Review on Reforestation Management and Socio-economic Status of Local Taungya Cultivators of Kaing Reserved Forest in Myanmar

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Abstract

Forest resources in Myanmar are very important for natural heritage that provide many species of plants and animals for biodiversity conservation. However, Myanmar's forests were being degraded by many ways. Reforestation and sustainable forest management are urgently required and Taungya method was used as afforestation method. Special teak plantation programme of Kaing Reserved forest with Taungya method were studied in last years. Continuously, socio-economic status of Taungya cultivators were assessed by using field survey and interviewing method with structured questionnaires. It was found that some of the teak plantation programme were successful with high survival rate. However, economic profit of local Taungya cultivators was not greater enough for life persistence. Nowadays, these plantations were destroyed and degraded by anthropogenic activities. Therefore, review upon the old plantations and providing to job opportunities of local Taungya cultivators were necessary for coming future.

Keywords: Reforestation, Taungya, Kaing Reserved forest, socio-economic

Introduction

Myanmar is one of the forested country in South-east-Asia. The forests provide a large number of plants and animal species and valuable for biodiversity conservation. Myanmar is rich in forest resources with 1,347 species of big trees, 741 species of small trees, 1,696 species of shrubs, 96 species of bamboo, 36 species of rattan and 841 species of orchids so far recorded (FAO, 2007). For centuries Myanmar has been known its teak reserves and its expensive forests, extending from the lowlands of Ayeyarwaddy delta to the hill regions and the alpine forests of Himalayas (Bryant, 1997). However, Myanmar's forest are now being degraded by many ways. The main reasons for forest losses are civilization, agricultural expansion, fuel wood consumption, charcoal production, and illegal wood cutting.

Once famed for its expensive closed canopy forest, Myanmar has been cited in some of these reports as one of 10 tropical countries worldwide with the highest annual deforestation rate (FAO, 2001). The country has retained much of its forest cover, but forest have been declined by 0.3 % annually (Leimgruber *et al*., 2005). Severe logging, expanding plantations and degradation poses increases threats and only 3.8 % of the country's forests can be considered intact with canopy cover >80% (Bhagwat, 2017). They also stated that, between 2002 and 2014, intact forests declined at a rate of 0.94 % annually, totaling more than 2 million ha forest loss. In 1990, the forest cover of Myanmar had 58. 66 % of national area. However, this rate was declined to 42.92 % in 2015 by the analysis of Forest-Resource Assessment (FRA) (Source from MRRP, 2017-2027)

To solve the challenge of deforestation, the first attempt to establish teak plantation using taungya method (agroforestry) was first made in 1856. One of the Taungya plantation was made by a Karen tribesman, U Pan Hee in the Thayarwady district, as a personal present to Detris Brandis in 1856 (Blanford, 1958). Myanmar will implement a 10-year plan of reforestation and rehabilitation of its forest. The project will cover 32,400-45,000 hectares a year including establishing forest, nurseries and replanting of trees in forest reserved areas.

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The success with this method led to a wide spread planting of teak *Tectona grandis*, *Acacia catechu* and *Xylia kerri* in 1930, a total of over 19,000 has been planted (FAO, 2007).

Taungya is a typical type of "agroforestry" that is combined plantation of agricultural crops with forest trees. In this method, local people and shifting cultivators could grow their agricultural crops in allotted lands, simultaneously they will take part in forest plantation. From this way, not only the forest department can do the forest plantations programme with low cost but also the cultivators can get the agricultural land and norm provided by forest department. Therefore, protection and maintaining to natural forests are the main task and rehabilitation to new forest plantations by Taungya method is the most proper way to keep the environment.

In this research, Special Teak Plantation Programme in compartment number (13) and (15) of Kaing Reserved Forest was chose as study area to investigate the reforestation management of forest department by Taungya method. That forest has been owned many species of timber, bamboo and natural vegetation. However, its status was un-classed and degraded during the investigated period.

Among the various ways of deforestation, illegal cutting and un-controlled shifting cultivation are the most important cases in study area. The poverty of local people and Taungya cultivators was more or less responsible to forest degradation. So, socio-economic conditions of Taungya cultivators are needed to determine in this deforestation. To study the socio-economic characters of Taungya cultivators, Farm Management Research Methodology is the essential main role. Farming System Research (FSR) aimed at identifying options for improving the well-being of rural households in specific local environment (Upton, 1996). Farm household systems are rural households, consisting of three basic sub-systems, which are closely interlinked and interactive. They are; household as decision-making unit, farm and its crops and livestock activities, and off-farm component (FAO, 1990).

This study was aimed to investigate the effect Taungya method upon the socio-economic condition of shifting cultivators in rural area. The objectives of this study are to study the management of reforestation in the losses of forests, to assess the socio-economic characteristics of Taungya cultivators in survey areas and to review the success of this forest plantations and socio-economic status of Taungya cultivators in studied areas.

Materials and Methods

Study Area

Kaing Reserved Forest was one of the ten reserved forests belong to Pyinmana Township, now it has being titled under the township of Oattara Thiri Township, Nay Pyi Taw (Fig. 1). It had 18 compartments and is part of the Bago Yoma mountain area. It was surrounded by Nga-light Reserved Forest in South; Taung-nyo Reserved Forest in East: and Lei-way township in North and West. Compartment No 13 has 711 acre wide and located near the Mon-nyit village. Compartment No 15 has 559 acre wide and situated near the Min-khone village. The first plot was far about 21 miles and the second was 22 miles from Pyinmana Township. These area were isolated, remote and difficult in communication.
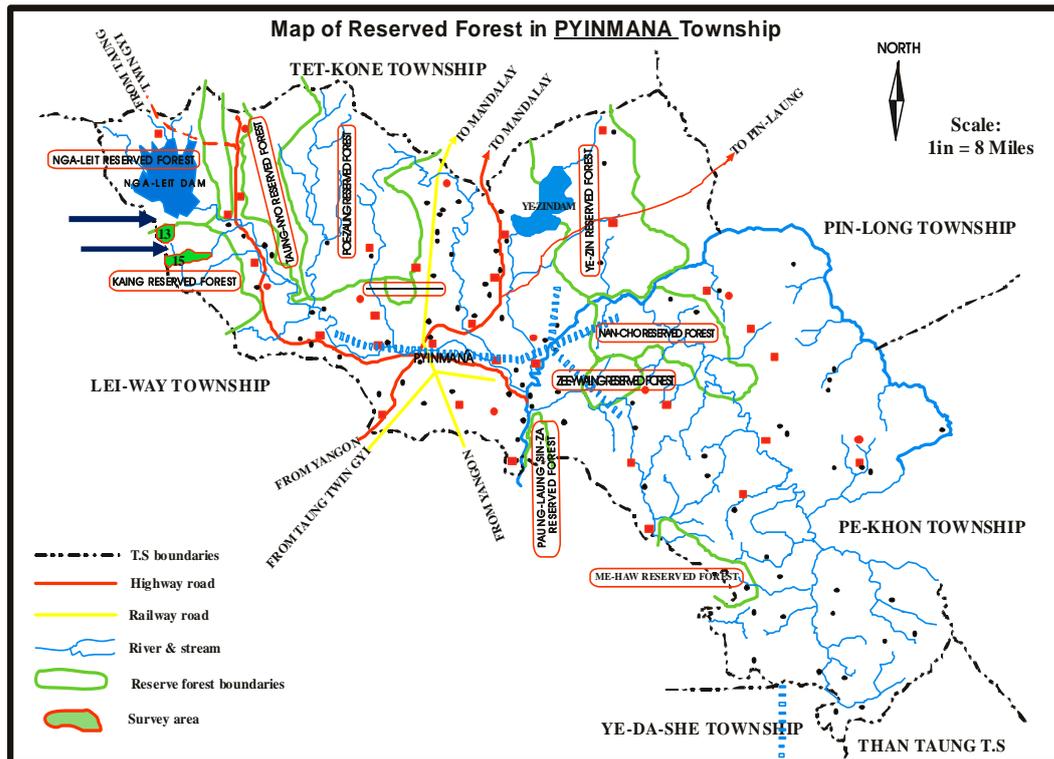
Figure (1). Location maps of study area

Data Collection

This study was based on primary and secondary source of data by using the three main data-collection methods; (1) direct observation, (2) interviewing respondents and (3) records kept by respondents (Parel *et al*., 1973).

. Primary data was collected at a household level of Taungya cultivators and secondary data from the forest officers and staff from forest department. The preliminary survey was started in July 2004 and information from the first survey was used to construct the suitable questionnaires to collect socio-economic data of cultivators. The head of household was considered as sampling unit, 16 households were randomly selected from the Kaing 13 and 21 households from Kaing 15 by using simple random sampling method depending upon the list of population within the study area.

The second-time survey was done in October 2004. Secondary data were plantation diary of afforestation procedure, wage of cultivators from forest department, rainfall distribution, land-use patterns in township and other knowledge information and gathered (Fig. 2). The third survey was done to observe reforestation procedures, the growing state of teak plants and mixed crops in agro-forestry. Other information from the forest department such as percentage of survival teak plants and crop yields were collected.

Method of Analysis

To calculate the summary of final results, the SPSS econometric software programme was used. Benefit-cost ratio analysis was used to determine the relative profitability of the crops. This ratio analysis was one of the most widely used criteria in economic evaluation.
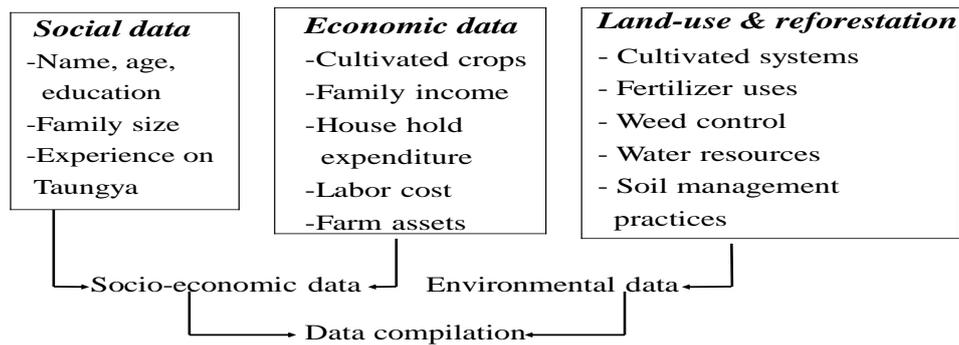
Data Collection

Social data	*Economic data*	*Land-use & reforestation*
-Name, age, education	-Cultivated crops	- Cultivated systems
-Family size	-Family income	- Fertilizer uses
-Experience on Taungya	-House hold expenditure	- Weed control
	-Labor cost	- Water resources
	-Farm assets	- Soil management practices

Socio-economic data ← Environmental data

Data compilation

Figure (2). Data collection procedure

Results

Basic steps in Taungya plantation in Study Area

The reforestation system by way of Taungya method was the rehalibilitation to natural forest with the collaboration of forest department and Taungya farmers. To establish commercial or special teak plantation, there were seventeenth kinds of working activities. Firstly, site selection and checking on land state were the primary tasks and mapped. The land use and water supply must be considered to become a plantation. Taungya plots allotment was the secondary work and done by forest officers with the help of village's headman or team leader depend on their family size or in their own personal wish. After allotment, excess land spaces were cut and continuously realized by the team of forestry staffs. Taungya cutting, burning, reburning (Kyuh-khwe) and staking were continuously working in February to May. In Taungya cutting, small trees like herbs and shrubs, underground- roots, creepers and twinners were cut first (Fig. 3). After clear felling, fire line of 4.5 meters wide was made around the plantation. Ya burning was started in April depending on weather condition.

Figure (3). Taungya cutting (Slashing) and burning

Figure (4). Collected un-burnt debris after slash and burn (Kyunkhwe)

After burning, unburned and remained debris were collected, piled up and burn again. This operation was called the "Kyun-kwe" and finished in second week of May (Fig. 4). After compartment was completely burnt, 1-meter long bamboo stakes are put into the ground with a spacing of (2.6 x 2.6) meters as staking process (Fig. 5).

Figure (5). Teak seedling in circular plots   Figure (6). Seeds beds and nursery stages

In nursery preparation, nursery beds were built according to number of nursery plants and extra 10% of seedlings were prepared. Primary new shooting state was kept under the shade, watering and weeding must be done in regular time. If one pair of true leaf and one pair of seed leaf were completed, seeds were well germinated and transferred into plastic bags with four poles to control water and air (Fig. 6). Depending upon growth of seedlings, equal ratio of (N-1: P-1: K-1) fertilizer was used. In June, seedlings were grown at staking place.

First weeding was started in July, not only the forest staffs and Taungya cultivators but also hired labours who are taken part in this operation. After first weeding, patching was continuously done. The second weeding was started in September and end in mid-October. The third weeding was done in November.

The counting of survival plants was made in first week of December and was called "December counting". All of these operations were supervised by the Forest Department. After the stage of planting, Taungya farmers were allowed to cultivate their agricultural crops in the blank space between the stakes. After the survival counting, fire protection was made by the forest department at the beginning of plantation establishment after 1 to 5 years.

General Characters of Taungya Cultivators

In study areas, almost all of the households were generally poor farmers. Their life style was very simple and honest. Most of the farmers lived in near the villages but some were new immigrants coming from other related townships. People in this area are engaged in different occupations; farmers, construction labors, shopkeeper, retired staffs, and the majority were landless and no employments. So, all have requirements of agricultural land for their livelihood. All households cultivate with an average 3 acres per family as their farm land and have small vegetable garden for domestic consumption.

Demographic Characteristics of Sample Cultivators

The demographic characteristics of sampled Taungya cultivators were shown in table (1). The mean age of sample household head was 38 years and minimum and maximum ages were 17 and 72 years. Their average farm size was 5 acres and minimum and maximum were 2 acres and 15 acres. The mean value of their experience in Taungya cultivation was 12 years while the minimum and maximum experiences were 1 and 30 years. The mean number of family labour was 3, minimum and maximum labours were 1 and 6 respectively. The sample household had average 1 child and maximum number was 5. The mean number of adult male and female was 1 and minimum and maximum numbers were 1 to 5 and 4. The mean value of total family size was 4 and minimum and maximum number were 2 and 12.

With regard to educational attainment, sample cultivators were classified according to years of schooling. About 43% were no attention to basic educational primary school and defined as monastery education. Those who had less than 5 years of schooling had primary

education and it was about 51%; 5 to 8 years of schooling had secondary education and it was found only 5%. They had no high school educational attainment and no graduate.

Table (1). Demographic characteristics of sampled cultivators in survey area

Characteristics	Units	Mean	Minimum	Maximum
Age	Years	38.16	17	72
Farm size	Acres	5.58	2	15
Experience	Year	12.08	1	30
Family labor	Number	3.02	1	6
Family size				
(1) Adult male	Number	1.83	1	5
(2)Adult female	Number	1.74	1	4
(3) Child	Number	1.81	1	5
Total family size	Number	4.89	2	12
Education				
(1)Monastery Edu;	Percent	43.24		
(2) Primary Edu;	Percent	51.35		
(3)Secondary Edu:	Percent	5.41		

Cropping Patterns and Crops Growing by Taungya Cultivators

Major cultivated crops of Taungya cultivators are paddy (Le), paddy (Ya), groundnut, and sesame. After reforestation operation, planting was started with help of monsoon. Majority planted paddy (Le and Ya) for their daily consumption. Groundnut and sesame were grown for selling commodity in winter season and maize was for their snack. The percentage of cultivators to Le, Ya, groundnut, maize and sesame were 8.11%. One kind of cropping was paddy (Ya) and 5.41%.

In study area, twenty-one kinds of cropping patterns were observed and presented in table (2). Among these, Le cultivation was 40.54%, Ya was 78.37%, groundnut was 72.97%, sesame was 56.75 % and maize was 62.16 %. The percent of cultivators with respect to different crops was as shown in figure (7). According to results, most of sample households cultivated paddy (Ya). The second largest cultivated crop was groundnut and third was maize. But they did not grow the maize for sale. So, the third largest crop cultivation was sesame.
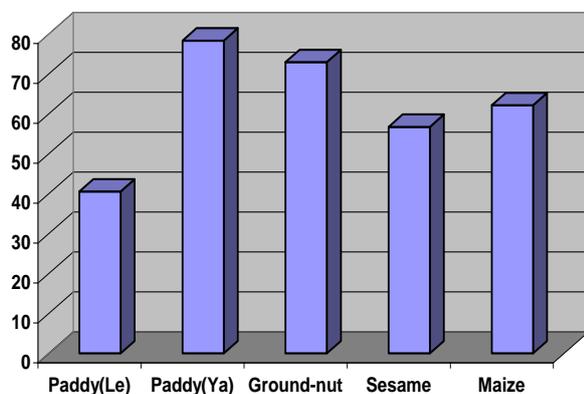

Figure (7). Percent of cultivators with respect to different crops

Table (2). Kinds of cropping patterns of Taungya farmers in study area

No	Patterns	Frequency	Percent
1	Paddy (Le) /Paddy (Ya) /Groundnut / Maize - Sesame	3	8.11
2	Paddy (Le) / Groundnut / Maize - Sesame	2	5.41
3	Paddy (Le) /Paddy (Ya) / Maize - Sesame	1	2.7
4	Paddy (Le) /Paddy (Ya) /Groundnut – Sesame	1	2.7
5	Paddy (Le) /Paddy (Ya) /Groundnut / Maize	1	2.7
6	Paddy (Le) /Groundnut / Maize	2	5.41
7	Paddy (Le) /Groundnut - Sesame	1	2.7
8	Paddy (Le) /Paddy (Ya) / Maize	1	2.7
9	Paddy (Le) / Maize - Sesame	1	2.7
10	Paddy (Le) /Paddy (Ya)– Sesame	1	2.7
11	Paddy (Le) /Paddy (Ya) /Groundnut	1	2.7
12	Paddy (Ya) /Groundnut / Maize – Sesame	3	8.11
13	Paddy (Ya) /Groundnut / Maize	6	16.21
14	Paddy (Ya) / Maize – Sesame	1	2.7
15	Paddy (Ya) /Groundnut – Sesame	3	8.11
16	Groundnut / Maize – Sesame	1	2.7
17	Paddy (Ya) /Groundnut	2	5.41
18	Paddy (Ya) – Sesame	2	5.41
19	Paddy (Ya) / Maize	1	2.7
20	Groundnut – Sesame	1	2.7
21	Paddy (Ya)	2	5.41
	Total	**37**	**100**

Assets of Sample Respondents in Survey Area

In survey area, it was observed that farmers possessed various status of house. Due to the houses conditions and value, those were divided into three types (Fig. 8). The first type was the least valued house, which is made up of Thekke and bamboo as roof, shield and floor, and value was less than or equal to thirty thousand kyat (Fig. 13). This home type was the largest percent and was 51.35%.

The value of second type was between thirty and fifty thousand kyat. This type of home used Thekke, bamboo, and wood as roof, shield and floor and 35.31%. The highest value of house was greater than fifty thousand kyat and has been possessed by higher income group. In this type, iron-roof, wood and bamboo were used and 13.51%.

In sample households, 2% owned television, 22 % owned radio and 14% used batteries for illumination. The mode of transportation by bicycle was 6% (Fig. 9). Percent holding of farm and livestock assets per household were presented in figures (15) and (16). Almost all of these cultivators possessed chopper. Plough, harrow, and sickle were kept as useful materials for land preparation, crops production and harvesting. Cattle and cart were used not only for land preparation and crop production but also used for the carrying of fire-wood and crops and other income activities.
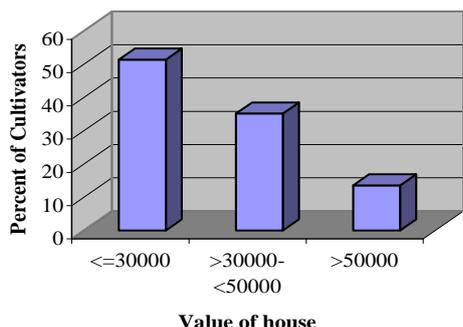
Figure (8). Percent of cultivators to
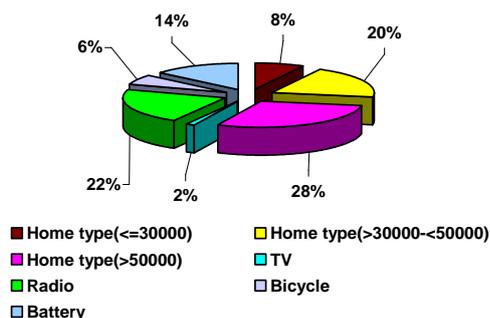different values of house

Figure (9). Percent of home assets owned by the
Taungya cultivators

All cultivators had on average 2 hoes and sickles; they owned average of 1 or 2 axes and spades per household. Plough and harrow were not possessed by low income households who tendered those materials from higher income groups when they are required. Higher income groups possessed the carts in small percent.

In study area, the cultivators raised three main livestock animals; cattle, poultry and pig. Low income cultivators had no cattle and pig. Middle and high income families had 1 to 4 buffalos or cows (Figs. 10 & 11). Taungya cultivators in all income groups raised the poultry and poultry raising is a quick source of cash income. Low income cultivators had 5 to 10 poultries whereas middle and higher income groups had more than 10. Therefore, majority of backyard livestock animals (cows, buffalos and pigs) were found as manure production and cash income in higher income groups.
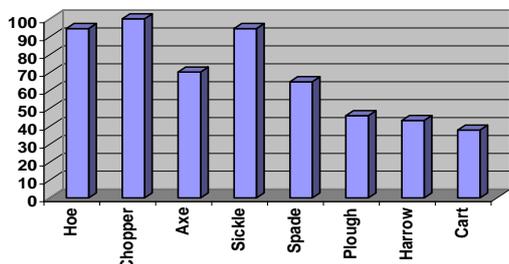
Figure (10). Farm assets percentage owned
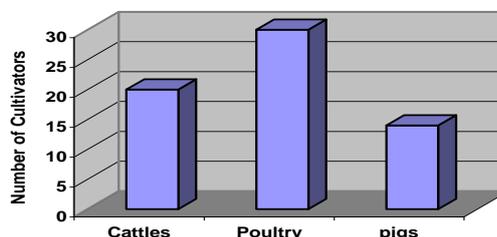by the Taungya cultivators

Figure (11). Number of Taungya cultivators
and their livestock assets

Incomes and Expenditure of Sample Households in Survey Area

In study area, income share of sample respondents were categorized into four bases; farm income, off-farm income (or) agricultural wage income, non-farm income, and norm from the forest department. It was showed that income from farm activities was 52% of total income. Average income component of Taungya cultivators were presented in figure (12).

Taungya cultivators obtained from agricultural off-farm activities (i.e. land preparation and seasonal daily labour) and it was 18% of total income. Non-farm income depends on non-farm jobs such as making charcoal kiln, labour in construction site, shopkeeper, government employee, selling fire-wood, renting of carts and buffalos, bamboo cutter, bamboo-shoot collection, digging to the medicinal plants and roots and honey collection. The non-farm income can be seen equal to their off-farm income. Norm was the income from the collaboration in teak plantation of forest department. Norm was the extra income of Taungya cultivators and they can get from Ya cutting, building to fire protection

roads, ploughing and reburning, stake collection, planting, weeding, patching, fire protection on plantation site and survival counting and 12% of their total income.
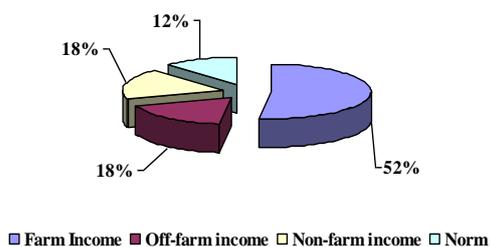

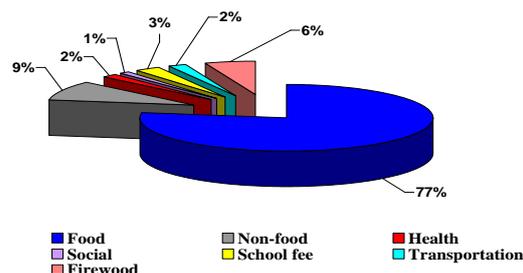Figure (12). Income components of Taungya cultivators

Figure (13). Percent of household expenditure of the sample respondents in a year

Percent of household expenditure of sample respondents in a year were described in figure (13). They used 77% of total cost to buy the ingredients for curry. Clothes, other household tools and non-food materials were in 9%. They expensed 2% of their income for health and 1% for social cases. In most families, 6% and 2% were used for school fee and basic needs. Transportation cost was 3% but most people used their own foot. The expenditure of sample households can vary depend upon their family size.

Production Cost of the Crops and Cultivated Acres of Taungya Cultivators

In survey area, Taungya cultivators had grown Khon-ni, Phyu-lon-yin, Pearl-thwe and yield were depending upon weather conditions and material inputs. Almost entire sample household planted paddy (Ya) for daily consumption, average farm size was 1.61 acre. The cost percent for rice production (Ya) was presented in figure (14). To plant 1 acre of Ya-paddy, 12% of total cost was used for slashing and site cleaning. Seed cost was 5% and weeding was required at least two or three times. 28% of hired labour cost and family labour 55% were needed for harvesting and threshing. Some had grown (Le) in valley and flat lands, yield of paddy (Le) was 4 or 5 times higher than paddy (Ya). Average acre of (Le) was 2 acres and maximum of 6 acres. The cost component for paddy (Le) was shown in figure (15). Only Manaw-thukha variety was grown in Le and seed cost was 4%. Urea fertilizer was applied and it was 10%. The cost for hired labour was 38% and family labour took 48%.
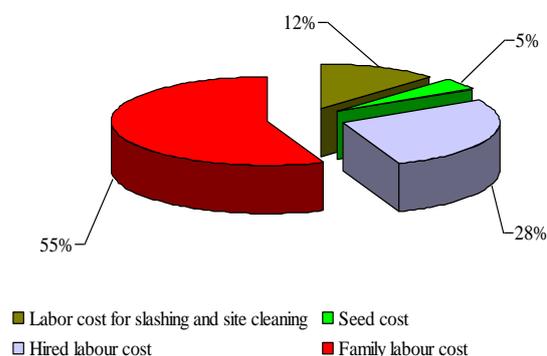

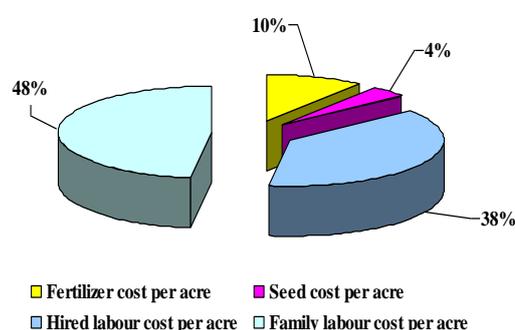Figure (14). Percent contribution of cost components for rice (Ya)

Figure (15). Percent contribution of cost components for rice (Le)

Taungya cultivators had grown groundnut as major crop for their income. Average acre in groundnut cultivation was 1.83 acres with maximum of 4 acres and minimum of 0.5 acre. Soil was dig or harrowed with hoe and seeds were put into the hole and covered the soil

onto the seed. Weeding was at least two or three times required, cost for pesticide was 3% and that for seed was 31.5%. The cost for labour in slashing and site cleaning was 14% in which 19% of hired labour cost and 32.5% of family labour cost were used. Figure (16) showed the percent cost component for growing of groundnut.

Other major crop was sesame and it was sensitive to climatic conditions. Average farm size of sesame was 3.04 acres, maximum was 7 acres and minimum was 1 acre. In sesame planting, 20% of total was used for labour cost in slashing and site cleaning. The variety was boat and seed cost was 27%. The cultivators used direct spreading of seed and one or two times of weeding were required. 16% of hired labour cost and 37% of family labour cost were used for harvesting, threshing and cleaning. The percent cost component for the cultivation of sesame was shown in figure (17) and average farm size of sample households in study area was represented in figure (18).
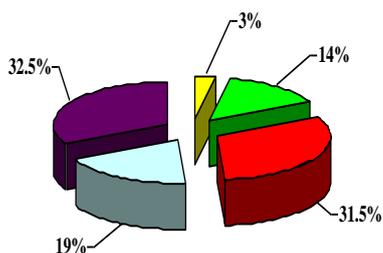

□ Pest control	■ Labour cost for Slashing and site cleaning
■ Seed cost	□ Hired Labour cost
■ Family Labour cost	

Figure (16). Percent contribution of cost components for groundnut

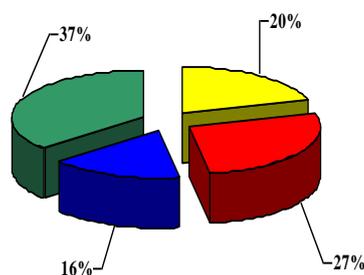| ■ Labour cost for slashing and site cleaning | ■ Seed cost |
| ■ Hired Labour cost | ■ Family Labour cost |

Figure (17). Percent contribution of cost components for sesame
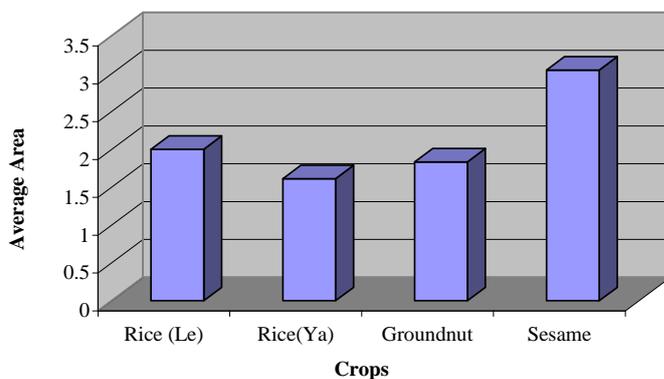

Figure (18) Average areas grown by different crops

Economic Analysis of Growing Crops in Study Area

To know the profitability of cultivated crops, cost and return analyses were utilized and four profitability measures were computed, namely, gross benefit (GB), return above variable cost (RAVC), return above cash cost (RACC), and benefit-cost ratio (BCR) (FAO, 1996). Calculation on economic analysis of growing crops in study area was tabulated in table (3), the items are rice, groundnut and sesame, and the units were baskets. The quantity was the average yield per acre of the crops.

Gross Benefit = Average yield per acre   x   Unit price

GB of rice production (Ya) was Ks.14650/acre, rice production (Le) was Ks. 62933/acre, groundnut production was Ks. 39240/acre and sesame production was Ks.26856/acre respectively.

Total variable cost (TVC) = Seed cost + Family labour cost + Hired labour cost

TVC of rice (Ya) was Ks.24551/acre however, in rice production (Le), fertilizer cost was cash cost and TVC was Ks. 41632/acre. In groundnut, pest control cost was cash cost and TVC was Ks. 17880/acre and TVC of sesame was Ks. 13444/acre. In total variable cash cost, family labour cost was not considered and it was total cash cost.

Total Variable Cash Cost (TVCC) = Seed cost + Hired labour cost

TVCC of the cultivated crops were Ks.11308/acre, Ks.25002/acre, Ks.10613/acre and Ks.7099/acre respectively. In the TVCC of rice production (Le) and groundnut, fertilizer cost and pest control cost are cash costs.

Return above variable cost (RAVC) was difference of gross benefit and total variable cost. RAVC of crops in study area are Ks.–9901/acre for (Ya), Ks. 21300/acre for (Le), Ks.21359/acre for groundnut and Ks.13411/acre for sesame respectively. Return above cash cost (RACC) means difference between gross benefit and total variable cash cost. RACC of grown crops in survey area were Ks. 3341/acre for rice production (Ya), Ks.37930/acre for (Le), Ks.28626/acre for groundnut and Ks.19756/acre for sesame, respectively. Benefit-cost ratio is the division of gross benefit and total variable cash cost. BCR of cultivated crops were 1.29 for rice production (Ya), 2.51 for (Le), 3.69 for groundnut and 3.78 for sesame, respectively.

If the profitability of cultivated crops were compared, profit of rice production Ya has negative value in Ks.-9901/acre. But we cannot say it is not profitable because calculation of RAVC has included cost of family labour. The net profit or return above variable cost of Le and groundnut were not different and RAVC of sesame has incentive to grow. The following figure (19) showed the net profit or RAVC of cultivated crops.

On the other hand, if return above cash cost of the planted crops were compared, RACC of rice production (Ya) has positive value Ks. 2341/acre. Because, in the calculation of RACC of rice production (Ya), the family labour cost was not considered so RACC of (Ya) had positive value. Within the comparison of RACC of cultivated crops, RACC of rice production (Le) was the highest (Ks. 37930/acr). RACC of groundnut was the second highest value (Ks. 28626/acre) and sesame was third (Ks.19756/acre). Cultivation of rice production (Ya) got the least RACC value of (Ks.3341/acre). The RACC of cultivated crops were compared (Fig. 20).

Table (3). Calculation on Economic Analysis of Growing Crops in Study Area

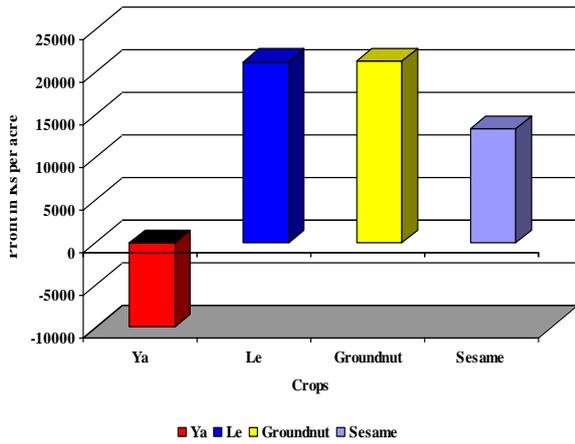| No.	Crop	Kyats per acre					
		(GB)	(TVC)	(TVCC)	(RAVC)	(RACC)	(BCR)
1	Ya	14650	24551	11308	- 9901	3341	1.29
2	Le	62933	41632	25002	21300	37930	2.51
3	Groundnut	39240	17880	10613	21359	28626	3.69
4	Sesame	26856	13444	7099	13411	19756	3.78

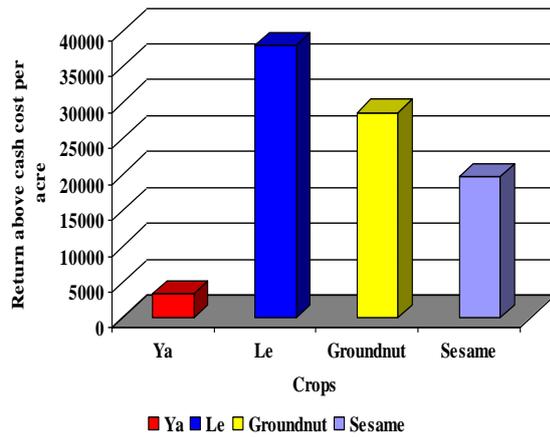Figure (19). Comparison of profitability of main crops

Figure (20). Comparison RACC of crops

Review on the Present State of Teak Plantations and socio-economic Status of Local Taungya Cultivators

The results of this study between 2004 and 2005 showed that the special teak plantation of reforestation programme is in success and high survival percentage of the teak plants were observed. According to final December counting, number of survival plants was 247135 in Kaing 13 and survival percentage was 91.53 %. The number of survival plants in Kaing 15 was 238774 and survival percentage was 88.42 % (Source from FD office, Oaktara Thiri Township). Final field survey was done in October, 2018 to review the state of these plantations and Taungya cultivators. According to the field study in present time, parts of this plantations were now been destroyed and remaining as degraded forests. Similarly, the socio-economic status of local Taungya cultivators were unchangeable. Moreover, It was observed that livelihood of local community were very rare as Taungya cultivators.

Figure (21). Present status of forest in the studied areas

Figure (22). Unchangeable lifestyle of villages near the forest

Discussion and Conclusion

Not only to provide the national economy but also to solve challenge of environmental threats: the reforestation and rehabilitation programme of new forest plantations, protection to natural forest are the most important issue in our country. Today, Myanmar Reforestation and Rehabilitation Programme were enforced with high acceleration to sustain the forests. The forest degradation and afforestation management is very interested in environmental point of view. Forest degradation is closely linked with various environmental conditions. It is destructive not only the forest area but also the structure and composition of the forest can be changed. If the deforestation problems are very large, it will lead to detrimental environmental hazards.

This study showed that special teak plantation of reforestation programme was in success and high survival percentage of the teak plants were observed during investigated time. Educational standard of Taungya cultivators in study area were very low and there is no graduated person. Their major problem was landless and difficult to life persistence. Therefore, they shifted into the forest and get agricultural land and employment opportunities. Their cropping patterns are very different from one another depending upon cash to invest. The most common cropping pattern is Ya-Groundnut-Maize. The total yields of the crops were low due to less soil fertility, investment of inputs and weather condition.

The child who attended the school is rare and mostly takes part as family labor or hired labor. They can receive another income from off-farm and non-farm activities. Some cultivators possessed the high valued houses and mostly owned low valued huts. Their home and farm assets are not large and raising of livestock were slightly differ. Results of the cost and return analysis showed that sesame was the most profitable and groundnut was the second. The rice production Le was the third and Ya was the least profitable. Some did not enough for daily consumption. Their socio-economic status was marginal because their institutional system as the Taungya cultivators is not perfect to their economy and fairly obtains the daily-bread.

If teak plantations are fully successful without any disturbance, long-term profit of the national economy was satisfactory. According to field survey in present time, parts of the old plantations were destroyed and remaining as natural degraded forest by illegal cutting. The application for fire-wood and other usages were depending on the poverty of local community near the forest. If weather condition was worse, crop production and income was less, the poverty of the people was large, so that the forest and plantations can be used as the

source of their income. They have no awareness to sustain the forest resources. Therefore, review upon the old plantations was necessary.

To solve the problem, technical assistance to cultivators in local community to promote their living standard and crop productivity, proper facilities of infrastructure, providing the employment opportunities with higher wages and financial support to invest in their farming activities. Moreover, educational awareness about the forest resource management should be trained.

Furthermore, to establish one thousand acres of new plantations, not only the State of Government invested large amount of budget but also the time and working skill of the forest department were expensed. So, restricted forced laws must be acted to maintain on negative impacts of forests. Ladrach, 1988 stated that a forest law in a country was designed to prohibit cutting a natural forest and native species, but all the same time to promote forest plantation. Continuously, further investigations need to carry out to assess the development of sustainable forest management for the nation.

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