

Effects of Summer Paddy Cultivation on Economy of Local Farmers in Myaungmya Township, Ayeyarwady Region

Win Pa Pa Myo, Khin Kay Khine and Myint Thida*
 Department of Geography, University of Distance Education
 Department of Geography, Patheingyi University

Abstract

Myaungmya is one of the townships in Ayeyarwady Region located in Deltaic area. Summer paddy is extensively cultivated as second crop in the cool dry period. Summer paddy cultivated area covers nearly 90 percent of the summer paddy cultivated area. Although most farmers cultivate summer paddy as a major crop, their cultivation practices differ from one farmer to another. Depending on cultivation practices, farmers are classed in to four groups: farmers of first group are the Rich who cultivate summer paddy intensively, they cultivate systematically and carefully. In second group, farmers cultivate summer paddy for the purpose of distributing seeds for local farmers, and farmers who cultivate paddy on self -help basis for household consumption are in the third group. Farmers of fourth group are poor and they do not cultivate paddy and rent the land to private company. Most farmers in the area cultivate high yield varieties to boost the yield with the intention of getting more income. Therefore, effects of summer paddy cultivation on economy differ in accordance with the cultivation practises. The objectives of the paper are to understand the reasons that cause different cultivation system, to explore different farming practices, to find out different rent returns from summer paddy cultivation and to forecast the future prospects of summer paddy cultivation in the area. To present the paper, primary data is mainly applied and mixed method is used.

Key words: Summer paddy, cultivation practice, varieties, input use, investment

I. Introduction

Myanmar (formerly known as Burma) was the dominant rice exporting country in the world during the first half of this century, accounting for nearly three-fourths of the world rice exports (Young, K.B., 1998).

Rice is the most important food crop of Myanmar and it remains as a strategic sector in terms of its continuing significant contribution to Gross Domestic Product (GDP), income and employment generation. Myanmar is still an agriculture country and total population was 51.42 million in 2014. Total paddy cultivated area was 7.28 mil ha, total production 28.32 mil mt and average yield 3.9 ton per ha. Although set target yield is 5.1 ton per ha in Myanmar, actual productivity was distinctly lower than target yield (Agricultural Statistics, 2014).

Ayeyarwady Region is known as rice granary of Myanmar and Myaungmya Township is one of the townships in Ayeyarwady Region. Myaungmya Township possesses largest summer paddy cultivated area among the townships of Ayeyarwady Region. Summer paddy cultivated area occupied 90 percent of the total rain fed paddy cultivated area, yield per unit area of summer paddy is higher than that of monsoon paddy and risk is lesser than that of monsoon paddy.

Summer paddy gives high yield because the cultivation period free from untimely rain and it is cultivated in dry period with the help of irrigation. As the area is located in the deltaic area, there are numerous streams. These stream networks also support irrigated water for summer paddy cultivation.

* Myint Thida, Department of Geography, University of Yangon

Four types of summer paddy cultivation are found in Myaungmya Township. Type of farming practiced by the Richs differs from that of the Poors. Input cost is high in cultivation of high yield varieties.

The objectives of the paper are to understand the reasons that cause different cultivation manners, to explore different farming practices, to find out different rent returns from summer paddy cultivation and to forecast the future prospects of summer paddy cultivation.

Study area

Myaungmya Township is located in the south western part of Ayeyarwady Delta. Most of the area is flat alluvial plain which supports paddy cultivation. The main rivers are Panmawady, Myaungmya, Pyamalow, Ywe, Pinlegalay and Pathein (Ngawun) rivers that provide irrigation water for summer paddy cultivation.

Data and methodology

In choosing the village tracts for case study among the 98 village tracts, 9 village tracts were selected as samples. Twenty farmers from each village tract were interviewed to get thorough understanding of summer paddy cultivation and choice for farmers depends on practises of paddy cultivation. Five farmers from each type of summer paddy cultivation are chosen to acquire primary data related to types of summer paddy cultivation; capital investment, selected quality seeds, and labouruse werecollected. Secondary data were also applied in preparation of the paper and they are obtained from departments concerned.

II. Temporal and Spatial Variation in Summer Paddy Cultivation

As Myaungmyaoccupies a vast productive and fertile alluvial land, paddy is the most dominant cereal crop within the township.

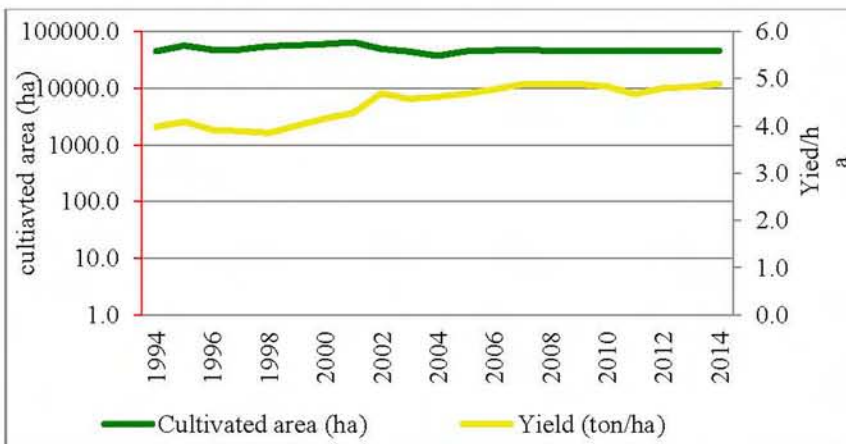


Figure 1. Temporal change of summer paddy cultivated area in Myaungmya Township

Source: Settlement and Land Records Department

Summer paddy was first introduced in 1993-94 and it is grown in area close to the sources of water. Summer paddy cultivated area is mainly found on the farmlands proximate to Myaungmya, Ywe, Panmawady and Pyamalow rivers and other streams from which water is pumped into the fields.

Owing to improved farming techniques, and better paddy strain, yield per hectare increased in the study period. Comparatively the yield per unit area of summer paddy is much higher than that of monsoon paddy due to receiving longer sunshine hours which enhances photosynthesis of the plants. Although summer paddy cultivated area fluctuated in the study period, yield per unit area increased gradually in Myaungmya Township (Figure 1). The large sown area of summer paddy is found near rivers and streams that can supply large amount of water to irrigate the farmlands.

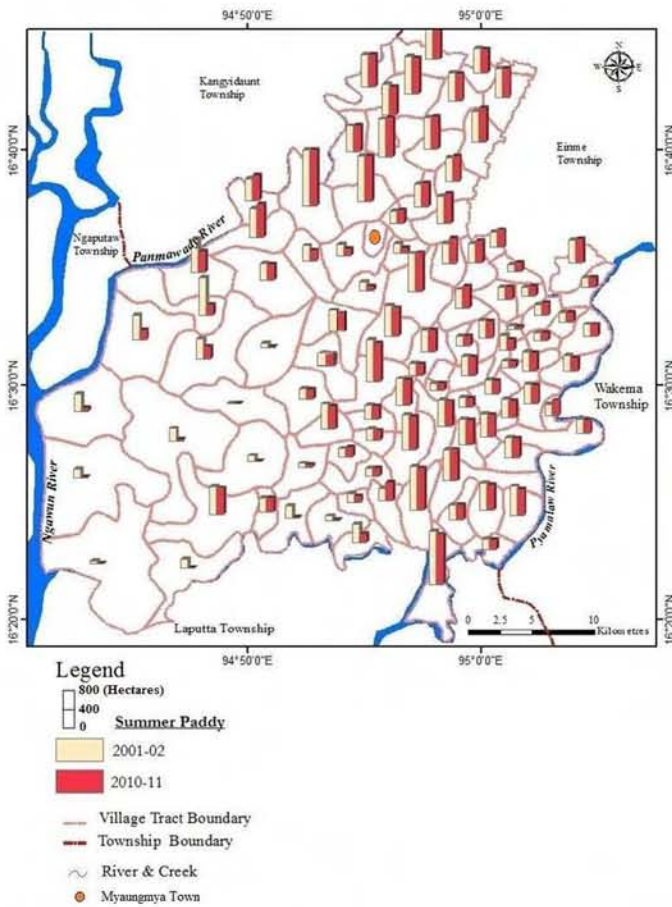


Figure 2. Spatial variation of summer paddy cultivated area in Myaungmya Township

Source: Settlement and Land Records Department

The village tracts with large sown area of summer paddy were Hpayarchaungahsugyi, Mwaytawshansu, Thazinkonegyi, Bamawthonegwa, Kantharkone, Kywechanpaykone, Lutaw and Kywetnwechaung village tracts. Irrigation water is available for these village tracts due to nearness to Myaungmya, Ywe, Panmawady and Pyamalaw rivers, Laputkular and Theinlar creeks and etc. Although summer paddy cultivated area fluctuated but yield per unit area slightly increased in Myaungmya Township (Figure 2).

Summer paddy varieties

Hybrid rice cultivation was started in 1974 for the purpose of increasing productivity per unit area to fulfill the local need as well as to boost amount of export rice (IRRI, 2009).

At present, new government has laid down the guide line to cultivate 100 acres of paddy for the production hybrid seeds in each region. Area occupied by high yield varieties is greater than that of special high yield varieties because the latter need more investment and some farmers cannot afford the cost of inputs (Figure 3).

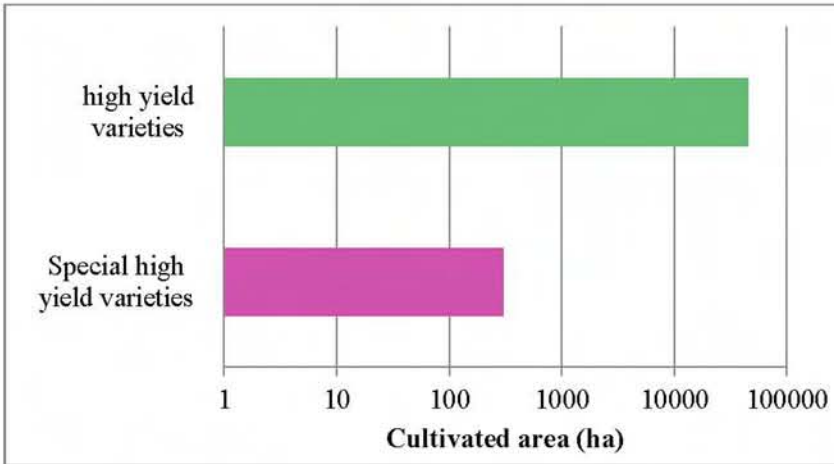


Figure 3. High yield varieties in Myaungmya Township
Source: Settlement and Land Records Department

By 1988, high yield varieties were planted on half of the country’s rice lands, including 98 percent of the irrigated areas. IRRI in Myanmar produced more than 50 new paddy varieties including Shwe War Tun, Sin ThiRi, YaGyaw, Pa Le Thwe, ShweThwe, KyawZe, Shwe Thwe Tun, Yenet, Yar Saba after 1988. Nowadays, short-duration varieties (less than 120 days) are extensively cultivated.

In Myaungmya Township, special high yield varieties and high yield varieties are grown. Special high yield varieties are Palethwe, Vietnam and Belgium (Figure 4). High yield varieties are Theehtupyin, Sinthukha and other varieties such as Marlarhmwe, Theehtupyin, Japan Hnankar and Shwemyanmar (Figure 5). They are short lived and high yield varieties. Although Japan Hnankar's price is high and tastes good, some farmers do not cultivate it because of the existing soils. Japan Hnankar likes sandy meadow soils and dislikes loamy soils.

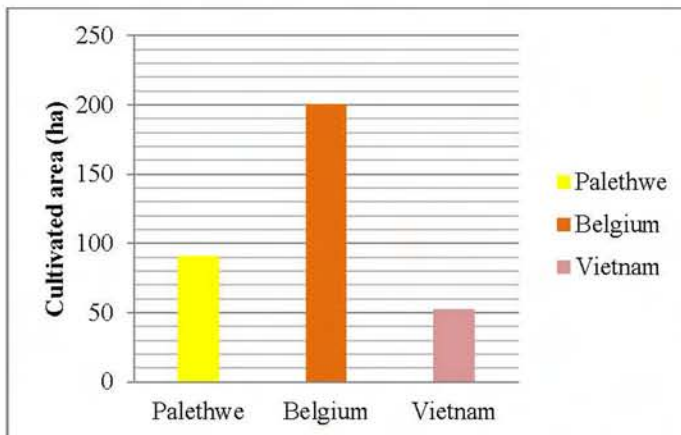


Figure 4. Special high yield paddy varieties in Myaungmya Township
Source: Settlement and Land Records Department

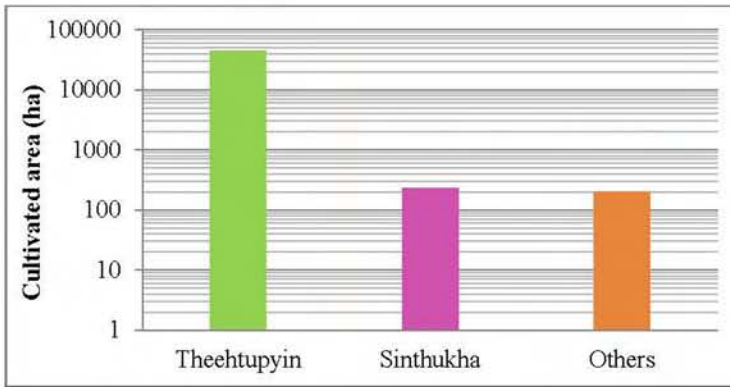


Figure 5. High yield paddy varieties in Myaungmya Township
 Source: Settlement and Land Records Department

III. Factor Affecting Summer Paddy Cultivation

Basic geographic factors support summer paddy cultivation in Myaungmya Township. On the other hand, farming methods, inputs and irrigation have significant influence on summer paddy productivity.

Physical factors

Physical factors such as relief, drainage, climate and soils directly or indirectly influencesummer paddy cultivation of any area.

Myaungmya Township is located in the southwestern part of Ayeyarwady Region and it lies between North latitudes 16°19' and 16°44' and also between East longitudes 94°40' and 95°05' (Figure 6 & Figure 7). It is located within the tropical zone near the equator and temperature and rainfall of the area are very suitable for summer paddy cultivation, if sufficient irrigation water in available.

The area of Myaungmya Township is 1,152.23 sq.km comprising 12 wards (urban) and 98 village tracts. The township is nearly compact in shape. Most of the boundaries are defined by rivers and creek. These creeks and streams support irrigation water for summer paddy cultivation.



Figure 6. Ayeyarwady Region in Myanmar

Source: Survey Department, Map Based on Topographic Map (1:63360)

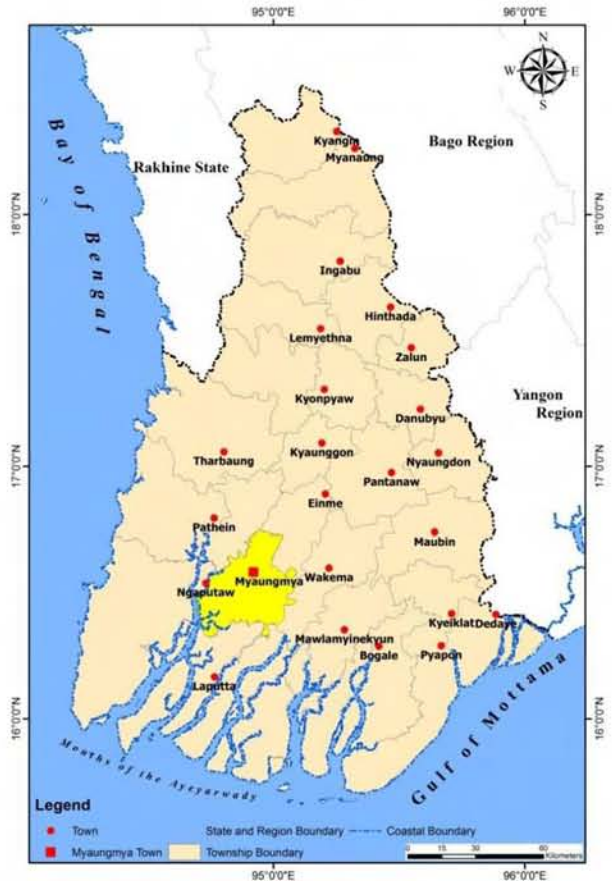


Figure 7. Myaungmya Township in Ayeyarwady Region

Source: Survey Department, Map Based on Topographic Map (1:63360)

Relief and drainage

The study area is located on the Ayeyarwadydeltaic region built up with alluvium. The lowland region is composed of alluvium with an elevation of 7.62 m (25 ft) above the sea level. It is almost a flat plain (Figure 8). The widest plain is seen along the Ywe River. The lowland region has a wide fertile low land, suitable soils for paddy cultivation and small rivers and streams that support irrigation water for summer paddy cultivation.

The major rivers are Panmawady, Myaungmya, Pyamalow, Ywe, Pinlegalay and Pathein (Ngawun). Panmawady, Pyamalow, Ywe and Pathein rivers are distributaries of Ayeyarwady River and flow from north to south. Pya Creek flows in the northern part of the township, Kyonton, Kangyi and Pulu creeks in the northeastern part of the township.

Pyamalow River flows from north to south and serves as an eastern boundary of Myaungmya and Wakema townships. Sakamyar Creek turns west and flows southwest as Ywe River.

Kunchan Stream flows into it from the north while Lutaw Stream flows into the river from the east, Laputkular and Dayeipauk streams flow into Ywe River which flows from the west.

Panmawady and Patheingyi rivers flow in the western parts of the study area. Panmawady River flows as a boundary between Myaungmya and Kangyidaunt townships. Myaungmya River and its distributaries of Laputkular stream flow into the Panmawady River from the east of Myaungmya River which is the main distributaries of Panmawady. Laybettwar Creek flows into this river from the east. Pinlegalay River and PoelaungChaung flow into Patheingyi River from the east.

Existing rivers and streams support irrigation water for summer paddy cultivation in the dry season.

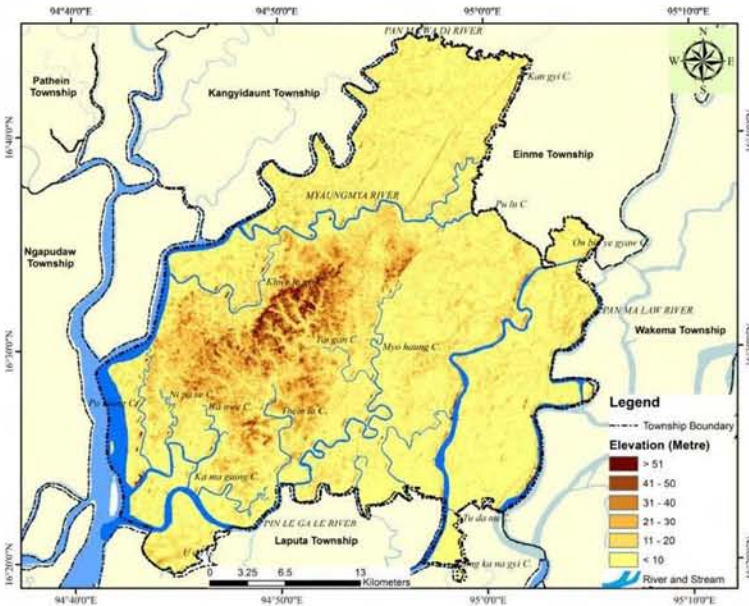


Figure 8. Relief and drainage of Myaungmya Township
Source: Digital Elevation Model

Climate

According to Koppen’s climatic classification, the study area experiences Tropical Monsoon climate (Amwg). Climate directly controls agriculture including summer paddy cultivation. The hottest month is April with a mean monthly temperature of 29.2° C (84.56°F) and January the coolest month with 23.1°C (73.58° F) (Figure 9). Paddy is extensively grown in the area because the optimum temperature for rice cultivation is between 25°C and 35°C (Ghadimezhad, 2014).

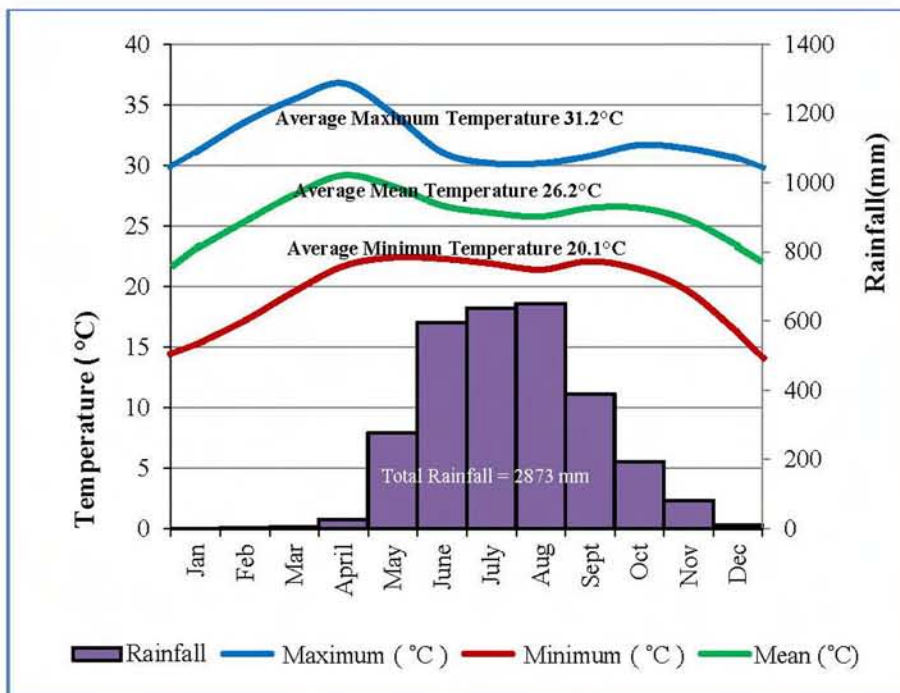


Figure 9. Climograph of Myaungmya Station (1981 to 2010)
 Data Source: Meteorology and Hydrology Department, Myaungmya

Myaungmya Township is one of the areas that receive high amount of annual rainfall in Myanmar. The average annual rainfall in 1981- 2010 period was 2,873 mm (113.11 inches) (MyintMyint Win, 2014). Water requirement is high for summer paddy cultivation because of high temperature and scarce rainfall in the hot dry period. Summer paddy is grown with the help of irrigation.

Water balance

In the area, ground Water Recharge is found until November and December. Then, from January to April, water deficit occurs. Therefore, it is difficult to grow summer paddy in dry season. But summer paddy is widely grown with the help of irrigation water (Figure 10).

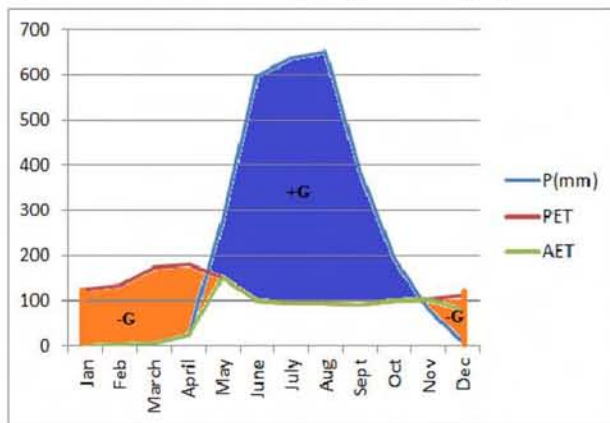


Figure 10. Water Balance of Myaungmya Township

Source: Own calculation, Data from Meteorology and Hydrology Department, Yangon

Soils

Soil types vary from place to place depending on climate, relief, parent material, vegetation and time, human and animal activities. There are ten types of soils of which Meadow alluvial soils (*Fluvisols*), Brown meadow soils (*Gleysols*), Light brown meadow soils (*Gleysols*), Brown meadow slightly gley soils (*Gleysols*), Meadow gley swampy soils (*HumicGleysols*), and Meadow gley soils (*Gleysols*) support summer paddy cultivation in the area (Figure 11).

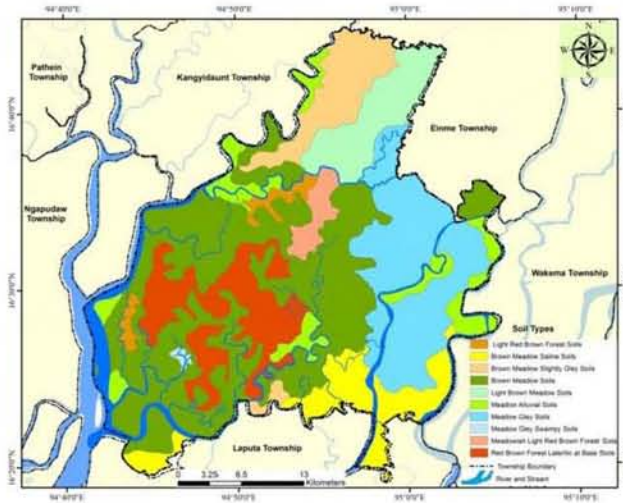


Figure 11. Soil Types of Myaungmya Township
 Source: Land Use Department, Yangon

Socio-economic factors

Urban and rural population

Generally the number of rural or urban population unfolds the major economy of the area. In 2015, total population was 298637 persons of whom urban population was 44795 persons (15 per cent) and rural population 253841 persons (75 per cent) (Figure 12). It shows that most of the population lives in the rural area and depends on agriculture.

Labour force and occupation

There were 241,857 people in 2011 of which 58,398(24.14per cent) were aged under 15 and 28,456 (11.77per cent) were age above 60 years. Thus dependency ratio was 35.91 per cent of total population and the remaining 155,003 (64.09per cent) represents the working age-group (Figure 13).

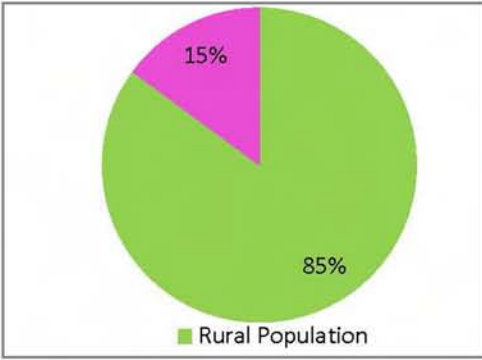


Figure 12. Urban and rural population of Myaungmya Township

Source: Immigration and Man Power Department, Myaungmya

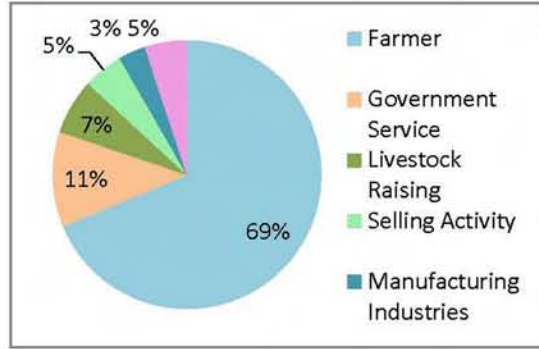


Figure 13. Labour force of Myaungmya Township (2010-2011)

Source: Planning Department, Myaungmya Township

In 2011, Myaungmya Township had a total population of 241,857 persons and the occupied area was 88,393.2 hectares (220,983 acres) and the man-land ratio, 1:0.37 hectare (1:0.91 acre). There were 18,921 peasant families and the average land holding size per peasant family was 4.67 hectares (11.67 acres) in 2011. Most of the village tracts with land holding per peasant family have between 4 and 8 hectares (10 and 20 acres).

The numbers of peasants who possess less than 2 hectares of *le* land were highest with 37.84per cent of the farmers and the average farm size was also 0.81 hectare or 2.03 acres in 2015.

Economy

The major economic activities of the area are agriculture, fishery, forestry, industry construction and mining. As major economic activity is agriculture, agriculture ranked first in net production value in Myaungmya Township (Table 1).

Table 1. Net production value in Myaungmya Township in 2014-2015

Production Sector	Percentage
Agriculture	68.45
Industry	20.03
Livestock and Fishery	7.73
Construction	3.50
Forestry	0.14
Mining	0.15

Source: Planning Office, Myaungmya.

In agriculture sector, paddy and pulses are chiefly grown for sale due to favourable relief, climate and soil, while the areas under oil seeds, vegetables and perennial crops are less extensive.

Market price

Global rice demand continues to be driven by population growth and economic growth in Asia and Africa (IRRI, 2010). It also affects market price of paddy in Myanmar and it is one of the most significant determining factors for summer paddy cultivation. Fluctuation of market price affects summer paddy cultivation.

Institutional factors

Policy

Since 2003, the government has changed the policy of selling rice and rice products and it allowed buying and selling paddy freely within the country.

To cultivate summer paddy, six means for exploiting water resources are being applied by the Ministry of Agriculture and Irrigation (2011). These are:

1. Construction of new dams and reservoirs,
2. Storage of water flowing from watershed area,
3. Renovation of existing dams and reservoirs,
4. Damming of creeks and rivers
5. Pumping water from rivers and creeks, and
6. Pumping water from underground.

On the other hand, to increase summer paddy production, government lends seasonal loans with an interest rate of 2 percent to farmers and distributes the necessary inputs (e.g., fertilizers, quality seeds, and farm machinery).

IV. Major Requirements in Summer Paddy Cultivation Inputs

In summer paddy cultivation, input includes fertilizers, pesticides, labour, irrigation water, etc.

In paddy cultivation, scientific application of fertilizers and manures is an important aspect. With regard to land preparation for cultivation, farmers are making more widespread use of low-cost natural inputs such as cow dung, lime, natural compost, and nitrogen treatment in order to manage and improve soil quality. Rice production employed 40 percent of the total labor force and consumed 70 percent of total commercial fertilizers (Myanmar and IRRI, 2000). Production is increased by applying of T-super and Potash in the early phase of flowering stage.

The optimum need for 0.4 hectare (one acre) of high yield paddy strain is 220 pounds (2 bags) of urea, 165 pounds (1.5 bags) of T-super and 55 pounds (0.5 bag) of potash (KyawMyint, 2004, p-112). Urea is used for growth of paddy plant, T-super increase the yield per unit area while potash protects plants from diseases (NyiNyi, 2004, p-139). During the period of high yield paddy programme implementation, chemical fertilizers were distributed at reasonable price until 1985-86, and as a result the yield per unit area increased

considerably. However, the government ceased distributing chemical fertilizers in the subsequent years.

The use of chemical fertilizers and pesticides remained very low in Myanmar (Tin HtooNaing, 2014). Now, farmers became aware the effects of chemical fertilizer on paddy yield. In 2010, 2.5 bags of urea per ha (a bag of urea per acre) was applied in summer paddy cultivation but in 2015, amount of urea used increased to 5 bags of urea per ha (2 bags of urea per acre).

After 2004 both rice procurement and chemical fertilizer distribution were abolished and the price of urea went up continuously. Increased labor wages and inadequate agricultural loans have led to lower use of fertilizers (Tin HtooNaing, 2015).

Labour

Farm labour is indispensable for the development of agriculture. Labourers constitute a vital input in agricultural production, but they are migrating to different parts of the country for earning a better livelihood, adding to the existing imbalance between labour demand and supply of labourers (Deshingkar, 2003). The important reasons identified for the labour scarcity include higher wages in other locally-available jobs, seasonal nature of agricultural jobs and presumption of an agricultural job to be of low esteem (Prabakar, 2011).

In Myaungmya Township, most young adults move to other urban areas to get high wage and better life, labour problem is distinct in harvesting and transplanting periods. As farm mechanization level is still low, manual labour is a critical factor in any type of agricultural activity. In the transplanting period, migratory labour from Dry Zone especially from Monywa, Magway, Pakokku are used in cultivation as it is necessary to cultivate nurseries in time.

Weeds are one of the major problems of production process for lowland rice (*Oryza sativa* L.). In order to control weeds, there are different ways all over the world such as hand weeding methods, chemical weeding, mechanical weeding and a combination of them. In the study area, last ten years ago, farm labours were used in removing weeds. Nowadays, farmers use chemical weeding methods because of high cost of labour.

Labour cost is getting higher due to labour shortage. Labour cost in paddy cultivation was 2000 ks per day in for each labourer 2012, 3000 ks per day in 2014, 4000 ks per day in 2015 and present labour cost is 4500 ks per day.

Irrigation

In the study area, water is acquired for irrigation from rivers and streams because the area possesses many rivers and streams being a deltaic area.

Paddy plants are designated as the plants that consume much water than other plants. In experimental plots, a paddy plant takes between 1,100 and 1,200 liters of water to produce 1 kg of paddy rice (Rabbinge, 1993). Therefore, water requirement is high in summer paddy cultivation. Amount of irrigation water mainly depends on type of soil. It is necessary to irrigate at least 4 times on sandy soils and 3 times on loamy soils.

Mechanization

Farm implements are necessary for land preparation, tilling, weeding and harvesting. The important implements are plough, harrow, hand-pushed tractors, rotary harrow, weeding gadgets, chopping hoe and sickle.

In Myanmar, production for cultivation, harvesting, and postharvest equipments for small-scale farms had been encouraged. Private firms and the Agricultural Mechanization Department had produced push welders, tillage tools and seeders, and treadle pumps (Myanmar and IRRI, 2000).

Mechanization affects the growing period of rice and it is a major factor that enhances double cropping in an area. Agricultural machinery use is gaining momentum in Myaungmya Township because farmers want to reduce growing period of paddy and to cultivate summer paddy in the cool dry period.

V. Current Farming Practice and Cost-Benefit Analysis in Summer Paddy Cultivation

In Myaungmya Township, 95 per cent of the farmers cultivate summer paddy on more than 90 per cent of the monsoon paddy cultivated area. Four farming practices are found in the area.

The first type includes farmers who own summer paddy cultivated area of more than 20 ha (50 acres) cultivate systematically and carefully. They have much investment and they use much input in paddy cultivation. They practice intensive paddy cultivation.

Farmers in the first group are rich and they have sufficient investment and they use sufficient inputs guided by staff of Agricultural Department. Some practice broadcasting method in summer paddy cultivation because of labour shortage.

They use agriculture machinery in plowing. They mainly use hand-pushed tractors which are made in China. The value of it is about 20 lakhs and some farmers lend agriculture machinery from the Rich and agricultural company. A hand-pushed tractor takes only 8 hours to plough a farm with an area of a hectare (2,471 acre). Rental cost is 20000 ks per day. Diesel cost is 3000 Ks per ha. To drive it, labour cost is 5000 ks per day. Therefore, total cost of plowing is about 30000 ks. They tilled their land twice to get high yield in paddy cultivation.

The seeds cultivated are high yield varieties because they have sufficient investment and they intend to get higher yield per unit area. Quality seeds are more expensive and the price is 8500 kyats per basket (185 kyats per lb).

Chemical inputs uses differ from one farmer to another. At the stage of tilling, they use weedicide to kill weeds. Shwenangar weedicide is most popular in that area and they use 2.5 bags per ha (one bag per acre) to protect the field from weeds. Price of a bag of Shwenangar weedicide is 18500 kyat. They also applied chemical fertilizer according to guidance of agriculture staff. They use 2 bags of Urea and 2 bags of T super per acre in summer paddy cultivation.

Labour cost includes costs of plowing, harvesting, pumping water and spraying pesticides. Although machineries are extensively used in plowing, manual labour is still mainly used in harvesting, pumping water and spraying pesticides. Average labour cost is 4000 ks per day and total labour cost is round about 100000 kyats.

Harvesting is also done by using harvesting machine. The price of harvesting machinery is too high and they do not buy the machinery. Most of them rent it and the cost is 100,000 ks per ha (40000 ks per acre) (Table 2).

Table 2. Cost- benefit in summer paddy cultivation (First farming practice)

Items	Cost/ acre	Cost/ ha
Tillage (machine)	15000	36000
seed (8000x3.5)	28000	69188
input costs		
Shwenagar weedicide	18500	45713.5
Urea 2 bags	40000	98840
T super 2 bags	30000	74130
labour cost	100000	247100
Pumping cost (5000 ksx3times)	15000	37065
Others	20000	49420
Harvesting	40000	98840
Total cost	306500	757362
return (100 basketsx6000 ks)	600000	1482600
Net benefit	293500	725239

Source: interview (2015)

Pumping cost varies from one place from another because of different soils. In some places, soils are sandy and the soils need more water. Generally, water is irrigated three times before harvesting. The cost of diesel is 5000 ks for irrigating one time and they irrigate 3 times. Therefore, total diesel cost is 15000 ks per acre. Diesel cost differs from one farmer to another because of existing soils. It is necessary to irrigate water 3 times on loamy soil but 5 times on sandy soils. Most farmers irrigate water three times.

Therefore, farmers get high benefit and they get 725239ks per ha (293500 ks per acre) due to high productivity which is resulted from high investment.

In the second group, the farmers cultivated summer paddy with their own investment for selling seeds to farmers in the area and to other areas. They get guidance of staff of agricultural department and they follow the guidance exactly to produce quality seed. They are very interested in paddy cultivation.

Rice production requires a high level of inputs the higher amount of fertilizers and pesticides that this system requires (Vitery 2007, p. 145). Fertilization cost ranked as the third highest cost after labor and mechanization. In fact, fertilizer costs represent 22.37 per cent of the total cost. The fertilization consists of macro-nutrients such as Nitrogen, Phosphorus, Potassium, Magnesium, Calcium and Sulfur, and also micro-nutrients such as Chlorine, Copper, Manganese, Zinc, Boron, Iron, and Molybdenum. Farmers usually apply the macro-nutrients as granular fertilizers, and the micro-nutrients as liquid that are applied jointly with the pesticides. Nitrogen is the most important nutrient for rice production and the urea is the most used fertilizer because it is composed of 46 per cent of nitrogen. However, the portion of urea actually used by rice plants is very low (Vargas, S.A.M., 2012).

Farmers in the group are also rich and they have much investment. They really understand systematic seed producing technology and use farm input sufficiently. They use much amount of investment in paddy cultivation for the purpose of producing quality seeds.

Cost of cultivation is larger than that in the first group. To produce quality seed, farmers till the land thoroughly. Therefore, cost of labour, rental cost of agriculture machinery and diesel cost is higher in land preparing stage.

Table 3. Cost- benefit in summer paddy cultivation (Second farming practice)

Items	Cost/ acre	Cost/ ha
Tillage(machine)	15000	37065
input costs		
seed (10000x2)	20000	48000
Fungicide & Pesticide	20000	48000
Potash 0.5 bags	13000	31200
Urea 1.5 bags	30000	72000
T super 1 bags	20000	48000
Harvesting	60000	144000
labour cost	200000	480000
Pumping cost (5000 ksx3times)	15000	36000
Others including lime)	20000	48000
Total cost	413000	991200
return (90 basketsx9000 ks)	810000	2001510
Net benefit	397000	1009245

Source: interview (2015)

They cultivate high yield quality seed to get high quality seeds. They need nearly 5 baskets per ha (1.5 baskets per acre) of seeds. Amount of seeds used is lower than that used in first group. They practice transplanting method in which systematic method (6 inches x 8 inches apart) are applied. Although the number of plants in an area is lower, the production and seed quality is higher due to sufficient nutrients. Price of seeds for cultivation is higher than seeds for consumption because of high quality seeds. Price of seeds is about 10000 ks per basket.

Labour cost is much higher because of intensive labour use. Systematic cultivation method needs much amount of labour and it takes more time. About 20 or 25 labours are needed to finish an acre of paddy. It costs much because of labour cost and some farmers cannot afford to cultivate summer paddy and to use the method. They cost more on planting and harvesting. Total labour cost is about 200,000 ks for the production of summer paddy seeds.

The price of seeds for cultivation is higher and it is about 9000 kyats per basket. Although they cost much investment, they get higher price and higher net income. Therefore,

farmers get high benefit and they get 725239ks per ha (293500 ks per acre) due to high productivity which is resulted from high investment (Table 3).

In the third group, the farmers cultivated summer paddy with their own investment for the purpose of getting household consumption and selling. But, they have not sufficient investment and they cannot afford to buy sufficient amount of inputs. They use less amount of input and get low yield.

Table 4. Cost- benefit in summer paddy cultivation (Third farming practice)

Items	Cost/ acre	Cost/ ha
Tillage (manual)	15000	37065
seed (8000x3.5)	28000	69188
Input costs		
Pesticide	10000	24710
Urea 1 bags	20000	49420
T super 1 bags	20000	49420
Harvesting	40000	98840
labour cost (weed removing, manual harvesting, pesticide spraying)	80000	197680
Diesel cost	10000	24700
Total Cost	213000	551023
return (75 x6000)	450000	1111950
Net return	237000	560827

Source: interview (2015)

Agriculture machinery is rarely used in this group because they do not have much investment. They usually practice broadcasting method to reduce labour cost. Therefore, only two labours are needed for seeds broadcasting and labour cost is low in seed broadcasting period. Total labour cost is about 100,000.

Moreover, they use less input. Authorities concerned guide to use 2 bags of urea per ha, but most farmers in the group use 1 or 1.5 bags per of urea. One bag of t-super per acre is applied though the authorities instruct to use 2 bag of t-super per acre. It affects yield per unit area and gives low return.

They do not use weedicide because they practice traditional method. Family members remove weeds reducing labour cost. Diesel cost is about 10000 kyats per acre. Their net benefit is 560827 ks per ha (237000 ks per acre) (Table 4).

The last group cultivated monsoon paddy with the support of private agricultural company. They have to cultivate under the guidance of private companies such as Armo, Myanmar Awbar, etc. They get only 200, 000 ks for summer paddy cultivation. Poor farmers practice the system because they do not need investment.

VI. SWOT Analysis of Summer Paddy Cultivation on Economy of Local Farmers

To illustrate the effects of summer paddy cultivation on economy of local farmers, SWOT analysis is applied. Therefore, farmers are grouped into two depending on their economy. They are rich farmers and poor farmers. The swot analysis has two parts: the first part is summer paddy cultivation of the rich farmers and the second part the poor farmers.

Strengths of the rich farmers on paddy cultivation are as follows:

<p>Physical Factors</p> <p>Less Risk Summer paddy cultivation is lesser risk than monsoon paddy cultivation because of lack of untimely rain and irregular climatic condition.</p>	<p>Social Factors</p> <p>More understanding on paddy cultivation They understand modern paddy cultivation methods.</p> <p>Getting aid of agricultural staff They frequently discuss on paddy cultivation with staff to realize the new methods, new varieties, pest, etc.</p> <p>Knowledge on paddy cultivation Under the guidance of agricultural staff, some farmers read papers and journals to understand systematic cultivation and the use of modern inputs.</p>
<p>Economic Factors</p> <p>Much investment. Farmers in the group are rich and they have much investment. Their farm size is large and the much investment they use are the main causes of high production.</p> <p>Higher Productivity Productivity of summer paddy is high due to less risk and high temperature.</p>	<p>Technological Factors</p> <p>Mechanization They use agricultural machinery in paddy cultivation. Although it costs more, it takes shorter period of time than traditional paddy cultivation.</p> <p>Sufficient inputs They use sufficient inputs in paddy cultivation and the production and return are also high.</p> <p>Using high yield varieties All farmers cultivate high yield varieties to get high return.</p> <p>Quality seed availability Some farmers cultivated paddy as seed farms. Therefore, seeds are easily available for intensive farming.</p>

Strengths of the poor farmers on paddy cultivation are follows:

<p>Environmental Factors Less Environmental deterioration They use fewer amount of fertilizer and pesticides to reduce cost of cultivation. It causes less environmental deterioration.</p>	
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Weakness found in summer paddy cultivation of the rich farmers group is high labor cost. In systematic transplanting method, labour requirement and labour cost increase. To finish transplanting and harvesting in time, 25 labours are needed for an acre of summer paddy.

Weakness of the poor farmers on paddy cultivation is as follows:

<p>Physical factors Small Farm Size Their farm size is small and mostly rectangular in shape. It is difficult to use machinery in tilling and harvesting. Therefore, work efficiency is low.</p>	<p>Social Factors Health problem While they are spraying pesticides, they do not use masks and body protection. It is also harmful to human health. Less contact to staff Poor farmers do not usually go to Agricultural Department and they do not get guidance from the staff. less awareness on pests Poor farmers do not have sufficient knowledge on pest and pesticide.</p>
<p>Economic Factors Expensive inputs Chemical inputs are expensive and they have less investment. They use insufficient amount of input. Low yield As a consequence of low input use, their productivity is low. High cost of diesel Farmers use diesel in river water pumping for summer paddy cultivation. Diesel price is higher in that period because of Thingyan Festival. Therefore, they cost more. No external support and Insufficient loan Amount of loan for paddy cultivation is</p>	<p>Technological Factors Low adoption of farm machineries Farmers have less amount of investment and they cannot afford to buy agriculture machinery. Lack of cow dung Most farmers rent and use agricultural machineries in paddy cultivation. They do not have cow dung due to lack of draught animals. Unsystematic cultivation method They practice broadcasting method because of labour shortage.</p>

<p>about 250,000 ks per ha (100,000 ks per acre). It is insufficient for paddy cultivation.</p> <p>No input support</p> <p>Cost of fertilizer and pesticides increased as government have stopped the fertilizer support since 1990s.</p>	
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Opportunity of the rich farmers on paddy cultivation is as follows:

<p>Adequate Water availability</p> <p>Existing stream networks support irrigation water.</p> <p>Locational advantage</p> <p>Myaungmya is situated in deltaic area which is one of the best areas for summer paddy cultivation.</p>	<p>strong market demand</p> <p>Summer Paddy is extensively cultivated in the area due to staple food and strong market demand.</p>
<p>Greater rural population</p> <p>In the study area, rural population is greater than urban population and most labours are engaged in agriculture. It supports summer paddy cultivation.</p>	

There is no opportunity of the poor farmers on summer paddy cultivation because they have no investment, lack of knowledge on chemical input, technology as well as their traditional belief.

Threat of the rich farmers on paddy cultivation is as follows:

<p>Environmental deterioration</p> <p>Most farmers cultivate paddy twice per year. They use much chemical fertilizers and it affects environment.</p> <p>Soil deterioration</p> <p>Overusing of soil causes soil deterioration and productivity of soils is low. Excessive use of chemical fertilizers and pesticides affect physical and chemical properties of soils.</p>	<p>Human health problem</p> <p>Farmers really know the effects of pesticide on paddy cultivation but they use them to protect their plant. It affects not only environment but also health of labours.</p>
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Threat of the poor farmers on paddy cultivation is as follows:

<p>No strong embankment</p> <p>In the lower part of the area, salt water intrudes into the paddy field in November. It affects and reduces paddy productivity.</p>	<p>Lack of knowledge</p> <p>They do not have much knowledge on paddy cultivation and using pesticide. It causes environmental deterioration and health</p>
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	<p>problem.</p> <p>Ineffective Training They are poor and do not have much knowledge on paddy cultivation.</p> <p>Labour shortage Poor farmers cannot hire agricultural machinery to plow the land. They depend manual labour and labour cost is high due to labour shortage.</p>
<p>Less investment They do not have sufficient investment and they do not use sufficient amount of inputs.</p> <p>Fluctuation in market prices The farmers depend on income from summer paddy cultivation. When the price is low, they get less profit and they are in debt.</p> <p>High interest rate Agricultural loan from Agriculture Bank is insufficient for paddy cultivation and they have to lend the loan from private money lender. High interest rate is one of the factors that decrease the return from the paddy cultivation.</p>	<p>Lack of support on chemical input Authorities concerned do not support agricultural inputs for summer paddy cultivation and they usually buy agricultural input from private shops.</p>

Summing up, according to interviews and field survey's results, many strength are distinctly found in the groups of rich farmers, with less weakness. The poor farmers, however, encounters many weaknesses because they possess less investment.

VII. Conclusion

Mayungmya Township is located in deltaic area which is one of the best cultivated lands in Myanmar. Ayeyarwady possessed largest summer paddy cultivated area in 2015. Existing physical conditions support the summer paddy cultivation. Topographically, it lies on low land and existing drainage conditions support irrigation water for summer paddy cultivation. The temperature and rainfall received are favourable for paddy cultivation. Most area is covered with meadow soils which are favourable for paddy cultivation.

Although it is insufficient for paddy cultivation, farmers get the loans about 250,000 ks per ha (100,000 ks per acre). Moreover, departments concerned support technology and information necessary for summer paddy cultivation.

Summer paddy is mainly cultivated where irrigation water is available. Depending on practices of paddy cultivation, farmers are classed into four: intensive cultivators, seed distributors, cultivators for household consumption and land tenants. Of these four types, intensive cultivators and seed distributors get much rent return because of systematic

cultivation and high investment. Farmers in third group get lower income than farmers of first and second groups but higher than farmers of fourth group. The fourth group gets lowest income due to lack of investment.

Like other aspects, the rich farmers have many strength and opportunities. They have much investment and they understand how to cultivate the paddy to get high yield. They take advice of the staff of agriculture department and they read the papers on agriculture. They use sufficient amount of input and they get high yield.

The poor farmers encountered much weakness and threats in summer paddy cultivation. They possess less investment and it is insufficient for summer paddy cultivation. Sometimes, they lend money from private lenders and they have to pay high interest rate. It also causes low return.

Summer paddy is cultivated after harvesting monsoon paddy and it is necessary to finish harvesting in time. Therefore the best way is the purchase of machineries by cooperative societies, private groups and non-government for the purpose of hiring them to poor farmers.

Some farmers use much amount of chemical fertilizer in summer paddy cultivation to get high yield and it causes such environmental deterioration as soil degradation. Therefore, education programs on summer paddy cultivation that causes less environmental impact should be initiated. Moreover, Education programs that enhance the capacity and skills of farmers to understand and solve problems of pests should be undertaken in close collaboration with government organization and nongovernment organizations.

The systematic management and efficient use of irrigated water should be promoted to maintain soils quality. Authorities concerned should renovate irrigation canals, hire agriculture machineries at a reasonable price, collect fund on emergency support to farmers when they are in need and control the market and price which are major items affecting income derived from paddy cultivation.

In the future, the importance of paddy cultivation may increase with increasing population. Therefore, it is necessary to extend summer paddy cultivated area to get high productivity. By cooperating between farmers, local authority's concerned, governmental and non-governmental organization, paddy cultivated area and productivity will be increased with less environmental impacts which lead to sustainable paddy cultivation in the area.

Further researches on the effects of chemical inputs on soil deterioration, soil deterioration caused by irrigation, etc should be done with the intention of getting successful summer paddy cultivation through systematic irrigation and input uses.

Acknowledgement

The receipt of the research funding for this research from the Asia Research Center, Yangon University is gratefully acknowledged.

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