the promotion of agriculture and agro-allied industries. For these reasons, the improvement of agricultural productivity has been accorded the highest priority in our national development programs.

Agroecological Aspects of Myanmar

Myanmar is a forest-clad mountainous country, with plateaus, valleys, and plains. The Tropic of Cancer divides the country into two main climatic regions, namely the tropical south comprising over two-thirds of Myanmar, and the sub-tropical, temperate north which comprises the remaining one-third of the country.

There are two distinct seasons; the dry season occurs from mid-October to mid-May and is followed by the wet season. There is a cold spell from December to February during the dry season.

The southwest monsoon, the major source of Myanmar's annual rainfall, occurs during May to October. The precipitation varies with both locality and elevation. The highest annual rainfall, varying from 250 to 500 mm, is in the coastal regions and in the northern part of the country; very low annual rainfall of below 100 mm occurs in the Dry Zone area, and moderate rainfall of 100 to

200 mm occurs in some parts of the country.

Major Crops Grown in Myanmar

Due to variations in agroecological conditions, more than 60 different crops are grown in Myanmar. They can be grouped into seven categories as follows:

1) **Cereals.** Rice, wheat, maize, and millets.
2) **Oil Seeds.** Groundnut, sesamum, sunflower, and mustard.
3) **Food Legumes.** Black mungbean, green mungbean, butter bean, red bean, pigeonpea, cowpea, chickpea , and soybean.
4) **Industrial Crops.** Cotton, jute, sugarcane, rubber, and tobacco.
5) **Food Crops.** Potato, onion, chillies, vegetables, and spices.
6) **Plantation Crops.** Tea, coffee, coconut, cocoa, oil palm, toddy palm, banana, and other fruits
7) **Miscellancous Crops.** Other crops which are not listed in the above groups.

Land Utilization

The present status of land use in Myanmar is summarized in Table 1. The area designated as arable wasteland is about the same size as the currently cultivated area, or some 12 percent of the total. The cultivated area could be expanded by developing the arable wasteland for agriculture, but it would require heavy capital investment to overcome the problems and constraints that limit crop production on these lands.

Table 1. Present Status of Land Use in Myanmar (1986-87).

Type of Land	Area	Percent of Total Area
	10^3 ha	*%*
Planted cropland	8080	12
Current fallow	1990	3
Culturable wasteland	8450	12
Reserved forest	10100	15
Other forest (decontrolled)	22300	33
Unclassified land not suitable for cropland	16800	25
Total*	67700	100

* Totals may not be precise due to rounding.

General Farming Practices in Myanmar

Under the government policy which gives the right of tilling the land to the actual tiller, the number of farmers with large holdings have substantially decreased while the number of farmers working on smaller holdings has increased accordingly (Table 2).

Table 2. Farm Size in Myanmar, Number of Farmers, and Total Acres in Each Category.

Farm Size	Number of Fanners	Total Area
ha	*10^3*	*10^3 ha*
Less than 2	2620	2460
2 to 4	1050	3060
4 to 8	490	2760
8 to 20	103	1120
20 to 40	1	37
More than 40	1	324
Total*	4270	9760

* Totals may not be precise due to rounding.

Mechanization in Myanmar's Agriculture

There are about 4,000 tractors in the Agricultural Mechanization Department which tilled 1.1 million acre-turns in 1988-89. Thus, a tractor tilled an average of 274 acre-turns. Since less than 6

percent of the total tillage is mechanized, the disruption of natural ecosystems, such as soil structure, from heavy machinery is not a serious problem in Myanmar. Human and animal power are utilized for most of the tillage operations.

Recent Agricultural Developments in Myanmar

Work has begun on many fronts to develop the agricultural sector in Myanmar.

Introduction of Chemical Fertilizers

The use of chemical fertilizers was initiated in the late 1960s. The domestic production of urea fertilizer is being supplemented with imported fertilizers. In 1987-88 total procurement of chemical fertilizers amounted to 0.40 million Mg, comprising 0.26 million Mg from domestic production, and 0.14 million Mg of imported fertilizers. The utilization of fertilizers by crops in 1987-88 totalled 0.33 million Mg. of which 70 percent nr 0.23 million Mg was utilized for paddy. Fertilizers were also used for other crops such as wheat, groundnut, and sesamum.

Utilization of chemical fertilizers decreased by 54,000 Mg, compared with the previous year. While efforts were being made for effective use of chemical fertilizer, organizational efforts were implemented for systematic use of biofertilizers, rhizobium, and locally-available natural fertilizers to supplement chemical fertilizers.

Introduction of Pesticides

The use of pesticides began in the late 1960s as one of the measures taken to increase production in the agricultural sector in Myanmar. About 277 Mg of powdered pesticides and 121,000 liters of liquid pesticides were utilized in 1988-89.

In order to reduce the residual effects of conventional synthetic pesticides, attempts were made to use natural pesticides as substitutes. Extracts from the neem tree, *Azedirachta indica* (A. Juss) which has long been known to have insecticidal properties, were thoroughly investigated and found to be effective. As a result, a pilot plant for neem extraction was constructed in 1986-87 at Paleik village near Mandalay under the Burmese-German Plant Protection Program. In 1989-90, it is projected that 80,000 kg of neem seeds will be processed into 16,000 liters of neem extract. A 35 percent soluble concentrate of neem extract in water is effective in controlling a number of pests on different crops.

Introduction of Quality Seeds

Contact has been made with international institutions, like IRRI (Philippines), ICRISAT (India), IITA (Nigeria) , CIMMYT (Mexico) , and CIAT (Columbia) , which will provide quality seeds of various crops.

Research work for the development of quality seeds was also undertaken in Myanmar to increase the yield per area and to improve crop quality. Quality seeds for paddy, wheat, maize, sesamum, sunflower, and coffee were multiplied and distributed to the farmers in 1988-89.

Introduction of Selective Concentrative Strategy (SCS)

The new rice production strategy designated as the Whole Township Rice Production Program using the new technology was first launched in 1977-78. The new technology required precise timing of plowing, harrowing, and transplanting, which was accomplished through a collective effort. The recommended plant population was 320,000 hills ha^{-1} which is twice that normally used by farmers.

The program covers over half of the total area under paddy in Myanmar. Rice production increased by a remarkable 65 percent from 1974-75 to 1982, with the national yield increasing from 1.65 Mg ha^{-1} to almost 3 Mg ha^{-1}.

Selective concentrative strategy is also being utilized to improve the production of other crops such as maize, groundnut, sunflower, cotton, wheat, sorghum, jute, potatoes, and pulses.

Introduction of Integrated Pest Management

The integrated pest management program in Myanmar has four major components for improvement of crop production:

1) Use of resistant varieties;
2) Use of suitable cultural practices;
3) Use of biological control methods; and
4) Use of chemical control methods.

Introduction of Soil Conservation Practices

Terracing in the hilly regions was implemented with the following objectives:

1) To promote self-sufficiency for the native population of the hilly regions;
2) To increase productivity in the agricultural sector;
3) To change shifting cultivation practices to terracing; and
4) To prevent soil erosion and deforestation.

A total of more than 8,910 ha spread over seven divisions and States was under terrace cultivation in 1986-87.

Wind erosion is a very serious problem which causes extensive soil degradation and loss of soil fertility in the Dry Zone central plains of Myanmar. A windbreak program was implemented in 1988-89 in three townships. Twelve thousand seedlings of *Leucaena glauca* and *Cassia siamea* were planted on 202 ha of land.

This windbreak program is to be expanded to six townships in Magway Division in 1989-90.

Introduction of Organic Fertilizers

Farmers in Myanmar are faced with increasing costs and uncertain availability of chemical fertilizers. Moreover, the continued use of some synthetic fertilizers has had adverse effects on soil productivity. In view of this, farmers are being encouraged to increase their use of available organic wastes and residues as organic or biofertilizers.

Use of Animal Wastes

The use of animal waste, especially cattle manure, has long been practiced in Myanmar. The population of farm animals in Myanmar is shown in Table 3.

Table 3. Population of Farm Animals in Myanmar.

Animal Type	Year		
	1986-87	1987-88	1988-89
		10^3	
Cattle	9760	9920	10100
Buffalo	2160	2190	2240
Sheep/goat	1480	1460	1500
Pig	2990	3060	3200
Fowl	32400	33500	33900
Duck	5790	6030	6230

The average amount of cattle manure collected per head is about 18 lb per day. The total amount of animal manure produced in Myanmar can be estimated from Table 3. However, because of insufficiency and mismanagement, the actual use of manure in Myanmar is much lower than the recommended rate of manure application (i.e., 3,360 to 6,720 kg ha^{-1}).

The Introduction of Biogas Plants and Organic Recycling

Due to the high cost of fossil fuels, a program to increase the production of domestic fuels by means of biogas plants was initiated in 1974. The efficiency of gas consumption for both cooking and lighting has been improved over the last decade. The Agricultural Mechanization Department is designing a family size digester and is assessing the feasibility of using it as a suitable energy source in rural areas. The effluent from the gas plant is effectively used as organic fertilizer.

Introduction of Green Manure Practices

The most commonly used green manure plants are sunnhemp (*Crotalaria juncea*), daincha (*Sesbania aculeata*), cowpea (*Vigna unguiculata*), black gram (*Vigna mungo*), and green gram (*Vigna rediata*).

Data from several investigations have indicated that green manure has a positive effect on crop yields, especially paddy.

Green manuring by sowing and incorporating pulses in hilly regions, especially in Shan State, not only increases the crop yield, but also effectively prevents soil erosion. The area under green manuring in Shan State amounts to about 3,240 ha.

Investigations on the use of various types of green manures, including the newly introduced stem-nodulating *Sesbania rostrata* (a West African species which grows well in standing water), are currently in progress. Although most of the green manures evaluated resulted in crop yield increases, the results do not justify their complete substitution of inorganic fertilizers. Only partial substitution of inorganic fertilizers with green manures is generally recommended.

Introduction of Biofertilizers

The nitrogen-fixing organisms which can be used as biofertilizers are:

1) *Rhizobia*: These are the best known nitrogen-fixing bacteria that associate symbioticly with legumes.
2) *Cyanobacteria* (*blue-green algae*): These are free living nitrogen-fixers that also have symbiotic relationships with the aquatic fern *Azolla*.

Rhizobia were used to inoculate seven different crops on a total of 63,200 ha in 1988-89. Studies comparing the effectiveness of blue-green algae and Azolla on rice production indicate that Azolla is more promising. Hence, the promotion of the use of Azolla is currently under consideration.

The Introduction of Improved Cropping Systems

Expanding the practice of multiple cropping has been accepted as one means of raising total crop production. The present trends in multiple cropping can be summarized as follows:

1) Growing a pre-monsoon crop before rice area (e.g., jute, cotton, and sesamum).
2) Growing some suitable crops after rice (e.g., groundnut, sunflower, peas, and beans).
3) Growing two suitable crops in succession on dryland with or without irrigation (sesamum, peas, beans, and maize).
4) Mixed sowing of two crops with different times of maturation in the same field (sesamum and pigeon peas, groundnut and maize, etc,).

The increased area under multiple cropping has been accomplished mainly through irrigation. The irrigated area as percent of the total planted area has increased from 7.5 percent in 1961-62 to 13.1 percent in 1986-87.

Future Direction of Myanmar's Agriculture

The major development objectives in the agricultural sector are:

1) To attain self-sufficiency in food for the increasing population of the country.
2) To produce sufficient raw materials to meet the requirement of agro-allied industries at home
3) To maximize the foreign exchange earnings by expansion of our export potential for agricultural produce.

In carrying out the task of higher production in accordance with the above guidelines, the first area of consideration is to increase the production per unit area by mobilizing all available resources on selected crops in selected regions. Second is to expand production by double or multiple cropping on lands already under cultivation, Notwithstanding the need for heavy investment to bring new lands under cultivation, yearly targets are being established for this program as well. Crops under consideration for increased yields per unit area are rice, wheat, and maize for cereals; groundnut, sesamum, and sunflower for oil seeds; jute, cotton, and sugarcane for industrial crops; and chickpea, butter bean, pigeonpea, and black mungbean for food legumes.

Measures for expanding adoption of improved cropping practices and distribution of quality seeds are being undertaken to increase the crop yields and to improve crop quality.

The amounts of chemical fertilizers and pesticides distributed to farmers in Myanmar are much less than the recommended optimum rates. Therefore, the destruction of natural ecosystems and environmental pollution from excessive use of fertilizers and pesticides are not considered to be

serious problems in Myanmar agriculture.
Organizational work is being carried out to increase widespread application of biofertilizers and natural fertilizers. Adoption of cropping patterns that are compatible with agroecological conditions in various regions is being encouraged for the benefit of the state as well as farmers. These measures are supplemented by organizational activities to strengthen mass participation in the implementation of agricultural development programs.

Conclusions

In addition to substantial amounts of nutrients removed from the soil by high yielding crops, natural factors causing erosion contribute to the further decline in soil fertility.
Maintaining and improving soil fertility is vital to the improvement of crop production in the agricultural sector.
Continuous use of chemical fertilizers alone may lead to the deterioration of soil structure and fertility and, consequently, of crop production. Therefore, appropriate alternatives to reduce the sole dependency on chemical fertilizers in agricultural production has been carefully explored.
Several studies on this issue have clearly indicated that various types of organic materials could augment all the plant nutrients except nitrogen, which often is a critical limiting factor. Most organic materials do not contain adequate amounts of nitrogen to sustain optimum crop yields. Hence, it would be premature to exclude the use of chemical fertilizers in any program designed to achieve increased crop production.
Since our prime target is to explore all the possible means of increasing crop production for home consumption as well as for export, we cannot as yet afford to have a drastic yield decrease which is often associated with switching over from chemical to organic farming.
Therefore, effective utilization of chemical fertilizers, combined with the systematic utilization of locally available natural resources to supplement chemical fertilizers, is still regarded as the best approach to improve crop production in the agricultural sector of Myanmar today.

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