Cropping Systems and Economy of Small Holder Farmers in Hinthada Township, Ayeyarwady Region

Myint Thida[1], Saw Sanda Win[2] and Thin Thin Oo[3]

Abstracts

The paper tried to present cropping systems and its effects on economy of the local people of the Hinthada Township from geographical point of view. In the study area, existing physical bases support crops cultivation and most farmers practiced double cropping. Choice of system depends on location of the field and investment of the farmers. Some farmers practice mono cropping due to its physical condition located in Low Land area. They cultivate paddy only at the end of the rainy season. Farmers who cultivate paddy in the rainy season and black gram in the cool dry season get more income due to price of black gram and soil suitability. The objectives of the paper are to present reasons for choosing cropping system, to understand the net return of the crops, and to explore problems in crops cultivation. To present this paper, primary data such as income, problems in crop cultivation, price, etc were mainly used and these were collected by interview, informal talks and group discussion.

Keywords: cropping system, yield, income, problems

INTRODUCTION

Today, the world faces challenges that are different from the ones 60 years ago. Further increases of agricultural production are urgently needed to meet the growing demand of a world population that is predicted to reach about 9 billion by 2050 (FAO 2011). Choice of crops and cropping system are important to meet the basic need in food security as well as poverty reduction.

Myanmar was once considered the 'pearl of the orient'. In the 1960s, the nation was a leading rice exporter in the global rice market. Rice is very important in Myanmar and is cultivated on 64% of the country's arable land—more than eight million hectares. Rice farming involves more than five million rural households (Australian government, 2007). Rice is the main crop of the country and important for food security as well as for export.

Ayeyarwady region is designated as rice bowl of the country and occupies the largest rice production area of 5 million acres (2.02 mil ha) which is representing 26 % of the total rice area of Myanmar. Myanmar is one of the leading countries of pea and bean production among ASEAN member countries. In addition to rice, pulses crop, especially black gram, are commonly grown as second crops after rice. Ayeyarwady Region plays an important role in pulse production in the country as 20 % of all pulses are grown (Report, 2014).

About 17 species of peas and beans are cultivated in the country. Major exportable species are green gram, black gram, pigeon pea, chickpea and soybean. Black gram and green gram are mainly grown in Ayeyarwady Region. The average farm size of land holding in Ayeyarwady Region is estimated as 3.31 ha (Report, 2014). In Hinthada Township, paddy is mainly cultivated in the rainy season and medium and short lived varieties are mainly cultivated for the purpose of cultivating second crops. Double crop cultivators get more income because of locational advantage. Farmers who own the field in the low land do not have a chance to cultivate twice and they get low income although they only cultivate paddy and they get high yield.

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Choice of cropping system is affected by existing physical conditions especially topography of the area and it somehow affects the income derived from crops cultivation and economy of the farmers. Therefore, Hinthada Township is selected as the study area to analyze the cropping pattern and economy of the small holder farmers from Geographical Point of view.

Study Area

Hinthada Township possesses extensive paddy and pulses cultivated areas. Low land paddy cultivation is found in the rainy season and pulses are cultivated as double crop in the cool dry period.

Research Problem

Different cropping systems such as paddy-pulses, paddy, etc. are found in the area. Cropping systems vary from one place to another and the common cropping system is paddy –pulses system. Cropping system choice is affected by topography of the area and it, in turn, affects the economy of the local people. The research problem of the paper is: "Cropping systems affect the economy of local farmers in Hithada Township".

Aim and objectives

The main aim of the paper is to find the ways that can support economy of the local people

The objectives of the paper are:

- to present reason for choosing cropping systems,
- to understand the choice of crops and crop cultivation periods, and
- to understand the net return of the crops.

Data and methodology

To present the paper, primary data was mainly used. Primary data include perception of the farmers, crop choice, input uses and net return. To get primary data, the village tracts were selected by purposive sampling to get through understanding on cropping systems and economy of the farmers. The farmers who own more than 3.31 ha (8 acre) were not selected for interviewing because the paper emphasizes the economy of small holders. Among 103 village tracts, 10 village tracts in which both mono cropping and double cropping were selected to study cropping system in detail. To present net return of the crop cultivation, cost-benefit analysis was done and presented.

GEOGRAPHICAL BACKGROUND OF THE STUDY AREA

Hinthada Township is located on the western bank of the Ayeyawady River and Hinthada Township lies between North latitudes 17˚26' and 17˚48' and also between East longitudes from 95˚11'to 95˚33' (Figure 1). It is situated on the deltaic plain of Ayeyarwady Region and southern part of the Hinthada District. The total area of the Hinthada Township is 980.81 square kilometers (378.695 square miles). This township is made up of 21 wards, 103 village tracts and 820 villages.

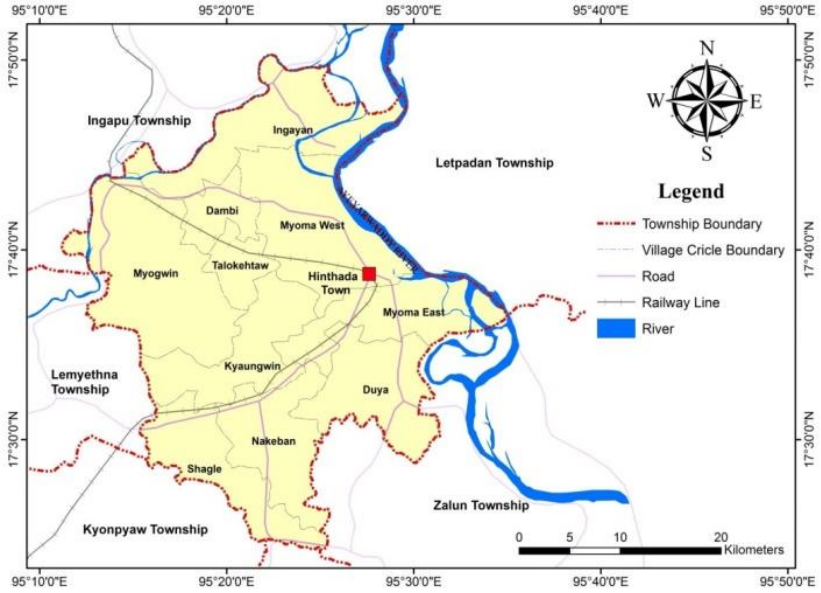


Figure (1). Location of Hinthada Township. (Source: Kyaw Min Htike, 2015)

This township has a large low-lying plain with the mean elevation of 44.3 feet above sea level (Figure 2). Therefore the study area is suitable for low and paddy cultivation.

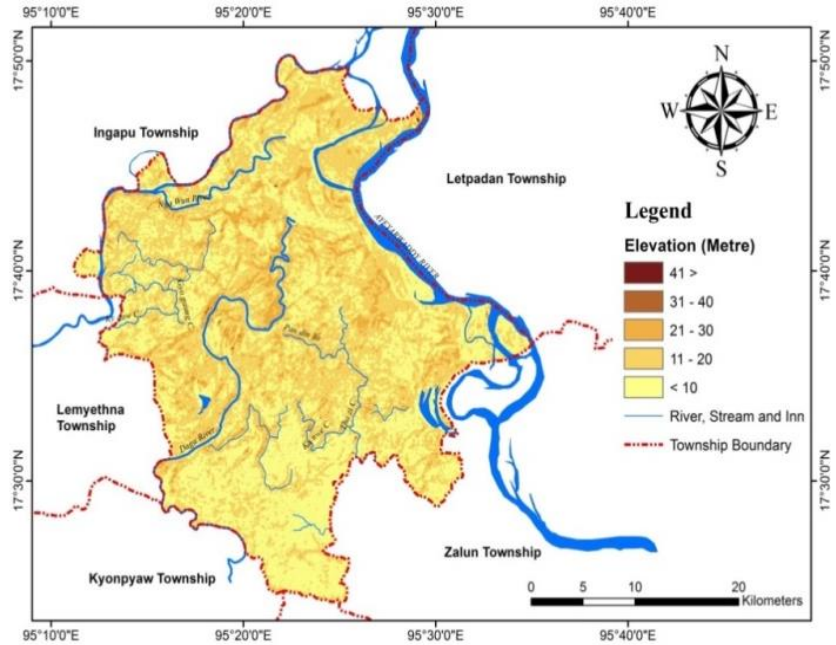


Figure (2). Relief of Hinthada Township. (Source: Kyaw Min Htike, 2015)

According to the Koppen's climatic classification, the study area experiences the Tropical Monsoon Climate (Am). The maximum temperature is 35.91^{o}C in April and the minimum temperature is 19.09^{o} C in January. The mean annual rainfall of this region is 2252.71 mm (Figure 3).

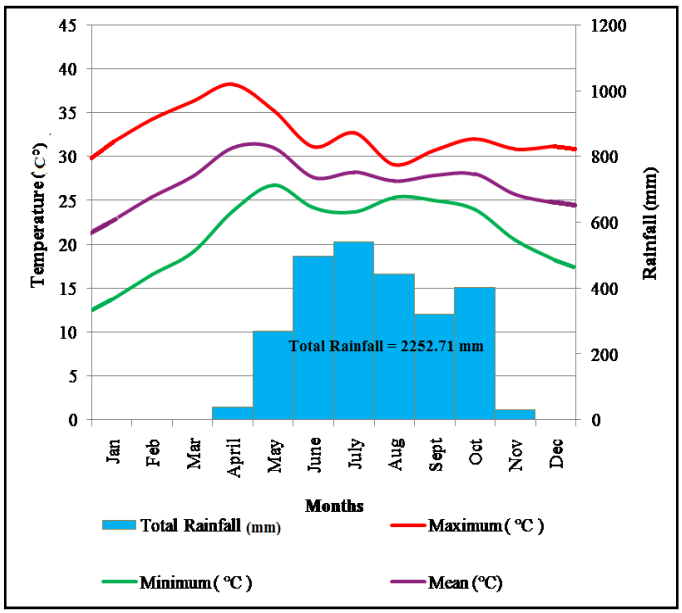


Figure (3). Climograph of Hinthada Township. (Source: Kyaw Min Htike, 2015)

Depending on location and elevation, soils differ from place to place and they are classified into six types.

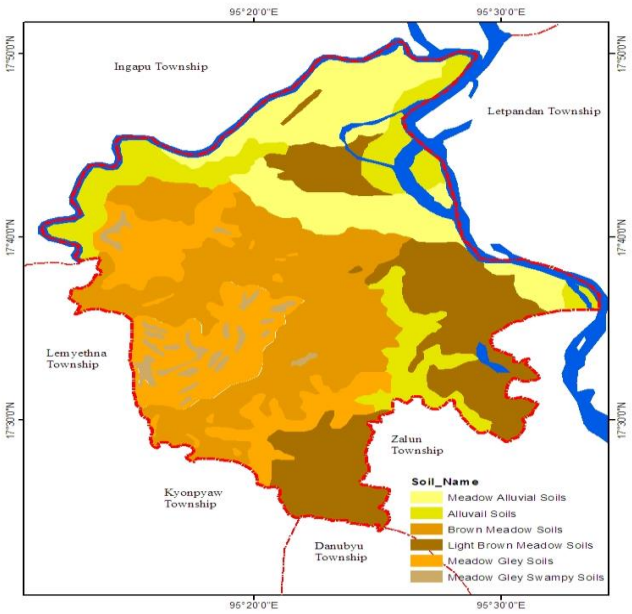


Figure (4). Soils of Hinthada Township. (Source: Kyaw Min Htike, 2015)

These are Meadow Alluvial Soils (Fluvisols), Alluvial Soils (Fluvisols), Brown Meadow Soils (Gleysols), Light Brown Meadow Soils (Gleysols), Meadow Gley Soils (Gleysols) and Meadow Glay Swampy Soils (Humic Gleysols). Existing soils support paddy cultivation (Figure 4).

Therefore, exiting physical conditions are favourable for paddy and pulses cultivation.

RESULTS AND FINDINGS

Cropping systems of Hinthada Township

As Hinthada Township is located in the deltaic area, the most fertile area in Myanmar, more than 30 crops are cultivated among the 60 crops cultivated in Myanmar. But, paddy and pulses occupies the largest percent of agricultural land due to staple food, market demand and price.

The crops covering small percentage of agriculture land were omitted and major cropping systems are illustrated to present distinct cropping system. In the study area, two cropping systems are distinct: paddy-pulses and paddy.

According to field survey, 81 percent of the farmers lived in the area practice paddy pulses system and the rest cultivate paddy only. Farmers who own the field on higher part practice paddy pulses system and those at lower part cultivate paddy only when the water recedes at the end of October. This paddy is locally called as *Muyin* paddy.

Paddy and Pulses Cultivation in Hinthada Township

Rain fed paddy is extensively cultivated in the area because of suitable physical conditions. Summer paddy cultivated area is only 0.8 percent of total paddy cultivated area because the cost of summer paddy cultivation is high and farmers have low capital investment. In Monsoon paddy cultivation, productivity is low with 3.5 tons per ha (70 baskets per acres). Productivity of summer paddy is 4.8 tons per ha (96 baskets per acres) (Figure 5).

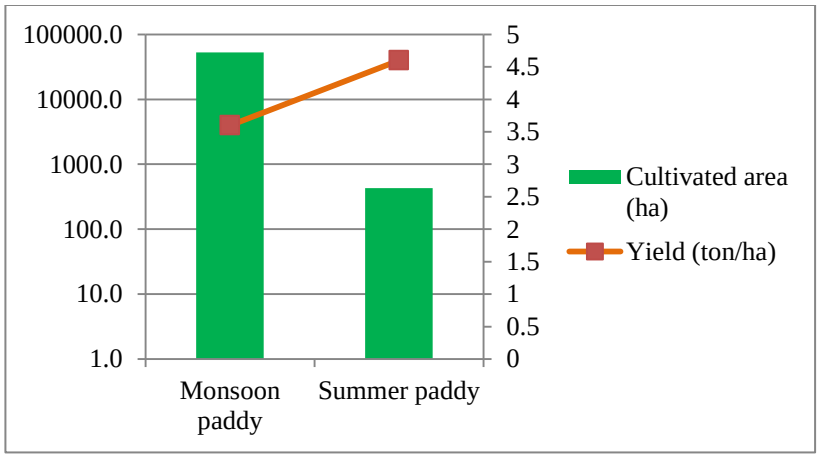


Figure (5). Paddy Cultivated area and productivity in Hinthada Township. (Source: Based on Data of Agricultural Land Management and Statistics)

Grain yields under different rice cropping systems vary largely due to site specific climate and soil conditions, varieties as well as different rice cultivars used (GIZ, 2013). Famers really know that the net return of the summer paddy is higher than that of monsoon paddy cultivation. But, in summer, farmers cultivate paddy because of low investment, less risk and high return.

All rain fed paddy is medium and short lived varieties because farmers choose to cultivate them to reduce growing period to cultivate second crop after harvesting paddy. Medium lived varieties are *Kayinma, Pagosein, Hmawbe-2, Mhawbi-3*, and *Sinthukha.* Their productivity slightly varies from one another and productivity ranges between 3.5 ton per ha

(70 baskets per acre) and 4 ton per ha (80 baskets per acre). Short lived varieties such as *Shwemann* are also cultivated.

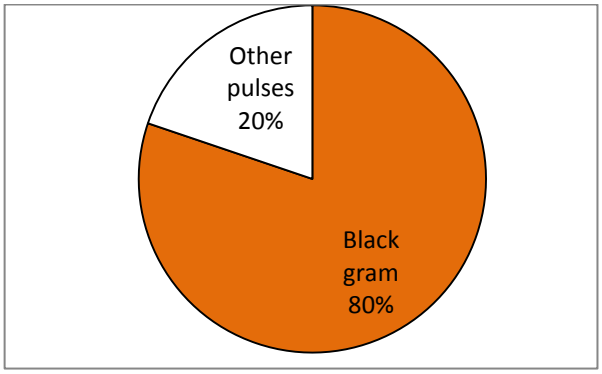


Figure (6). Pulses cultivation in Hinthada Township. (Source: Based on Data of Agricultural Land Management and Statistics)

Hinthada Township possesses the largest pulses cultivated areas with 66825 ha (165126acres) among the townships located in Hinthada District. Among the pulses cultivated in Hinthada Township, black gram (*Mat pe*) ranks first in cultivated areas (Figure 6).

CROPPING SYSTEM CALENDAR

At the higher part, rains fed paddies are cultivated in the rainy season and pulses are cultivated in the cool dry period by suing moisture in the soils (Table.1). Farmers who practice double cropping work eight months per year and they get more income.

In the lower part, drainage is poor because of low elevation and famers have a chance to cultivate rain-fed paddy. They cultivate paddy at the end of November but the productivity of the paddy is higher than that of rain-fed monsoon paddy.

Table (1). Cropping Calendar of farmers in Hinthada Township. (Source: Field Survey, Sep, 2017)

Cropping system	M	J	J	A	S	O	N	D	J	F	M	A
Paddy- Pulses System												
Paddy												

Land Preparation
Paddy growing period
Harvesting
Pulses Growing period

Cost and Benefit Analysis on Cropping Systems

Paddy–pulses System

In Paddy Pulses system, in the higher parts, farmers cultivate paddy in the rainy season. Land preparation is done by using agriculture machinery because of draught, animal shortage and other reasons such as to save time in land preparation to cultivate second crops.

Table (2). Cost and benefit in Monsoon Paddy Cultivation (2016). (Source: Interview, Sep, 2017)

Items	Cost (Ks)/ acre	Cost(Ks)/ ha
Tillage (manual)	10000	24710
Seed (8000ksx3basket)	24000	59304
Pesticide, weedicide	5000	12355
Fertilizer	22000	54362
Harvesting	45000	111195
Labour cost	50000	123550
Total Cost	156000	385476
Return (70 x6000)	420000	1037820
Net return	**264000**	**652344**

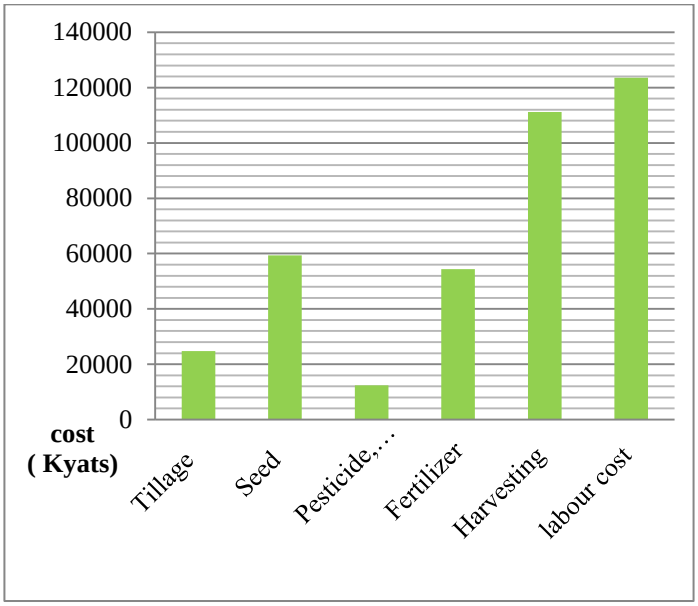


Figure (7). Cost and benefit in Monsoon Paddy Cultivation. (Source: Table 2)

Most small holders practice broadcasting system to reduce the labour cost. In the rainy season, they use a bag of urea (50 kg) because of high risks caused by irregular and untimely rain. Some farmers applied small amount of Triple Sulphur Phosphate (T-Super) in paddy cultivation. Harvesting is also done by manual labour as well as combine harvester. Among the total cost, labour cost including the cost on weed removing, manual harvesting, and pesticide spraying is more than 30 percent of the total cost because of labour shortage and high labour cost. Average labour cost of male is 4500 ks per day and that of female 3500 ks per day. Net return is 652344 kyat per ha (264000 kyats per acre) for monsoon paddy cultivation (Table 2 & Figure 7).

As a second crop, pulses especially black gram (mat pe) is cultivated. Depending on soils and relief of the area, three cropping methods: *Yaelite*, *Htun pea* and *Khote pea* are used in black gram cultivation. Some farmers use machinery in land preparation. Most farmers want to cultivate pulses because pulses are more resistant and less risky.

The major black gram varieties are *Yezin*-1, *Yezin*-2, *Yezin*-3, *Yezin*-4, *Yezin*-5, *Mwayhauk, Galonetaung* and *Myetkyal*. Average productivity of the black gram is between

10 baskets per acre and 15 baskets per acre. Choice of varieties depends on relief of the area. In lowland areas, *Yezin*-1, *Yezin*-2, *Yezin*-3, *Yezin*-4, *Yezin*-5 and *Galonetaung* are cultivated. *Mwayhauk,* and *Galonetaung* are mainly cultivated in slightly higher areas.

In pulses cultivation, plant nutrients are applied to get high yield. They also use Aciphate to kill pesticides. Total cost is 205093 ks per ha (83000 ks per acre) and net rent return is 289107 ks per ha (117000 ks per acre) (Table 3 & Figure 8).

Therefore, farmers who practice double cropping with Paddy-Pulses system get more income and their income is sufficient for their survival and their living standard is high.

Table (3). Cost and benefit in Pulses Cultivation (2016). (Source: Field observation, Sep, 2017)

Items	Cost (Ks)/ acre	Cost(Ks)/ ha
Tillage	10000	24710
Seed	20000	49420
Pesticide, weedicide	8000	19768
Harvesting	15000	37065
Labour cost (tilling, pesticide spraying)	30000	74130
Total Cost	83000	205093
Return (10 x20000)	200000	494200
Net return	**117000**	**289107**

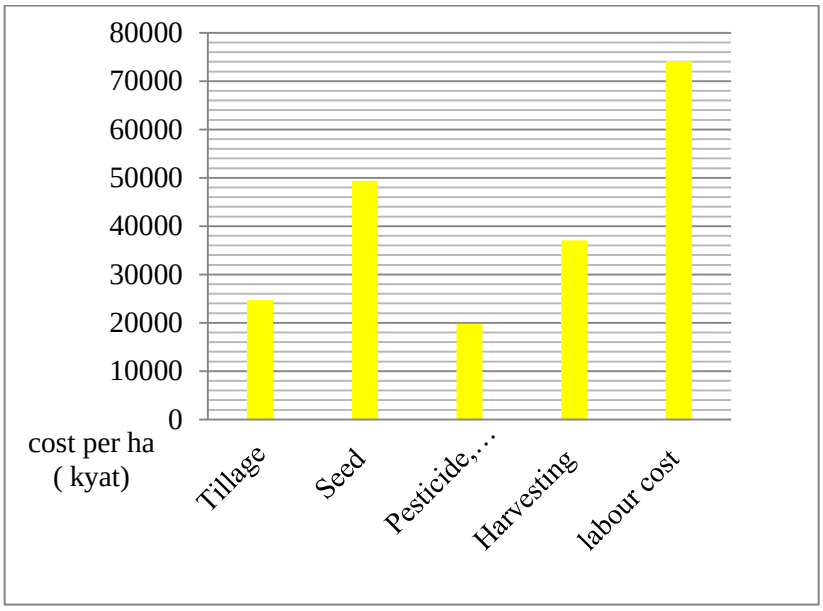


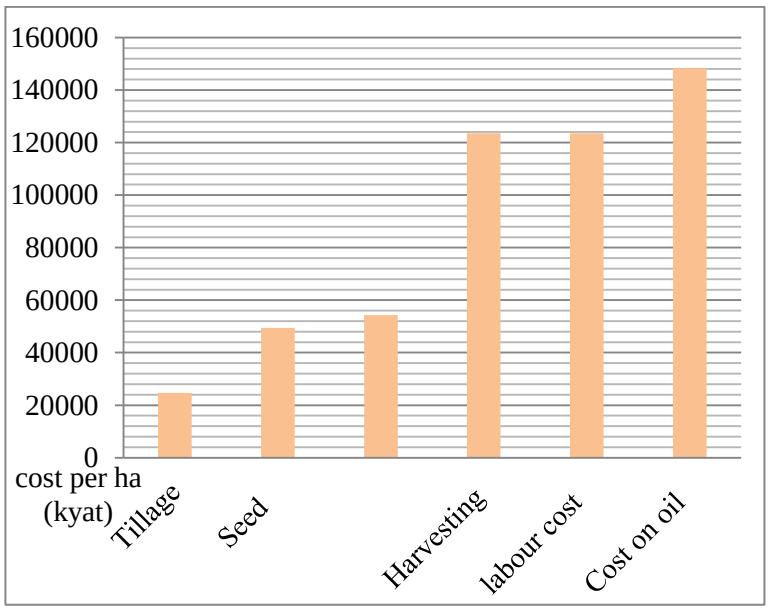
Figure (8). Cost and Benefit in Pulses Cultivation. (Source: Table 3)

Mono Cropping System: Summer Paddy Cultivation in Hinthada Township

The farmers who own the field on the high land do not have a chance to grow the paddy in the monsoon because the land is poor in drainage conditions and much water covered the field for 3 months. Therefore, they till the land in October and the paddy cultivated in November is locally called *Muyin* Paddy.

Table (4). Cost and benefit in Muyin Paddy Cultivation (2016). (Source: Field observation, Sep, 2017)

Items	**Cost (Ks)/ acre**	**Cost(Ks)/ ha**
Tillage	10000	24710
Seed (2 baskets)	20000	49420
Fertilizer and Pesticide	22000	54362
Harvesting	50000	123550
Labour cost	50000	123550
Cost on oil for pumping	60000	148260
Total Cost	212000	523852
Return (110 x 5500)	605000	1494955
Net return	393000	971103



Figure(9). Cost and benefit in summer paddy (Muyin Paddy) Cultivation. (Source: Table 4)

In *Muyin* paddy cultivation, most farmers practice broadcasting method and some transplanting method because of high labour cost. In harvesting, agricultural machineries are used but threshing is done by manual labour. In the dry period, water is irrigated through pumping and it uses diesel. As they irrigate 4 times in the dry period, diesel cost is 1148260ks per ha (60000 ks per acre).

Grain yields under different rice cropping systems vary largely due to site specific climate and soil conditions as well as different rice cultivars used (GIZ, 2013). The average productivity of summer paddy is 5 ton per ha (100 basket per acre). Although the cost of summer paddy cultivation is higher than monsoon paddy, local people cultivate summer paddy due to high productivity caused by long day length and high temperature. Their net rent return is more than 900,000 ks per ha (Table 4 & Figure 9).

In the high land area, farmers practice double cropping and those who live in low land area mono cropping. In the area, incomes derived from mono cropping and double cropping are not distinctly different. But, the main thing is that the amount of investment is high in summer paddy cultivation. It is a major problem for the farmers. In the cool dry

period, famers extensively cultivate paddy due to less investment and labour shortage. Pulse cultivation does not need much amount of labour.

FINDINGS AND SUGGESTIONS

Hinthada Township is locationally advantageous for being located in deltaic area. But one place differs topographically from another and it affects not only crop cultivation but also cropping system. Climatic conditions especially temperature and rainfall are favourable for crop cultivation. Existing soils are meadow soils that support cultivation.

The choice of cropping system mainly depends on relief of the area and investment of the local farmers. Farmers whose farm located in low land area practice mono cropping and they cultivate muyin paddy in the summer. Those who own the farm in the higher part practice double cropping and they cultivate rain-fed paddy in the monsoon period and pulses in cool dry period. Although they practice different cropping systems, their amount of income is nearly the same because of higher productivity of Muyin Paddy.

Some areas located on the higher part are suitable for summer paddy cultivation but the small holder farmers can not afford to cultivate summer paddy because of less effort. Therefore, it is necessary to support the loan for summer paddy cultivation to upgrade the income and economy of the local farmers. It is needed to plan to give short-duration and high-yielding paddy to the farmers and to guide best management practices that increase income. Labour cost is much higher in cultivation cost, department concerned should plan to support agriculture machinery for the purpose of planting and harvesting in time. Moreover, famers want to get long term loan to buy agriculture machinery and these sold be sold in installment basis to local farmers.

CONCLUSION

Hinthada Township is located between North latitudes 17° 26' and 17° 48' and also between East longitudes from 95° 11' to 95° 33' and it lies in deltaic area. It has locational advantage for crop cultivation. But, relief of the area affects crop choice and cropping systems in the study area. Most of the local people are small holder farmers and their survival depends on income derived from crop cultivation. Although the income obtained from different cropping systems is nearly the same, it is insufficient for their survival. Therefore, it is necessary to upgrade the economy through giving agriculture loan and supporting inputs.

By supporting the major requirement such as investment, technology, seeds and agriculture machinery, the economy of local farmers will be higher in the future. On the other hand, it is necessary to do research on input application, soil conservation and agriculture technology uses with the intention of upgrading the livelihood of local farmers.

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