

2.2.12 FARMING FROM GENDER PERSPECTIVE

(1) Farming Activities of Female

Practitioners who were in charge of respective farm works required for paddy, upland and vegetable cropping were surveyed from a viewpoint of sexual specificity, differentiating minor children not more than 15 years old from adults and family members from employees. Namely, practitioners of respective works provided by respondent families were categorized as a) male of the respondent family, adult, b) male, hiring worker, c) male of the respondent family, child, d) both of male and female (both, hereafter) of the respondent family, adult, e) both, hiring workers, f) both of the respondent family, children, g) female of the respondent family, adult, h) female, hiring worker, and i) female, child of the respondent family.

Table 2.2.8: Required works for cropping in target townships

Paddy		Upland crop		Vegetable			
Category	Item	Category	Item	Category	Item		
Water supply	Irrigation & drainage	Land preparation	Land cleaning Plowing Harrowing Cow dung application	Land preparation	Land cleaning Plowing Harrowing Cow dung application		
Nursery preparation	Plowing Harrowing Leveling Fertilization		Leveling		Leveling		
Land preparation	Land cleaning Plowing Harrowing Cow dung application Chem. fertilization		Farm management		Drilling Seeding Seeds covering Weeding/filling Thinning Fertilization Spraying (pesticide, etc.)	Farm management	Seedling Watering Seeds covering Weeding/filling Thinning Fertilization Spraying
Farm management	Un-rooting Seedlings transport (Ox-cart) Seedlings transport (Man power) Transplanting Broadcasting seeds Additional fertilization Weeding/filling Spraying	Harvest		Picking pods/combs Transport (fields to storages) Removing husks Threshing Drying Cleaning Packing	Harvest		Harvesting Transport (fields to storages) Drying/cleaning/grading
	Harvest			Transport (from storages to markets)			Transport (from storages to markets)
			Category			Item	
Transportation (storages to markets)				Farm manage.	Spraying Fertilization Covering fruits		
				Harvest	Harvesting Transportation (from fields to storages) Cleaning/grading		
					Transportation (storages to markets)		

1) Female participation to field work by crop

- The highest participation of male was found in paddy cropping (more than 80% of all workers, and so on), the second highest was in perennial cropping (close to 80%), then the third was in upland cropping (more than 70%). About 50% of the male practitioner was members of respondent families.
- Although the total number responded was merely 0.3% of that of paddy cropping, activities performed by only male were declined into less than 50% of all workers in vegetable cropping whereas those done by female in respondent families were accounted for nearly 40% of all.
- Participation of minor children in farm works was few accounting for 0.1 (in upland and paddy cropping) to 4% (in vegetable cropping) of all workers.

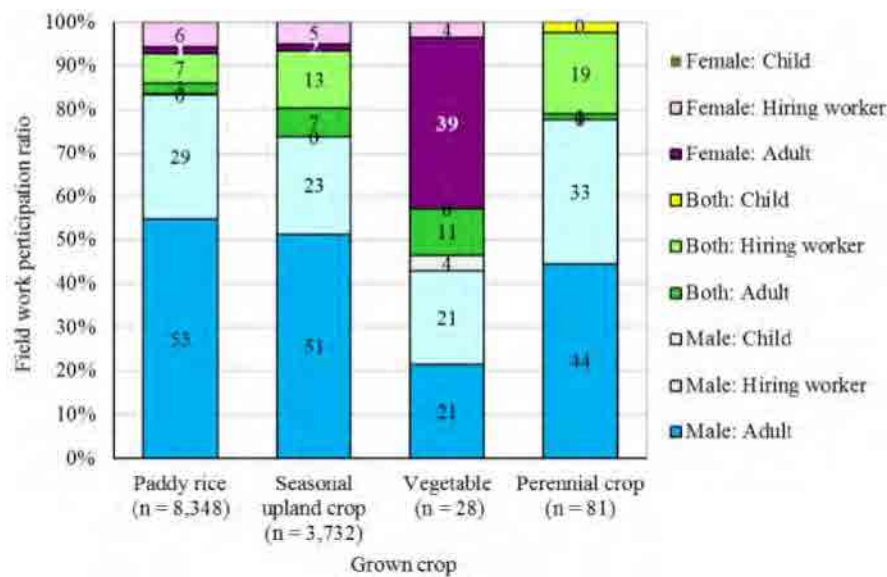


Fig. 2.2.64: Practitioner ratio of the different crop farming from a viewpoint of sex-related differences
 (Note1: Numbers in the figure show total household participated in each work step for respective crop production.)

2) Female participation to field work by township

- Although the respondent number varied from 51 (Zigon) to 85 (Nattalin), about 20% of listed all activities was done by female or both of male and female on average as a whole, which can be regarded as “female participated activities”. (Fig. 2.3.10, right)
- The female participation was low in Nattalin Thegon, and Zigon accounting for about 15%, was high in Pyay and Paungde accounting for about 25%. (Fig. 2.3.10, right)
- Among the female activities, works in paddy cropping reached 60% and those in vegetable cropping did 40% though the listed paddy related works were more than those of vegetable. (Fig. 2.3.10, left)
- About 70% of female farm forks were related to paddy cropping and the rest was done to upland cropping in Paungde, Nattalin, and Zigon. On the other hand, the paddy related works were about 40% of all and the rest was related to upland cropping in Pyay. (Fig. 2.3.10, left)
- About 50% of female works were found in paddy cropping in Paukhaung and Thegon, and the rest was related to upland and perennial cropping (close to 5%) in Paukhaung and to upland and vegetable cropping (about 5%) in Thegon. (Fig. 2.3.10, left)

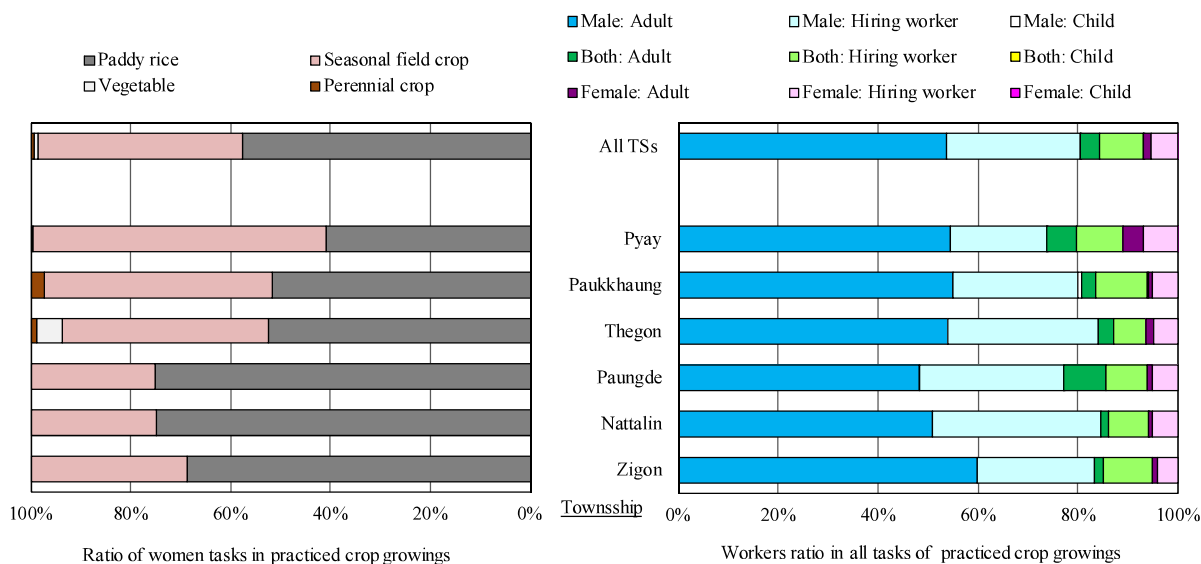


Fig. 2.2.65: Practitioner ratio of the farming in different townships from a viewpoint of sexual specificity (the right), and respective crop growing ratio that women participate in (the left)

3). Female Participation to field work by work category

In Fig. 2.3.11, the male workers as adult and minor males from respondent family, and hired male workers were categorized as “male” in order to make clearer women’s participation.

〈Overall Findings〉

- Looking respective activities of listed cropping, the male was mostly in charge of land preparation, fertilization, and transportation.
- The females including hired one were highly involved in transplanting of paddy cropping accounting for 85% of all practitioners, and the sum of female and both of male and female participation reached 95%. Nevertheless, the female adults from respondent families were only 6% of all.
- The sum of female and both sex worker ratio was second highest in weeding/filling and manual harvesting accounting 70 to 80%, but the ratios were low in the other works accounting merely 30% or less.
- The participation ratio of females from respondent families remained as low as 7% or less in all practitioners in any works, and was almost limited in weeding/filling, transportation of produce from storages to markets, and transplanting.

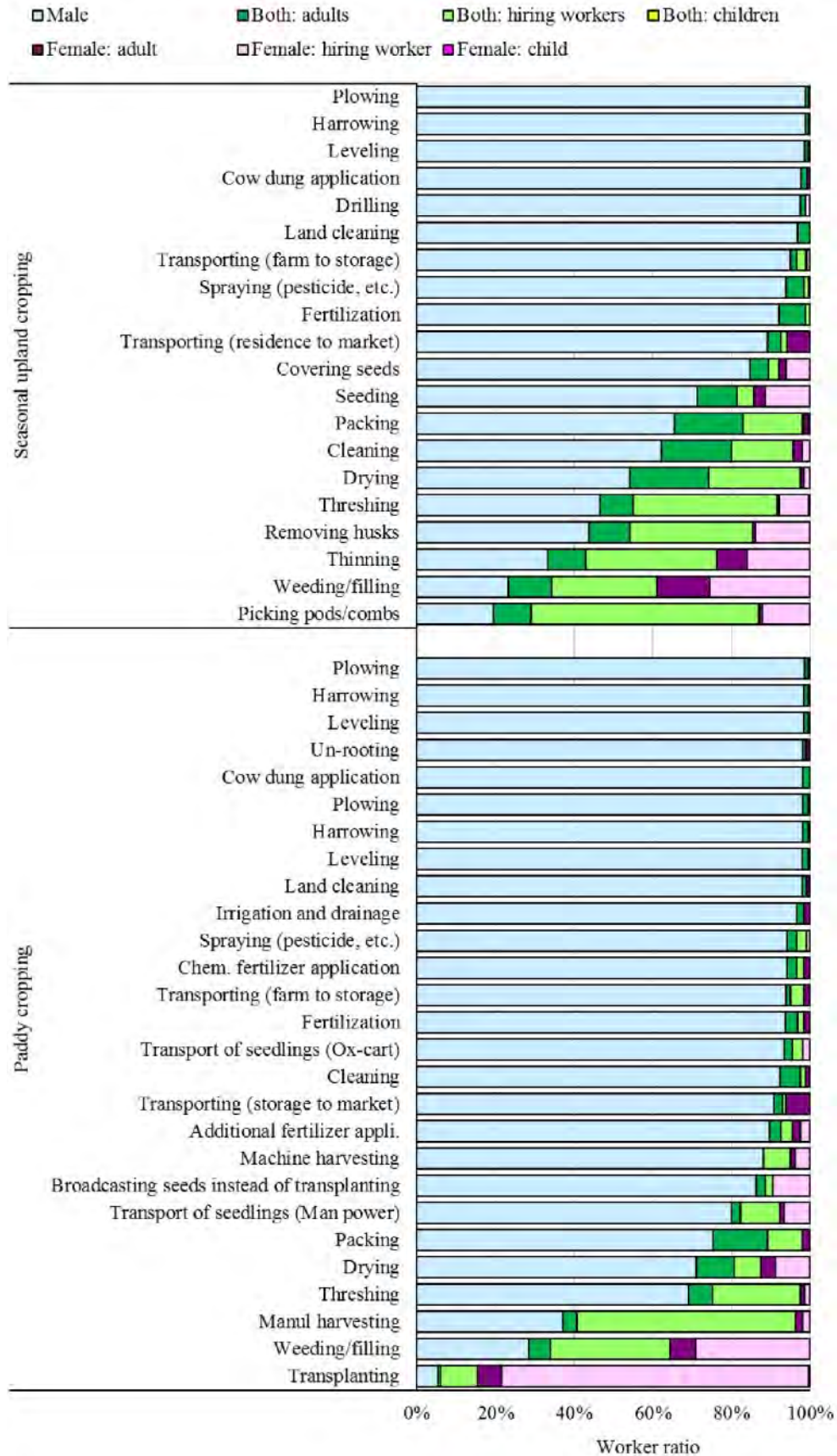


Fig. 2.2.66: Practitioner ratio of the respective procedures in paddy rice and seasonal field crop growing from a viewpoint of sexual specificity
 (The category “male” indicates males from respondent families, hiring male workers, and male children.)

〈Paddy Cropping〉

- According to producers in northern townships, broadcast seeding in paddy cropping had shown sharp growth in a couple of years in order to reduce labor cost and to shorten cropping period, and 70 to 80% of them practiced it. Nevertheless, the producers who practiced it remained 10 to 30% and around 90% of them adopted transplanting in the surveyed period (June 2015 – May 2016), though both of methods were used by a part of the respondents. It is certain, anyhow, broadcast sowing has been quickly expanded in the southern target areas.

Table 2.2.9: Household ratio that practiced transplant and/or broadcast to grow paddy rice (June 2015 – May 2016)

Township	Transplant	Broadcast
	----- % -----	
Pyay	91	25
Paukkhaung	91	28
Thegon	93	13
Paungde	96	32
Nattalin	96	20
Zigon	86	16

- Besides private companies and DOA have recently started planting service using transplanting machine, so that transplanting work by each family is in descendent trend.
- Broadcast sowing was done mainly by males in nearly 90% of respondent families.
- Therefore, it can be said that female participation in paddy cropping has been decreasing.

〈The Other Cropping〉

- Females including hired workers and both of males and females of the respondent families occupied 50 -90% of practitioners who worked on picking of crop pods, weeding/filling, thinning, and threshing of upland crops. However, females from respondent families mostly worked on weeding/filling (13% of all workers, and so on), thinning (8%), and transporting from residence to markets (6%).
- Females worked on perennial cropping together with males in Paukkhaung, but practitioners from respondent families were less than 5% of them.

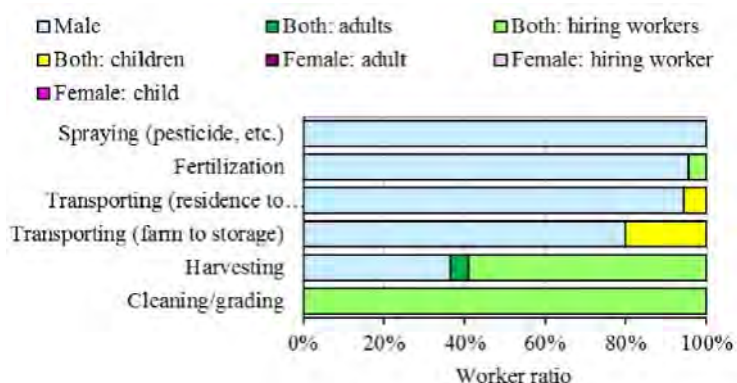


Fig. 2.2.67: Practitioner ratio of the respective procedures in perennial crop growing from a viewpoint of sexual specificity

(The category “male” indicates males from respondent families, hiring male workers, and male children.)

- Growers of vegetables were a few accounting for merely one (1) to four (4) respondents in

Thegon, but females and both males and females from respondent families mainly worked through all procedures of cropping except land preparation. No answer was obtained about thinning of vegetable seedlings. (Table. 2.2.10)

Table 2.2.10: Practitioner number of the respective procedures in vegetable cropping from a viewpoint of sexual specificity

(The category “male” indicates males from respondent families, hiring male workers, and male children.)

Work procedure		Male	Both			Female		
Category 1	Category 2		Adult	Hired	Children	Adult	Hired	Child
Land preparation	Land cleaning	-	-	-	-	1	-	-
	Plowing	2	-	-	-	-	-	-
	Harrowing	2	-	-	-	-	-	-
	Cow dung application	-	-	-	-	1	-	-
	Leveling	1	-	-	-	-	-	-
Farm management	Seedling	-	1	-	-	1	-	-
	Watering	-	1	-	-	1	-	-
	Covering seeds	1	-	-	-	1	-	-
	Weeding/filling	-	-	-	-	2	-	-
	Fertilization (NPK, hormone etc.)	1	-	-	-	1	-	-
	Spraying (pesticide, etc.)	1	-	-	-	1	-	-
Harvest	Harvesting	1	1	-	-	1	1	-
	Transporting (farm to storage)	1	-	-	-	-	-	-
	Drying /cleaning/grading	1	-	-	-	-	-	-
Marketing	Transporting (residence to market)	2	-	-	-	1	-	-

(2) Decision Making in the Target Households

Decision makers of major domestic issues (Table 2.2.11) in surveyed families in the target townships were asked categorizing sole male, sole female, and both male and female as decision maker. Respective decision maker ratios of all issues were obtained based on total number of answers toward each issue.

Table 2.2.11: Major household affairs of farmers in target areas

Decision making		Ownership holding		Management
Category	Issue	Category	Issue	HH account keeping
Purchase	Residential land Farm land Domestic animals (buffalo, goat, etc.) Motorbike Agricultural machinery	Property	Residential land Farm land Domestic animals Automobile Motorbike Agricultural machineries	Domestic account book-keeping Agricultural account book-keeping
Sale	Seed Grain Vegetable Perennial crop (fruits, etc.) Forest tree (fire wood, bamboo, etc.) Domestic animal	Income	Grain sale Vegetable sale Perennial crop sale Forest tree sale Domestic animal sale Lending fee of agri. machinery	
Others	Crop to grow Field worker hiring Lending cash out Loan obtaining Attendance of training Education of children			

1) Decision making from the viewpoint of townships

- Ratios of decision maker of sole male and sole female on domestic issues were 40 and 10%, respectively, on average of all townships, which showed less influence of female in families (Fig. 2.3.68).
- Nevertheless, almost 60% of the issues reflected female's intension because nearly 50% of the cases were decided by agreement of two partners.
- Female intension was less affected in Zigon and Nattalin accounting for 50%, which implied rules of each sex in families tended to be specialized.
- On the other hand, the cases decided by females and the partners reached the highest ratio of 70% in Pyay, which was presumably induced from high percentage of female who participate in upland cropping and/or who lead the family.
- The ratios were middle of the above-mentioned groups accounting for 40% in Thegon, Paungde, and Nattalin.

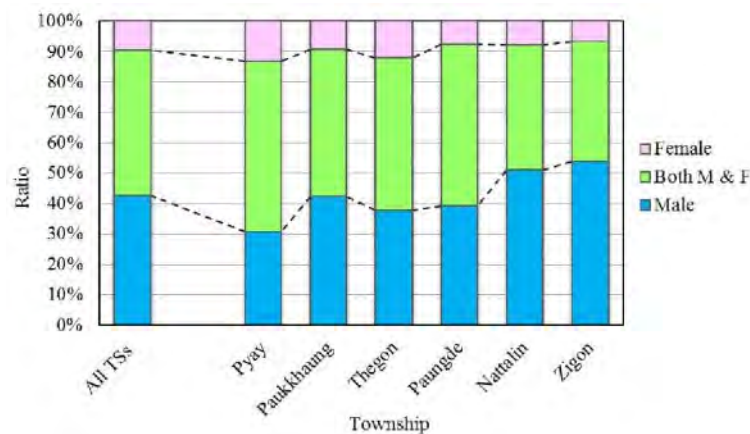


Fig. 2.2.68: Decision maker ratio on domestic affairs from a sexual specificity point of view

2). Decision Making of Surveyed Domestic Issues

- Sole female ratios that decide respective domestic issues were lower (5-30%) than those of sole males (15-65%).
- The female intension that was regarded as a sum of decision ratios by sole female and agreement of partners was highly reflected in vegetable sale (7 HHs), education of children (187 HHs), and lending cash out (246 HHs) accounting for over 80% of the total ratio, and in domestic animal sale, agricultural produce sale and decision crops to be grown accounting for 60-70%. High effect of female intension seemingly appeared in the issues directly related to family budget.
- On the other hand, sale of forest trees (12 HHs) and participation to seminars were mainly decided by males, and the cases shown the female intension remained by around 30%.
- The findings showed that women had hardly attended seminars, and that external affairs had been specialized as male issues.
- Furthermore, it suggested that the role of females in business agriculture has not recognized, and that empowerment of females has not been strategically placed in relation to the rural development activities.

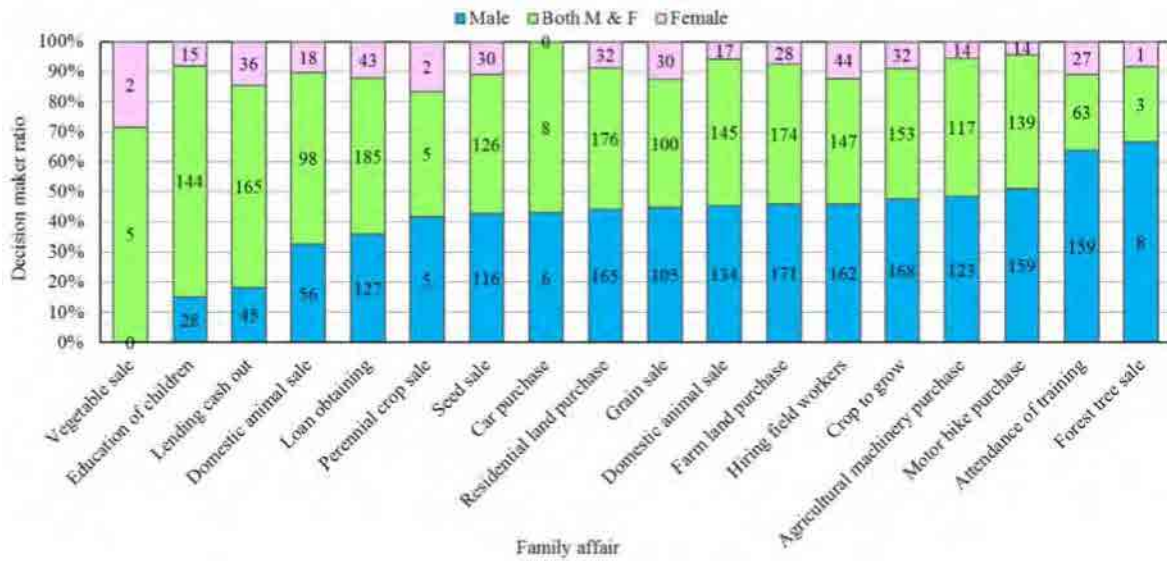


Fig. 2.2.69: Decision maker ratio on respective domestic affairs from a viewpoint of sexual specificity
(Numbers in the figure show total household responded.)

(3) Accounts Keeping (Household Account / Agriculture Business Account)

- Household accounts had kept in nearly 50% of surveyed households with the range from 30% in Thegon to 60% in Paungde. Sole females had kept the accounts in more than 60% of account keeping households in each township, and the female participation, furthermore, achieved 90% by addition of the cases that both males and females had kept the accounts (Fig. 2.2.70).
- Households which had kept agriculture business accounts reached for three fourth (3/4) of the respondent families with variation from 70% in Paungde to 80% in Nattalin.
- The agriculture business account book keeping by females including collaborative cases of males and females reached 60%, which implied this ratio of female recognized the agriculture business situation of the family. Especially in Nattalin where the permanent labor holder ratio was highest, females were highly involved in agriculture business management so that sole females of 40% of households were in charge of the book keeping.
- Among all households that practiced the agriculture business book keeping, females of three fourth (3/4) households (sole female in 40% households) participated in it.

Overall findings are following;

- Households which had kept agriculture business accounts reached for three fourth (3/4) of the respondent families with variation from 70% in Paungde to 80% in Nattalin.
- Importance of accounts book keeping, especially in agriculture business accounts, seemed to be fully recognized by the target producers.
- Domestic accounts keeping was mainly done by females, but agriculture business book keeping was considered as a family subject so that partners of male and female were in charge of it in most of households.
- Therefore, both of males and females in households manage the agriculture business, together, and the conation for empowerment of the management skill was considered very high.

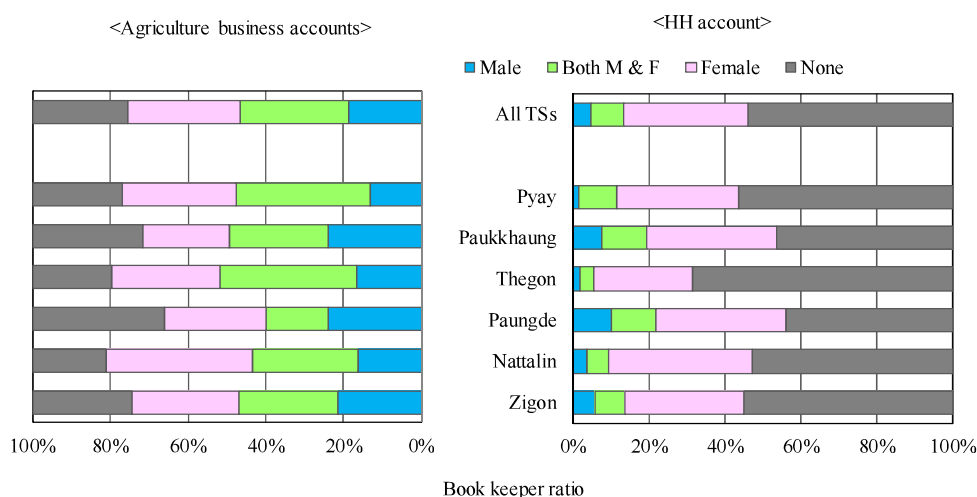


Fig. 2.2.70: Bookkeeper ratio in charge of the household account book (the right) and the farming account book (the left) in the target townships from a viewpoint of sexual specificity

(4) Ownership Holders of Capital Assets, Movables, and Family Income

1) Capital Assets and Movables, and Income

Ownership holders of capital assets and movables listed in Table 2.3.16 in the target households were surveyed.

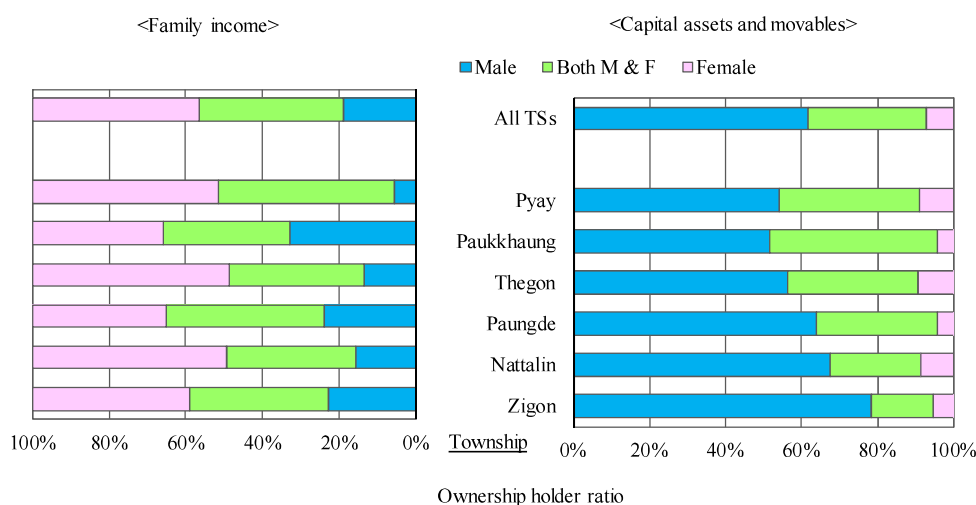


Fig. 2.2.71: Ownership holder ratio of capital assets and movables (the right) , and the family income (the left) in the target townships from a viewpoint of sexual specificity

〈Capital and Assets and Movables〉

- Capital assets and movables of the whole target households were owned by male(s), female(s) and both partners in the ratio of 60, 10, and 30%, respectively.
- The ratio of female related ownerships, those of sole females and partners of both sexes, was lower in Zigon and Nattalin accounting for 20-30% of all cases than in the other townships accounting for 40-50%.

⟨Income⟩

- Household income obtained from primary commodities, mainly agricultural produce, sale and lending of agricultural machineries was mainly managed by sole females (over 40% of all cases) and partners of both sexes (nearly 40%) in the surveyed households, which showed 80% of female participation in all income management cases.
- The female participation was low in Paukkhaung with the ratio of nearly 70%, and high in Pyay with that of over 90%. The ratio accounted for 80-90% in the other townships.
- Income from grain sales which more than 80% of households obtained was under female related management (sole females and females with the partners) in more than 80% of surveyed households.
- Income from vegetables and perennial crop sales was mostly managed by sole females and females with the partners as well as the sale decision of the produce though it was not their main income in the area shown in the small number of respondents.

⟨Overall findings⟩

- The obtained results derived that females were generally in charge of administration management of the family budget as shown in high participation in the sale decision of the produce and in book keeping of agriculture business accounts.
- On the other hand, ownership holders of capital assets like a motor bike and agricultural machineries were mainly sole male accounting for over 60% of the cases as well as those of movables such as residential land and means of produce like farm land.

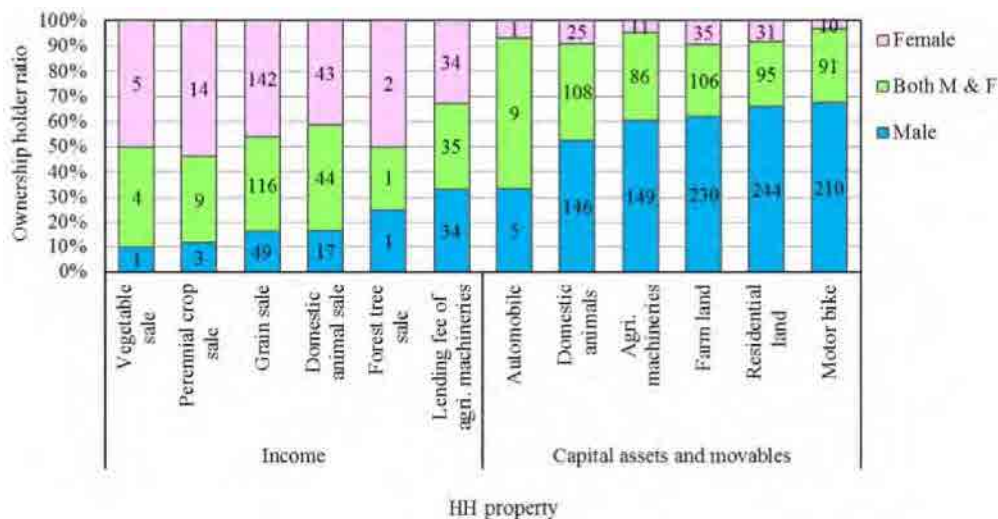


Fig. 2.2.72: Ownership holder ratio of respective domestic assets and income sources from a viewpoint of sexual specificity

(Numbers in the figure show total household responded.)

(5) Supports for Females Aiming Increase of Household Income

In response to the results from (1) to (4), followings are overall view and suggestion based on investigation of farming in the Project Area from gender perspective

- Female participation ratio in production activities was higher in northern townships, Pyay and Paukkhaung, and lower in southern townships, Zigon and Nattalin. The rate of townships in central part, Thegon and Paungde, are middle of the above-mentioned two groups.

- As a result, the female ratios of those who makes decision in families and that has ownerships of family property were higher in northern townships, and lower in southern townships.
- Anyhow, it does not change that females are main actor in family finance management because of high involvement of females (sole females and those with the partners) in it accounting for 70-80% of the surveyed households.
- Females of surveyed family rarely joined farm works, but several percent of cases showed the female participation in transplanting and weeding/filling (paddy and seasonal upland crop).
- Therefore, empowerment of females in seed multiplication that requires transplanting and strict weeding and removing of off-types seems useful.
- Over 50% of cases showed that females were involved in decision making in family affairs, and that female intension was highly reflected in sales of agricultural produce and selection of crops to grow, which directly affect management of family finance.
- Females were generally family finance manager and 60% of them recognized their agriculture business situation through book keepings of domestic and farm accounts.
- Based on these established activities by females, it can be said that they are highly interested in rationalization of farm management through analysis and utilization of account books, market information sharing and the analysis, improvement of selling methods, and/or participation of price making those which empower their management capability, and that their empowerment in management capability will provide a high effect in their agriculture business.
- Nevertheless, female participation in trainings/seminars was not prevailed at present in spite of their important roles in families, and external affairs were done mainly by males.
- The Project is going to improve the social recognition of female roles in agriculture business through feedback of the survey results to target households, and to promote their participation in trainings/seminar focusing on highly interested issues of females.
- The above-mentioned activities are expected to facilitate enhancement of the agriculture business income of producers in the target areas.

2.2.13 ISSUES FARMERS ARE CONSCIOUS OF

Table 2.2.12 shows the various items of basic condition necessary for farming, such as social condition or fundamental facilities, and cultivation / post-harvest technique. The Project team surveyed whether the respondents were conscious of difficulty with each item with plurality answers. The result is shown in Fig. 2.2.73. Among the items which showed as choices in the questionnaire, “Size of farmland”, “Cultivation technique”, “Quality of product”, “Quality of seed”, “Market”, and “Post-harvest technique” were all categorized into “Others”, since the ratio of respondents who regarded difficulty with those items accounted less than 20% in all townships.

Table 2.2.12: Questioned issues to confirm if farmers consider as their difficulties

Category	Issue	Category	Issue
Fundamentals	Water shortage	Cropping technique	Cropping techniques
	Flood		Pest & disease
	Poor road		Produce quality
	Farm land leveling		Seed quality
	Farm land size		Market finding
	Poor soil	Post-harvest management	Post-harvest techniques
	Labor shortage		Low produce price
	High fertilizer price		
	Getting credit loan		

Note: The blue shadowed issues were regarded as difficulties by more than 80% of interviewees in each township.

- Majority of items which the respondents were conscious of difficulty with were related to fundamental condition, which should be the matter before considering cultivation technique or post-harvest technique. (Table 2.2.12)
- On the whole, the ratio of the respondents regarded that they have faced difficulty with farming in Paungde was the lowest. On the other hand, those in Pyay, Nattalin and Thegon were higher than others, followed by Paukkaung and Zigon.
- In all townships, from quarter (1/4) to three fourth (3/4) of the respondents in each township regarded following four (4) points as problems they have with farming: “Labor shortage”, “Water shortage”, “High fertilizer price”, and “Pest and disease”. (Fig. 2.2.73)
- Beside the major items above, “Flood” was regarded as a problem by 40-50% of respondents in Nattalin and Zigon, which are located in downstream area of the river. In addition, even though Pyay is near to water source, 20% of the respondents in Pyay regarded “Flood” as a problem.
- “Farm land leveling” (Nattalin), “Low produce price” (Paukkaung), and “Poor road” (Nattalin and Thegon) were also regarded as problems: about one fifth (1/5) to one fourth (1/4) of the respondents were conscious of each item in each township.
- In Pyay and Paukkaung, where sandy soil largely covers, more than 20% of the respondents pointed out that “Poor soil” was a problem. Given that “Poor soil” the respondents were conscious of represented low nutrient content and nutrient preserving capability of soil, both of “Poor soil” and “High fertilizer price” can be regarded as same problem, namely “Fertilization of soil”. It means that from 30% (Paungde) to 70% (Pyay) of the respondents in each township had difficulty with fertilization of soil.

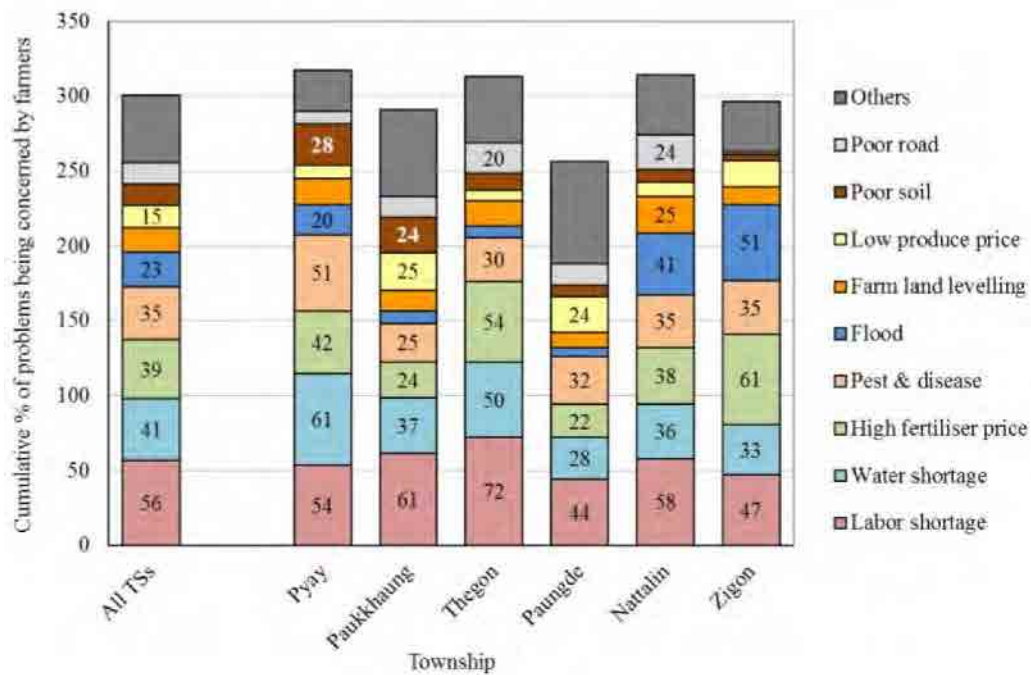


Fig. 2.2.73: Ratios of farmers who regarded each issue as difficulty in respective townships

2.2.14 FUTURE PLAN

The team surveyed future plan that respondents wished to be engaged in or to start managing in future with its reason. Figure 2.2.74 shows the results.

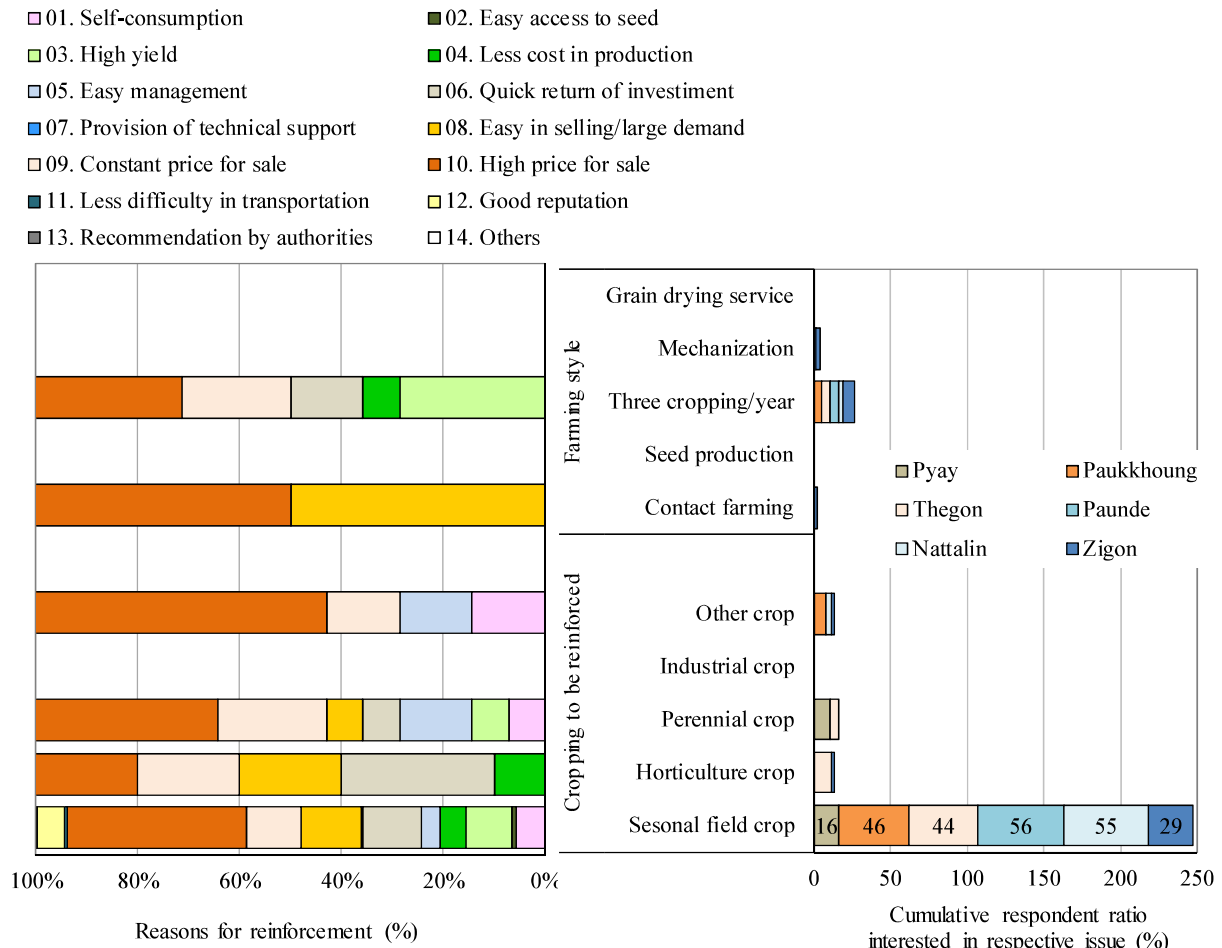


Fig. 2.2.74: Cumulative respondent ratio interested in respective issues (%) and reasons for reinforcement of each issue (%)

- Majority of respondents who gave valid responses wished to reinforce cultivation of seasonal crop, and there was some who were willing to reinforce cultivation of horticulture and perennial crops.
- The respondents in Thegon who were willing to enlarge or to start horticulture crop cultivation were considerably more than other townships. On the other hand, relatively more respondents in Pyay were willing to be engaged in perennial crop cultivation rather than other townships.
- The reason to be willing to reinforce seasonal crop which was commonly pointed out by the respondents was “High price for sale”, followed by “Quick return of investment” and “Easy in selling / large demand”. Whereas, the major reason to wish to reinforce horticulture crop was “Quick return of investment”, and the ratio who pointed out “Easy in selling / large demand” and “Constant price for sale” were larger than those of seasonal crop.
- Some respondents in Thegon who wished to enlarge horticulture crop cultivation may have its

experience according to field survey: there were a certain number of farmers in Thegon who were cultivating vegetables using water from well in downstream area. Since cultivation period required for vegetables is generally shorter than seasonal crop, they recognize its profitable point like quick return of investment due to short growth period, and its market demand fluctuation.

- More than a half of those who wished to be more engaged in Perennial crop cultivation pointed out “High price for sale” and “Constant price for sale” as reasons for reinforcement. The majority of the respondents here were from Pyay, followed by Thegon. According to the survey, commonly cultivated perennial crop was sugarcane, and sugarcane cultivation was largely observed in Thegon in the survey, which was expected to have been managed under contract with sugar factory. With regard to the respondents in Thegon, it can be expected the respondents referred to sugarcane cultivation currently carried out around, when they thought the reason of reinforcement. “Easy management” was also commonly pointed out as a reason.
- From the viewpoint of farming style, three cropping per year was most popular. The ratio of those who were interested in three cropping per year in Zigon was relatively more than those of other TSs.

2.3 AGRICULTURAL MANAGEMENT

As mentioned above, this baseline survey got the information from 376 respondents of six target townships in total. Of it, however, some responses were calculated as invalid, and the valid responses were 285 respondents, for the analysis of this chapter (Table 2.3.1).

Table 2.3.1: Number of valid responses

Township	Sample Number	Valid sample Number	Valid sample %
Pyay	69	43	62.3
Paukkhaung	67	43	64.2
Thegon	54	44	81.5
Paungde	50	37	74.0
Nattalin	85	78	91.8
Zegon	51	40	78.4
All	376	285	75.8

According to the Baseline Survey, most farmers engaged farming for both income generation and self-consumption. For quantitative valuation of self-consumption, the unit prices of each crop were estimated based on average farm gate prices. The rebated prices by those unit prices are applied in the analysis.

2.3.1 GROSS AGRICULTURAL INCOME

(1) Average Gross Agricultural Income per Household

- Average gross agricultural income per household in whole townships was about 3,803,000kyats. However, total amounts of Pay and Paukkhaung were almost half of it (Fig. 2.3.1).
- The highest earner was Nattalin, and its total amount was about 5,989,000kyats.
- Farmers earned agricultural income from paddy, pulse (including black gram, green gram, and lab lab bean), groundnut, sesame and sugarcane. Among them, paddy is the main income source in all townships, accounting for more than a half of total income.
- As mentioned above, sugarcane was mainly grown in northern townships (Pyay, Paukkhaung, and Thegon). Especially, around 40% of farmers in Thegon harvested it. However, the amount of gross income from sugarcane was quite low, since it is a perennial crop and farmers could not earn income every year. Hence, from the viewpoints of income, sugarcane could not be the major crop.
- Regarding Pyay and Paukkhaung which had lower gross agricultural income than other four townships. It seemed that farmers earned income from many varieties of crops, for the dispersion of risk caused by unexpected weather. On the other hand, farmers in Paungde, Nattalin, and Zegon cultivated only paddy and/ or black gram. Farmers in Thegon got income from several varieties of crops. However number of variety of crops was less than Pyay or Paukkhaung.
- Gross agricultural income per household of paddy in Thegon, Paungde, Nattalin, and Zegon was higher than that of Pyay or Paukkhaung.

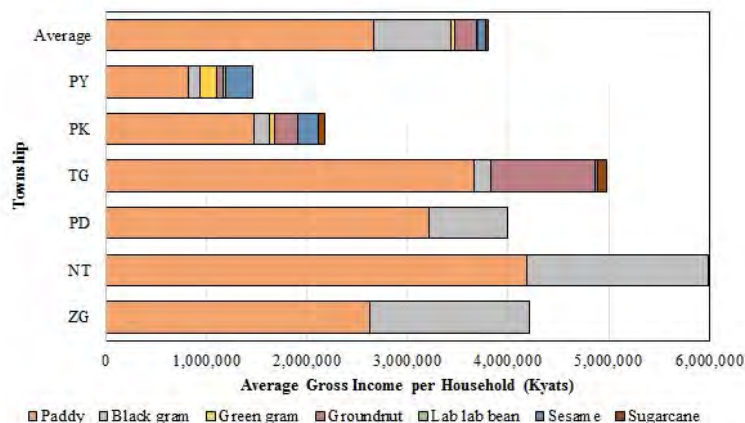


Fig. 2.3.1: Average gross income per household

(2) Number of Farmers who Earned Agricultural Income by Each Crop

When total numbers of valid respondents by each township are calculated as 100%, farmers’ ratio who earned agricultural income (including self-consumption) by each crops are shown in below.

Overall, it seemed that farmers got income from monsoon paddy and winter black gram. In addition, most of farmers did not rely on the income from summer crops. Rarely, there were farmers who got income from summer paddy or pulse.

[Paddy]

- In the LCAs of all six townships, almost half of farmers got income from monsoon paddy. The highest ratio was Pyay (58%) and the lowest ratio was Nattalin (47%). It was not observed significant difference (Fig.2.3.2).
- Regarding the outside of CA, there was a stronger tendency, that most of farmers got income from monsoon paddy cultivation. The highest ratio was Thegon and Paungde (89%) and the lowest ratio was Pyay (77%).
- In winter and summer, the earners’ ratios were nil or quite lower than monsoon (winter; 0%, summer; 2~21%).
- In both areas of Paukkaung, 21% of farmers got income from summer paddy, and it was the highest ratio among six townships. On the other hand, in both areas in Nattalin and Zegon, the earners’ ratio was nil.
- In Myanmar, there was a governmental policy that farmers are forced to cultivate monsoon paddy and summer paddy during period of the last government. Hence, in this decade, farmers had been familiar to cultivate paddy in both seasons. Nowadays, however, farmers are allowed to grow any kinds of crops freely. In addition, farmers have begun to realize that the summer paddy cultivation is not more profitable than monsoon paddy cultivation, from their experiences. It could be considered that those conditions made the lowness of summer paddy.
- Even though, some of farmers in Pyay, Pakkhaung, Thegon, and Zegon earned income from summer paddy. According to some of those farmers, they grow summer paddy for capital of monsoon paddy, since the profit from summer paddy is quite lower. In short, they do not expect high profit from summer paddy.

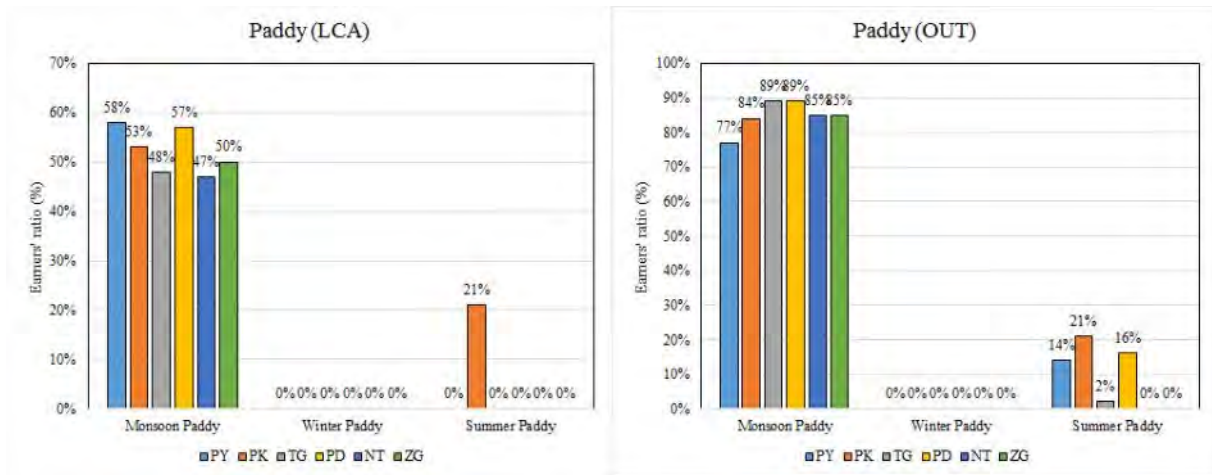


Fig. 2.3.2: Earners' ratio of paddy

[Black gram]

- In the LCA of Nattalin, there was a few farmers who got income from monsoon or winter black gram, while there was no farmers in the other five townships (Fig.2.3.3).
- Regarding the outside of LCA, more than 12% of farmers in all six townships earned income from winter black gram. The highest ratio was Zegon (60%) and the lowest was Pyay (12%), and there was five time differences. With township becoming southerner, the ratio increased.
- On the other hand, less than 10% farmers got income from monsoon or summer black gram in the outside of LCAs.

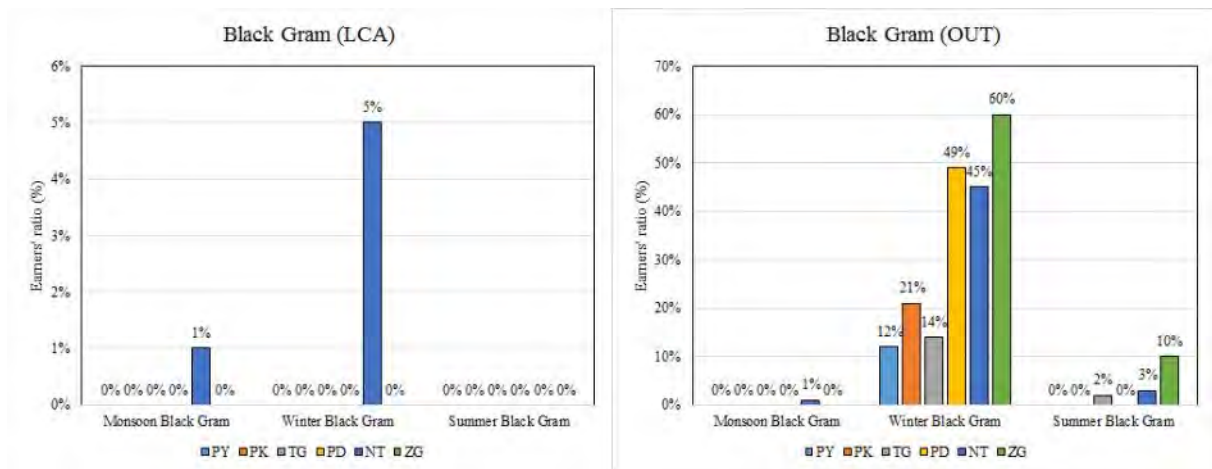


Fig. 2.3.3: Earners' ratio of black gram

[Green gram]

- In the LCAs of whole townships, almost no farmer got income from green gram (Fig.2.3.4).
- Regarding the outside of LCA, 16% of farmers in Pyay and 9% of farmers in Paukhaung got income from monsoon green gram. In addition, 23% farmers in Pyay also got income from winter green gram. However, the ratio of summer green gram was almost nil in all townships.
- In Pyay, especially in the outside of LCA, ratios of monsoon and winter green gram were higher than monsoon and winter black gram in each.

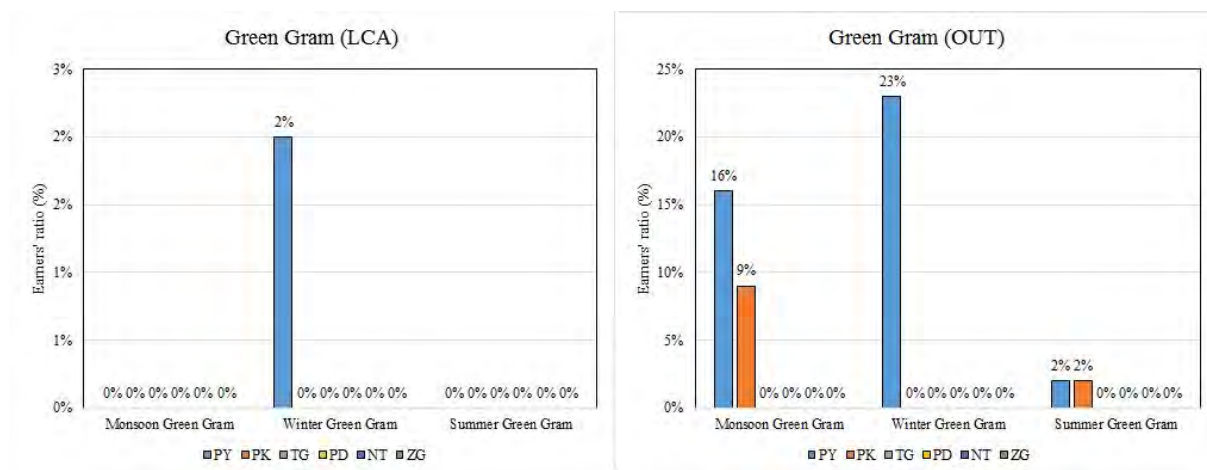


Fig. 2.3.4: Earners' ratio of green gram

[Groundnut]

- In all LCAs, there was no farmer who earned income from groundnut in any seasons (Fig.2.3.5).
- Regarding the outside of LCAs in Pyay, Paukhaung, and Thegon, more than 19% farmers got income from monsoon groundnut. The highest ratio was Thegon (32%) and the lowest ratio was Pyay (19%). In other two seasons, the ratios were almost nil among all six townships.

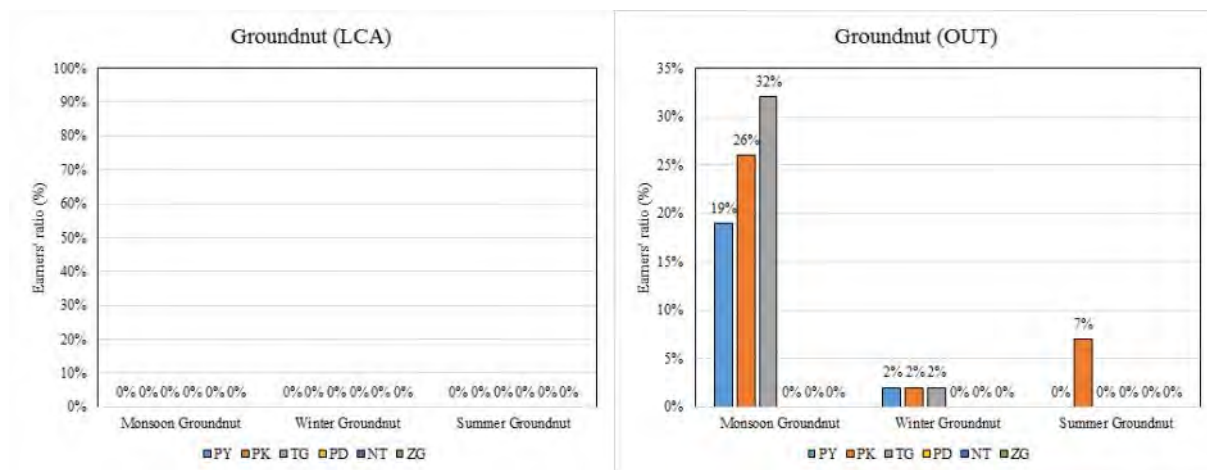


Fig. 2.3.5: Earners' ratio of groundnut

[Lab lab bean]

- In all LCAs, there was no farmer who earned income from lab lab bean in any seasons (Fig.2.3.6).
- Regarding the outside of LCA, only 9% of farmers in Pyay earned income from winter lab lab bean. As mentioned above, farmers in Pyay cultivated much varieties of crop than other townships. Lab lab bean was one option to get income for them, while it was not the major crop from viewpoints of earners' ratio in other five townships.

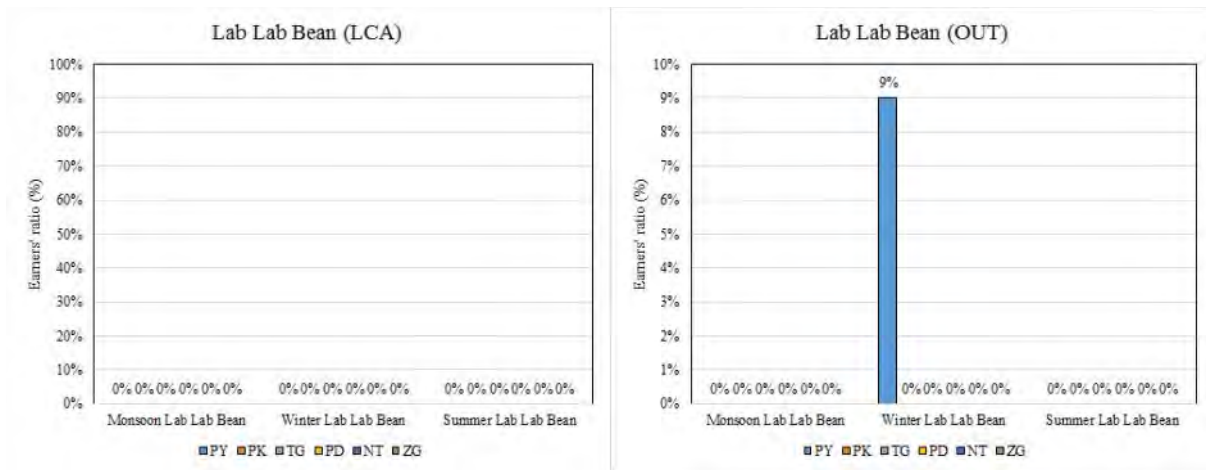


Fig. 2.3.6: Earners' ratio of lab lab bean

[Sesame]

- In the LCA of Pyay, there was 2% of farmers who got income from monsoon sesame (Fig.2.3.7).
- Regarding the outside of LCA in Pyay and Paukhaung, almost half of farmers earned profit from monsoon sesame, while the ratios in other townships were almost nil. There was the tendency that farmers in northern part relied on the profit from monsoon sesame.
- According to some farmers, they had experiences to cultivated summer sesame several decades ago, while there was no farmers who got income from summer sesame in this survey. In addition, they said that they want to try it, if they have enough irrigated water and/ or suitable soil condition for summer sesame cultivation.

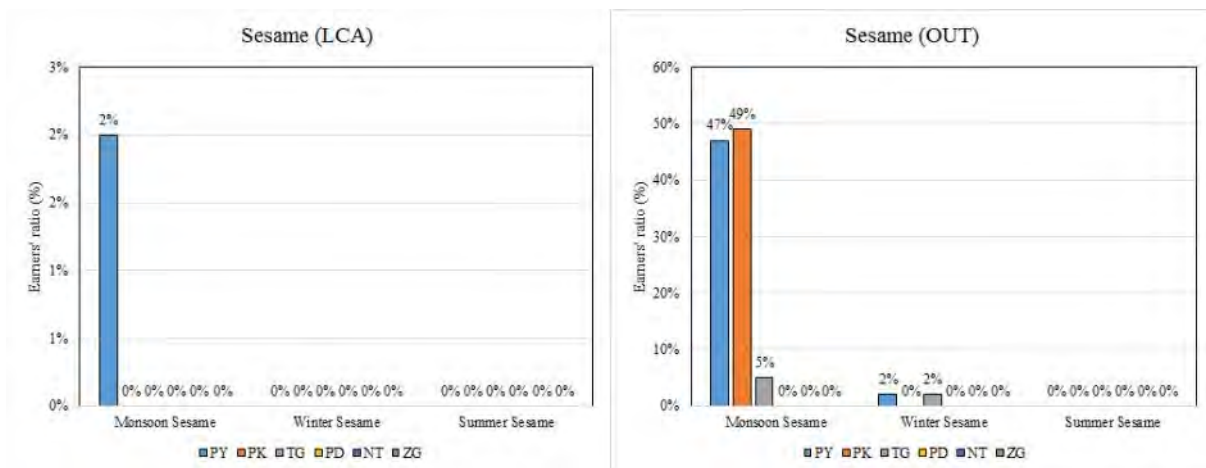
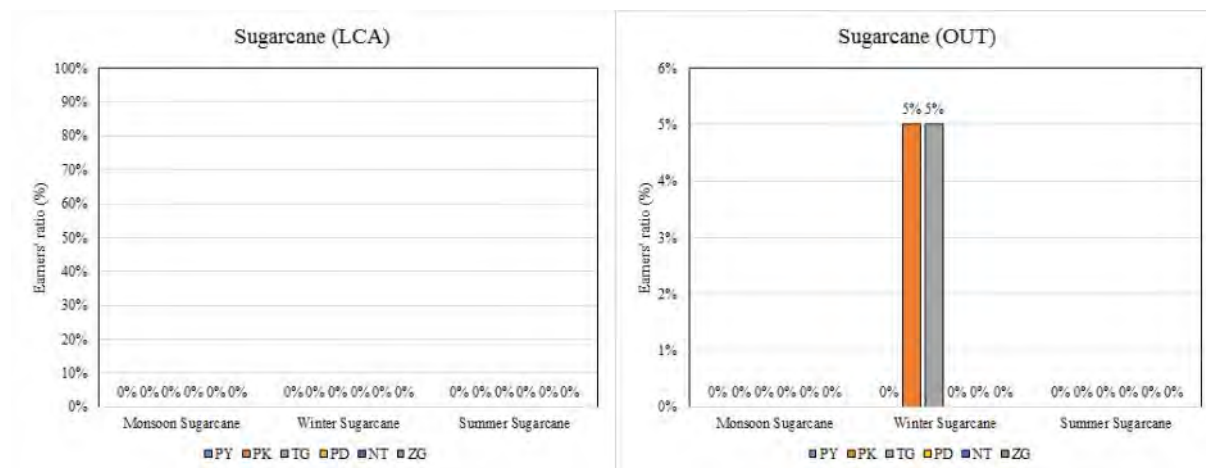


Fig. 2.3.7: Earners' ratio of sesame

[Sugarcane]

While Sugarcane is a perennial crop of which farmer can harvest through all year, most of farmers responded that they harvested in winter season in this survey. In addition, this earners' ratio seemed quite differ from growers' ratio which was mentioned in '2.2 Agricultural Production,' since it mostly takes two years until harvest.

- In the LCAs of all townships, there was no farmer who got income from sugarcane (Fig.2.3.8).
- Regarding the outside of LCAs in Paukhaung and Thegon, there were 5% of farmers who got income from winter sugarcane in each townships.



(3) Number of Owned Plots for Cropping per Household

- Average numbers of owned plots for cropping per household in all townships were 2.3 plots within LCA, and 15.1 plots in the outside of LCA. Farmers in all townships tended to have larger amount of plots in the outside of LCA than the within LCA (Table 2.3.2).
- The largest owned plot was 24.9 plots (within LCA; 2.0 plots, outside of LCA; 22.9 plots) in Thegon. The area was almost two time of 12.0 plots in Paukkaung which was the lowest amount.

Table 2.3.2: Number of owned plots for cropping

Township	LCA (plots)	OUT (plots)	Total (plots)
PY	1.9	10.3	12.2
PK	2.0	10.0	12.0
TG	2.0	22.9	24.9
PD	2.6	14.9	17.5
NT	3.3	18.9	22.2
ZG	2.1	13.7	15.7
Total	2.3	15.1	17.4

(4) Area of Cultivated Land per Household

- Average cultivated areas per household were 2.1 acres in the LCA, and 7.8 acres in the outside of LCA. In addition, cultivated areas of the outside of LCA in all six townships were larger than that of LCA (Table 2.3.3).
- Regarding Thegon, sum of cultivated areas were more than 10.3 acres. Especially, farmers in Nattalin had largest cultivated land (13.6 acres), which was about two time of Pyay which was the smallest (6.3 acers).

Table 2.3.3: Average cultivated land

Township	LCA (acres)	OUT (acres)	Total (acres)
PY	1.3	5.1	6.3
PK	2.0	4.8	6.8
TG	1.4	8.9	10.3
PD	2.6	8.7	11.3
NT	3.0	10.6	13.6
ZG	1.7	8.6	10.3
Total	2.1	7.8	10.2

The average cultivated areas of each crop are shown in below.

[Paddy]

- In the LCA and outside of LCA, average cultivated area of monsoon paddy was the largest as compared with other two seasons. The largest township was Nattalin in both areas, respectively, 2.8 acres in the LCA and 7.3 acres in the outside of LCA. In addition, there was almost three time differences (Fig. 2.3.9).
- On the other hand, the smallest townships were Pyay and Paukkaung, respectively, 1.1 acres in Pyay LCA and 2.2 acres in the outside of Paukkaung LCA.
- The cultivated areas of winter paddy in all townships were nil, since there was no earners, as mentioned above.
- Regarding summer paddy of the LCA, Paukkaung was the largest (0.7 acres), while others were nil. In outside of LCA, Paungde was the largest (0.7 acres).

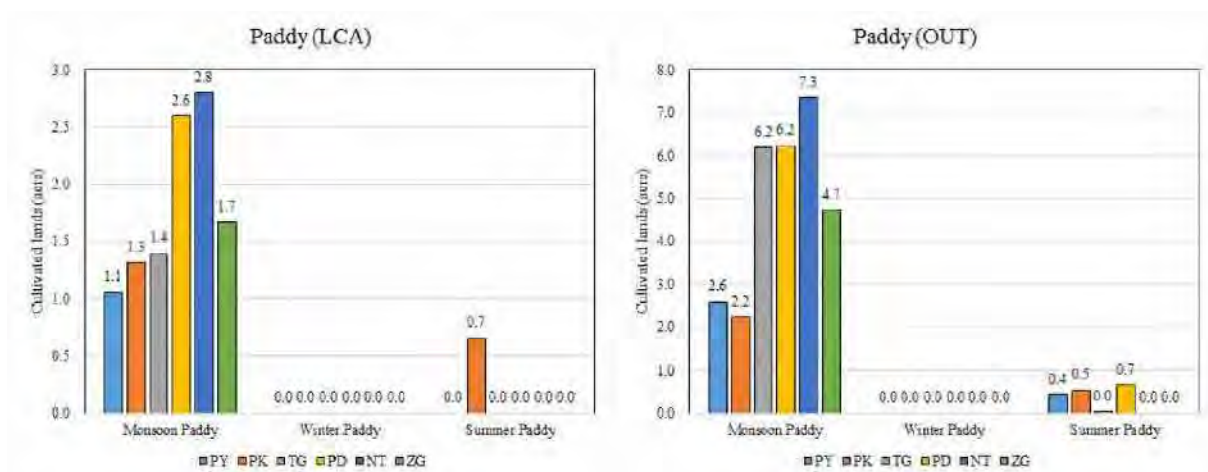


Fig. 2.3.9: Average cultivated area of paddy

[Black gram]

- In the LCA and the outside of LCA, black gram was cultivated in winter season, mainly. While only farmers in Nattalin cultivated black gram in the LCA, farmers in all six townships cultivated it in the outside of LCA (Fig. 2.3.10).
- Regarding winter black gram, the largest township was Nattalin in both areas, respectively, 0.2 acres in the LCA and 3.3 acres in the outside of LCA.
- As becoming southern townships, cultivated area of winter black gram increased in the outside of LCA, remarkably. There was almost two time differences between the largest (Zegon; 3.3 acres) and the smallest (Pyay; 0.2 acres).
- Zegon also had the largest cultivated area of summer black gram (0.6 acres), in the outside of LCA.

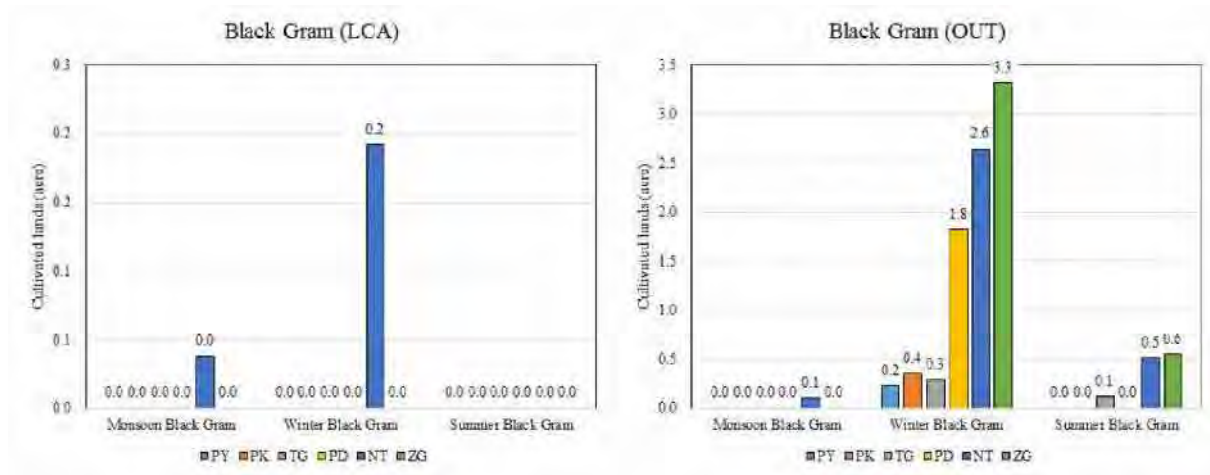


Fig. 2.3.10: Average cultivated area of black gram

[Green gram]

- Green gram was mainly cultivated in winter season, as same as black gram. While it was cultivated in Pyay and Paukkhaung, the areas were less than 0.3 acres in the LCA and the outside of the LCA (Fig. 2.3.11).
- From the viewpoint of cultivated area, green gram was not major crop in all six townships, as compared with paddy or black gram.

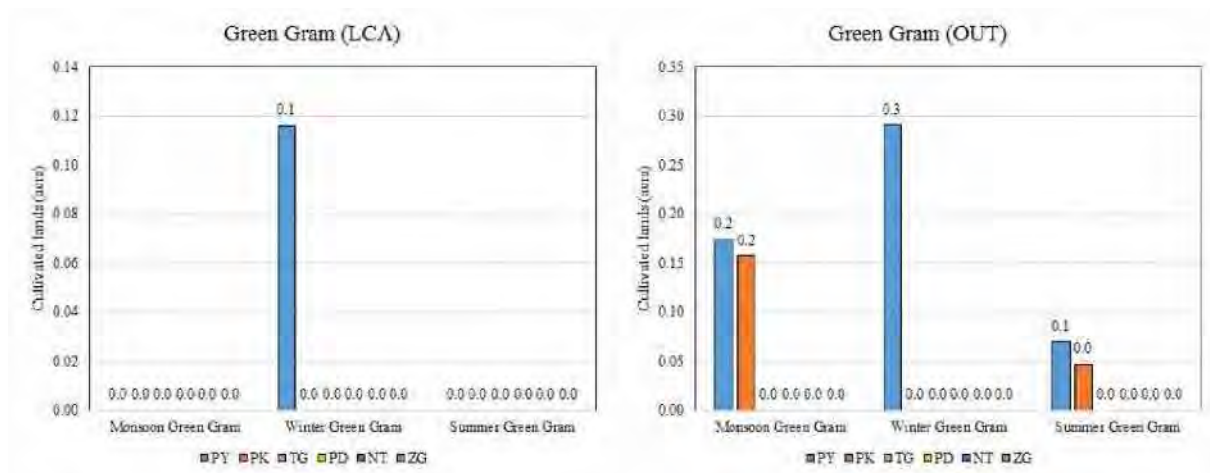


Fig. 2.3.11: Average cultivated area of green gram

[Groundnut]

- Average cultivated area of groundnut in monsoon season was largest (1.7 acres) in outside of Thegon LCA (Fig. 2.3.12). On the other hand, in both areas of other townships, the areas were extremely small or none.
- As same as green gram, groundnut was not major crop in all townships. However, in the outside of Thegon LCA, cultivated area of monsoon groundnut was larger than monsoon black gram or green gram in there, but smaller than monsoon paddy. Between monsoon paddy (6.2 acres) and monsoon groundnut (1.7 acres), there was almost four time differences in the outside of Thegon LCA.

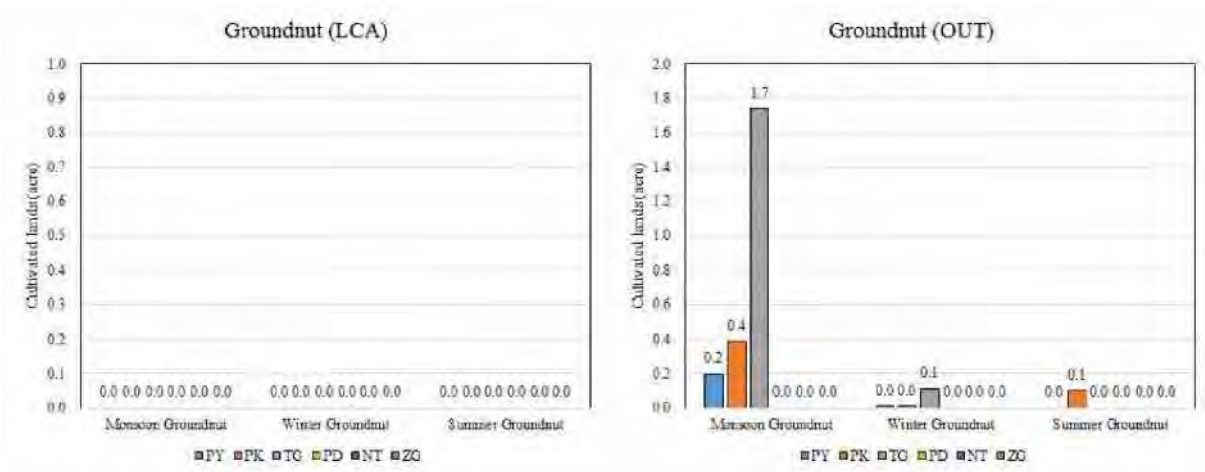


Fig. 2.3.12: Average cultivated area of groundnut

[Lab lab bean]

- Only farmers in the outside of Pyay LCA cultivated winter lab lab bean, and the average cultivated area was around 0.1 acres (Fig. 2.3.13).
- Lab lab bean was also not the major crop among all six townships, as same as green gram and groundnut.

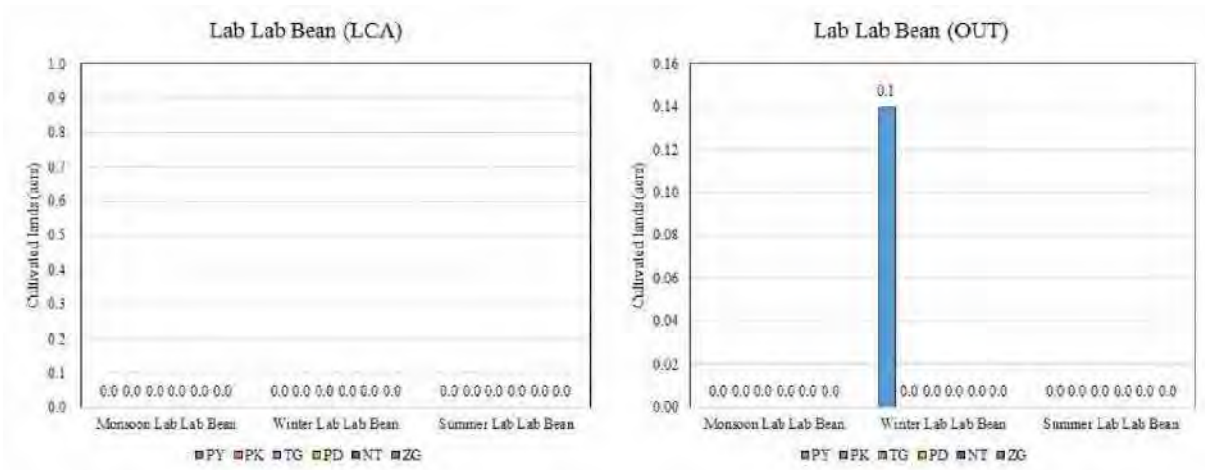


Fig. 2.3.13: Average cultivated area of lab lab bean

[Sesame]

- In the Pyay LCA, average cultivated area of monsoon sesame was 0.1 acres, while cultivated areas of sesame in other five townships were nil through all seasons (Fig. 2.3.14).
- On the other hand, regarding monsoon sesame in the outside of LCA, the largest areas were 0.8 acres of Pyay and Paukhaung. Other than monsoon, cultivated areas were less than 0.1 acres in all six townships.
- As mentioned above, some of farmers had experiences to cultivate summer sesame and are interested in it. In addition, the expert of sesame cultivation from Japanese company which has exported sesame from Myanmar to Japan said, there is possibility that the company will buy sesame from this project site, if the quality is sufficient with their requests. Hence, the promotion of summer sesame cultivation was set as one of important activity in this project. As a result of it, it is expected that cultivation area of summer sesame will be increased.

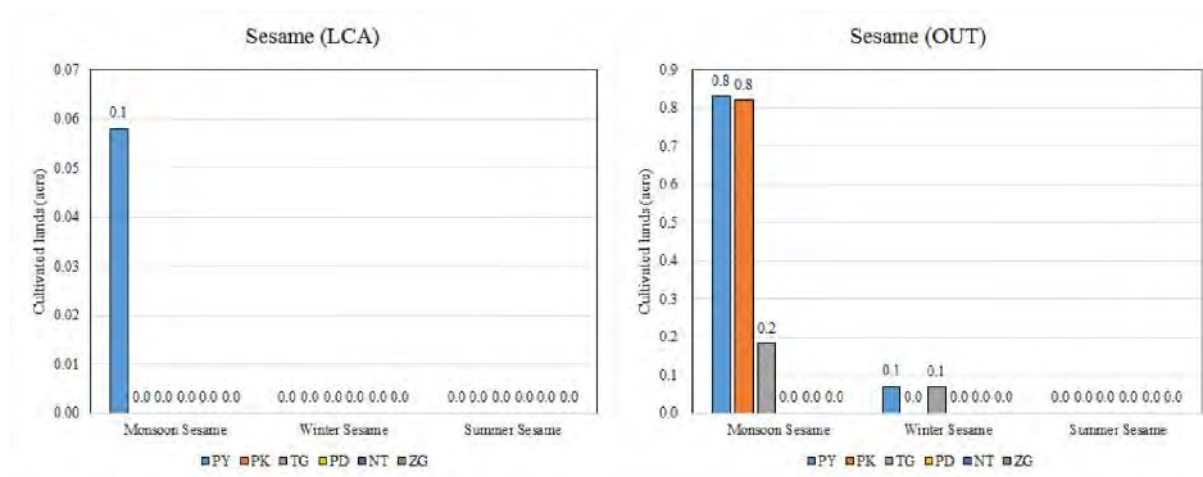


Fig. 2.3.14: Average cultivated area of sesame

[Sugarcane]

- Among the LCAs of all townships, the cultivated areas of sugarcane was nil (Fig. 2.3.15).
- Regarding winter sugarcane in the outside of LCA of Paukhaung and Thegon, the areas were almost 0.2 acres in each township.

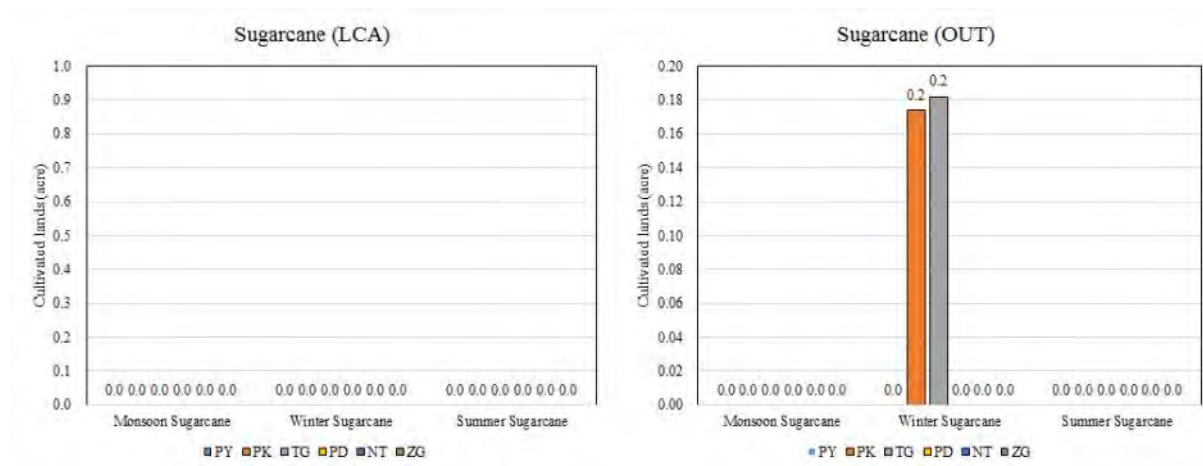


Fig. 2.3.15: Average cultivated area of sugarcane

In addition, table 2.3.4 shows the cultivated area from a different perspective.

- Number of farmers who had 5 ~ 10 acres was the largest group, and was 112 farmers.
- Number of farmers who had or more than 25 acres was extremely low. However, there were two farmers who had more than 40 acre.

Table 2.3.4: Frequency distribution of cultivated area per household

Cultivated areas (~or less) acres	No. of Farmers	%
0	0	0.0
5	73	25.6
10	112	39.3
15	43	15.1
20	30	10.5
25	26	5.6
30	8	2.8
35	1	0.4
40	0	0.0
more than 40	2	0.7
Total	285	100

Based on the frequency distribution of cultivated area per household (Table 2.3.4), farmers were divided into three categories and each category has around 100 farmers. Table 2.3.5 shows number of farmers by each category. The numbers in parenthesis in the table means ratio of farmers. Colored columns mean the largest values of each township.

- In all townships, number of Category 1 (farmers who had or less than 10acres) was the largest, and was estimated at 65% of all townships (Table 2.3.5). Regarding farmers in Pyay and Paukkaung, number of farmers in Category 1 was more than 80% in each township.
- Almost 40% of farmers in Thegon were categorized into Category 2 (farmers who had 10 ~ 25 acres), and small number of farmers were categorized into Category 3 (farmers who had more than 25 acres).
- Regarding north townships (Pyay, Paukkaung, and Thegon), there was no farmer in Category 3. On the other hand, 12% of farmers in Nattalin were categorized into Category 3.
- Farmers who had larger scale of cultivated area tended to see in southern area.
- It seemed that southern townships could get higher gross agricultural income per household, because of large-scale agricultural management from the viewpoint of land, since cultivated area in southern part (Paungde, Nattalin and Zegon) were larger than northern part (Pyay, Paukkaung, and Thegon).

Table 2.3.5: Number of farmers by category of cultivated lands

Township	Category 1	Category 2	Category 3	Total
PY	39 (91%)	4 (9%)	0 (0%)	43 (100%)
PK	36 (84%)	7 (16%)	0 (0%)	43 (100%)
TG	27 (61%)	17 (39%)	0 (0%)	44 (100%)
PD	21 (57%)	15 (41%)	1 (3%)	37 (100%)
NT	38 (49%)	31 (40%)	9 (12%)	78 (100%)
ZG	24 (60%)	15 (38%)	1 (3%)	40 (100%)
Total	185 (67%)	89 (30%)	11 (3%)	285 (100%)

(5) Average Gross Agricultural Income per acre

- Except Nattalin, average gross income per acre of the LCA was higher than it of the outside of LCA (Fig. 2.3.16).
- While the difference was not significant, the average of all six townships also had the same tendency. Specifically, averages in both areas were less than 400,000 kyats/ acre.
- Among six townships, the lowest gross income per acre was Pyay in both areas, and those were around 232,000 kyats/ acre. On the other hand, the highest was Thegon in both areas, and those were nearly 482,000 kyats/ acre. Between farmers in Pyay and Thegon, the differences were more than two times.

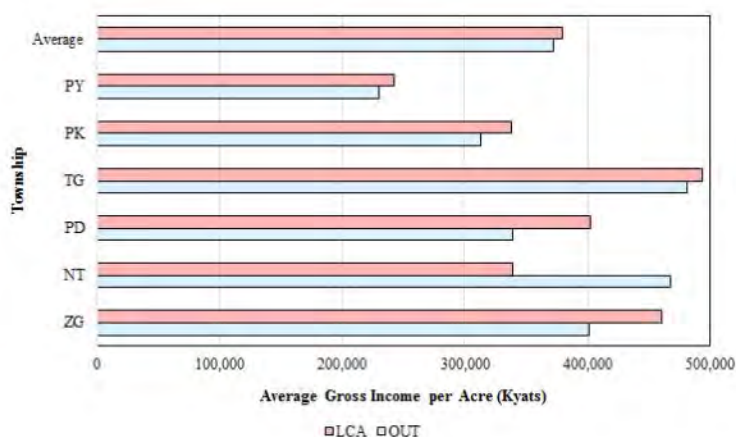


Fig. 2.3.16: Average gross income per acre

Gross agricultural income per acre of major crops are shown in below.

[Monsoon Paddy]

- Farmers in all six townships earned agricultural income from monsoon paddy in the LCA and the outside of LCA (Fig. 2.3.17).
- The highest amount of the LCA was Thegon (about 493,000 kyats/ acre), and the lowest was Pyay (about 225,000 kyats/ acre). There was two time differences.
- Except Nattalin, average gross incomes of other five LCAs were higher than the outside of LCA, in each.

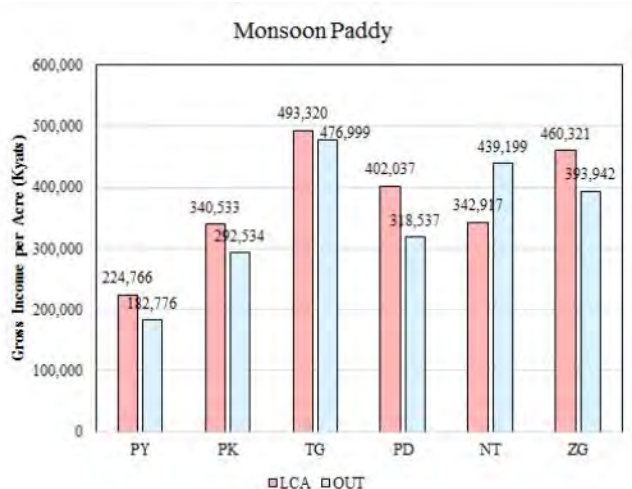


Fig. 2.3.17 Gross income per acre from monsoon paddy

- According to Counterparts, outside LCA of Nattalin and Paungde had suffered from flood which results in water lodging in monsoon paddy field in 2016. Hence, the level of gross agricultural income of this period was not same as usual.

[Summer Paddy]

- Farmers in both areas in Paukkaung earned gross income from summer paddy. And gross income per acre of the LCA (about 333,000 kyats/ acre) was higher than the outside of LCA (about 277,000 kyats/ acre) (Fig. 2.3.18).
- Regarding gross income of the outside of LCA in four townships, where farmers cultivated summer paddy in the outside of LCAs, the amounts were from about 246,000 kyats/ acre (Pyay) to 360,000 kyats/ acre (Thegon).
- The differences of gross incomes per acre between monsoon paddy and summer paddy were observed not so significant.

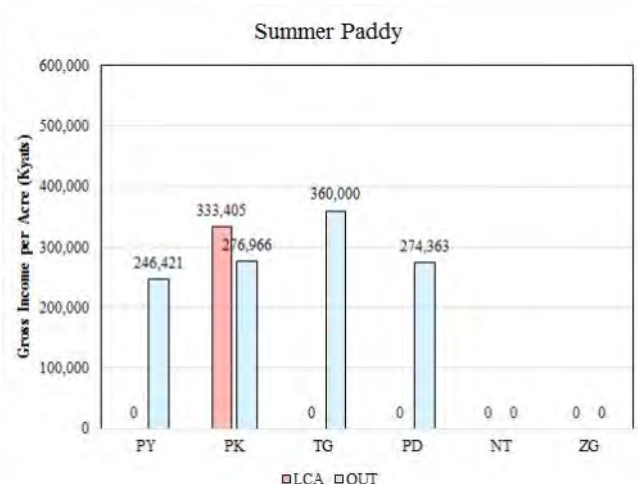


Fig. 2.3.18: Gross income per acre from summer paddy

In the target townships, more than 14 varieties of paddy, including the varieties which are for export to China, EU, Russia, etc., were cultivated. Additionally, each farmers cultivated 1~3 varieties. Table 2.3.6 shows the characteristics of those varieties.

Table 2.3.6: Varieties and characteristics of paddy

No.	Name of Variety	Growing Period*	Characteristics*
1	Chinese hybrid	120-125 days	Hybrid seed variety provided by a Chinese company. The company made a contract forming with farmers providing farm inputs in advance and but products directly from farmers.
2	Hmwabi san	140-150 days	Production area is increasing due to good taste. Mainly for home consumption.
3	Inhle	None.	One of variety for local consumption.
4	Innma yebaw	None.	One of variety for local consumption.
5	Kyain ma	None.	One of variety for local consumption.
6	Kyaw zeya	150 days	This variety can get good yield in sandy soil, and dominant in Thegon, and grow without intensive care (than Yadanatoe). However, this easily get chalkiness, resulting in more broken rice.
7	Manaw Thukha	135 days	Valuable to Pyricularia and Xanthomonas oryzae. Main production areas are located in Thegon and Paungde.
8	Pahle thwe	None.	One of variety for local consumption.
9	Shwebo pawsan	150 days	This variety is the most popular in Myanmar. Basically, inflow from Shwebo, and trial production just started from last year in Pyay township. This variety is generated from Pawsan in Ayeyarwaddy, but became more popular than the original due to preferable environment conditions.
10	Sin thulha	140 days	This variety was generated from Manaw Thukha to resist Xanthomonas oryzae. The volume increases after cooking, which is one of popularity indicators of Myanmar people.
11	Sin thwe latt	135-140 days	Yield is higher in summer (90-100 basket/ acre) than monsoon (70-80 basket/ acre). Popular variety in Western Bago and main production areas are in Paukkaung and Paungde. Chinese traders prefer this than Yadanatoe.
12	Taung pyan (hmwe)	150 days	This variety is popular in Western Bago. It can get good quality in Nattalin, Paungde, and Zigon. Harvesting season is always November, even if rain delayed/ Delta-based variety and can resist heavy rain. Better variety for rained area where is difficult control.
13	Yadanatoe	120-125 days	This variety is grain for China, parboil for EU or Russia, and provided small volume for local market. Demand from China is still increasing, but price is unstable due to demand from China and exchange rates.
14	Others	-	-

Note; Regarding “Growing Period” and “Characteristics,” information was provided by counterparts.

- Regarding monsoon paddy, variety of “Taung pyan (Hmwe)” was the most popular in all townships. The second was Kyaw zeya, and then, the third was Yadanatoe (Fig. 2.3.19).
- On the other hand, Yadanatoe was the most popular in all townships. About other than it, the differences were not significant.

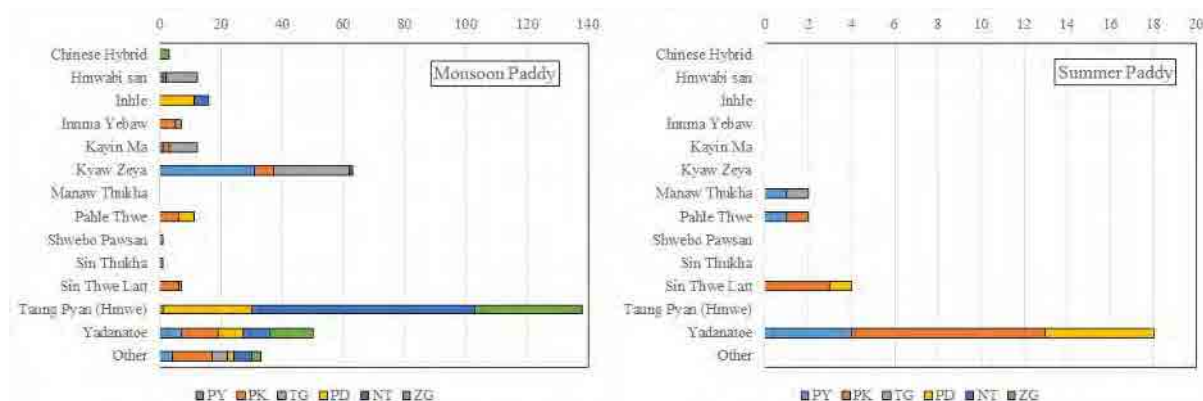


Fig. 2.3.19 Major varieties of paddy by season

Table 2.3.7 shows the major varieties of paddy in each township.

- In Pyay and Thegon, the varieties such as Kyaw zeya for local markets were popular in monsoon season (Table 2.3.7).
- In the south townships of Paungde, Taung pyean (hmwe) was popular for monsoon paddy, since those areas have advantage on soil distribution. According to Counterparts, the market price of this variety is higher than others, while it is lower than Shwebo pawsan.
- The next most popular of monsoon paddy variety in all 6 Townships was Yadanatoe. This variety is sensitive on impacts of changing market price, since it is for exports to China, EU, and Russia.
- Except Thegon, Yadanatoe was the most popular for summer paddy. Then, the next most popular of summer paddy variety was Sin thwe latt.
- According to farmers and Counterparts, the varieties of summer paddy was limited, in comparison with monsoon paddy. In this survey, such a tendency was observed.

➤ **Table 2.3.7: Major varieties of paddy by township**

TS	Monsoon			Summer		
	No.1	No.2	No.3	No.1	No.2	No.3
PY	Kyaw zeya	Yadanatoe	Others	Yadanatoe	Manaw thukha, Pahle thwe	
PK	Other	Kyaw Zeya, thwe latt	Pahle thwe, Sin	Yadanatoe	Sin thwe latt	Pahle thwe
TG	Kyaw zeya	Hmawbi san	Kayin ma	Manaw thukha	N/A	N/A
PD	Taung pyan (Hmwe)	Inhle	Yadanatoe	Yadanatoe	Sin thwe latt	N/A
NT	Taung pyan (Hmwe)	Yadanatoe	Others	N/A	N/A	N/A
ZG	Taung pyan (Hmwe)	Yadanatoe	Chinese hybrid, Others	N/A	N/A	N/A
All	Taung pyan (Hmwe)	Kyaw zeya	Yadanatoe	Yadanatoe	Sin thwe latt	Manaw thukha, Pahle thwe

[Winter black gram]

- Farmers in both areas of Nattalin earned gross income from winter black gram. And gross income per acre of the outside of LCA (566,000 kyats/ acre) was slightly higher than it of the LCA (about 205,000 kyats/ acre). The difference between them was about three time (Fig. 2.3.20).
- Regarding gross income of the outside of LCAs in all six townships, the amounts were from about 351,000 kyats/ acre (Thegon) to 566,000 kyats/ acre (Nattalin).
- Those amounts were almost same or a little bit higher in comparison with amounts of paddy.

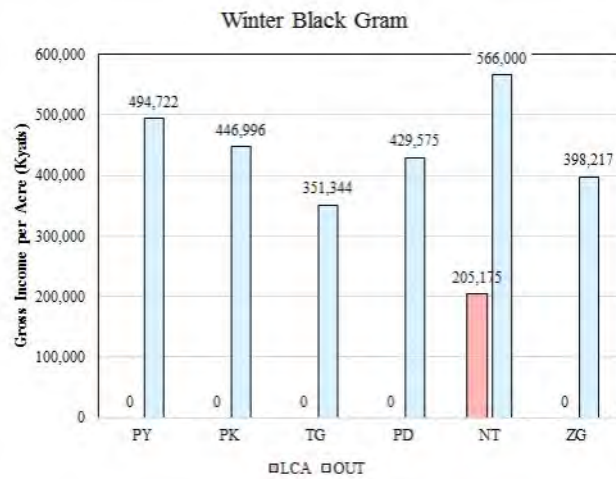


Fig. 2.3.20: Gross income per acre from winter black gram

[Monsoon green gram]

- Farmers in the outside of LCAs of Pyay and Paukhaung earned gross income from monsoon green gram (Fig.2.3.21).
- The highest amount was about 251,000 kyats/ acre in the outside of Pyay LCA. And the lowest amount was about 244,000 kyats/ acre in the outside of Paukhaung LCA.
- Those amounts were almost same with summer paddy in the outside of LCA in each.

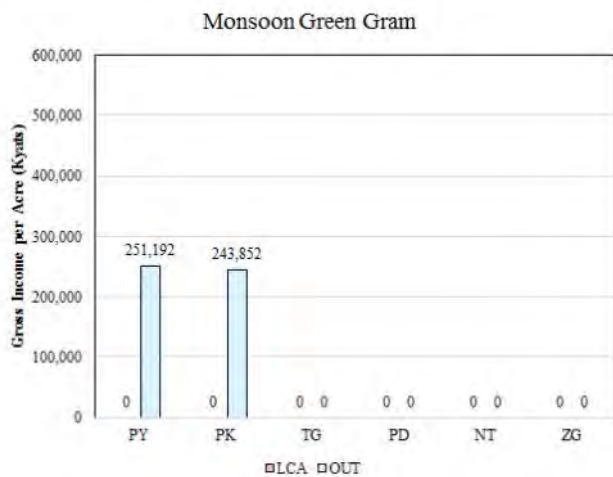


Fig. 2.3.21: Gross income per acre from monsoon green gram

[Winter green gram]

- Farmers in both areas in Pyay earned gross income from winter green gram (Fig.2.3.22).
- Amount of LCA was higher (400,000 kyats/ acre) than the outside of LCA (about 287,000 kyats/ acre). There was 1.4 time differences.
- Amount of Pyay LCA was higher than amount of monsoon paddy in

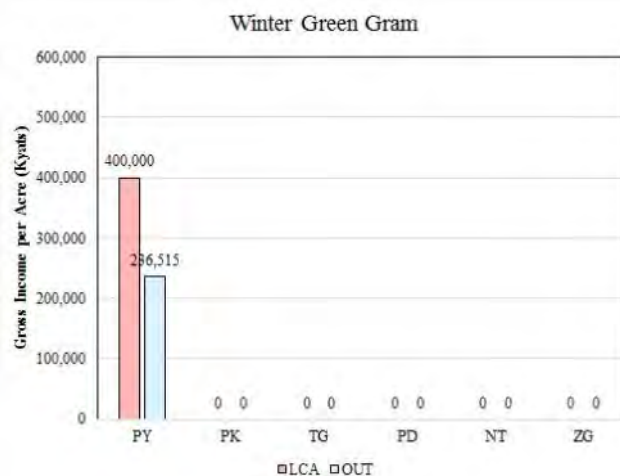


Fig. 2.3.22: Gross income per acre from winter green gram

Pyay LCA. And amount of the outside of Pyay LCA was slightly higher than monsoon paddy in the outside of Pyay LCA.

[Monsoon groundnut]

- Farmers in the outside of north townships of Thegon earned gross income from monsoon groundnut (Fig.2.3.23).
- As becoming northern township, the amount increased. The highest amount was about 572,000 kyats/ acre of Thegon, and the lowest amount was about 321,000 kyats/ acre of Pyay.
- In case of Thegon, amount of monsoon groundnut of the LCA was higher than monsoon paddy of the outside of LCA.
- In case of Pyay, amount of monsoon groundnut of the outside of LCA was higher than monsoon paddy of the outside of LCA.

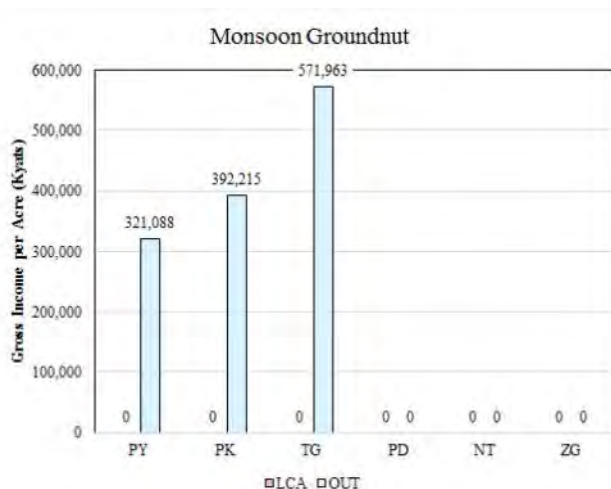


Fig. 2.3.23: Gross income per acre of monsoon groundnut

[Winter lab lab bean]

- Farmers in the outside of Pyay LCA earned gross income from winter lab lab bean (Fig. 2.3.24).
- Gross income per acre was about 136,000 kyats/ acre. This was slight lower than amount of monsoon paddy of the outside of Pyay LCA.

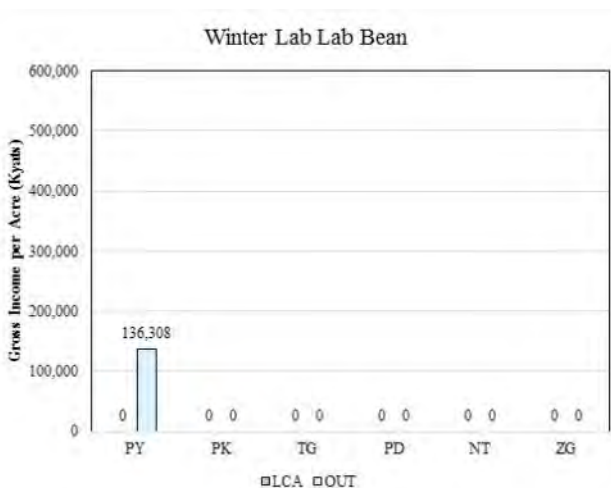


Fig. 2.3.24: Gross income per acre of winter lab lab bean

[Monsoon sesame]

- Farmers in the Pyay LCA, and the outside of north LCAs of Thegon, earned gross income from monsoon sesame (Fig. 2.3.25).
- Regarding Pyay, the amount of the LCA was about 240,000 kyats/ acre. And the amount of the outside of LCA was 280,000 kyats/ acre. In addition, the latter amount was the highest among outside of LCAs of three townships where farmers cultivated monsoon sesame. Those amount were higher than

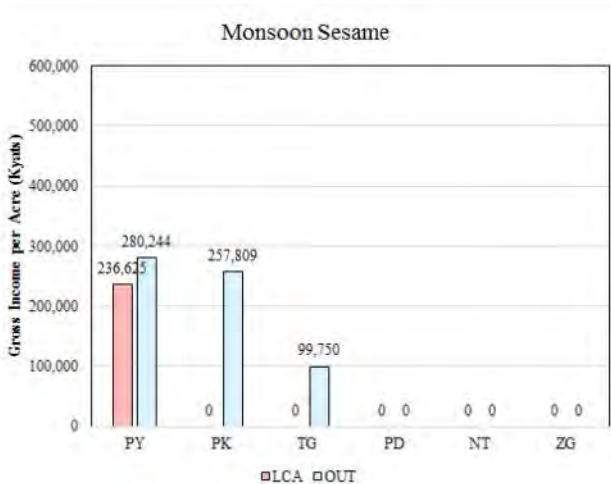


Fig. 3.4.25: Gross income per acre of monsoon sesame

monsoon paddy in both areas.

- The lowest amount was about 100,000 kyats/ acre of the outside of Thegon LCA.

[Winter sugarcane]

- Farmers in the outside of LCAs in Paukhaung and Thegon, earned gross income from winter sugarcane (Fig. 2.3.26).
- The highest amount was about 469,000 kyats/ acre of Thegon, and the lowest amount was 364,000 kyats/ acre of Paukhaung. The differences were 1.3 times.

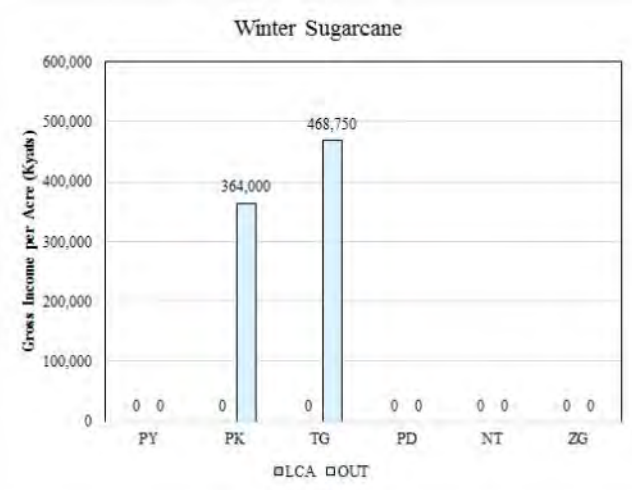


Fig. 2.3.26: Gross income per acre of winter sugarcane

2.3.2 AGRICULTURAL COST

(1) Cost-1 (Material Inputs)

- Average of all townships was about 533,000 kyats/ household, and material inputs for paddy was the highest in all townships (Fig. 2.3.27).
- The highest cost for material inputs was observed in Thegon, and it was about 755,000 kyats/ household. This amount was 3.4 times of Pyay which had the lowest cost for material inputs (about 221,000 kyats/ household).
- In south townships of Thegon, the amount of material inputs for paddy was higher than that in Pyay and Paukhaung.
- Regarding southern townships which had higher gross agricultural income, farmers put higher material inputs.

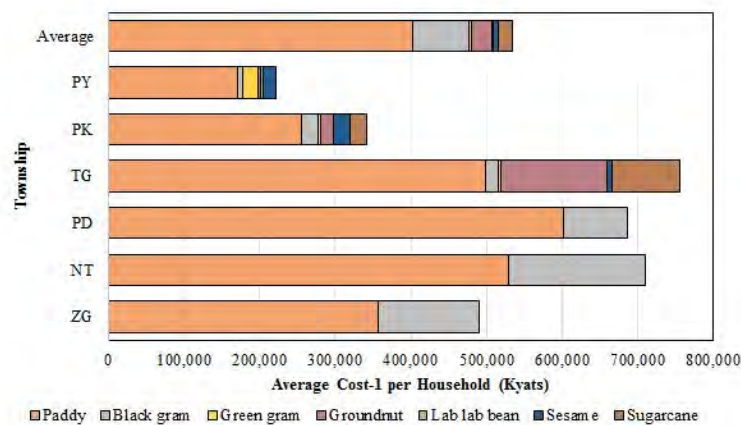


Fig. 2.3.27: Average agricultural cost for material inputs per household

Cost-1 (material inputs) per acre of major crops are shown in below.

[Monsoon Paddy]

- In both areas of all six townships, costs for material inputs to monsoon paddy were roughly from about 40,000 kyats/ acre to about 70,000 kyats/ acre (Fig. 2.3.28).
- In most of all areas, farmers put the highest amount for fertilizer. Regarding the outside of Paukkhaung LCA, the cost for manure was the highest amount, however, the total amount for material inputs was almost same as other townships.

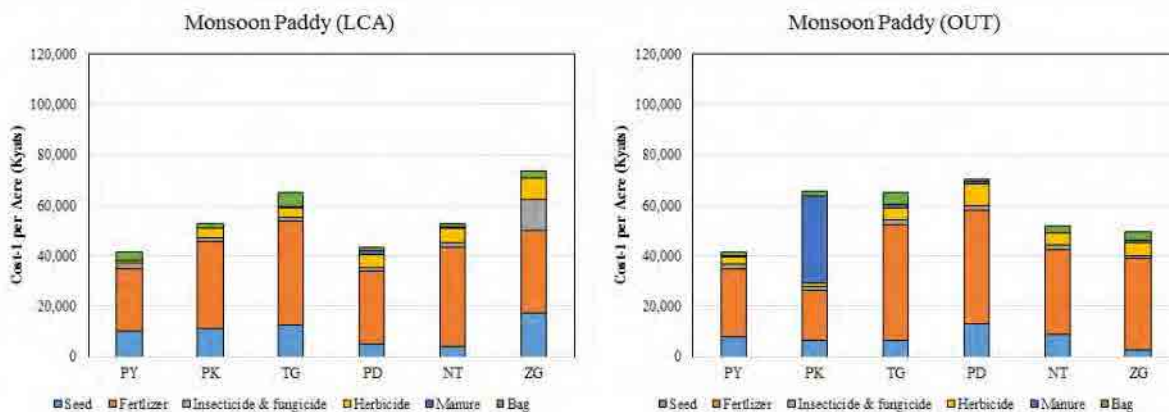


Fig. 2.3.28: Average agricultural cost for material inputs per acre for monsoon paddy

[Summer paddy]

- In both areas of all six townships, costs for material inputs to summer paddy were drastically different. The highest amount was almost 120,000 kyats/ acre of the outside of Thegon LCA, and the lowest amount was about 20,000 kyats/ acre of the outside of Paukkhaung LCA (Fig. 2.3.29).
- As same as monsoon paddy, farmers put the highest amount for fertilizer in all townships where farmers cultivated summer sesame.
- In case of Paukkhaung, farmers spent about 40,000 kyats/ acre in the LCA, and the differences between within the LCA and the outside of LCA were two times.
- Regarding the outside of Thegon and Paungde LCA, the costs to summer paddy were higher than costs to monsoon paddy.

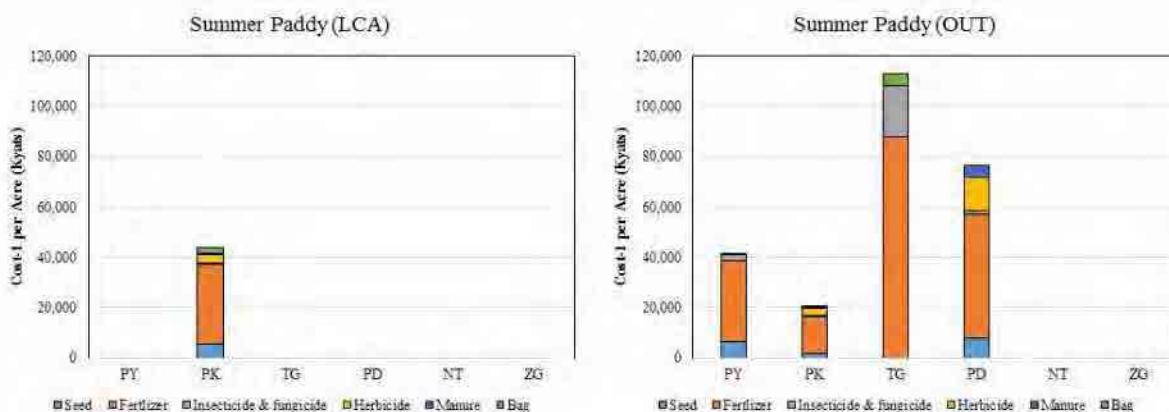


Fig. 2.3.29: Average agricultural cost for material inputs per acre for summer paddy

[Winter black gram]

- In all areas, costs for material inputs to winter black gram were drastically different. The highest amount was more than 60,000 kyats/ acre of the outside of Nattalin LCA, while the lowest was almost 20,000 kyats/ acre of the outside of Paukhaung LCA. There was almost three times (Fig. 2.3.30).
- Mainly, farmers put costs for seed, fertilization, insecticide and fungicide. Regarding the outside of Nattalin LCA, the highest amount for insecticide and fungicide.
- Between the LCA and the outside of LCA in Nattalin, the differences of those cost were almost two times.
- It observed that farmers in southern townships spend higher costs for material inputs to winter black gram than farmers in northern townships.

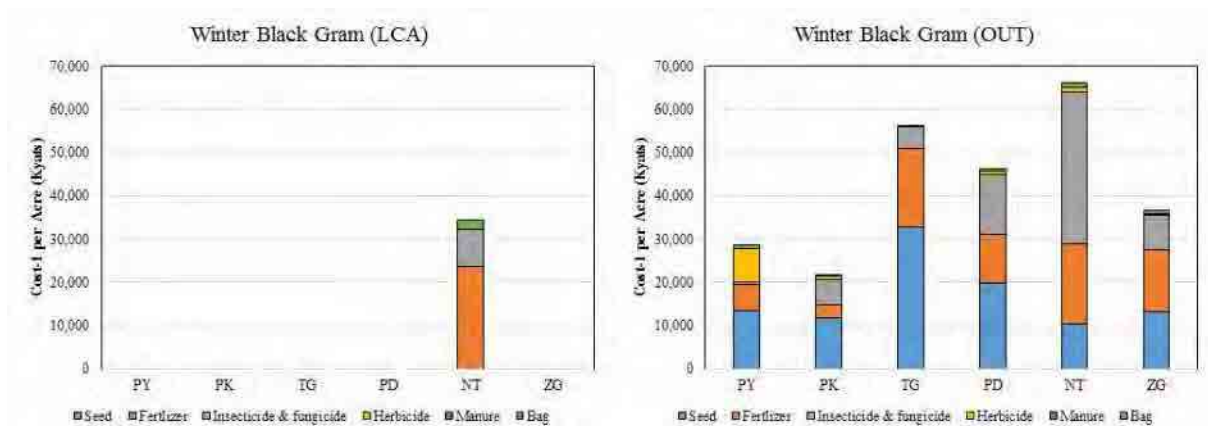


Fig. 2.3.30: Average agricultural cost for material inputs per acer for winter black gram

[Monsoon green gram]

- The highest costs for material inputs to monsoon green gram was around 29,000 kyats/ acre of the outside of Pyay LCA. On the other hand, the lowest costs was about 12,000 kyats/ acre of the outside of Paukhaung LCA. Between those two areas, the differences were more than two times (Fig. 2.3.31).
- Farmers in Pyay spent the highest cost for insecticide and fungicide. On the other hand, farmers in Paukhaung mainly spent seeds of monsoon green gram.

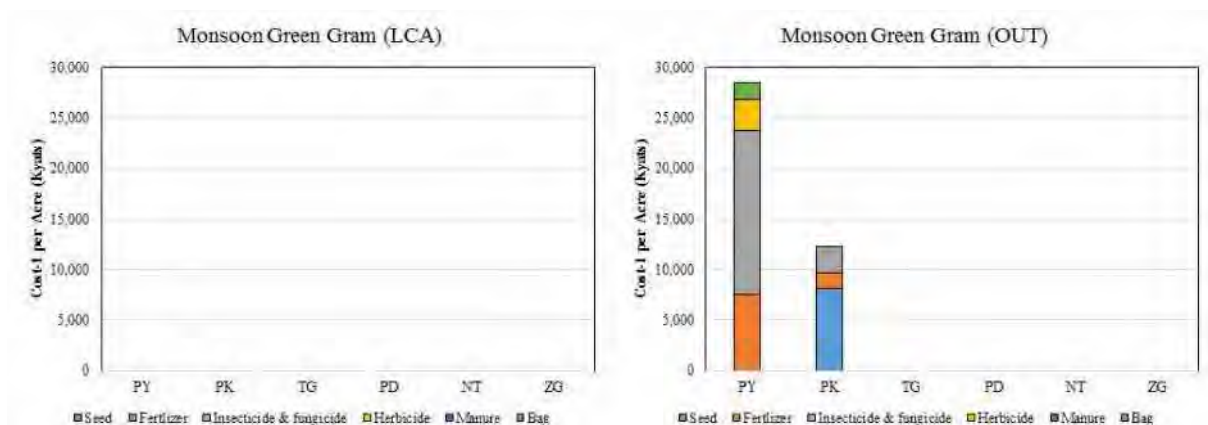


Fig. 2.3.31: Average agricultural cost for material inputs per acer for monsoon green gram

[Winter green gram]

- Farmers in Pyay LCA spent higher cost for material inputs than farmers in the outside of LCA (Fig. 2.3.32).
- Of it, the main costs were for seed, fertilizer, insecticide and fungible.

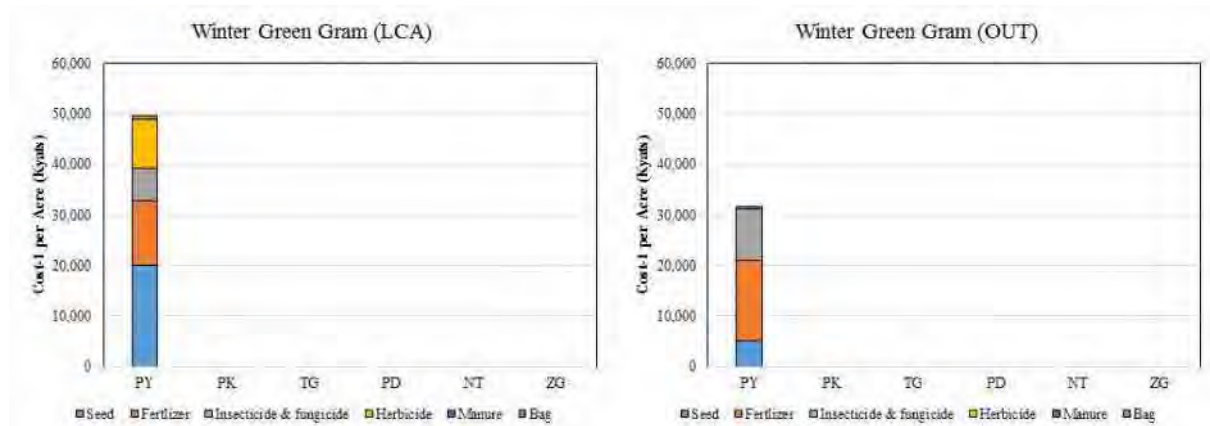


Fig.2.3.32: Average agricultural cost for material inputs per acre for winter green gram

[Monsoon groundnut]

- Farmers in the outside of Thegon LCA spent the highest cost for material inputs to monsoon groundnut and total amount was about 80,000 kyats/ acre. And the lowest cost amount was about 15,000 kyats/ acre in the outside of Pyay LCA (Fig. 2.3.33).
- In case of Thegon farmers, they costed mainly seed and fertilizer.

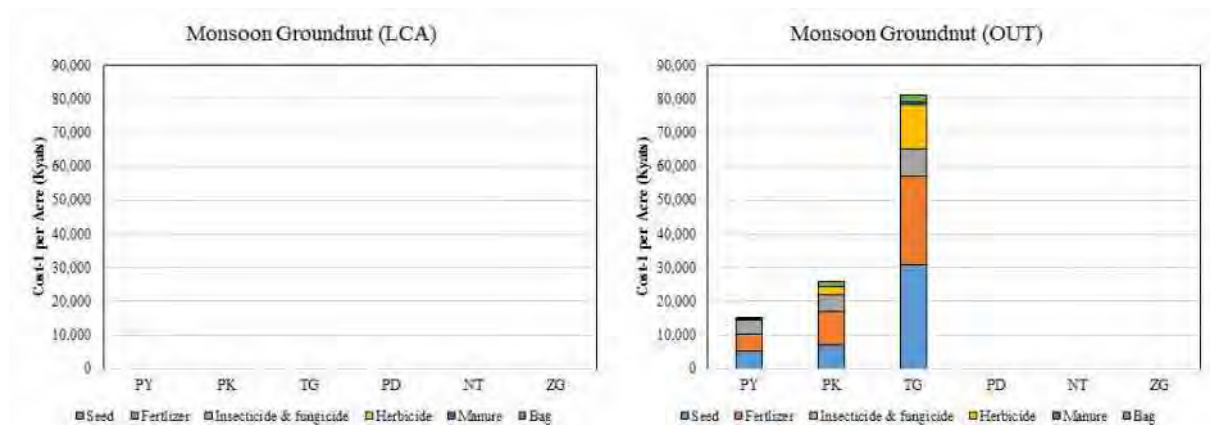


Fig. 2.3.33: Average agricultural cost for material inputs per acre for monsoon groundnut

[Winter lab lab bean]

- Farmers in the outside of Pyay LCA spent cost for material inputs about 24,000 kyats/ acre. The main material was insecticide and fungicide (Fig. 2.3.34).

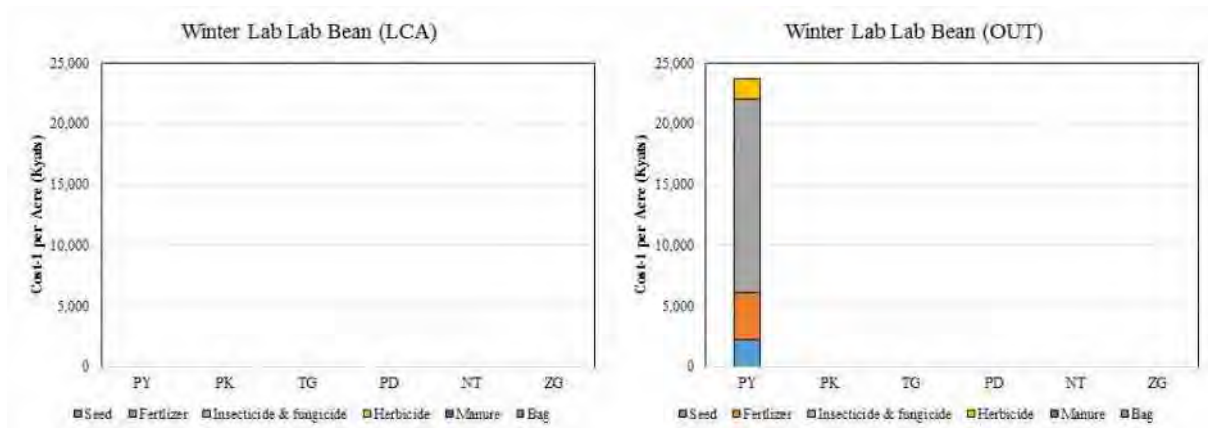


Fig. 2.3.34: Average agricultural cost for material inputs per acre for winter lab lab bean

[Monsoon sesame]

- Farmers in the outside of Thrgon LCA spent the highest amount of material inputs to monsoon sesame, and it was about 35,000 kyats/ acre. Of it, the main cost was for fertilizer, insecticide and fungicide (Fig. 2.3.35).
- In case of Pyay, costs for material inputs were almost same in both areas of the LCA and the outside of LCA, namely 15,000 kyats/ acre.

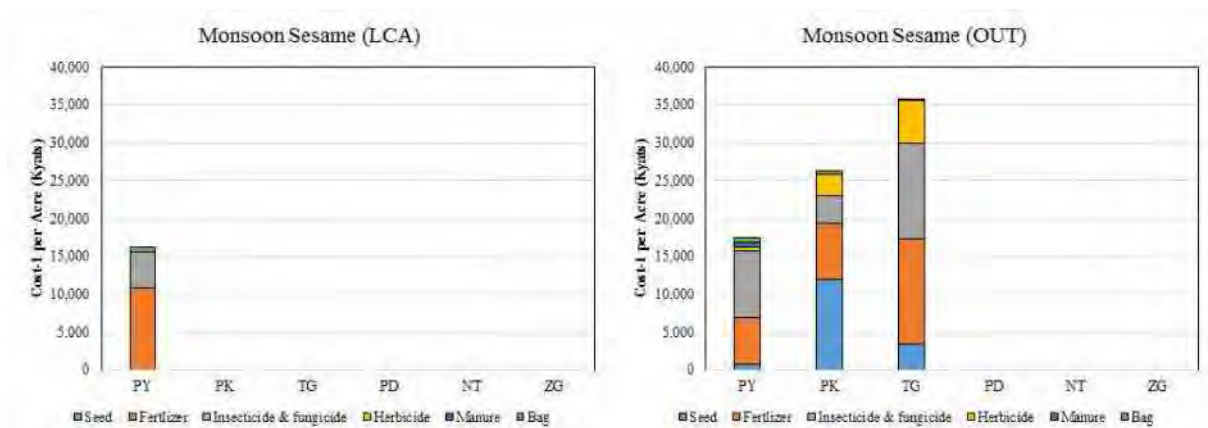


Fig. 2.3.35: Average agricultural cost for material inputs per acre for monsoon sesame

[Winter sugarcane]

- Farmers in the outside of Thrgon LCA spent the highest amount of material inputs to winter sugarcane, and it was about 500,000 kyats/ acre. Of it, the main cost was for fertilizer (Fig. 2.3.36).
- In case of the outside of Paukhaunw LCA, total cost was around 100,000 kyats/ acre, and its main cost was for seed.

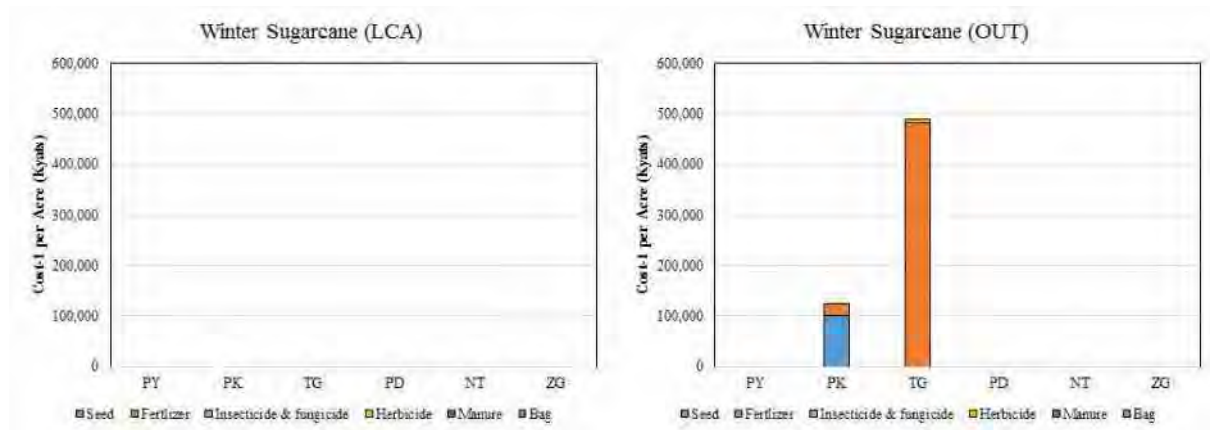


Fig. 2.3.36: Average agricultural cost for material inputs per acre for winter sugarcane

(2) Cost-2 (Labors and Machinery)

The labor costs of this analyzing included both of family and hired labors.

- Average labor and machinery cost of all townships was about 1,249,000 kyats/ household, and inputs of labors and/or machinery for paddy was the highest in whole townships (Fig 2.3.37).
- The highest input of labor and/or machinery was observed in Thegon, and was around 1,640,000 kyats/ household. This amount was 2.2 times larger than that of Pyay, which had the lowest inputs of labor and/or machinery (about 739,000 kyats/ household).
- As same as costs for material inputs, the inputs of labors and machinery for paddy was higher in Thegon than that in Pyay and Paukkhaung.
- Regarding southern townships which had higher gross agricultural income, farmers tended to use higher costs for labors and machinery.

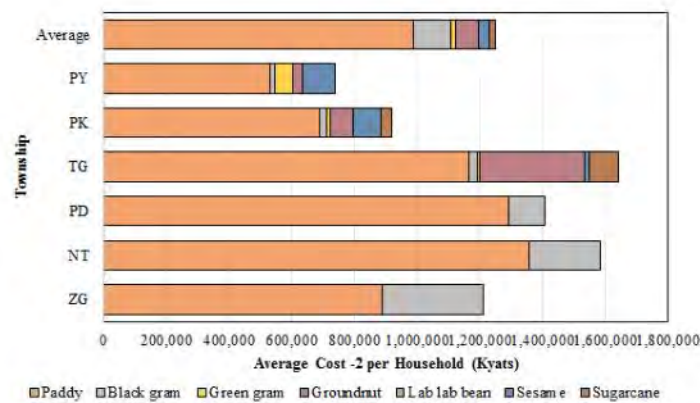


Fig. 2.3.37: Average agricultural cost for labors and machinery per household

Cost-2 (labors and machinery) per acre of major crops are shown in below.

[Monsoon paddy]

- In both areas of all townships, farmers spent roughly from about 100,000 kyats/ acre to about 160,000 kyats/ acre for labors and machinery. Between the areas of the LCA and the outside of LCA, it was not observed significant differences (Fig. 2.3.38).

- The main costs were for land harvesting, land preparation, and sowing.

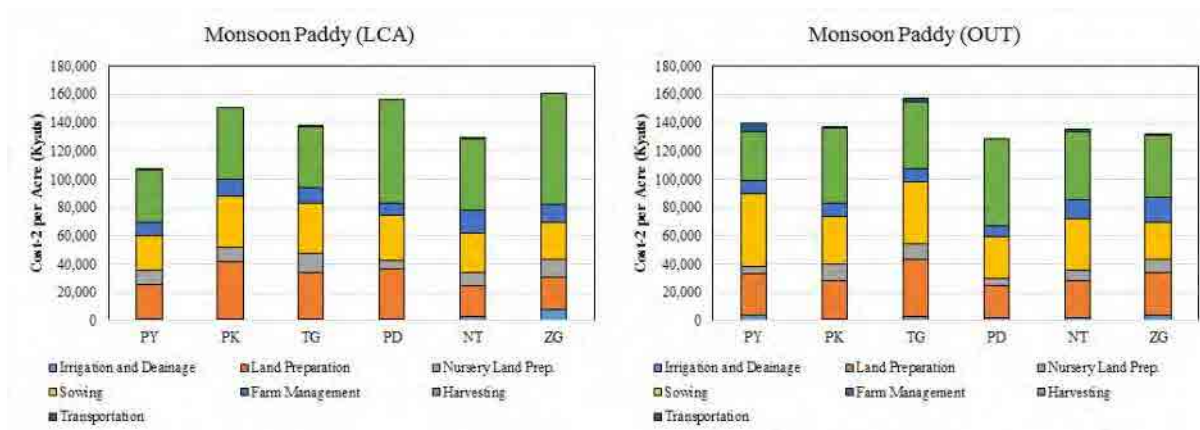


Fig. 2.3.38: Average agricultural cost for labors and machinery per acre for monsoon paddy

[Summer paddy]

- In case of Pyay LCA, the cost for labors and machinery was about 180,000 kyats/ acre, and it was the highest among all areas where farmers got income from summer paddy (Fig. 2.3.39).
- Regarding the outside of LCAs, farmers spend roughly from about 100,000 kyats/ acre to about 120,000 kyats/ acre.
- The main cost was for sowing, harvesting, and land preparation, through all areas.
- It was not observed significant differences between monsoon paddy and summer paddy.

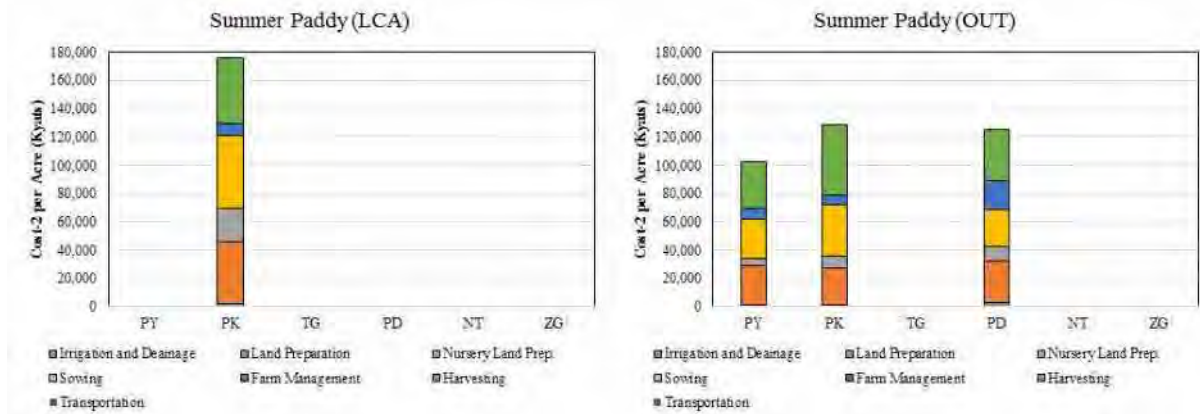


Fig. 2.3.39: Average agricultural cost for labors and machinery per acre for summer paddy

[Winter black gram]

- Farmers in Nattalin LCA spent about 60,000 kyats/ acre for labors and machine to winter black gram cultivation, and it was mainly for harvesting (Fig. 2.3.40).
- Regarding the outside of LCAs, farmers spent roughly from about 40,000 kyats/ acre to about 95,000 kyats/ acre. And with becoming southern townships, the cost increased clearly.
- In all areas, the main costs were for harvesting and land preparation.

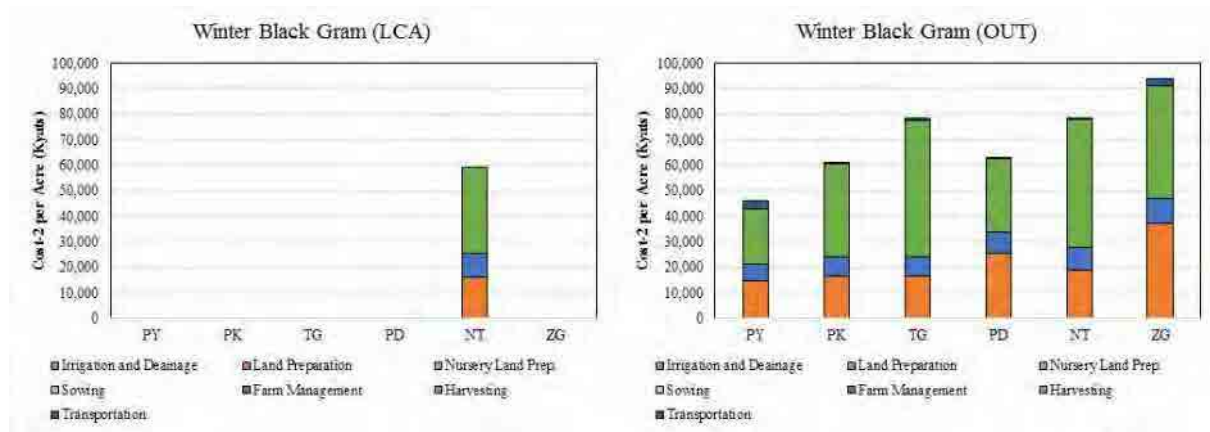


Fig. 2.3.40: Average agricultural cost for labors and machinery per acre for winter black gram

[Monsoon green gram]

- Farmers in the outside of Pyay LCA spent the highest cost which was about 130,000 kyats/ acre for labors and machinery to monsoon green gram (Fig. 2.3.41).
- The lowest cost was about 60,000 kyats/ acre of the outside of Paukhaung LCA, and that amount was half of the outside of Pyay LCA.
- The main cost was for harvesting in both townships.

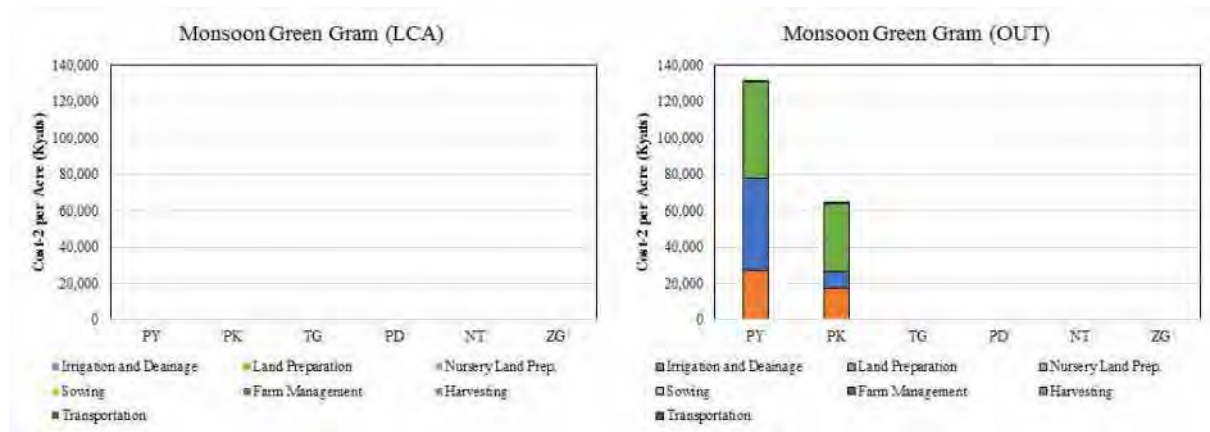


Fig. 2.3.41: Average agricultural inputs for labors and machinery per acre for monsoon green gram

[Winter green gram]

- Between the LCA and the outside of LCA in Pyay, the costs for labors and machinery to winter green gram were about 60,000 kyats/ acre in both areas. However, the main cost of the LCA was for land preparation, while it of the outside of the LCA was for harvesting (Fig. 2.3.42).

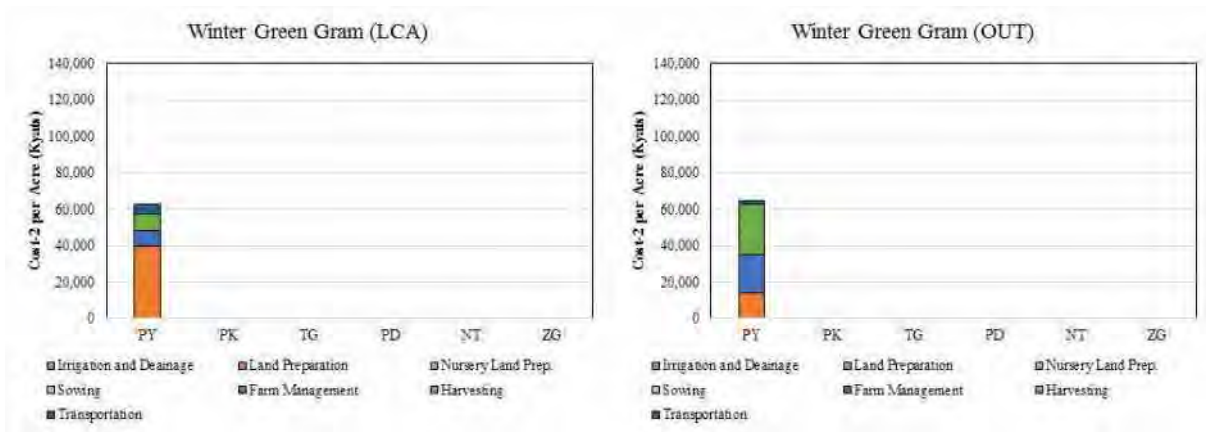


Fig. 2.3.42: Average agricultural inputs for labors and machinery per acre for winter green gram

[Monsoon groundnut]

- Farmers in the outside of Thegon LCA spent the highest amount which was about 200,000 kyats/ acre for labors and machinery, while the amount for land preparation and farm management were lower than other two townships (Fig. 2.3.43).
- The lowest costs was about 120,000 kyats/ acre of the outside of Pyay LCA.
- In all areas where farmers earned from monsoon paddy, the main cost was for harvesting.

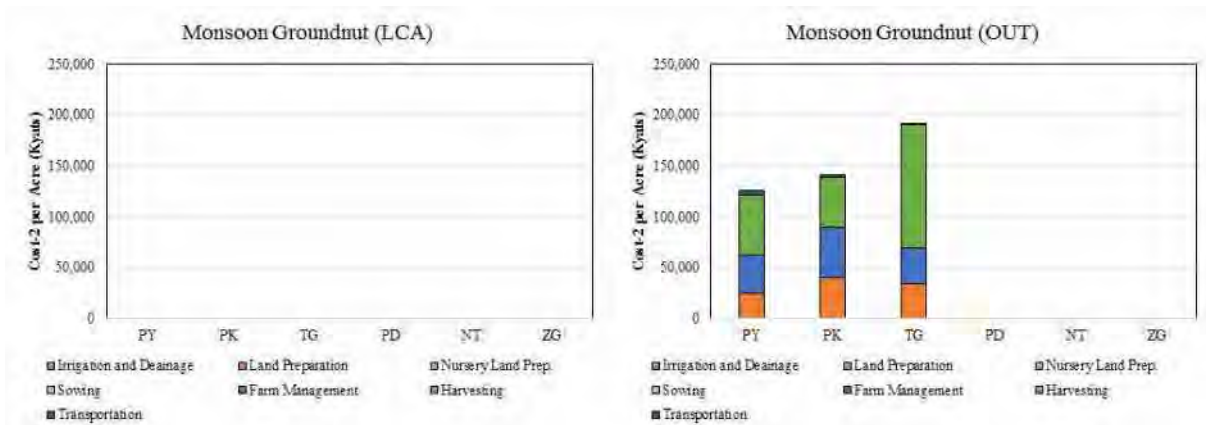


Fig. 2.3. 43: Average agricultural inputs for labors and machinery per acre for monsoon groundnut

[Winter lab lab bean]

- While farmers in the outside of Pyay LCA earned income from winter lab lab bean, they did not spent any cost for labors nor machinery.

[Monsoon Sesame]

- In case of Pyay, farmers spent about 200,000 kyats/ acre to the LCA and about 100,000 kyats/ acre to the outside of LCA. The differences were almost two times (Fig. 2.3.44).
- Regarding the outside of LCAs in Paukhaung and Thegon, the amount was around 100,000 kyats/ acre.
- Farmers in all areas, the main costs were for land preparation, farm management, and harvesting.

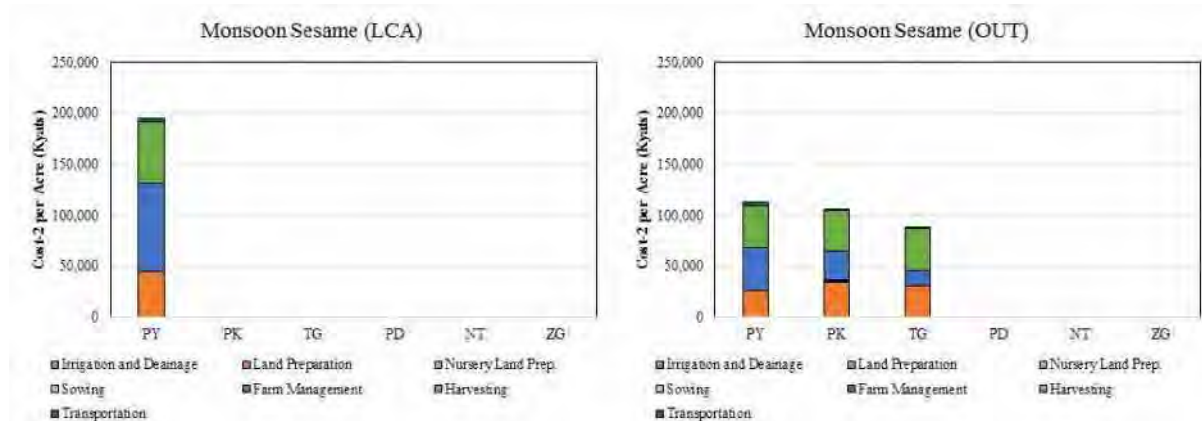


Fig. 2.3.44: Average agricultural costs for labors and machinery per acre for monsoon sesame

[Winter sugarcane]

- Farmers in the outside of Thegon LCA spent about 350,000 kyats/ acre for labors and machinery, and it was higher than the outside of Paukkaung LCA (about 200,000 kyats/ acre) (Fig. 2.3.45).
- The main cost in the outside of Thecon LCA was for harvesting, while it in the outside of Paukkaung LCA was for Transportation.

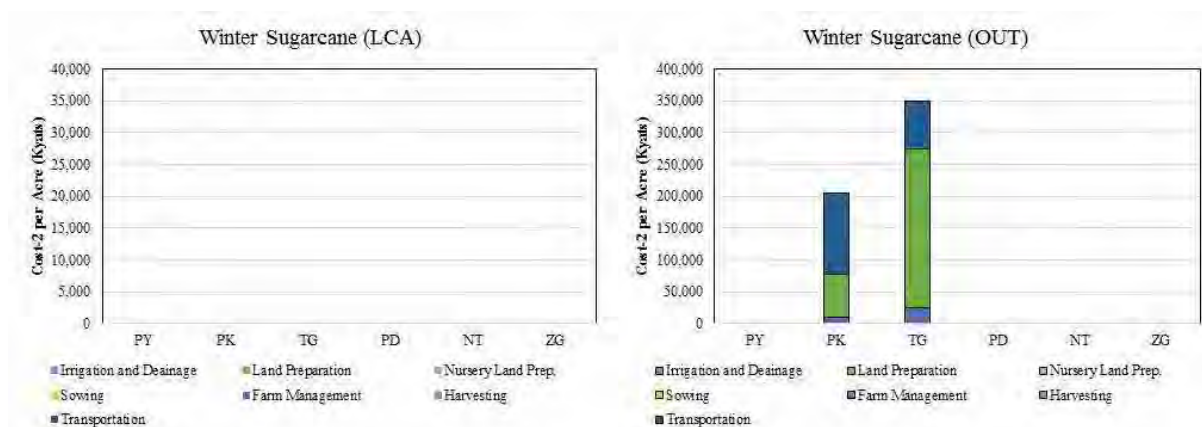


Fig. 2.3.45: Average agricultural costs for labors and machinery per acre for winter sugarcane

2.3.3 NET AGRICULTURAL INCOME

- Average net agricultural income per household of all townships was about 2,019,000 kyats/ household. The ratio of paddy and black gram were higher than other crops (Fig. 2.3.46).
- The highest earner of net agricultural income per household was Nattalin (about 3,696,000 kyats/ household).
- From cultivation of only paddy, farmers in Thegon, Paungde, Nattalin, and Zegon earned more than around 1,500,000 kyats which is same as total amounts of Pyay and Paukkaung.
- The lowest earner of the net income was Pyay (about 499,000 kyats/ household). Between Nattalin and Pyay, the differences were almost seven times. While farmers in Pyay cultivated several varieties of crops, the amount of net agricultural income per household was extremely low.
- Regarding Thegon, amount of income from sugarcane was deficit, since sugarcane is a perennial

crop that farmers cannot earn income in the first year, while they put costs for cultivation from first year.

- By comparison between northern townships (Pyay and Paukkaung) and southern townships (Thegon, Paungde, Nattalin, and Zegon), it was observed that farmers in southern townships earned higher net income than farmers in northern townships.

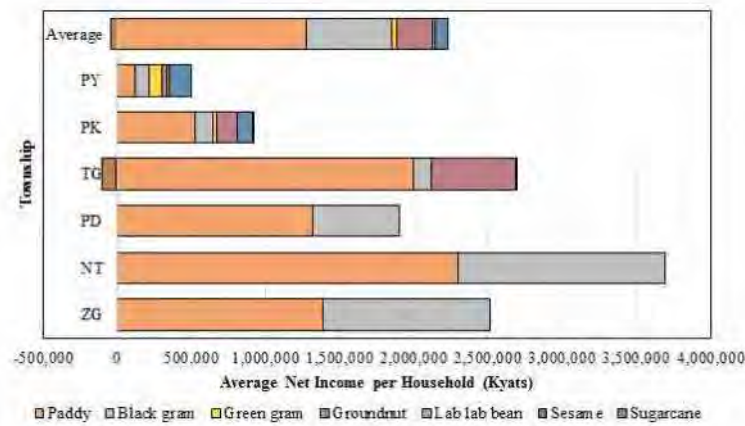


Fig. 2.3.46: Average net agricultural income per household

[Monsoon paddy]

- Except Nattalin, net agricultural income from monsoon paddy in the outside of LCAs were higher than the LCA (Fig. 2.3.47).
- The highest was about 290,000 kyats/ acre of Thegon LCA, and the lowest was less than 2,000 kyats/ acre of the outside of Pyay LCA.
- Regarding Pyay, the amount of the LCA was the lowest (about 76,000 kyats/ acre) in all six townships, too.
- In case of Nattalin, amount of the LCA was 160,000 kyats/ acre, and amount of the outside of LCA was about 252,000 kyats/ acre.
- It was clearly observed that the amounts of both areas increased, with becoming southern townships. In addition, the both areas of Thegon which the gross incomes were the highest in each area got the highest net income from monsoon paddy.

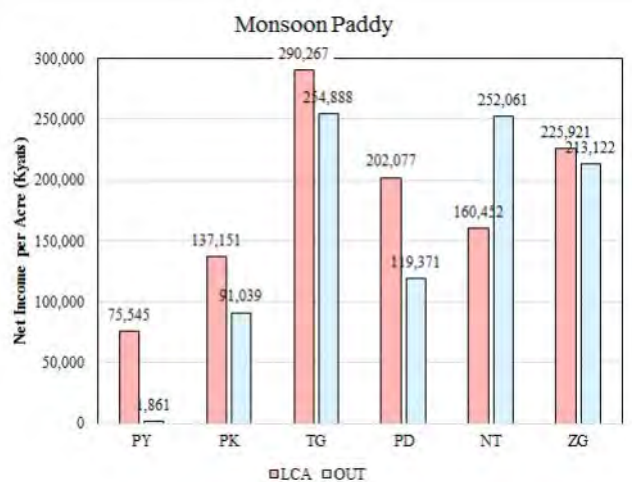


Fig. 2.3.47: Average net agricultural income per acre from monsoon paddy

[Summer paddy]

- The highest net agricultural income from summer paddy was about 247,000 kyats/ acre of the outside of Thegon LCA which earned the highest gross income from summer paddy (Fig. 2.3.48).
- The lowest was about 73,000 kyats/ acre of the outside of Paungde LCA.
- Regarding the outside of Pyay LCA which had the lowest net income from monsoon paddy, net

income from summer paddy was higher than monsoon paddy.

- As mentioned above, farmers thought that the profit (net income) from summer paddy is lower than monsoon paddy. Actually, however, net income from summer paddy was not so differ from monsoon paddy, especially in Pyay and Paukkaung.

[Winter black gram]

- While farmers in northern townships got lower net income per household than southern townships, net income from winter black gram in northern townships was almost same or higher than southern townships (Fig. 2.3.49).
- The highest amount was about 421,000 kyats/ acre of the outside of Nattalin LCA, and the lowest was about 112,000 kyats/ acre of Nattalin LCA. The differences were four times.
- Most of townships got higher net income from winter black gram than monsoon paddy or summer paddy. Thus, winter black gram was more profitable crop than paddy.

[Monsoon green gram]

- Net income from monsoon green gram was from about 91,000 kyats/ acre to about 167, 000 kyats/ acre in the outside of LCAs of Pyay and Paukkaung (Fig. 2.3.50).
- The outside of Paukkaung LCA which earned higher gross income from monsoon green gram got the highest net income from it.
- While gross incomes from monsoon green gram of above two areas were almost same, the differences of net incomes were nearly two times. That

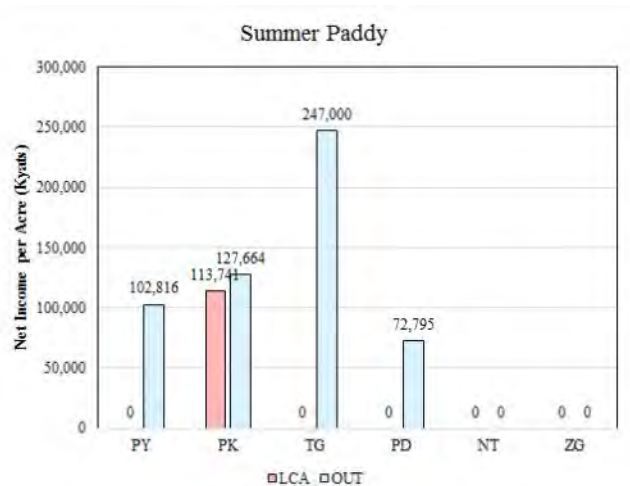


Fig. 2.3.48: Average net agricultural income per acre from summer paddy

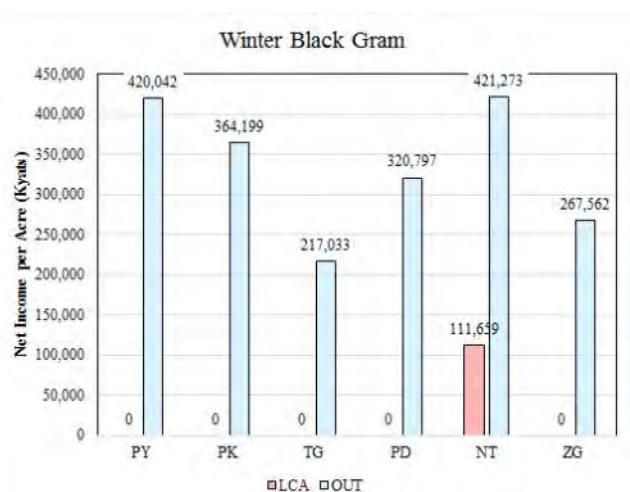


Fig. 2.3.49: Average net agricultural income per acre from winter black gram

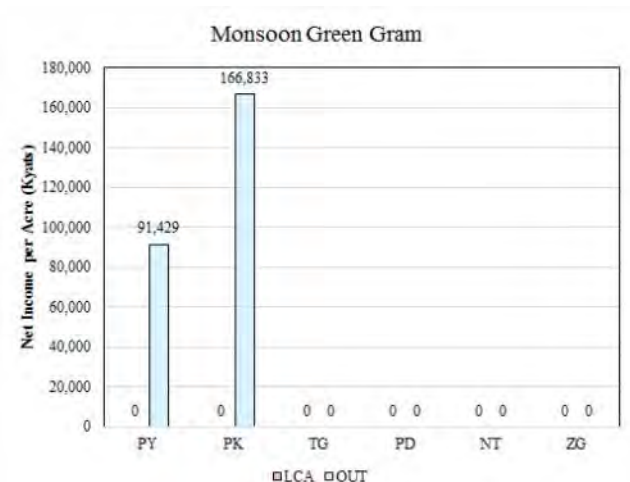


Fig. 2.3. 50: Average net agricultural income per acre from monsoon green gram

was caused by the highness of spending cost of material inputs, labors, and machinery in the outside of Pyay LCA.

[Winter green gram]

- Net income from monsoon green gram in Pyay LCA was from about 288,000 kyats/ acre, and about 140,000 kyats/ acre in the outside of Pyay LCA. The differences was two times (Fig. 2.3.51).
- Regarding the outside of LCA, net income from winter green gram was lower, by simple comparison with winter black gram of that area. However, it was higher than net income from monsoon paddy or summer paddy. In case of comparison with monsoon paddy, net income from green gram was 75 times higher.

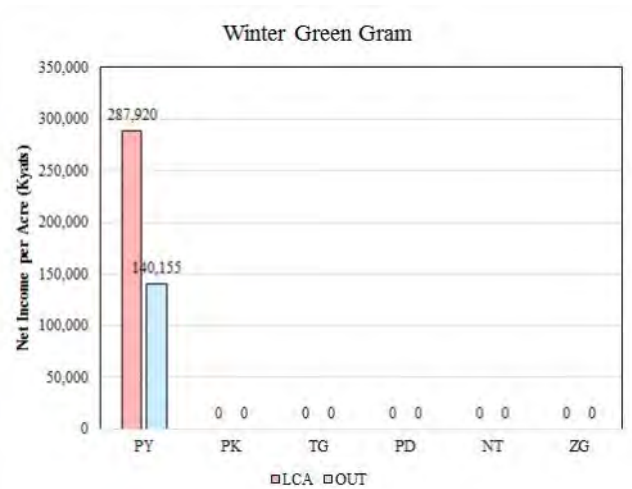


Fig. 2.3.51: Average net agricultural income per acre from winter green gram

[Monsoon groundnut]

- Net income from monsoon groundnut was from about 180,000 kyats/ acre to about 299,000 kyats/ acre among three areas of outside of LCAs in Pyay, Paukkhaung, and Thegon (Fig. 2.3.52).
- Between amounts of the highest and the lowest, the differences were more than 1.6 times.
- The outside of Thegon LCA which earned the highest gross income got the highest net income.

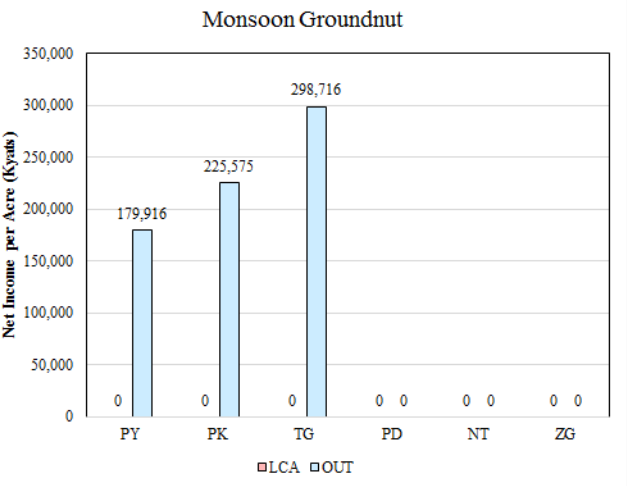


Fig. 2.3.52: Average net agricultural income per acre from monsoon groundnut

[Monsoon sesame]

- The lowest net income from monsoon sesame was about -24,000 kyats/ acre of the outside of Thegon LCA. Farmers of the area put the largest amount of material inputs, while the gross income was the lowest in all areas where farmers cultivated monsoon sesame. Thus, the net

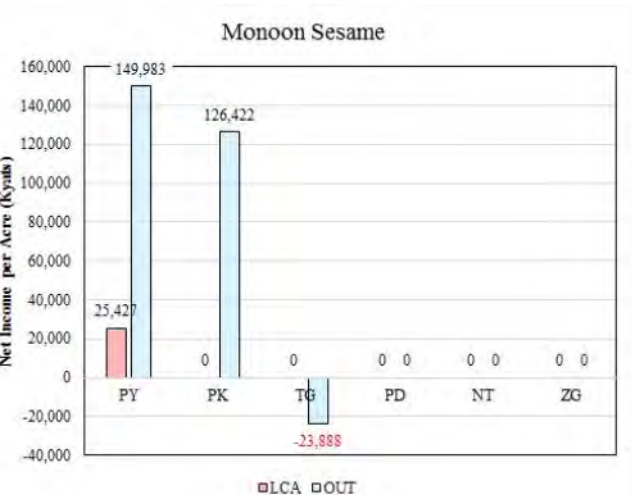


Fig. 2.3.53: Average net agricultural income per acre from monsoon sesame

income was deficit (Fig. 2.3.53).

- The highest net income from monsoon sesame was about 150,000 kyats/ acre of Pyay LCA which area got the highest gross income from it.
- While gross incomes from monsoon sesame in the both areas of Pyay were almost same, the differences of net income were almost six times. The differences on net income were increased, since farmers spent higher costs for material inputs, labors, and machinery to monsoon sesame cultivation in the LCA.

[Winter sugarcane]

Since this baseline survey tried to clarify the farmers’ conditions during 2015 and 2016, there is a possibility that farmers could not responded about cultivation of sugarcane which is a perennial crop well. However, the supplemental information about sugarcane cultivation was collected from Counterparts, as mention in Chapter 3.

- The highest net income from winter sugarcane was about 34,000 kyats/ acre of the outside of Paukhaung LCA (Fig. 2.3.54).
- The lowest net income from winter sugarcane was about – 369,000 kyats/ acre of the outside of Thegon LCA. The large amount of labors and machinery costs for harvesting caused the deficit.
- As mention above, farmers cannot get income from the first year, since it is a perennial crop which needs for two years until the harvesting. This condition might cause the lowness of net income.

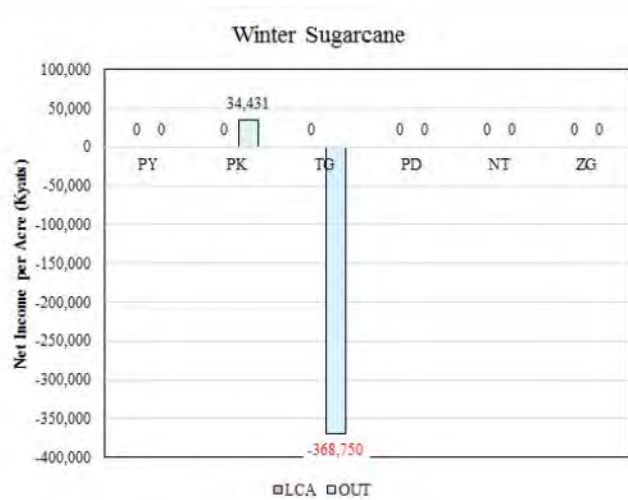


Fig. 2.3.54: Average net agricultural income per acre from winter sugarcane

Net agricultural incomes by cropping pattern are shown in below. Thirty-two cropping patterns were observed in all six townships. Of it, the major cropping patterns from the viewpoint of number of farmer were “only monsoon paddy”, “monsoon paddy + winter pulse,” “monsoon paddy + monsoon groundnut”, “monsoon paddy + summer paddy,” and “monsoon paddy + monsoon sesame.”

[Only monsoon paddy]

- Average net agricultural income per acre of monsoon paddy was about 161,000 kyats/ acre (Table 2.3.8).
- The highest net income per acre was about 231,000 kyats/ acre of Zegon, while the lowest amount was about 82,000 kyats/ acre of Pyay. Between Zegon and Paukhaung, the differences were almost three time.

- Regarding Pyay, while gross income was only about 264,000 kyats/ acre, farmers spent cost for material input, labors and machinery as same as average use of all township. Area of cultivated lands (acre/ household) in Pyay was the smallest among 6 townships. According to farmers, when they input materials to their cultivated lands, they do not consider proper volume since it was not clear. Hence, it might be suspected that farmers put materials in surplus, from view point of management.
- Farmers in Zegon, amounts of material inputs, labors and machinery were lower than the average, even though the farmers earned higher gross income.

Table 2.3.8: Input and output per acre of only monsoon paddy

TS	No. of farmers	Gross income (a)	Material inputs (b)	Labors and Machinery (c)	Net Income (d) = (a)-((b)+(c))
PY	6	263,823	55,734	125,953	82,136
PK	5	277,651	38,114	138,597	100,941
TG	23	407,494	57,804	144,892	204,799
PD	14	371,803	78,827	151,173	141,803
NT	37	393,231	54,947	129,828	208,456
ZG	12	412,764	50,216	132,038	230,510
All	97	354,461	55,940	137,080	161,441

[Monsoon paddy + winter pulse]

Winter pulse included amounts of winter black gram, winter green gram, and winter lab lab bean.

- Average net agricultural income per acre of monsoon paddy + winter pulse was about 566,000 kyats/ acre (Table 2.3.9). The amount was extremely higher than only monsoon paddy (161,000 kyats/ acre). In simple calculation, the differences between only monsoon paddy and monsoon paddy + winter pulse were almost four times.
- The highest amount was about 927,000 kyats/ acre of Thegon, while the lowest amount was about 120,000 kyats/ acre of Pyay. There was about eight times difference between Thegon and Pyay.

Table 2.3.9: Input and output per acre of monsoon paddy + winter pulse

TS	No. of farmers	Gross income (a)	Material inputs (b)	Labors and Machinery (c)	Net Income (d) = (a)-((b)+(c))
PY	4	328,037	68,953	139,263	119,820
PK	3	978,015	40,067	194,494	743,453
TG	3	1,321,593	162,744	231,772	927,077
PD	17	787,297	103,298	195,976	488,024
NT	37	918,560	85,773	198,706	634,080
ZG	24	842,017	105,829	254,041	482,146
All	88	862,586	94,444	202,375	565,767

[Monsoon paddy + monsoon groundnut]

- Average net agricultural income per acre of monsoon paddy + monsoon groundnut in all townships was about 433,000 kyats/ acre which was lower than the amount of only monsoon paddy (161,000 kyats/ acre) (Fig. 2.3.10).

- The highest amount was 550,000 kyats/ acre of Thegon. In comparison with the highest amount of only monsoon paddy (231,000 kyats/ acre), the amount of monsoon paddy + monsoon groundnut was higher. The differences were almost two times.

Table 2.3.10: Input and output per acre of monsoon paddy + monsoon groundnut

TS	No. of farmers	Gross income	Material inputs	Labors and Machinery	Net Income
		(a)	(b)	(c)	(d) = (a)-(b)+(c)
PY	3	479,703	50,260	112,022	317,421
PK	0	0	0	0	0
TG	11	1,045,124	159,047	335,864	550,213
PD	0	0	0	0	0
NT	0	0	0	0	0
ZG	0	0	0	0	0
All	14	762,414	104,653	223,943	433,817

[Monsoon paddy + summer paddy]

- Average of net agricultural income per acre of monsoon paddy + summer paddy was about 175,000 kyats/ acre (Table 2.3.11). Although farmers cultivated paddy twice in a year, the amount of this pattern was lower than only monsoon paddy (161,000 kyats/ acre).
- Farmers in Nattalin and Zegon who earned higher net agricultural income did not cultivate summer paddy.
- The highest income was about 292,000 kyats/ acre in Thegon, while the lowest income was about -17,000 kyats/ acre in Pyay. One of reason that Pyay's income is the lowest is higher input costs to relatively smaller farm lot.
- Even though farmers cultivated paddy twice in a year, they could not get double amount of net income, by comparison with net income of the only monsoon paddy. In other words, the cultivation of summer paddy caused deficit, rather than plus.
- Regarding summer paddy cultivation, the schedule during harvesting is very tighter than monsoon paddy cultivation, since farmers have to prepare for cultivation of the next monsoon paddy after summer immediately (Fig. 2.3.55). On the other hand, from monsoon to winter season, farmers can manage their schedule more flexibly. Hence, farmers put more higher the inputs of summer paddy than monsoon paddy.

**Fig. 2.3.55: Cropping schedule**

- In addition, according to counterparts and farmers, farmers' gate price of summer paddy is almost always lower than monsoon paddy. Even if farmers get yields enough same as monsoon paddy, the gross income of summer paddy might decrease.
- The last Myanmar Government (~ 2015) had the policy that farmers must grow monsoon paddy and summer paddy. Currently, most of farmers who still cultivated summer paddy realized that

they can earn higher income, if they grow other crops in summer. However, they cannot change easily, since they tend to avoid the fails of new crops. Moreover, some of farmers said that income from summer paddy is for capital for cultivation of monsoon paddy. They have not aimed that they earn higher income from summer paddy.

Table 2.3.11: Input and output per acre of monsoon paddy + summer paddy

TS	No. of farmers	Gross income (a)	Material inputs (b)	Labors and Machinery (c)	Net Income (d) = (a)-((b)+(c))
PY	2	479,115	99,936	396,630	-17,450
PK	6	495,309	38,498	245,657	211,154
TG	1	791,442	214,810	284,286	292,347
PD	5	593,946	112,467	265,552	215,928
NT	0	0	0	0	0
ZG	0	0	0	0	0
All	14	589,953	116,428	298,031	175,495

[Monsoon paddy + monsoon sesame]

- Average net agricultural income per acre of monsoon paddy + monsoon sesame in all townships was about 49,000 kyats/ acre which was lower than the amount of only monsoon paddy (161,000 kyats/ acre) (Fig. 2.3.10).
- Even the highest amount of monsoon paddy + monsoon sesame was lower than average of only monsoon paddy.

Table. 2.3.12: Input and output per acre of monsoon paddy + monsoon sesame

TS	No. of farmers	Gross income (a)	Material inputs (b)	Labors and Machinery (c)	Net Income (d) = (a)-((b)+(c))
PY	6	452,096	82,343	284,137	85,617
PK	5	334,837	75,138	247,930	11,769
TG	0	0	0	0	0
PD	0	0	0	0	0
NT	0	0	0	0	0
ZG	0	0	0	0	0
All	11	393,467	78,740	266,033	48,693

Analysis based on Category of Net Agricultural Income

Based on the frequency distribution of net agricultural income (Table 2.3.13), farmers were categorized three groups of which each group have around 100 farmers.

- The valid responses were 285 farmers. Among them, net agricultural income of 30 farmers (about 11%) was deficit balance (agricultural cost > gross agricultural income) (Table 2.3.13).
- Through the whole categories, the largest group is Category 1 which has 85 farmers (30%).

Table 2.3.13: Frequency distribution on net agricultural income

Net agricultural income (~ or less) Kyats	No. of Farmers	%	Category
0	30	10.5	Category 1 (poorer)
1,000,000	86	30.2	
2,000,000	60	21.1	Category 2 (middle)
3,000,000	39	13.7	
4,000,000	16	5.6	Category 3 (wealthier)
5,000,000	16	5.6	
6,000,000	13	4.6	
7,000,000	9	3.2	
8,000,000	1	0.4	
9,000,000	4	1.4	
10,000,000	4	1.4	
more than 10,000,000	7	2.5	
Total	285	100	-

Table 2.3.14 shows the relation between townships and scale of net agricultural income. The numbers in parenthesis of the table means ratio of farmers, when total number of each townships were 100%. And the colored columns mean the largest values of each township.

Table 2.3.14: Number of farmers by category of net agricultural income

Township	Category 1	Category 2	Category 3	Total
PY	35 (81%)	7 (16%)	1 (2%)	43 (100%)
PK	28 (65%)	12 (28%)	3 (7%)	43 (100%)
TG	17 (39%)	15 (34%)	12 (27%)	44 (100%)
PD	13 (35%)	16 (43%)	8 (22%)	37 (100%)
NT	13 (17%)	30 (38%)	35 (45%)	78 (100%)
ZG	10 (25%)	19 (48%)	11 (28%)	40 (100%)
Total	115 (40%)	100 (35%)	70 (25%)	285 (100%)

- More than 65% of farmers in Pay and Paukhaung are belonged to Category 1 (Poorer). On the other hand, other townships (the south of Paungde) are belonged to Category 2 (Middle) or Category 3 (Wealthier). Regarding Thegon, nearly equal of farmers are categorized into three categories.
- In Nattalin, the scale of cultivated land was larger than the other townships, and farmers practiced the large-scale management. Hence, almost half of farmers (45%) are belonged to Category 3.
- As a whole, it had a tendency that the ratio of farmers, who earned higher net agricultural income, were higher in the southern townships, particularly Paungde. The direct reason of this highness was the largeness of cultivated land per household in southern three townships.

Based on the category of agricultural net income, following characteristics of farmers were observed through analysis.

(1) Constitution of farmers

- The sum of “ordinary farmers” and “control farmers” were more than 78% in each category (Fig. 2.3.56).
- 47% of Category 1 was defined as “control farmer”. The second largest group was “ordinary farmer” and it was 40%. “Model farmer” (“Core Farmer” in the Fig. 2.3.56) was only 12%.
- 39% of Category 2 was defined as “ordinary farmer”. The second largest group was “control farmer” (38%). The ratio of “core (model) farmer” in the Category 2 was the highest among three categories (22%).
- 57% of Category 3 was defined as “control farmer,” and the ratio was highest among three categories. The second largest group was “ordinary farmer” (29%), whereas the lowest was core farmer (16%).
- There was no tendency that the “core (model) farmers” earned higher net agricultural income, in comparison with other two defined farmers group. In short, between the definition and amount of net agricultural income, there was no much correlation.

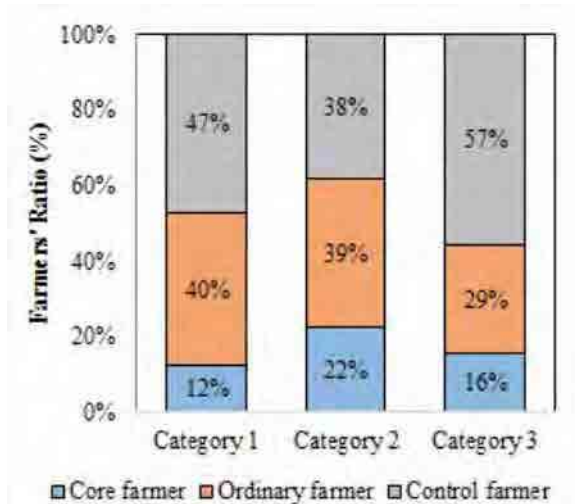


Fig. 2.3.56: Constitution of farmers by category

(2) Characteristics of Household Heads

[Sexuality]

- Among three categories, there was no significant difference, while the male ratio of Category 2 was slightly higher than other two categories (Fig.2.3. 57).
- In all categories, male was more than 90% and ratio of female was less than 10%.
- Difference of sexuality of household heads was not an integrant which affects amount of net agricultural income strongly.

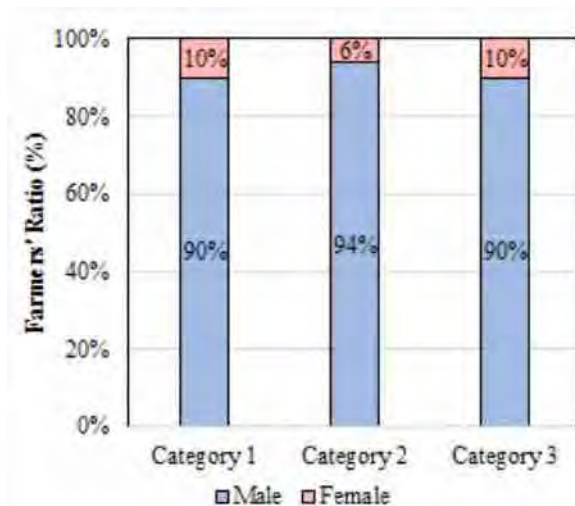


Fig. 2.3.57: Sexuality of household heads by category

[Educational status]

- There was a tendency that household heads of higher income category had got higher education than secondary school (Fig. 2.3.58).
- 38% of Category 1 graduated from primary school. As net income category increases, the ratio decreases to less than 10%.
- Majority of Category 2 graduated from higher than secondary school, while the ratio was lower than Category 3.

- 90% of Category 3 graduated from secondary school or higher school.
- While there was a tendency that farmers who had higher educational status earned higher net agricultural income, some farmers (16% of Category 1) who graduated from high school earned less than 1 million kyats. In addition, 9% of Category 3 who graduated from primary school earned net agricultural income more than 3 million kyats.

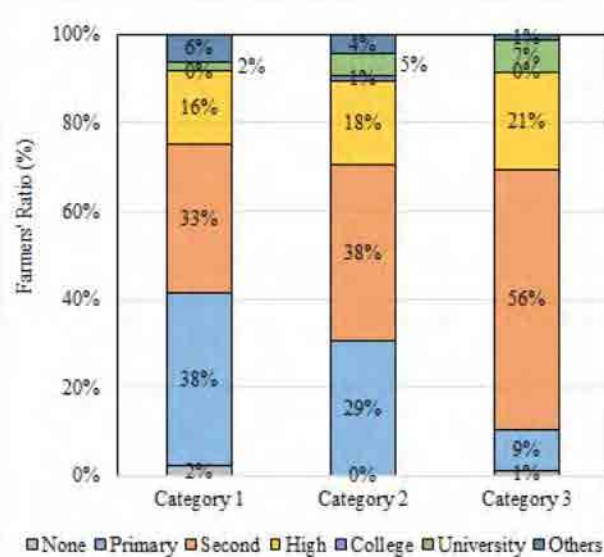


Fig. 2.3.58: Educational status of household heads by category

(3) Owned Lands

[Number of plots]

- Number of plot in the outside of LCA tended to increase, when the income category increase (Fig. 2.3.59).
- Regarding LCA, the differences were not high among categories. Farmers of all three categories had around two to three plots in LCA. On the other hand, regarding outside of LCA, there was about one and half time differences between Category 1 (10.0 plots) and Category 3 (24.8 plots).
- Regarding within LCA, the largest group was Category 2 (2.8 plots).

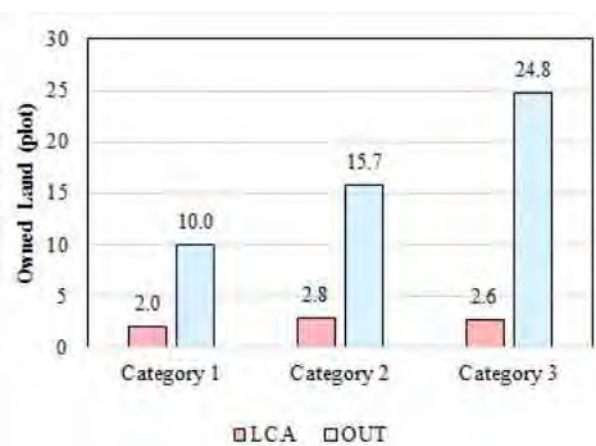


Fig. 2.3.59: Number of plots of owned lands by category

[Area of owned lands]

- Area of owned lands showed same tendency as number of plots. As income category increased, area of owned land in the outside of LCA increased. Regarding the inside of LCA, the difference is not so significant (Fig. 2.3.60).
- There was about three time differences between Category 1 (4.1 acres) and Category 3 (12.2 acres), outside of LCAs.
- Regarding within LCA, the largest group was Category 2 (2.5 acres) which had

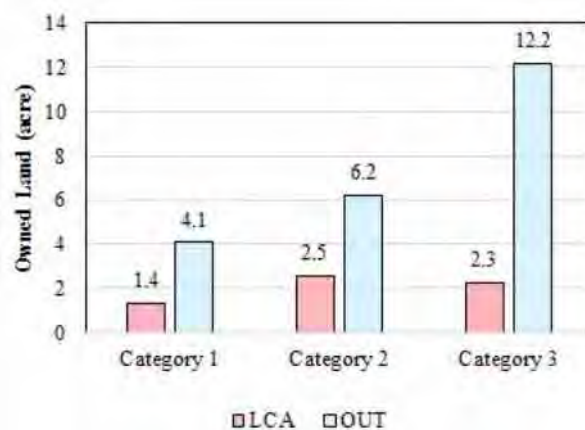


Fig. 2.3.60: Area of owned lands by category

the largest amount of plots within LCA.

[Area per plots]

- Area per plots of owned land within LCA and outside of LCA between categories were not so different (Fig.2.3.61).
- In comparison between within LCA and outside of LCA, there was two time differences. Specifically, the owned land within LCA was about 0.8 acres per plot, while the scale of outside of LCA was only about 0.4 acres per plot.
- It means that the area per plots was not necessary condition for belonging to wealthier category, while number of plots or area of owned land were necessary conditions.

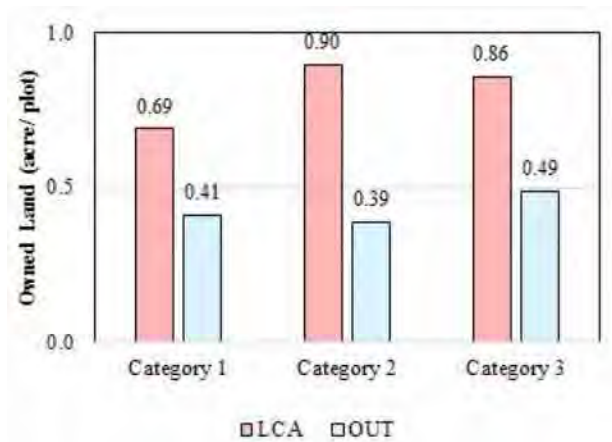


Fig. 2.3.61: Area per plots of owned lands by category

(4) Cultivated Lands

[LCA]

- Ratios of Paddy in all categories were the largest. Other than paddy, area of cultivated lands were small and their differences were not much (Fig. 2.3.62).
- Farmers of Category 2 had largest cultivated land among three categories (2.73 acre/ household) within LCA. The second largest group was Category 3, and the farmers have 2.34 acre/ household.
- Farmers of Category 1 had smallest cultivated land (1.43 acre/ household) within LCA, and the scale was almost half of Category 2.

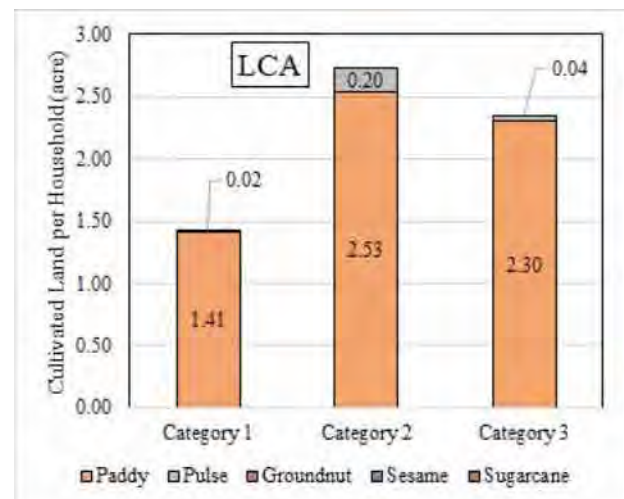


Fig. 2.3.62: Area of cultivated land within LCA by category

[Outside of LCA]

- As becoming wealthier group, area of cultivated land in the outside LCA increased drastically (Fig. 2.3.63).
- Regarding the outside of LCA, farmers of Category 3 had the largest cultivated land (totally, 15.6 acre/ household).
- Farmers of Category 1 had the smallest cultivated land (totally 4.31 acre/ household) in the

outside of LCA. That amount was about one-quarter of Category 1.

- For whole categories, cultivated area of paddy was largest, and the second largest was pulse.
- Especially, farmers of Category 3 had the largest areas of paddy and pulse in the all categories. Regarding other than those two crops, the differences were not so much.
- In comparison with LCA, farmers of all categories had larger cultivated lands in the outside of LCAs.

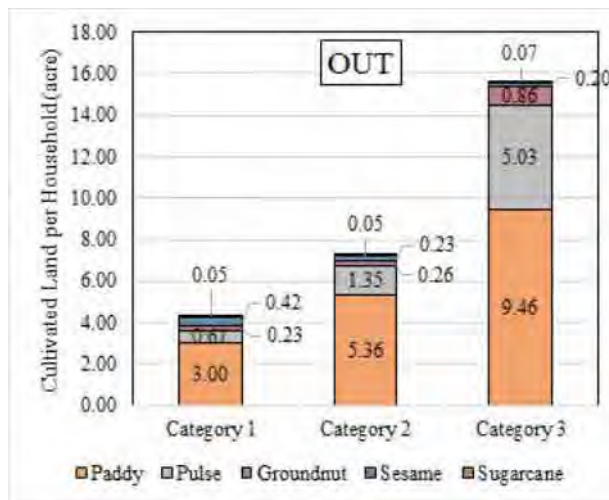


Fig. 2.3.63: Area of cultivated land in the outside of LCA by category

[Both area]

- In comparison between within the LCA and the outside of LCA, sums of cultivated lands had three to six time differences in each category, because of the largeness of cultivated land in the outside of LCA.

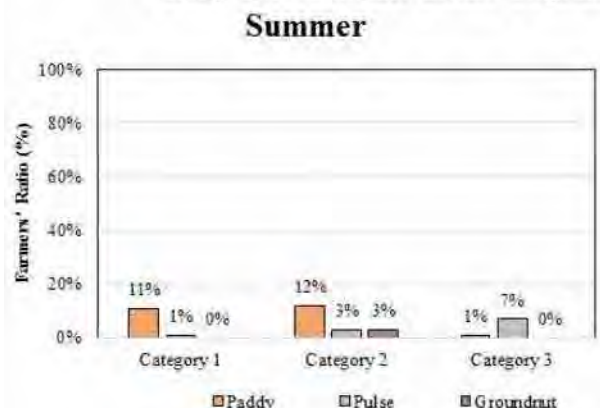
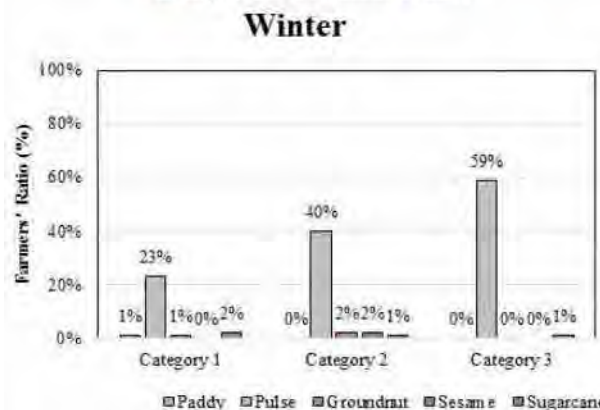
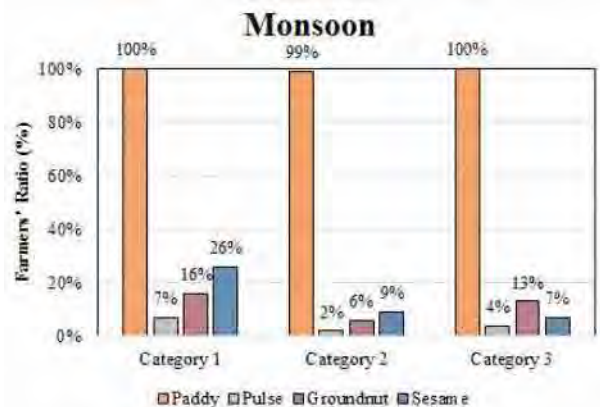


Fig. 2.3.64: Major crops in each season by category

(5) Major Crops

At this part, the major cropping patterns of which farmers responded that they earned agricultural income were analyzed. According to Counterparts, because of shortage of irrigated water or clay soil, etc., farmers cannot cultivate in all seasons, even though they want to do that. Where those issues have not occurred, farmers have cultivated crops through a whole year. If those issues were solved, they might start cultivation in seasons that they had not cultivated (winter or/ and summer).

[Major crops in each seasons]

- Regarding the tendency of monsoon season, there was not significant difference among three categories. The major crop was paddy. And a few farmers cultivated pulse, groundnut, and Sesame (upper figure of Fig. 2.3.64).
- As net agricultural income category

becoming wealthier, the ratio farmers who cultivated pulse in winter season increased. For other crops, the differences were not large (middle figure of Fig. 2.3.64).

- Most of farmers, who earned higher net agricultural income, were observed in southern townships, and higher ratio of those farmers applied the cropping pattern of “monsoon paddy + winter black gram.” And they cultivated winter black gram in larger cultivated lands, as compared with farmers in northern townships. In general, the earnings ratio of black gram is higher than the other crops. Thus, it seemed that those conditions caused the high net agricultural income of farmers who were categorized as Category 3.
- Farmers who cultivated in summer season was minority. However, the ratio of Category 1 and Category 2 who cultivated paddy was higher than Category 3. The ratio of summer pulse of Category 3 was slightly higher than other two categories (lower figure of Fig. 2.3.64).

[Number of cropping seasons]

- 64% of farmers belonging Category 1 cultivated only one season. On the other hand, 69% of farmers belonging Category 3 cultivated in two seasons. (Fig. 2.3.65).
- Most of farmers who cultivated in three seasons belonged to Category 2. However, the ratio was very low (4%).
- As income category becoming wealthier, the number of cropping seasons increased to two seasons. It means that the maximum cropping seasons (= three seasons) was not necessarily required to earn higher net agricultural income.

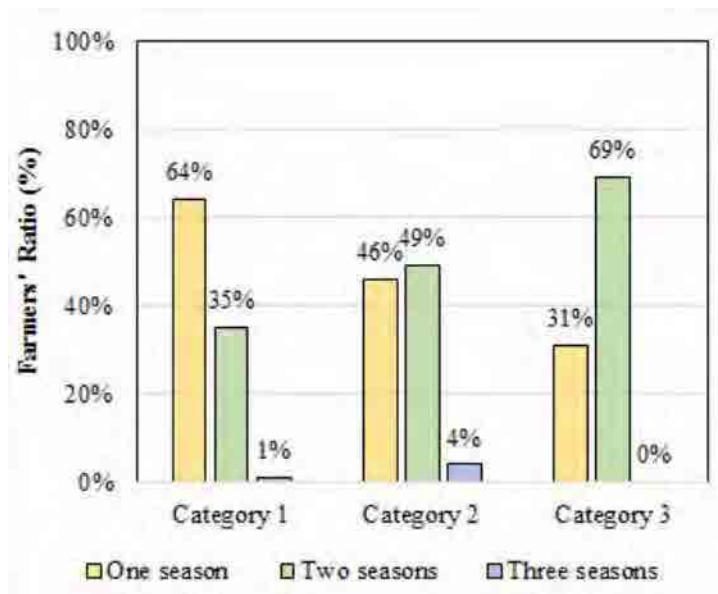


Fig. 2.3.65: Number of cropping season by category

[Major cropping pattern]

- As mentioned above, most of farmers cultivated crops in monsoon season only or monsoon + winter season. Especially, the major season to cultivate was monsoon. Hence, the major cropping patterns were almost limited to combination of crops of those two seasons, namely, “only monsoon paddy”, “monsoon paddy + monsoon groundnut”, “monsoon paddy + monsoon sesame”, “monsoon paddy + winter pulse”, and “monsoon paddy + summer paddy” (Fig. 2.3.66).
- Farmers who cultivated only monsoon paddy were around 40% in Category 1 and 2, while Category 3 was 20%. Regarding Category 1, the ratio of this pattern was the highest in that category (39%).
- For Category 2, “only monsoon paddy” (40%), and “monsoon paddy + winter pulse” (39%) were higher than other patterns.

- The highest ratio of Category 3 was “monsoon paddy + winter pulse” (59%). Pulse included black gram, green gram, and lab lab bean. The ratios of Category 1 and 2 were lower than Category 3.
- The ratios of “monsoon paddy and summer paddy” of Category 1 and 2 were around 10%, while the ratio of Category 3 was nearly null (1%).
- As net agricultural income category becoming wealthier, the ratio of farmers who applied the pattern of “monsoon paddy + winter pulse” increased. This pattern had more remarkable tendency than the other patterns.
- Farmers who cultivated crops in three seasons were only 3% of Category 2. Cropping in three seasons was not necessarily required to earn higher net agricultural income.

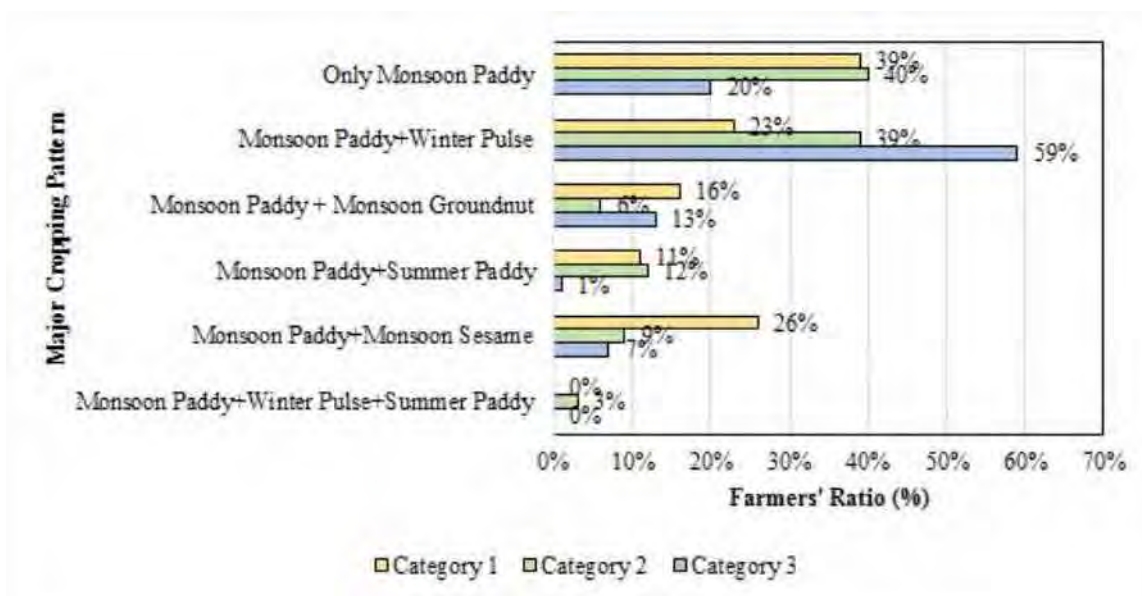


Fig. 2.3.66: Major cropping pattern by category

Note; Regarding patterns other than “only monsoon paddy”, the same farmers might be counted redundantly, since some farmers grew some of monsoon groundnut, monsoon sesame, winter pulse, and summer paddy with monsoon paddy. Hence, total percentages of each categories are not 100%.

(6) Dependency of Crops on Agricultural Gross Income

- Through whole categories, the ratios of paddy was highest (Category 1; 78%, Category 2; 79%, and Category 3; 64%). The ratio of paddy increases as category increases (Fig. 2.3.67).
- The next largest dependency was pulse in all categories (Category 1; 9%, Category 2; 16%, and Category 3; 30%). With becoming wealthier category, the ratio increased. In comparison between Category 1 and 3, the difference was about 3.3 time differences.
- Regarding other crops except paddy and pulse, the ratios were not much different.

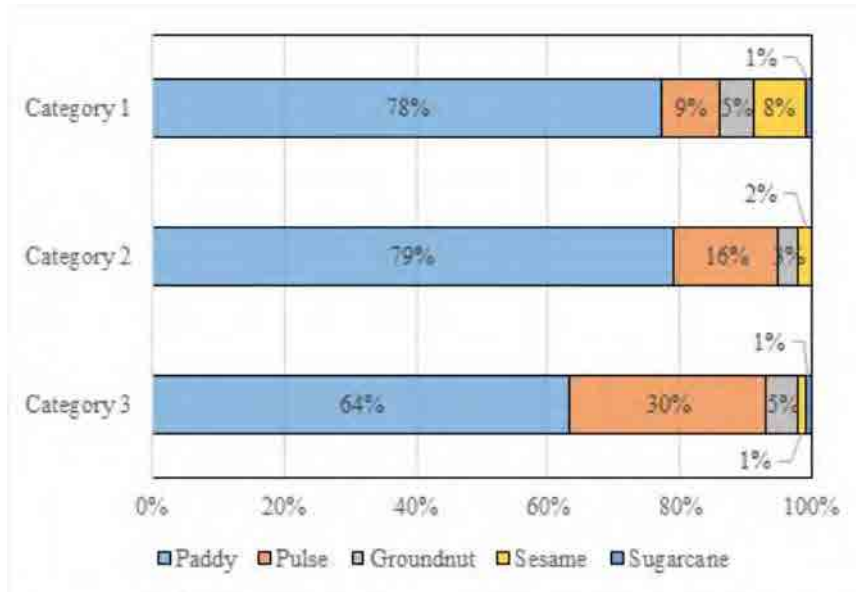


Fig. 2.3.67: Dependency of agricultural gross income by category

(7) Net agricultural income per acre

- About monsoon paddy and winter pulse, net income per acre increased as income category becomes wealthier (Fig. 2.3.68).
- Net income of summer paddy was lower than that of monsoon paddy in all categories. The highest net income of summer paddy was Category 2 (about 14,000 kyats/ acre). The differences between Category 1 and Category 3 were not so much.

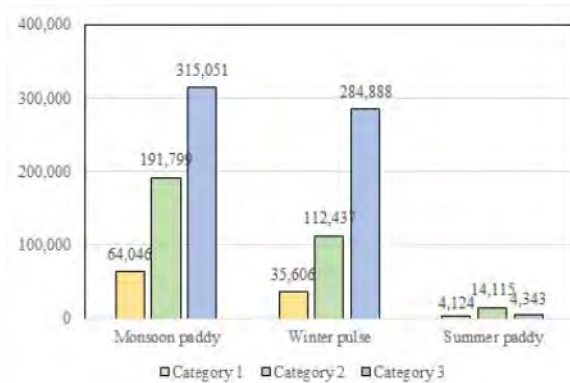


Fig. 2.3.68: Net income per acre of major crops by category

(8) Productivity per Man-day

Productivity per man-day was calculated by following formula.

$$\text{Gross income} / (\text{Man} \times \text{day}) = \text{Productivity}$$

Regarding labor costs of this analyzing, it was calculated by including both of family and hired labors.

[Paddy]

- Regarding LCA, the productivity was quite lower than outside of LCA, in all three categories. The highest productivity of within LCA was Category 2 (677 kyats/man-day) (Fig. 2.3.69).
- Labor productivity of the outside of LCA

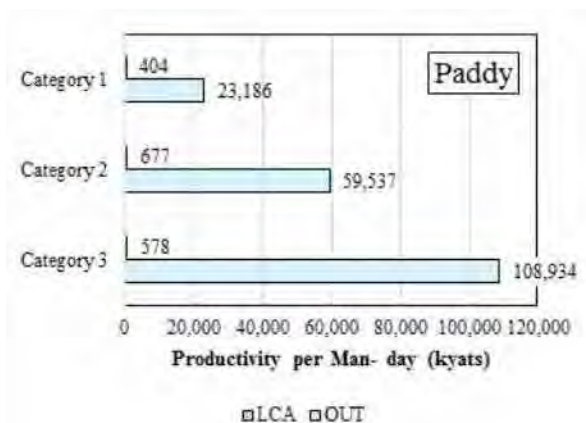


Fig. 2.3.69: Productivity of paddy by category

drastically increased, as income category becoming wealthier. The highest productivity of outside of LCA was Category 3 (108,934 kyats/ man-day), while that of Category 1 which was the lowest was 23,186 kyats/ man-day. The differences between Category 1 and 3 were almost five times.

- Productivity of the LCA and the outside of LCA had more than 50 times differences in all three categories. As income category becoming wealthier, the differences increased. Especially, in case of Category 3, between the LCA and the outside of LCA, there was 188 times differences. From this condition, it seemed that the impact of the higher productivity of paddy in the outside of LCA was huge to the higher net income.
- As mentioned in below, farmers who earned higher income had much agricultural machinery or equipment, for example, hand tractor, water pump, etc. Because of the highness of capital equipment ratio caused increasing productivity.

[Pulse]

- The labor productivities of within the LCA and the outside of LCA became higher, as income category increased (Fig. 2.3.70).
- Regarding the LCA, the productivity was extremely lower than the outside of LCA. The highest productivity was Category 3, and was only 167 kyats/ man-day.
- Regarding outside of LCA, the labor productivity increases as income category increases. The highest productivity was Category 3, and was 5,797 kyats/ man-day.

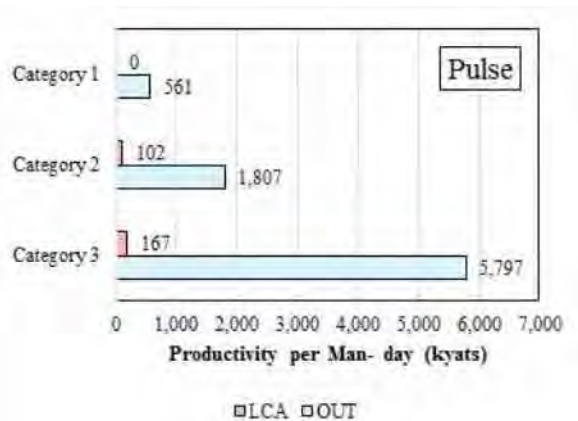


Fig. 2.3.70: Productivity of pulse by category

[Groundnut]

- As income category increases, labor productivity clearly increased (Fig. 2.3.71).
- The highest productivity was Category 3 (250 kyats/ man-day). And the lowest productivity was Category 1 (100 kyats/ man-day). The differences between Category 1 and 3 were 2.4 times.

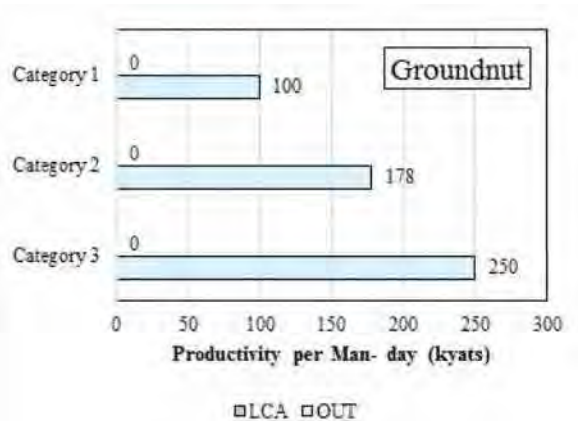


Fig. 2.3.71: Productivity of groundnut by category

[Sesame]

- Regarding sesame, there was not significant difference in labor productivity among three income categories, comparing to other crops (Fig. 2.3.72).
- The highest was Category 2 (166 kyats/ man-day), whereas the lowest was Category 1 (134 kyats/ man-day). There was only 1.2 time difference.

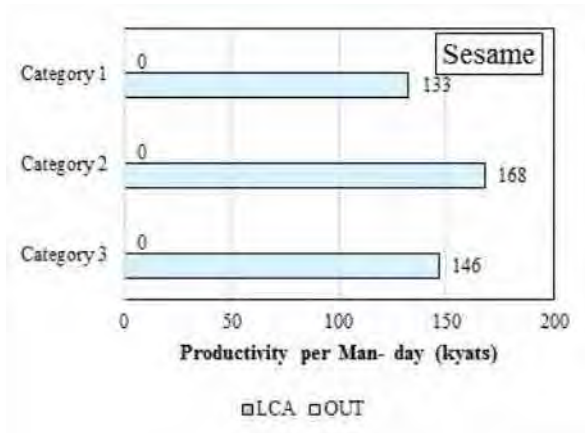


Fig. 2.3.72: Productivity of sesame by category

[Sugarcane]

Since this baseline survey tried to clarify the farmers’ conditions during 2015 and 2016, farmers could not responded about cultivation of sugarcane which is a perennial crop well. However, the supplemental information about sugarcane cultivation was collected from Counterparts, as mention in Chapter 3.

(9) Domestic Animals

- In all categories, more than 69% of farmers had domestic animals (Fig. 2.3.73).
- The lowest holder’s ratio of domestic animals was Category 1 (69%). The highest ratio was Category 3 (81%).
- As income category becoming wealthier, the ratio increased gradually.
- Among whole categories, the highest earner from domestic animals per household was farmers of Category 2, and the amount was about 233,000 kyats/ year. The lowest earner, farmers of Category 1 got about only 107,000 kyats/ year and the amount was only 40% of that of Category 2. Regarding Category 3, farmers earned about 165,000 kyats/year, which was about 72% of Category 2 (Fig. 2.3.74).

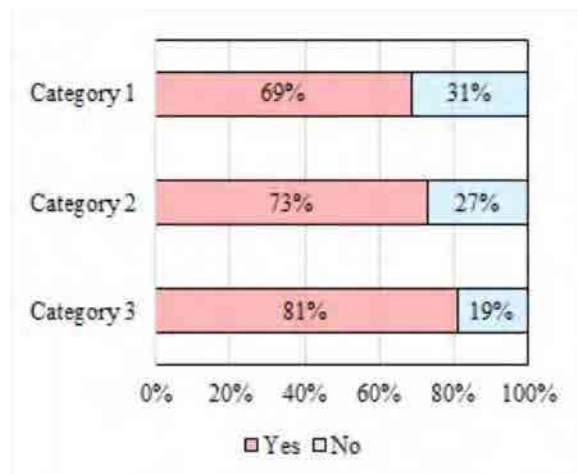


Fig. 2.3.73: Holders’ ratio of domestic animals by category

- While the income of Category 3 was lower than Category 2, there was a tendency that farmers who earned higher net agricultural income had domestic animals and got higher income from them.
- Major kinds of domestic animals were of ox for working or pig. Other than those kinds, the number was not so large. This tendency can be observed in all categories

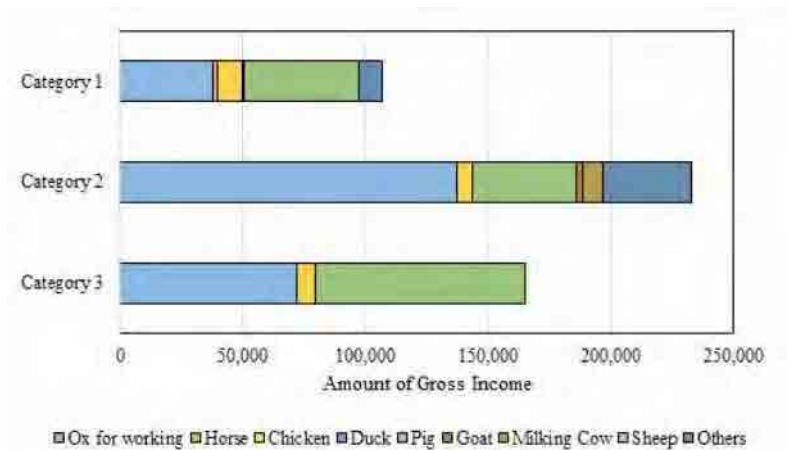


Fig. 2.3.74: Gross income from domestic animals per household by category

(10) Installed Agricultural Machinery and Equipment

- By machinery or equipment, the ratio of farmers who installed agricultural machinery were quite different. The major machinery among all three categories were Ox-cart, Ox-plow, and Ox-harrowing, and those were more than 60% (Fig. 2.3.75).
- Farmers could apply those machinery, because of their lower price, and manageability. The differences of those machinery’ ratios were not so different among categories.
- For all machinery, as income category becoming wealthier, the ratio also increased. It means that farmers who were well-financed relatively tended to install more agricultural machinery.
- However, regarding ratios of some machinery, such as Knap-sack sprayer, Combine harvester, and Dryer, Category 2 were slightly higher than Category 3.

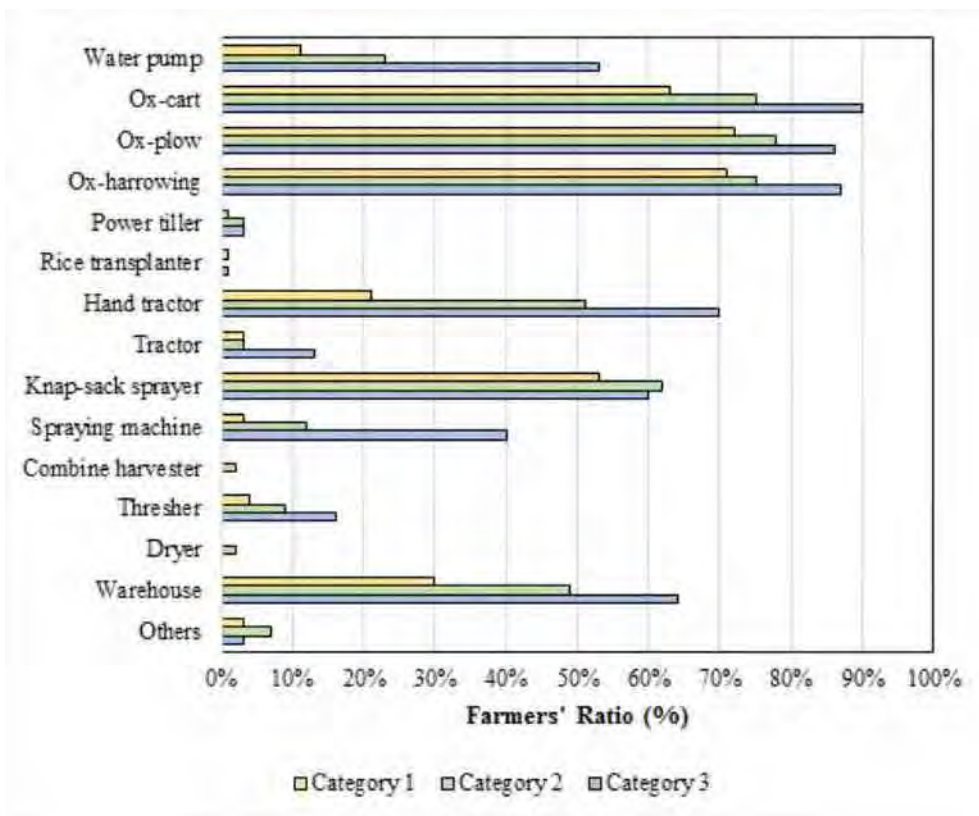


Fig. 2.3.75: Farmers' ratio of installed agricultural machinery and equipment by category

(11) Loan for Crop Production

[Amount of loan]

Table 2.3.15 shows amount of loan for crop production in each category.

Table 2.3.15: Amount of loan for crop production per household (kyats/ year)

Category	Commercial Banks	National Banks (e.g., MADB)	AMD Loan Scheme	Supplier's Credit*	Informal Financing Organization	Friends/ Relatives	Other	Total
1	4,741	333,621	2,586	0	3,879	6,466	10,233	361,526
2	6,061	712,626	7,071	0	2,525	23,434	8,081	759,798
3	2,857	851,857	0	0	3,571	60,000	8,429	926,714
Average	4,553	632,701	3,219	0	3,325	29,967	8,914	682,679

Note: Supplier's Credit means that is provided due to the purchase of the product.

- The highest amount of loan for crop production per household among three categories was 926,714 kyats/ year of Category 3. On the other hand, the lowest was 361,526 kyats/ year of Category 1. Regarding Category 2, the amount was a bit higher (756,798 kyats/ year) than average of three categories (682,679 kyats/ year). The differences between Category 1 and 3 were about two and half times (Table 2.3.15).
- Major lender was national banks (e.g., MADB) for all three categories. The second largest lender was “friends/ relatives.”

[Object of loan]

- For the reason to borrow money, there was not so much difference by the income category. The tendencies of responses were almost same (Fig. 2.3.76).
- Approximately 90% of farmers, who borrowed money, responded that they used loan for cultivation of monsoon paddy. The second major reason was cultivation of crops other than monsoon/ summer paddy and black gram, and was more than 14% in all categories.
- Regarding agricultural machinery, education for children and livestock production, the ratios were extremely low (nearly 0%).

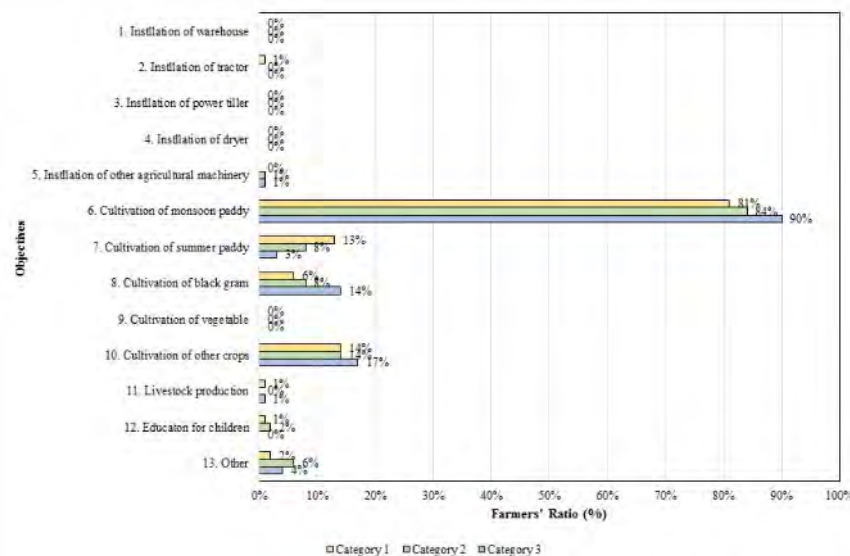


Fig. 2.3.76: Objects of loan for crop production by category

(12) Off-farm Income

On this Baseline Survey, the items of Employment, Casual work, Remittances (support from farmers’ relatives), Business (Lending fee of machinery, Road-side trading, etc.) were surveyed. Regarding business (especially, road-side trading), the data should be taken care, since the amount might be gross income.

- Category 3 was the highest earner of off-farm income per household, and they got about 986,000 kyats/ year. The lowest earner was Category 2, and they earned about 510,000 kyats/ year. The amount was almost same as Category 1 (about 466,000 kyats/ year) (Fig. 2.3.77).
- The difference between Category 3 and others was almost two times. Hence, it can be said that farmers who earned higher off-farm income also got higher net agricultural income, even though the amount of Category 2 was slightly lower than Category 1.
- Major items of off-farm income was employment, casual work, and business (lending fee of machinery). Especially, farmers of Category 3 earned more than 400,000 kyats/ year from employment.

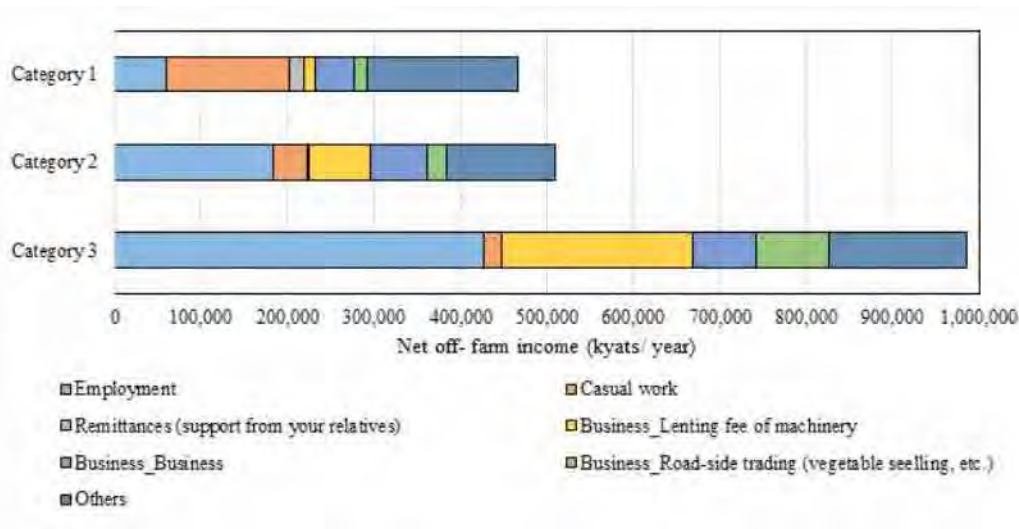


Fig. 2.3.77: Average net off-farm income per household by category

[Remittance]

- Number of farmers who got remittance from other cities or countries were only three farmers in all category. The ratio was only 1.1% of total farmers in all categories (Table 2.3.16).
- Those farmers were categorized in Category 1 or 2. It means, there was a tendency that farmers who are belonging poorer category got remittance.
- Two farmers got remittances which was higher than amount of net agricultural income.
- Especially, remittances of farmer 1 and 2 in table 2.3.16 were more than 67% of amount of net off-farm income.
- Regarding three farmers, the remittance was brought by wife (one farmers) and other relatives (two farmers).

Table 2.3.16: Situation of farmers who got remittance

Farmer	Township	Category of Net Agricultural Income	Remittance from	Amount of Remittance (kyats/ year) (a)	Amount of Net off-farm income (kyats/ year) (b)	Percentage (c) = (a)/(b)	Amount of Net Agricultural income (kyats/ yea)
1	PY	1	Wife	100,000	150,000	67%	147,350
2	PK	1	Other relatives	1,800,000	2,520,000	71%	618,107
3	TG	2	Other relatives	200,000	2,600,000	8%	1,955,900
Average				700,000	1,756,667	49%	907,119

(13) Balance of Net agricultural Income and Net Off-farm Income

Fig. 2.3.78 and Table 2.3.17 shows balance of annual net agricultural income and annual net off-farm income by category.

- While the amount of net off-farm income of Category 3 was extremely high (985,857 kyats/ year), the dependency of off-farm income for gross household income was the lowest among three categories.
- The balance between net agricultural income and net off-farm income in Category 2 was almost same as Category 3. Namely, the ratio of off-farm income was about 20%.
- Total amount of off-farm income of Category 1 was lowest, however, the ratio of net off-farm income was higher than other two categories. It might mean that the farmers had to rely on the income source other than agriculture.

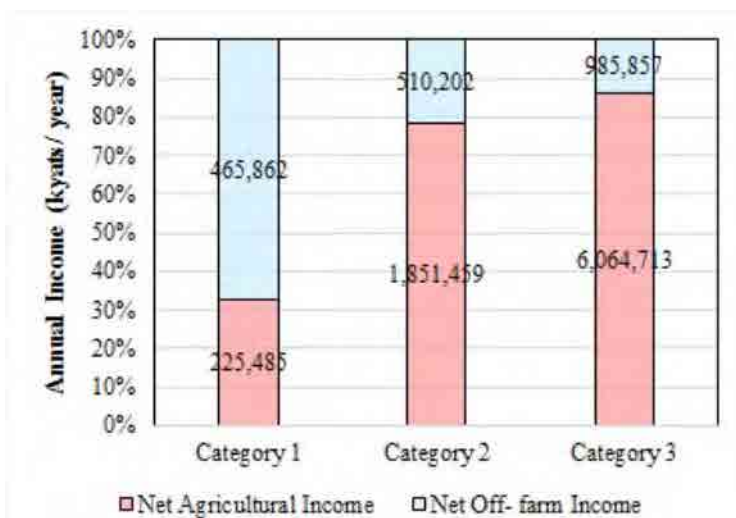


Fig. 2.3.78: Balance of annual income by category

Table 2.3.17: Balance of net agricultural income and net off-farm income by category

Category	Net agricultural Income (kyats/ year)	Net off-farm Income* (kyats/ year)	Total (kyats/ year)
1	225,485	465,862	691,347
2	1,851,459	510,202	2,361,661
3	6,064,713	985,857	7,050,570
Average	2,713,885	653,974	3,367,859

Note; Regarding net off-farm income, it included business of road-side trading which might be gross income. However, the ratio of this business was only 6% of total amount of net off-farm income (653,974 kyats/ year).

Fig. 2.3.79 and Table 2.3.18 shows balance of annual get agricultural income and annual net off-farm income by township.

- Amount of net off- farm income of Thegon was extremely higher (1,172,727 kyats/ year). And the lowest amount was Pyay (125,581 kyats/ year).

- Regarding Pyay, amount of net agriculture was lowest in all townships. However, the degree of dependency of off-farm income was about only 20%.
- The highest ratio of off-farm income was Paukkhaung (about 40%).
- Most of farmers who earned higher net agricultural income, and were categorized to wealthier category, the ratios of net agricultural income were higher.

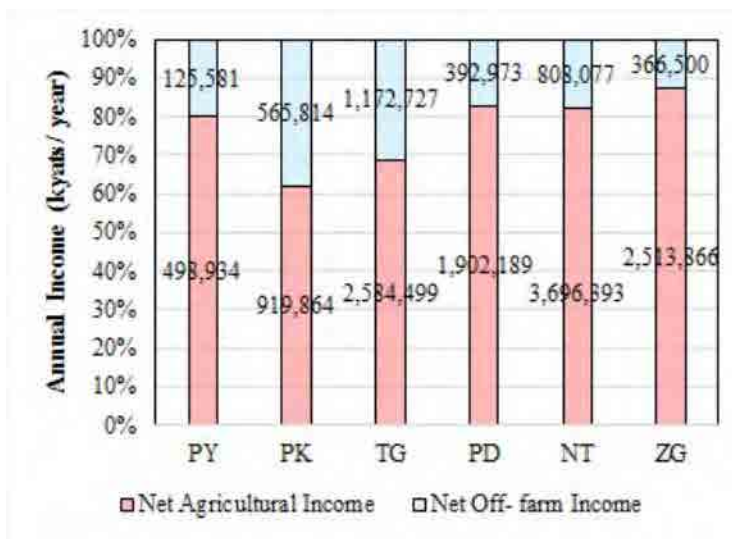


Fig. 2.3.79: Balance of annual income by township

Table: 2.3.18: Balance of net agricultural income and net off- farm income by township

Township	Net agricultural Income (kyats/ year)	Net off-farm Income* (kyats/ year)	Total (kyats/ year)
Pyay	498,934	125,581	624,515
Paukkhaung	919,864	565,814	1,485,678
Thegon	2,584,499	1,172,727	3,757,226
Paungde	1,902,189	392,973	2,295,162
Nattalin	3,696,393	808,077	4,504,470
Zegon	2,513,866	366,500	2,880,366
Average	2,019,291	571,945	2,591,236

Note; Regarding net off-farm income, it included business of road-side trading which might be gross income. However, the ratio of this business was only 4% of total amount of net off-farm income (571,945 kyats/ year).

2.3.4 COST AND BENEFIT OF MAJOR CROPS

In addition to the baseline data collected from farmers, the PROFIA Team collected cost-benefit data estimated by DOA C/P of each township. DOA township officers estimate cost-benefit of major crops grown in the township in every year. The estimation is shown in table (1) Net Profit by Crop.

Also, the PROFIA Team and C/P developed current cropping calendar of the project sites, in where major cropping pattern with estimated share of the irrigated area (low land) in each township is illustrated. Following table (2) Annual Income Estimation shows annual income of farmers by major cropping pattern.

Table 2.3.19: Cost and benefit of major crops

【Pyay Township】

(1) Net Profit by Crop

Sr. No.	Crop	Production cost (kyat/ac)	Yield (bskt/ac)	Unit Price (kyat/bakt)	Gross Income (kyat/acre)	Net Income (kyat/acre)
1	Monsoon Paddy (Yadana Toe) /a	252,000	100	5,000	500,000	248,000
2	Monsoon Paddy (Kyawzeya)	280,724	77	5,200	402,324	121,600
3	Summer Paddy (Kyawzeya)	320,500	84	5,000	418,750	98,250
4	Blackgram	226,000	17	35,000	595,700	369,700
5	Sesame (monsoon)	207,000	12	60,000	705,600	498,100
6	Groundnuts	287,500	56	16,000	890,400	602,900
7	Greengram	187,000	15	35,000	521,150	334,150
8	Pigionpea	169,800	19	25,000	467,500	297,700

Source: DOA Pyay Township

Note: Net profit of Yadana Toe is estimated based on interview survey.

(2) Annual Income Estimation

Sr. No.	Cropping Pattern	Monsoon (kyat/acre)	Winter (kyat/acre)	Summer (kyat/acre)	Annual Income (kyat/acre)	Remarks
1	MP + GG	248,000	334,150	-	582,150	Current: 74%
2	MP + SP	248,000	-	98,250	346,250	Current: 15%
3	MP + Sesame	248,000	-	498,100	746,100	Current: 3%
4	MP + GG + SP	248,000	334,150	98,250	680,400	Current: 2%
5	MP + GG + Sesame	248,000	334,150	498,100	1,080,250	Non

- Among variety of crops grown in Pyay, net profits of 8 crops are shown in table (1) Net Profit by Crop. 2 major varieties of paddy in Pyay are Yadanatoe and Kyaw zeya, and net profits of them are estimated at 248,000 kyats/ acre and 121,600 kyats/ acre respectively. Yadanatoe is planted in monsoon season only whereas Kyaw zeya is planted both monsoon and summer season since it is relatively short term variety (120–125 days).
- Pulses and beans are more profitable than paddy varieties, and most the profitable crop among major 8 crops is groundnuts (603,000 kyats/ acre), followed by sesame (498,000 kyats/ acre), black gram (370,000 kyats/ acre) and green gram (334,000 kyats/ acre).
- According to DOA officer, the most dominant cropping pattern in the irrigated low land in Pyay is monsoon paddy and green gram, which is accounted for 74% of the cultivable area, and a simple estimation of annual income from both crops is estimated at 582,000 kyats/ acre. Annual income from the combination (MP+GG) is higher than the paddy-paddy combination (MP+SP).

【Paukkhaung Township】

(1) Net Profit by Crop

Sr. No.	Crop	Production cost (kyat/ac)	Yield (bskt/ac)	Unit Price (kyat/bakt)	Gross Income (kyat/acre)	Net Income (kyat/acre)
1	Monsoon Paddy (Shinthwelat)	253,000	82	6,000	492,000	239,000
2	Summer Paddy (Yadanatoe)	253,000	85	6,000	510,000	257,000

Source: DOA Paukkhaung Township

(2) Annual Income Estimation

Sr. No.	Cropping Pattern	Monsoon (kyat/acre)	Winter (kyat/acre)	Summer (kyat/acre)	Annual Income (kyat/acre)	Remarks
1	MP + BG	239,000	369,700	-	608,700	Current: 46%
2	MP + SP	239,000	-	257,000	496,000	Current: 42%
3	MP + BG + SP	239,000	369,700	257,000	865,700	Current: 11%
4	MP + BG + Sesame	239,000	369,700	498,100	1,106,800	Non

Note: Net income of BG and SS is quoted from Pyay's Figure

- In Paukkhaung, the most dominant paddy variety is Yadanatoe, followed by Shinthwelat, Kyaw zeya and Pahle thwe, according to the baseline survey. Net profits of Yadanatoe and Shinthwelat are 257,000 kyats/ acre and 239,000 kyats/ acre respectively.
- According to DOA officer, the most dominant cropping pattern in the irrigated low land in Paukkhaung is monsoon paddy and black gram, and annual net income from the combination is estimated at 609,000 kyats/ acre. In LCA, major cropping pattern is paddy-paddy combination (MP+SP), which generates 496,000 kyats/ acre per annum. However, if farmer introduce 3-cropping including monsoon, winter and summer, it is possible to obtain more than 800,000 kyats/ acre (of course, farming is not simple as mathematics). In some area in Paukkhaung, 3-cropping (MP+BG+SP) is practiced where irrigation water is available in summer season.

【Thegon Twonship】

(1) Net Profit by Crop

Sr. No.	Crop	Production cost (kyat/ac)	Yield (bskt/ac)	Unit Price (kyat/bakt)	Gross Income (kyat/acre)	Net Income (kyat/acre)
1	Monsoon Paddy	205,000	80	7,500	600,000	395,000
2	Summer Paddy	216,000	85	6,000	510,000	294,000
3	Sesame	122,500	10	50,000	500,000	377,500
4	Blackgram	177,500	20	40,000	800,000	622,500
5	Groundnuts	207,500	54	13,300	718,200	510,700

Source: DOA Thegon Township

(2) Annual Income Estimation

Sr. No.	Cropping Pattern	Monsoon (kyat/acre)	Winter (kyat/acre)	Summer (kyat/acre)	Annual Income (kyat/acre)	Remarks
1	MP	395,000	-	-	395,000	Current: 43%
2	MP + BG	395,000	622,500	-	1,017,500	Current: 37%

Note: Net profit of MP in 2-cropping and 3-cropping pattern is quoted from Yadanatoe in Pyay.

Net income of vegetables will be estimated based on additional survey.

- Baseline result indicated that the most dominant variety of monsoon paddy is Kyaw zeya in Thegon Township, whereas that of summer paddy is Manaw thukha. Kyaw zeya is a long-term variety (150 days) and can give a good yield even in the sandy soil area like Thegon.
- According to the cost-benefit data provided by DOA Thegon, the most profitable crop in 2015/16 is Black Gram (622,500 kyats/ acre), followed by Groundnuts (511,000 kyats/ acre) and Monsoon

paddy (395,000 kyats/ acre).

- Vegetable production is observed within irrigation service area in Thegon. According to farmers, however, irrigation water cannot reach to their farmland more than a decade due to water shortage in South Nawin Dam. Therefore, most farmers grow vegetables by irrigating from tube well-constructed by themselves. Thegon is a production area of lowland vegetable in Myanmar, and Wat Pote is one of price monitoring markets of vegetables under Market Information System (MIS) of DAP.

【Paungde Township】

(1) Net Profit by Crop

Sr. No.	Crop	Production cost (kyat/ac)	Yield (bskt/ac)	Unit Price (kyat/bakt)	Gross Income (kyat/acre)	Net Income (kyat/acre)
1	Monsoon Paddy (Yadanatoe, Shint)	202,600	80.00	4,200	336,000	133,400
2	Monsoon Groundnuts	196,000	65.75	13,000	854,750	658,750
3	Winter Groundnuts	196,000	58.59	11,000	644,490	448,490
4	Monsoon Sesame	124,000	13.50	40,000	540,000	416,000
5	Winter Sesame	124,000	10.46	50,000	523,000	399,000
6	Monsoon Greengram	91,000	15.11	28,000	423,080	332,080
7	Winter Greengram	91,600	16.82	32,000	538,240	446,640
8	Blackgram /a	125,100	18.77	40,000	750,800	625,700

Source: DOA Nattalin Township

Note: a/ data for blackgram is collected in 2016/17.

(2) Annual Income Estimation

Sr. No.	Cropping Pattern	Monsoon (kyat/acre)	Winter (kyat/acre)	Summer (kyat/acre)	Annual Income (kyat/acre)	Remarks
1	MP + BG	133,400	625,700		759,100	Current: 63%
2	MP + SP	133,400	357,125		490,525	
3	MP + Sesame	133,400		399,000	532,400	

Note: Net income of summer paddy is quoted from Nattalin since Taung Pyan is also one of dominant oaddy variety in Paungde.

- Dominant variety of monsoon paddy in Paungde is Yadanatoe and Taung pyan. According to the baseline result, Yadanatoe is the most dominant variety among farmers in the outside of LCA, whereas Taung pyan is major variety among farmers in the LCA. Other varieties grown in the township are Sin thwe lat, Inhle and Pahle thwe.
- In 2015, net profits of pulses/beans and oil crops including groundnuts, black gram, green gram and sesame are higher than that of both monsoon paddy in Paungde. According to the DOA's statistic shown in the table above, Monsoon groundnuts makes the highest net profit, followed by black gram, winter groundnuts, winter green gram, and monsoon sesame. Mostly, pulses/beans and oil crops in Paungde are grown in winter and monsoon season.
- According to DOA officers, monsoon paddy and winter black gram is the most dominant cropping pattern in Paungde. In some area, only monsoon paddy is grown in Paungde. Net income from the monsoon paddy – black gram cropping pattern is estimated at 759,000 Kyat per year, which is 5 times larger than that of single cropping pattern of monsoon paddy.
- Another cropping pattern observed in this township is monsoon paddy and winter sesame. The cropping pattern generates 532,400 kyat per year in 2015, but the income is lower than the cropping pattern of monsoon paddy and black gram, since yield of black gram is higher than winter sesame in spite of lower price.

【Nattalin Township】

(1) Net Profit by Crop

Sr. No.	Crop	Production cost (kyat/ac)	Yield (bskt/ac)	Unit Price (kyat/bakt)	Gross Income (kyat/acre)	Net Income (kyat/acre)
1	Monsoon Paddy (Yadana Toe)	252,000	85	7,000	595,000	343,000
2	Summer Paddy (Taung Pyan)	237,875	70	8,500	595,000	357,125
3	Monsoon Groundnut	216,000	50	11,000	550,000	334,000
4	Winter Groundnut	228,000	55	10,000	550,000	322,000
5	Monsoon Sesame	117,000	9	50,000	450,000	333,000
6	Winter Sesame	121,000	10	35,000	350,000	229,000
7	Black Gram	273,500	20	43,000	860,000	586,500
8	Green Gram	253,500	20	32,000	640,000	386,500

Source: DOA Nattalin Township

(2) Annual Income Estimation

Sr. No.	Cropping Pattern	Monsoon (kyat/acre)	Winter (kyat/acre)	Summer (kyat/acre)	Annual Income (kyat/acre)	Remarks
1	MP + BG	343,000	586,500	-	929,500	Current: 100%
2	MP + SP	343,000	-	357,125	700,125	
3	MP + Sesame	343,000	-	229,000	572,000	

Note: Net income of winter sesame is temporary used for summer sesame

- Dominant variety of monsoon paddy in Nattaline is Taung pyan and Yadantoe. Taung pyan is a long-term (year-round) variety and shape is round and short like Pathein and Phypa Powsan. Retail price in 2016 is 36,000 to 39,000 kyats/ bag which is higher than middle class rice including Hmaubi-2 (30,000 kyats/ bag) and Kyaw zya (28,000 kyats/ bag), and lower class rice such as Yadanatoe (20,000-22,000 kyats/ bag). However, yield of Taung pyan is not so higher, ranging between 60 to 70 basket/acre, than that of Yadanatoe (80 to 100 baskets/ acre). Therefore, net profit of Taung pyan (357,000 kyats/ acre) is not so different from Yadanatoe (343,000 kyats/ acre) in 2015.
- In 2015, net profit of black gram and green gram is higher than that of both monsoon and summer paddy in Nattalin. On the other hand, sesame cannot make better profit than paddy in this year as table above shows.
- According to DOA officers, monsoon paddy and winter black gram is the most dominant cropping pattern in Nattalin.

【Zigon Township】

(1) Net Profit by Crop

Sr. No.	Crop	Production cost (kyat/ac)	Yield (bskt/ac)	Unit Price (kyat/bakt)	Gross Income (kyat/acre)	Net Income (kyat/acre)
1	Monsoon Paddy /a	121,750	85	7,000	595,000	473,250
2	Blackgram /a	132,500	20	43,000	860,000	727,500

Source: DOA Zigon Township

Note: a/ Yield, unit price are quoted from Nattalin's data.

(2) Annual Income Estimation

Sr. No.	Cropping Pattern	Monsoon	Winter	Summer	Annual Income	Remarks
1	MP + BG	473,250	727,500	-	1,200,750	Current: 75%
2	MP + BG + SP	473,250	727,500	357,125	1,557,875	Current: 22%
3	MP + SP	473,250	-	357,125	830,375	Current: 4%
4	MP + Sesame	473,250	-	229,000	702,250	

Note: Net incomes of Nattalin's monsoon paddy (Yadana Toe) and winter sesame are temporary used for MP and SS..

- In Zigon, the most dominant variety of paddy in 2015 is Chinese hybrid. According to DOA C/P, a Chinese company made a contract farming with farmers in lowland area, providing hybrid seed and fertilizers to farmers and buying paddy at higher price.
- The most dominant cropping pattern in lowland area is monsoon paddy and winter black gram in Zigon, which account for 75% of the irrigable area. In some area, 3-cropping of MP+BG+SP is practiced where irrigation water is available in summer season.
- Fig. 2.3.80 shows cost structure of major crops. For all crops, labor costs including family labor and hired labor is the highest cost item, accounting for 52 (groundnuts) to 72% (monsoon paddy). Basically, cost for family labor is higher than that of hired labor except sesame. In should be noted that mechanical service fee is included in the hired labor cost.
- Farmers use manure and fertilizers for paddy and sesame production, but not use for black gram and groundnuts production.
- For paddy production, share of seed cost is only 4%, whereas that of pulses and beans is relatively higher, e.g. seed costs of green gram and black gram are 33% and 21% of total production cost.

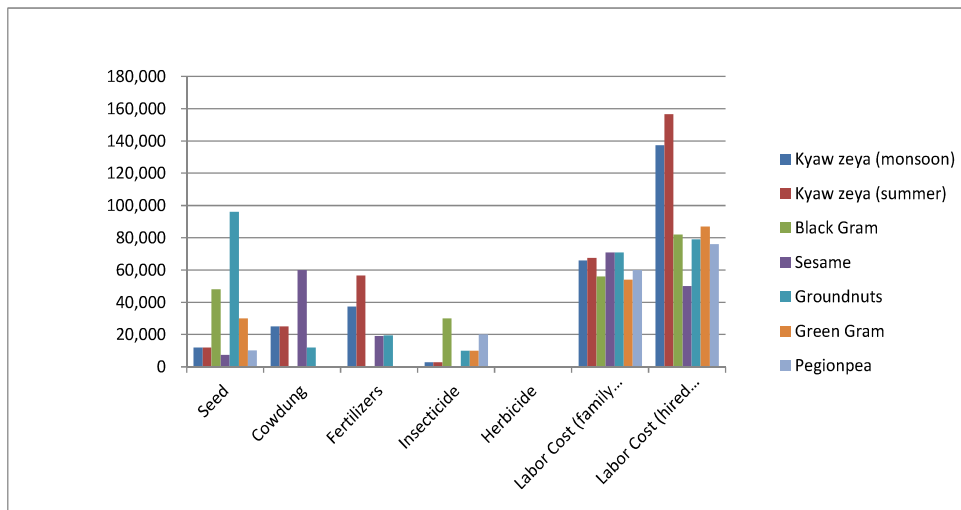
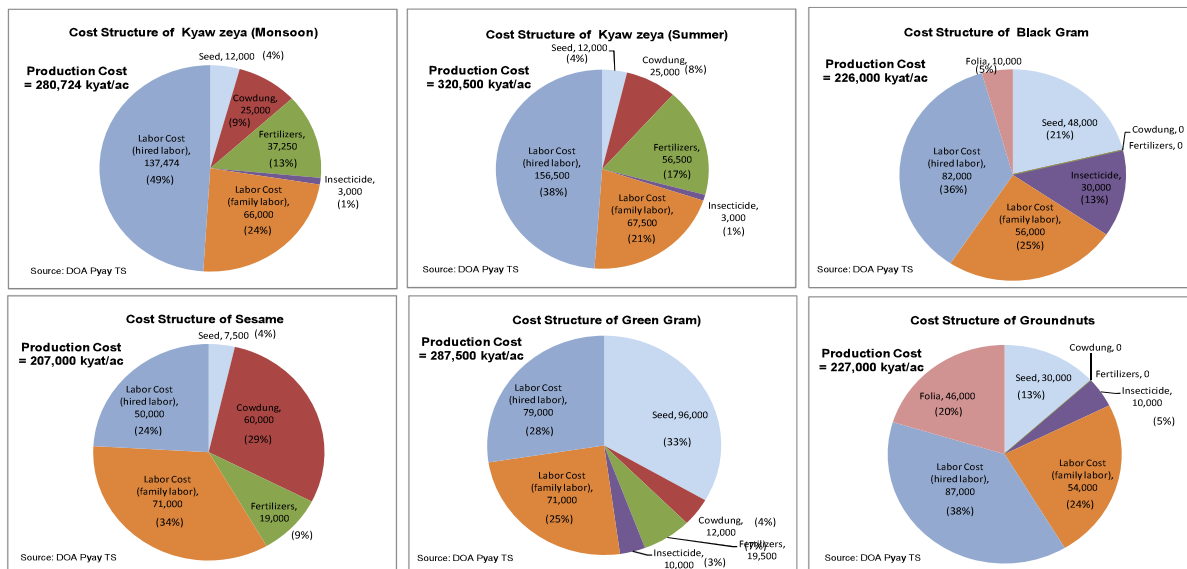


Fig. 2.3.80: Cost structure of major crops

- Fig.2.3.81 shows comparison of cost items by crops. Seed cost of groundnuts is the highest and followed by black gram, while that of sesame are the lowest. According to farmers, sesame seed is regenerated by farmers themselves and in some case, 8-generation seed is used for the sesame production. Seed cost of paddy is also low because relatively lower price of paddy seed.
- For paddy production, costs for fertilizer and hired labor are higher than those of other crops. In monsoon season, labor is hired for sowing (34%), harvesting (32%), threshing (20%) and land preparation (14%), while in summer season, works for hired labor includes harvesting (32%), sowing (28%), threshing (20%) and land preparation (20%). For family labor, total cost is almost same to that of other crops.

Fig. 2.3.81: Production cost of major crops

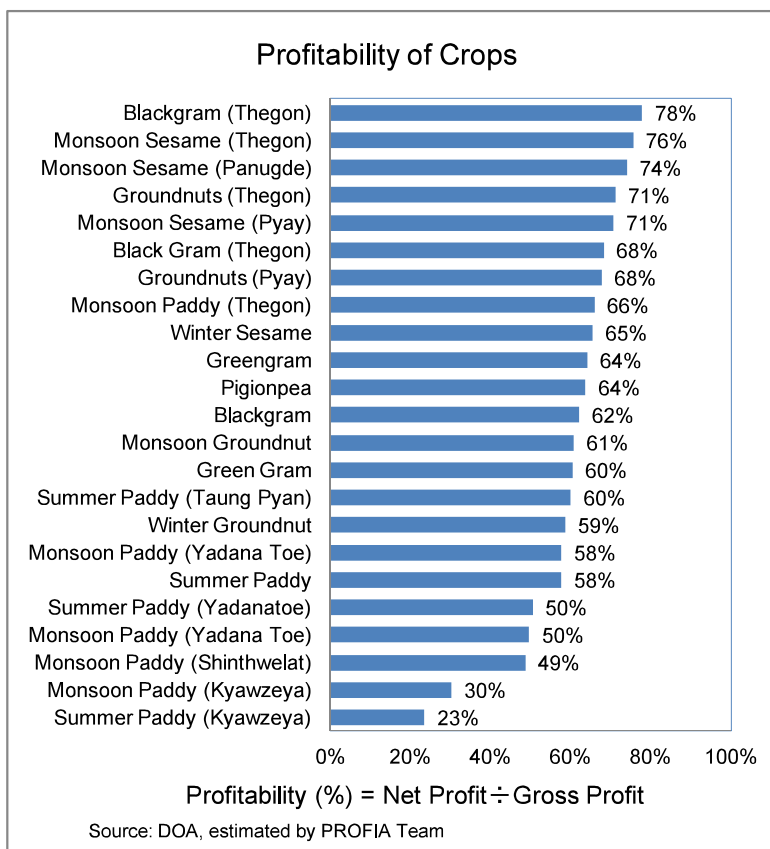


Source; DOA Pyay Township

Fig.2.3.82 shows profitability of crops in six townships. The profitability is estimated to divide net profit (gross income – production cost) by gross profit. Data for applying this estimation is provided by DOA townships offices as 2015/16 production data.

- As the diagram indicated, Black Gram, Sesame and Groundnuts are profitable crops in the project area. Green gram and Pigeon pea are also profitable than paddy. Among paddy varieties, Taung Pyan is the most profitable, followed by Yadanatoe. The data will be analyzed further to grasp accurate characteristics of each crop.

Fig. 2.3.82: Profitability of Crops



CHAPTER 3 CONCLUSION AND FURTHER PLAN

3.1 CONCLUSION

3.1.1 BASELINE VALUE

(1) Average agricultural income at national level

“Agriculture at a glance,” published by Department of Planning, Ministry of Agriculture and Irrigation, shows information about harvested area, yield, production, and prices of major crops. However, there was no data on average agricultural income nor farmers’ population, at national level. Hence, by using above data, amount of agricultural income per hectare was estimated (Table. 3.1.1).

Table 3.1.1: Average gross agricultural income of Myanmar

Crop Name	1955/96	2000/01	2005/06	2010/11	2012/13	2013/14	2014/15	Average (3 years)
Paddy	5,343	24,549	173,718	420,446	368,265	345,137	386,194	366,532
Black gram	13,831	58,556	200,389	529,002	265,994	327,666	423,326	338,955
Green gram	10,705	32,853	164,060	487,941	293,732	388,090	449,711	377,178
Groundnut	112,181	58,187	231,303	440,826	666,321	569,143	589,894	608,452
Sesame	8,259	17,686	89,234	222,007	265,619	305,111	1,957,011	842,580
Sugarcane	20,566	44,854	169,170	456,583	754,298	752,677	771,528	759,501

Source: “Agriculture at a glance,” Department of Agricultural Land Management and Statistics, Ministry of Agriculture and Irrigation

Gross income of selected products are estimated by following formula;

$$\text{Agricultural income per acre (kyats/ acre)} = \text{Production (ton)} \times \text{Price (kyats/ ton)} / \text{Harvested area (acre)}$$

Following table shows comparison of average gross income of selected agricultural products in the 6 townships with national average. On average, gross income of paddy, black gram, green gram and groundnut in the project area are higher than that of the national average except sesame.

Table 3.1.2: Comparison of average gross income of agricultural products in project area and national average.

	Project Area							National Average
	Pyay	Paukkhaung	Thegon	Paungde	Nattalin	Zigon	Average	
Paddy	440,358	501,000	555,000	336,000	595,000	595,000	503,726	366,532
Black gram	595,700		800,000	750,800	860,000	860,000	773,300	338,955
Green gram	521,150			480,660	640,000		547,270	377,178
Groundnuts	890,400		718,200	749,620	550,000		727,055	608,452
Sesame	705,600		500,000	531,500	400,000		534,275	842,580

Source: Gross income of project area is quoted from Cost-Benefit data of each Township.

(2) Baseline Value

The project will be measured by various indicators stated in the PDM of PROFIA. Among them, two indicators, including objectively verifiable indicator (OVI) for the project purpose and the output-2, are a key to measure increase of agricultural profit from the baseline year of 2015 to the end-line year of 2020. Therefore, baseline value of net agricultural income in 2015 is need to be estimated based on the baseline result. In this regard, the net income of farm household had been surveyed and estimated as shown in Table 3.1.3.

Table 3.1.3: Average Net Agricultural Income by Township

Township	Sample Number (n)	Average net income per HH (Ks / HH)
Pyay	41	357,075
Paukkhaung	40	829,464
Thegon	41	1,847,234
Paungde	37	1,902,189
Nattalin	77	3,535,227
Zigon	38	2,166,123
Total (Average)	274	(2,001,684)

To estimate the net income of farmer household, difference in farming environment among 6 townships in the project area, including soil types and distance to market, needs to be considered. Therefore, the net agricultural incomes of farmer household, as a baseline values, are estimated by townships.

The project evaluation will be conducted by comparing the increase in net income of target and that of the control farmers. However, “model farmer,” “ordinary farmer” and “other farmer (control farmer)”, as defined in Chapter 1, are treated altogether to estimate the baseline value. At the time of report completion of the baseline survey (December 2017), “Model farmers” are not necessarily the target farmer of the project any more, since main activities of the project had been shifted from the land consolidation area to the new areas where water users group was established, as written in the following section. Thus, there is no meaning to distinguish these groups in the estimation of the baseline value.

Following table shows summary of the interpretation of the baseline value.

Table 3.1.4: Interpretation of the Baseline Value

Location	Summary
Pyay	Monsoon paddy and upland pulses are the most major income source. Considerably low land profitability (mainly due to low yield) of monsoon paddy and its small grown area results in making the farmers’ income to belong to low income bracket among all. In addition to low land profitability of monsoon paddy, the farmers in the area rely on upland crops cultivation, which allows the farmers to earn money not so much as that from black gram. Many farmers could not cultivate summer paddy due to canal rehabilitation during dry season in 2015, which must be one of reason of lower income level than other townships.
Paukkhaung	The condition is similar to that in Pyay. The farmers in the area allocate their farmland monsoon paddy, summer paddy, several kinds of upland crops including pulses and sugarcane, and a few lands for black gram. Since land profitability of monsoon paddy is relatively low among all, and monsoon paddy grown area was smaller than other locations like Pyay, which seemed result in lower income overall. Allocation of farmland for upland crops, which has lower land profitability, also leads not to be so high enough income compared to other locations.
Thegon	During dry season in 2015, canal was rehabilitated which result in no harvest of summer paddy in some lowland area. However, due to relatively larger monsoon paddy grown area than that in Pyay and Paukkhaung, and considerable yield which seemed to lead to high land profitability of monsoon paddy, income level in the area keeps competitive with that in southern townships where the farmers could earn fair income both from monsoon paddy and black gram. Large population in the area belong to lower income bracket among all, almost same levels of Pyay and paukkhaung, while some who earn much higher income from large-scale cultivation

Location	Summary
	of sugarcane.
Paungde	Farmland where monsoon paddy and black gram were grown per household was the second highest among all location. Furthermore, fair land profitability of monsoon paddy and black gram contributed to the income level in the location to belong to higher income bracket among all.
Nattalin	Distribution of the individual income level widely varied in the location, however, both of farmland areas for monsoon paddy and black gram are the highest among all and both high yield levels eventually contributed to make overall income level in the location to be outstanding. Furthermore, Considerably more farmers own machinery in the area, which indicates overall farming level in the area is higher than other locations.
Zigon	Although the farmers grow monsoon paddy relatively smaller area, the farmers in the area could earn income from black gram growing it for large farmland area. Both of monsoon paddy and black gram land profitability level are fair, not so low like north two townships, and large area for black gram allow income level keep high, overcoming relatively small area of monsoon paddy. Some farmers in land consolidation area grow Chinese hybrid rice under the contract farming with Chinese company.

(3) Additional Baseline Survey

At the initial stage of PROFIA, the project team supposed to establish profitable irrigated agriculture model in LCA of 6 Townships, where farming environment was usually better than surrounding irregularly-shaped farmland. However, it was found through first-year activity of the project, that newly established LCAs were not suitable for establishing the models due to several inconveniences including difficulty in water access, poor soil condition, uneven farm land, and inappropriate water structure. Therefore, the project sites had to change from LCA to other suitable areas to establish profitable farming models, and the change was approved at 2nd JCC meeting organized on June 22, 2017.

Then, new model areas, including CL-3 in Pyay TS and LDY-4 and LDY-6 in Paungde TS, were selected from BWID's pilot areas in where water users group (WUG) has been established. In this connection, additional baseline survey was conducted to grasp baseline data of the new model sites. Result of the additional baseline survey will be prepared as an attachment of this report.

3.1.2 GENERAL FEATURE OF MODEL FARMER IN BASELINE SURVEY

To support clear understanding of farmers in the project area, general feature of target farmer and control farmer are highlighted as follows.

(1) Farmers in Alotawya village in Pyay Township

There are about 1,000 people in the village. There about four to five kinship groups in the village. Since almost all neighbors are relatives, they often get together and know conditions each other very well. There are some migrators; for example, one of our target farmers moved to the village when he married to his wife whose origin is this village, after working as driver in Magway. However, the village is ancestral homeland for almost all the villagers.

Their cropping pattern in the village had been largely under control of the government and their farming history had changed in accordance with the government strategy.

In the past around 1975, cotton cultivation in upland field was pushed by the government with material supply, i.e., seed, fertilizer and pesticide, for which farmers could pay after harvesting. On the other hand, in lowland field, paddy and sesame were promoted as governmental strategic crops.

Farmers cultivated paddy in monsoon, and started sesame in summer after irrigation water became available thanks to dam construction. Yield of paddy at that time was considerably better than current yield; farmers could obtain 82 to 83 baskets per acre on average.

After 1988, the government started promoting summer paddy cultivation. Farmers were obliged to cultivate summer paddy although it was not profitable like sesame. According to the farmers, only paddy cultivation in monsoon season in a year using local variety with high market value and dual cropping of monsoon and summer paddy eventually resulted in almost same cash income for them. That was because they had to choose shorter growth period variety with low market value in monsoon season to secure time for summer paddy cultivation in case of such dual cropping. Furthermore, income obtained from summer paddy had been very limited.

After years passed after having continued paddy dual cropping in their lowland, they realized farmland soil had severely exhausted, sending paddy yield largely decrease. Since monsoon paddy is the most important for farmers because monsoon paddy cultivation can sustain family members and also provide domestic animals with necessary feed, they are much worried about yield reduction. In addition, paddy dual cropping required intensive workload; it was too busy for them.

Therefore, now they are willing to restart sesame cultivation in summer season very much. However, administration office had announced through village tract leader that they had to cultivate summer paddy again at the end of last year (2016). They were bewildered to have such instruction from the administration while having the information from the project. They are still afraid of such instruction from the government may come to them again this year (2017). They already recognize that the irrigation system in the area cannot provide water for all irrigable fields if people cultivate summer paddy so largely, therefore, they do not prefer summer paddy from such view point of public interest. Furthermore, now people are searching for more profitable crop since their farmland is getting smaller and smaller after inheritance for years. That is also one of the reason they are now willing to cultivate sesame in summer this year.

Their another interest now is mechanization, since their farming has changed drastically in the past several years with increased mechanization. Youngest farmer in the target farmer wishes to purchase tractor if he could earn enough money, since tractor can finish land preparation work very quickly and he does not have to rush so much not to miss the proper timing watching water availability.

(2) A farmer in the outside of LCA

Farmer Mr. A was one of “control farmer” in this survey, and was from Zegon Township. His age was 47 years old, as of June, 2016. In his family, he was the household heads, and there were two males and three females. His educational background was high school, as same as his wife.

His household did not have any permanent employee, nor spent money for it during 2015 to 2016. Regarding land ownership, his household had 25 plots of irrigated land in the outside of LCA. The sum of those area was 10 acres. Other than it, his household did not have areas. Then, Mr. A had not participated into any activity, such as Water Users’ Group.

His household cultivated only monsoon paddy in 10 acres of the outside of LCA. And some amount of production was sold. His household used labors for plowing, transplanting, weeding, water management, harvesting, and threshing. Regarding utilization of agricultural machinery, his household received services from private company for plowing, and threshing. In addition, his household used animals for land levering, and transporting from farm to storage. On the other hand, his household did not use any service from AMD for other than borrowing of agricultural machineries.

3.2 FURTHER PLAN

3.2.1 BASIC STRATEGY

Primary objective of four irrigation schemes in the project area, including North Nawin, South Nawin, Wegyi and Taung Nyo irrigation schemes, are to supply sufficient irrigation water to monsoon paddy which is regarded as absolutely necessary crop for national food security on Myanmar. Irrigation water supply to winter and summer crops comes next under the design concept of the irrigation schemes from the beginning.

Over a period of time, since 1988, farmers in the irrigation schemes had forced to cultivate summer paddy as long as irrigation water was available. However, paddy consumes irrigation water a lot and the water was not enough to cover whole farm land in the schemes. As a result, on average, less than 30% of total farm land in the schemes could receive irrigation water in summer season, and rest of farm land could not irrigate for many years.

According to recent estimate of BWID, out of 219,500 acre of total irrigable area, only 7% of the total irrigable area (or 25% of current summer paddy area) can be irrigated if summer paddy is cultivated. Thus, it is a PROFIA's strategy to establish any cropping patterns profitable without summer paddy cultivation.

3.2.2 MAJOR CROPPING PATTERN TO BE PROMOTED

According to field survey conducted by the project team, many farmers willingly introduce three cropping pattern if irrigation water is available in summer season. However, farming schedule will be tight if farmers introduce three cropping, and it will be difficult to repeat the cropping pattern every year. Further, nutrition elements in the soil will be rapidly consumed if appropriate fertilizer is not done. Therefore, even though PROFIA keeps 3 cropping pattern as a target or challenge, the project will establish at first profitable 2 cropping pattern with rotation cropping for sustainable purpose

Following table shows summary of current and ideal cropping pattern in PROFIA Model Areas. Advantage and issues to be considered are also stated in the table for further planning.

Table 3.1.5: Major cropping pattern in PROFIA Model Areas

Cropping Pattern	Monsoon Season			Winter			Summer			Rainy		Remarks	
	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr		May
Base CASE [2 Cropping] (MP-SP) (Not Recommended)	Monsoon Paddy (Variety: Yadanaloe (125 days) shorter-medium duration, higher yield)			Summer Paddy (Variety: Yadanaloe (125 days) shorter-medium duration, higher yield)									
CASE A [3 Cropping] (MP-GG-SS) (PY, PK, TG, PD)	Monsoon Paddy (Variety: Yadanaloe (125 days) shorter-medium duration, higher yield)			Green Gram (Variety: N/A)			Pre-monsoon Sesame (Variety: Sin Yadana-3 (90 days) higher yield and better quality)						
	Monsoon Paddy (Variety: Yadanaloe (125 days) shorter-medium duration, higher yield) Transplanting			Pulses (Variety: Yasin-2, 3, 5, and 7 (90 days), shorter grain, 7-8 clusters, yellow mosaic virus)			Pre-monsoon Sesame (Variety: Sin Yadana-3 (90 days) higher yield and better quality)						
CASE C [2 Cropping] (MP-BC) CL-3, PY LDY-1&6, PD (PY, PK, TG, PD, NI, ZG)	Monsoon Paddy (Variety: Yadanaloe (125 days) shorter-medium duration, higher yield)			Pulses (Variety: Yasin-2, 3, 5, and 7 (90 days), shorter grain size, 7-8 clusters, yellow mosaic virus)			Green Manure (1.5 months)						
	Monsoon Paddy (Variety: Yadanaloe (125 days) shorter-medium duration, higher yield)			Summer Sesame (Variety: Sin Yadana-3 (90 days) higher yield and better quality)									
CASE D [2 Cropping] (MP-SS) CL-3, PY LDY-4, PD (PY, PK, TG, PD)	Monsoon Paddy (Variety: Yadanaloe (125 days) shorter-medium duration, higher yield)												

Advantage:
Farmers in the area are familiar with this system where applicable.
Issues to be Considered:
- Only about 7% of the total irrigable area, or 25% of current summer paddy areas can be irrigated.
- Expected net income is relatively low.

Advantage:
- Income opportunity can be increased
- Issues to be Considered:
- Schedule is tight and it is difficult to repeat 3 cropping every year
- Delay of GG makes SS difficult to start at right time
- Practically, it sometimes results in lower profit as compared to that of 2 cropping due to unsuccessful production as per increased cost of inputs
- Nutritional elements in the soil are rapidly consumed if appropriate fertilization is not done.

Advantage:
- Income opportunity can be increased
- Issues to be Considered:
- Schedule is tight and it is difficult to repeat 3 cropping every year
- To minimize the loss, transplanting method should be introduced for monsoon paddy, otherwise, 3 cropping cannot be managed
- Due to the competition over the labor and machinery, it is difficult to manage as a larger group (i.e., WUGA CG).
- Risk of loss of pre-monsoon sesame is quite high!
- Currently, pre-monsoon sesame is managed with pumping water (40g)
- Nutritional elements in the soil are rapidly consumed if appropriate fertilization is not done.

Advantage:
- Enough time is available for preparation of next crop
- By incorporating green manure, soil fertility can be increased
- Farmers are more familiar with this type
- Adjustable against unexpected events (daisy of rain)
- With more intensive care, quality/quantity can be increased
- With enough time, there is more freedom of choice in variety, farming method, etc.
- Income opportunity is limited as compared to 3 cropping
- If outbreak of disease occurred (i.e. black gram), impact of loss of income opportunity is significant
- In a short run, green manure is a cost factor (cannot see the immediate outcome)
- International market price of black gram fluctuates a lot (influenced by Indian market)

Advantage:
- Enough time is available for preparation of next crop
- By incorporating green manure, soil fertility can be increased
- Adjustable against unexpected events (daisy of rain)
- With more intensive care, quality/quantity can be increased
- With enough time, there is more freedom of choice in variety, farming method, etc.
- Quality of summer sesame can be better than pre-monsoon sesame, suggesting higher selling price.
- There are both international and domestic market
- Sesame can be more used for agro-inkushy
- International price of sesame is more stable than that of black gram
- More efficient crop varieties can be introduced, improving soil condition
- Sesame is free from VMV disease which is currently most problematic to black gram
- Issues to be Considered:
- Income opportunity is limited as compared to 3 cropping
- In a short run, green manure is a cost factor (cannot see the immediate outcome)
- Summer sesame is new to many farmers

For further discussion to identify recommendable cropping pattern to farmers, following issues need to be taken into consideration.

(1) General

- Cropping pattern depends heavily on the cropping schedule of Monsoon Paddy (when they get rain water). For example, if the harvest of monsoon paddy delayed due to prolonged rain, then, commencement of winter crop including black gram cultivation will also delay. Black gram plants would encounter severe Yellow Mosaic Virus (YMV) disease if it is planted in December. Moreover, as start of summer crops including sesame would also delay. In case of summer sesame, it might suffer from too much moisture at the onset of monsoon season in May to June—loss of harvest or quality reduction.
- Continued cultivation of black gram may increase the risk of disease; thus, diversification of winter crop should be considered. Many pulse and beans are grown in the project area, but dominant winter crops are black gram, green gram and groundnut.

(2) Irrigation

- For the use of irrigation water other than summer paddy, close coordination shall be necessary among farmers. Irrigation for one crop (i.e. before the flowing time of sesame) may disturb the harvest of others (i.e. pulses); some arrangement among farmers may be required.
- For pulses, gravity irrigation might cause some damage to black gram, which is susceptible to excessive water than any other pulses. For on-farm irrigation of pulses, furrow irrigation should be carried out (5-6 hours per acre with high-water level).
- For summer sesame, flood irrigation is necessary two times during the land preparation stage (3 inches/time) (from middle of December to middle of January). If sesame plant become wilted due to dry condition, then, furrow irrigation may be necessary just before flowering; however, gravity irrigation is risky to sesame (susceptible to excessive water)
- Timing of irrigation for summer sesame can be as same as it for the flowering stage of pulses, such as chick pea (approximately 45 days after sowing).

(3) Paddy

- In lowland area, most farmers cultivate monsoon paddy, while summer paddy cultivation area is limited due to availability of irrigation water. Current summer paddy cultivation area is shown in Attachment 1. The map is developed based on a workshop with PROFIA counterparts from 6 Townships.
- "Yadanatoo" is more tolerant against heavy rain, pest and disease, lodging than "Sin Thwe Latt," while "Sin Thwe Latt" is better in taste and aroma.
- If two cropping is pursued, longer duration variety can be selected such as Taung Pyan. Taung Pyan is a seasonal variety that harvesting time is always the same regardless of the starting time, that is, mid of November.
- At the mid of October, there is a risk of rain; thus, harvesting time should be around end of October. Harvest time of monsoon paddy may delay as late as middle of November, especially for those who have larger areas.
- Cost: 252,000kyat/ac; Gross Income: 500,000 kyat/ac; Net Income: 248,000kyat/ac (DOA, Pyay TS 2016)

(4) Sesame

- Sesame is grown mainly in the northern including Pyay, Paukhaung and Thegon, and is cultivated mostly in monsoon season except some area where winter sesame is also cultivated. In Pyay, summer sesame had produced until 20 years ago, but nowadays, there is no record of cultivation of summer sesame. Therefore, to promote summer sesame, it is necessary to collect data which show profitability of summer sesame.
- Following data shows initial result of summer sesame production in Pyay in 2017. Out of 6 trial plots, summer sesame was sold to a local buyer at relatively higher price, but balance is minus due to high input cost and low yield. The trial was conducted in the newly developed LCA where soil condition was quite poor, and excessive amount of fertilizer was needed.
- Case study was also conducted based on the result of summer sesame trial production in Pyay. The result shows that input costs particularly fertilizer need to be reduced under the current price level. Otherwise, summer sesame production cannot be an alternative to summer paddy cultivation.

Table. 3.1.6: Result of summer sesame production in Pyay in 2017

Actual Situation		(Ks)				
Plot No.	1	2	3	4	6	
Acre	0.90	1.00	1.00	1.00	0.15	
Production Cost						
Land Preparation	81,000	44,000	44,000	44,000	9,300	
Cow dung	0	0	72,000	72,000	0	
Fertilizer	129,180	143,534	143,534	143,534	30,819	
Chemicals	38,396	35,957	40,440	40,440	2,366	
Irrigation	36,808	25,009	11,009	11,009	1,113	
Labor	132,727	100,086	71,336	71,336	17,014	
Seeds	24,816	23,684	0	0	0	
Subtotal	442,928	372,271	382,319	382,319	60,613	
Gross Income (actual)						
Yield (bskt/ac)	4.8	3.0				
Unit Price (Ks/bakt)	40,000	40,000				
Sales (Ks)	192,000	121,330				
Net Income	-250,928	-250,941				

Case Study (base case = original of plot no. 2)						
Case	0	1	2	3	4	
Production Cost						
Cow dung	0	0	60,000	60,000	60,000	
Fertilizer	143,534	143,534	71,767	19,000	71,767	
Chemicals	35,957	35,957	35,957	0	35,957	
Irrigation	25,009	25,009	25,009	25,009	25,009	
Labor	100,086	100,086	100,086	121,000	100,086	
Seeds	23,684	23,684	23,684	7,500	23,684	
Subtotal	328,271	328,271	316,504	232,509	316,504	
Gross Income (actual)						
Yield (bskt/ac)	3	10.0	10.0	10.0	10.0	
Unit Price (Ks/bakt)	40,000	35,000	35,000	35,000	60,000	
Sales (Ks)	121,330	350,000	350,000	350,000	600,000	
Net Income	-206,941	21,729	33,496	117,491	283,496	
B/C	N.A.	107%	111%	151%	190%	
Break-even Yield (price=35,000)	8.2	9.4	9.0	6.6	5.3	
Break-even Price (yield=10)	108,224	32,827	31,650	23,251	31,650	
Comparison to summer paddy in 2015/16 (Net Income = 98,250 ks/acre)	-305,191	-76,521	-64,754	19,241	185,246	

Note:

- Case 1: Original (too much investment cost due to poor soil condition of LCA.)
- Case 2: Same production cost of case 1, but change yield (ave.) and price (ave.)
- Case 3: yield and price are same as case 2, add cow dung price and reduce fertilizer from case 1.
- Case 4: Using production cost of DOA's estimation (monsoon sesame), add irrigation cost. Yield and price are same as case 2.
- Case 5: Production cost is same as case 2, with price level in 2015/16.

- Sesame in Pyay has a bad reputation among traders and exporters due to its poor quality. Relatively heavy rain comparing to Magway is one of reason since sesame is quite sensitive to moisture particularly during harvest period. However, summer sesame had a great advantage to moisture and acid value, and has high demand from importers including Japanese buyers. Therefore, summer sesame is one of promising alternative crop to summer paddy particularly in the northern townships. Potential area of summer sesame in view of soil and water condition is shown in Attachment 4.
- In January, temperature becomes low, making it difficult for the plant to grow well. If sesame cultivation extend up to June, then, there is a risk of damage by rain (die down, or quality goes down). Pre-monsoon sesame's sowing time is around March. Sowing time of summer sesame is around February, whereas that of monsoon sesame is around May and June.
- Cost: 207,000kyat/ac; Gross Income: 705,600 kyat/ac; Net Income: 498,100kyat/ac (DOA, Pyay TS 2016, reference as pre-monsoon sesame)

(5) Black gram

- Yield of black gram is better in Southern Townships including Nattalin, Paungde and Zigon, whereas that in northern townships particularly in Pyay is quite poor. Black gram cultivation area and average yield is shown in Attachment 2.
- Yellow Mosaic Virus (YMV) disease widely spread in the project area, particularly in Pyay and Puangde as shown in Attachment 3. The disease is not so severe in the southern townships including Nattalin and Zigon.
- In addition, there is a disease that in some area black gram is suddenly dead at the beginning of flowering stage due to unknown reason. According to field survey and interview survey to DAR/YAU/DOA, one of possible cause of the disease is fungus accumulated on the surface of soil. The disease can be observed in all townships in the project area, but is severe in upstream area of each irrigation scheme, except Pyay where the disease spread whole area. Location of the disease infected area is also shown in Attachment 3.
- Black gram is better started as early as possible to reduce the risk of Yellow Mosaic Virus (YMV) disease. However, mouse risk increase if it is too early to start cultivation. If black gram is planted in early November, plant is exposed to lower temperature in which population of the vector of yellow mosaic virus is lower.
- Cost: 226,000kyat/ac; Gross Income: 595,700 kyat/ac; Net Income: 369,700kyat/ac (DOA, Pyay TS 2016)

(6) Groundnut

- Groundnut is basically grown in upland area in the project sites with rain-fed condition.
- In the lowland area, farmers want to cultivate monsoon paddy during the season.

(7) Sugarcane

Since this survey took interview about cultivation for one year (namely, from 2015 to 2016), it seemed that farmers who have cultivated sugarcane, which is grown in the field 2 years or more, could not answer well. For supplement information of condition of sugarcane cultivation in the area, the Project Team collected following data from counterparts. Table 3.1.5. shows average cost and benefit of sugarcane cultivation of farmers in west Bago region.

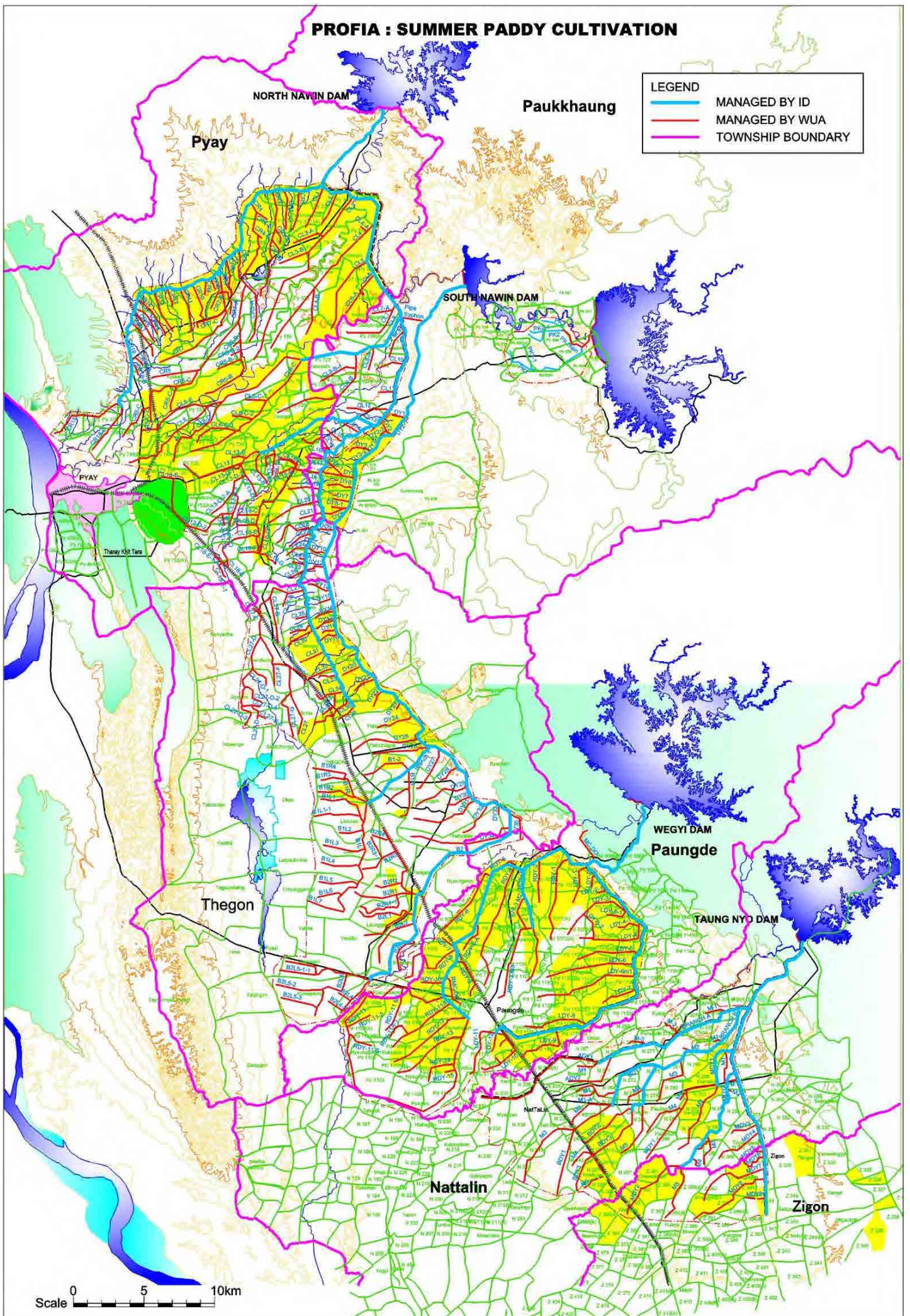
- Net profit (income) from sugarcane cultivation was 634,700 kyats/ acre, while the highest net agricultural income from monsoon paddy cultivation was about 290,000 kyats/ acre of Thegon LCA. Furthermore, sugarcane was more profitable than winter black gram (about 421,000 kyats/ acre) which was observed as the most profitable crops in this survey (Table 3.1.6).
- On the other hand, cultivation of sugarcane requires more intensive inputs than other crops. Namely, it took cost about 715,300 kyats until the first harvesting time.
- In general, the factory for processing sugarcane is required being operated nearby the production area, since it needs to process immediately after harvesting. However, there is a few factories surrounding project target areas. When the project promote sugarcane cultivation, it should be considered the location of such factories or newly construction.

Table 3.1.7: Cost and benefit per acre of sugarcane cultivation (2017-2018) FY

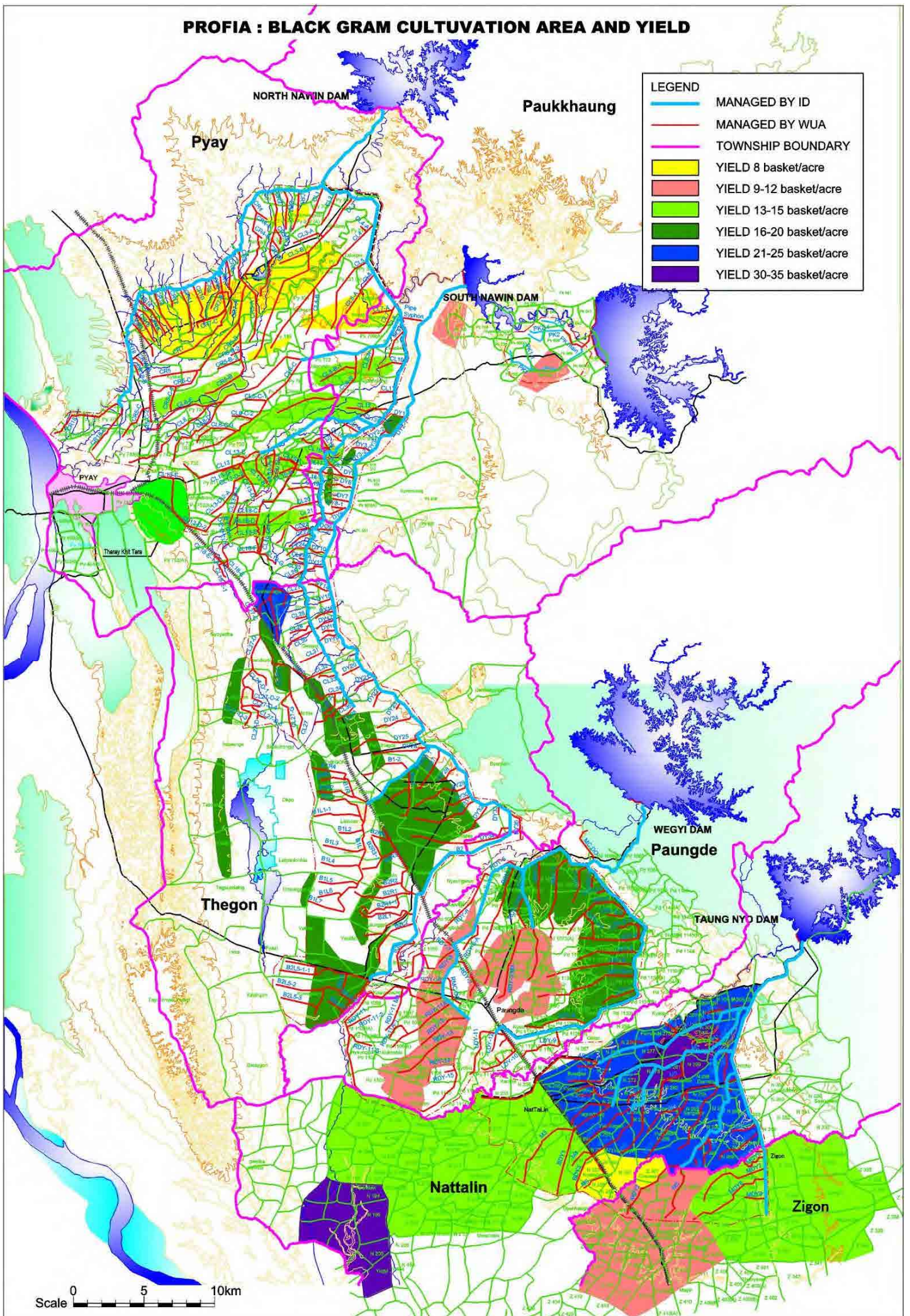
Sr. No.	Description	Unit	Unit Price (kyats)	Quantity	Total Cost (kyats)
2016-2017 FY					
1. Land preparation	Ploughing	Time by tractor	25,000	2	50,000
	Harrowing	Time by tractor	12,500	4	50,000
	Cold Crushing and Leveling	Time by tractor	12,500	2	25,000
	Sub-total				125,000
2. Sowing	Lining	Time by tractor	25,000	1	25,000
	Seed (sugarcane plant) cutting, dried leaves removing	Person	3,500	10	35,000
	Seeding, fertilization, cow-dung application	Person	3,500	6	21,000
	Covering by soil	Pair of cattle	5,000	2	10,000
	Ridge making	Pair of cattle	5,000	2	10,000
Sub-total				101,000	
3. Inputs	Seed (sugarcane plant)	Ton	30,000	4	120,000
	Urea (50 kg)	Bag	20,500	4	82,000
	T-super (50 kg)	Bag	22,000	1	22,000
	Potash (50 kg)	Bag	30,000	1	30,000
	Cow dung	Acre	5,000	5	25,000
Sub-total				279,000	
4. Crop management	Fungicide and pesticide	Acre	10,000	1	10,000
	Fungicide and pesticide application	Person	3,500	1	3,500
	First time inter cultivation	Gallon	3,500	5	17,500
	Fuel for irrigation by generator (1 st & 2 nd time)	Person	2,550	6	15,300
	Labor for irrigation (1 st & 2 nd time)	Person	3,500	4	14,000
	Sub-total				60,300
2017-2018 FY					
5. Crop management	Second time inter cultivation	Person	3,500	5	17,500
	Fertilization	Person	3,500	2	7,000
	Earthing-up	Pair of cattle	5,000	2	10,000
	Removing dried-leave (2 times)	Person	3,500	3	10,500
	Sub-total				45,000
6. Harvesting	Labor for harvesting	Ton	3,500	30	105,000
	Sub-total				105,000
TOTAL					715,300

Note: Average yield 30 ton/ acre
Farm-gate price 45,000 kyats/ acre
Gross profit 1,350,000 kyats/ acre
Net profit 634,700 kyats/ acre

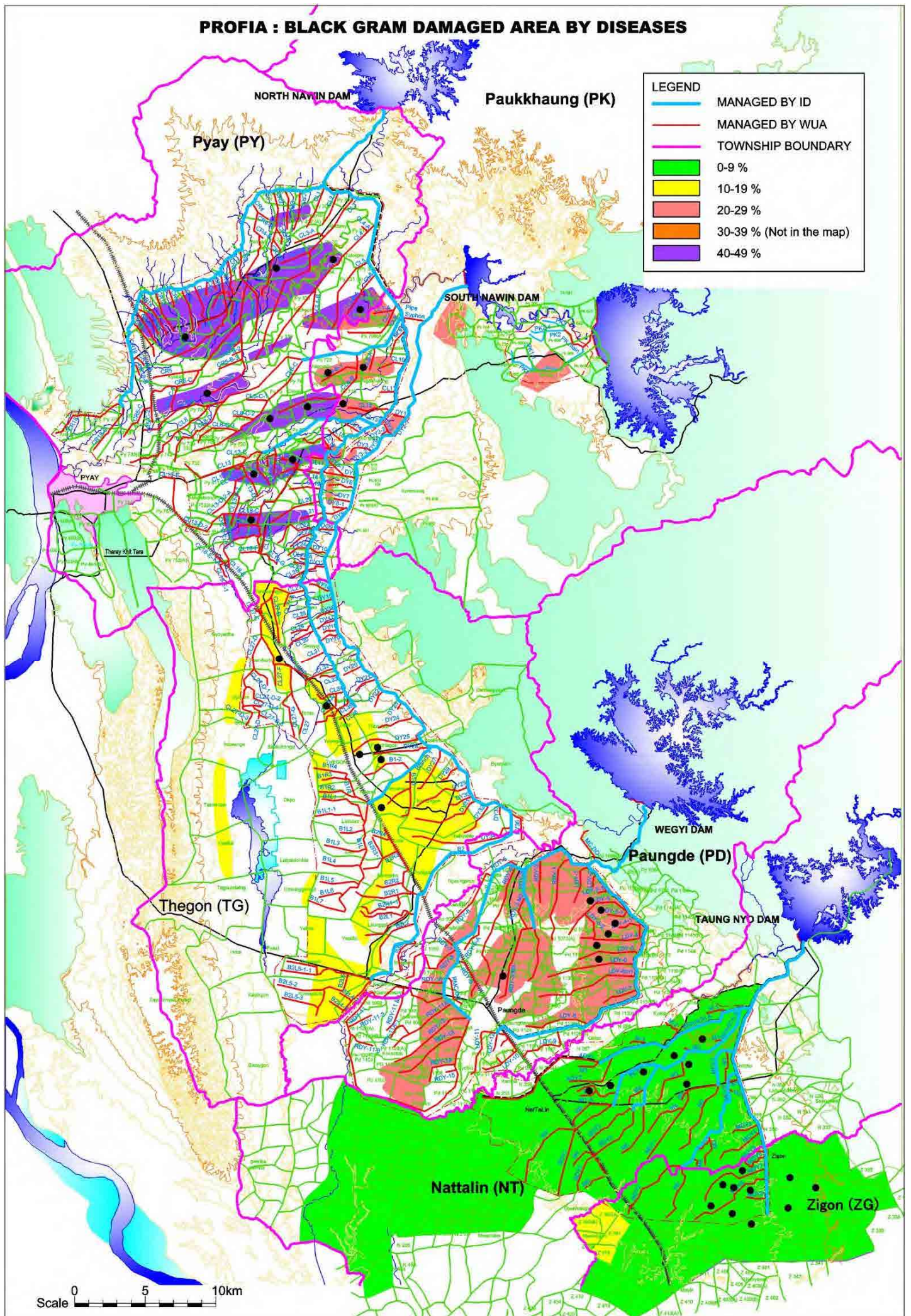
PROFIA : SUMMER PADDY CULTIVATION



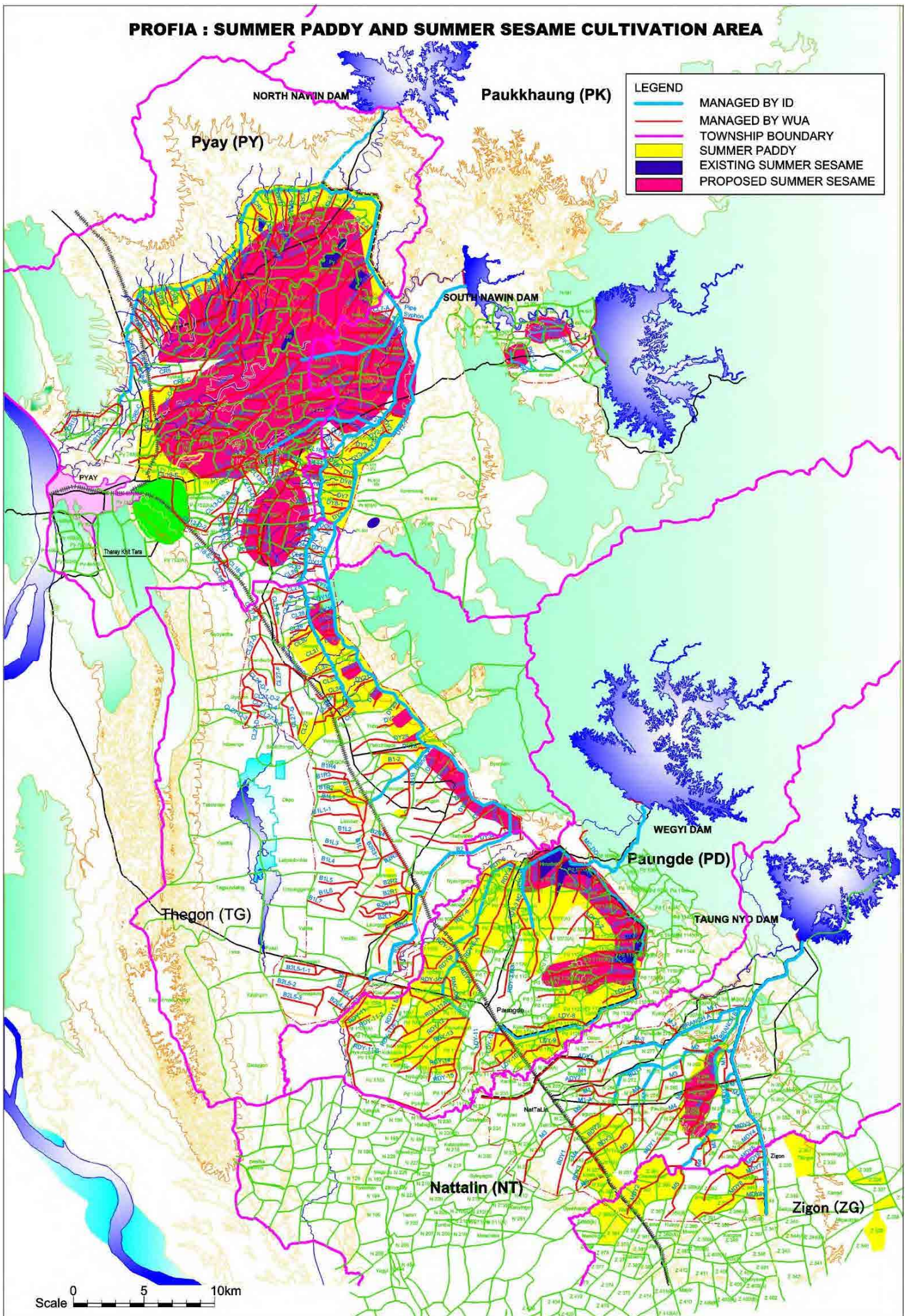
PROFIA : BLACK GRAM CULTIVATION AREA AND YIELD



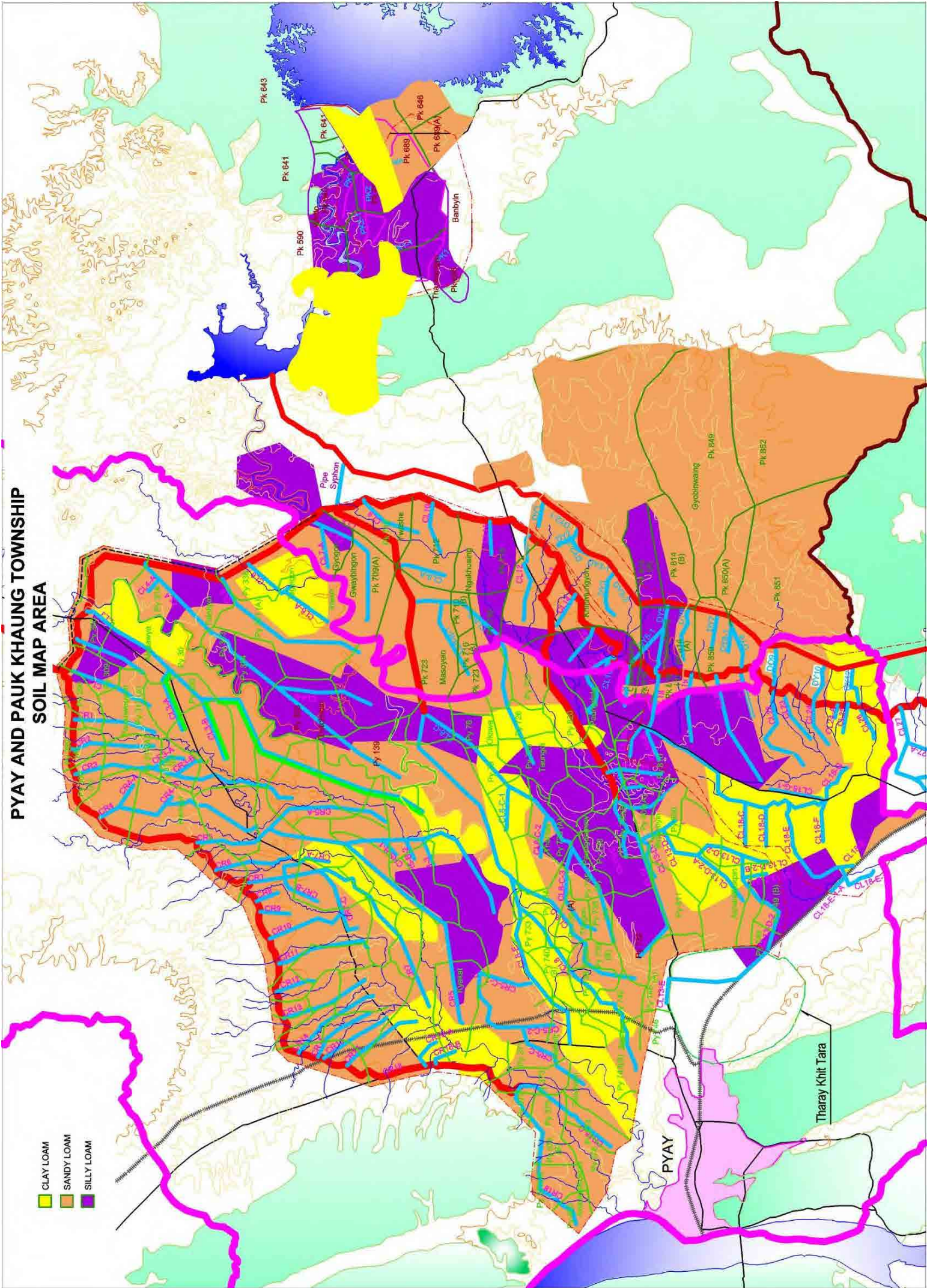
PROFIA : BLACK GRAM DAMAGED AREA BY DISEASES



PROFIA : SUMMER PADDY AND SUMMER SESAME CULTIVATION AREA

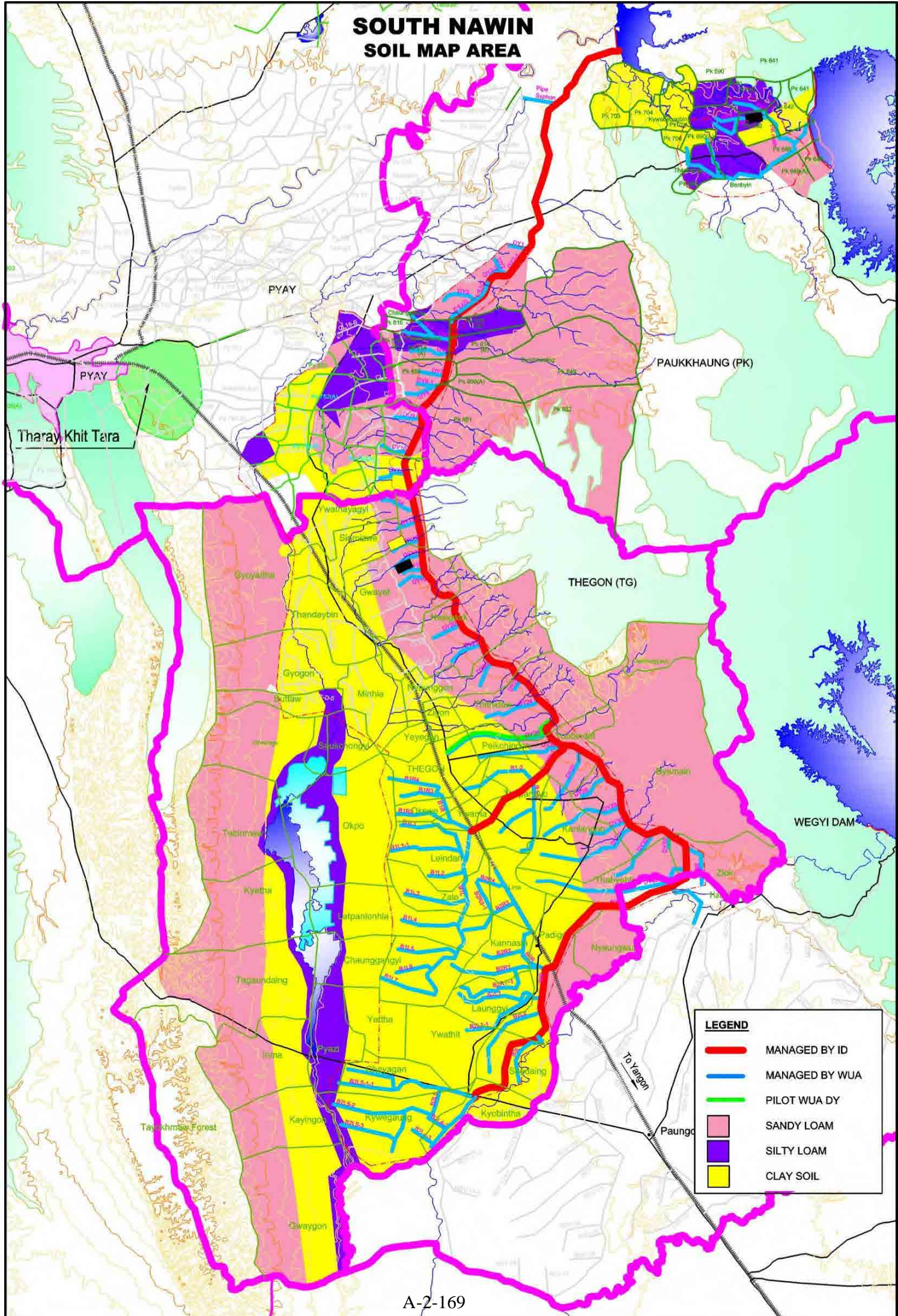


PYAY AND PAUK KHAUNG TOWNSHIP SOIL MAP AREA



- CLAY LOAM
- SANDY LOAM
- SILTY LOAM
- CLAY LOAM

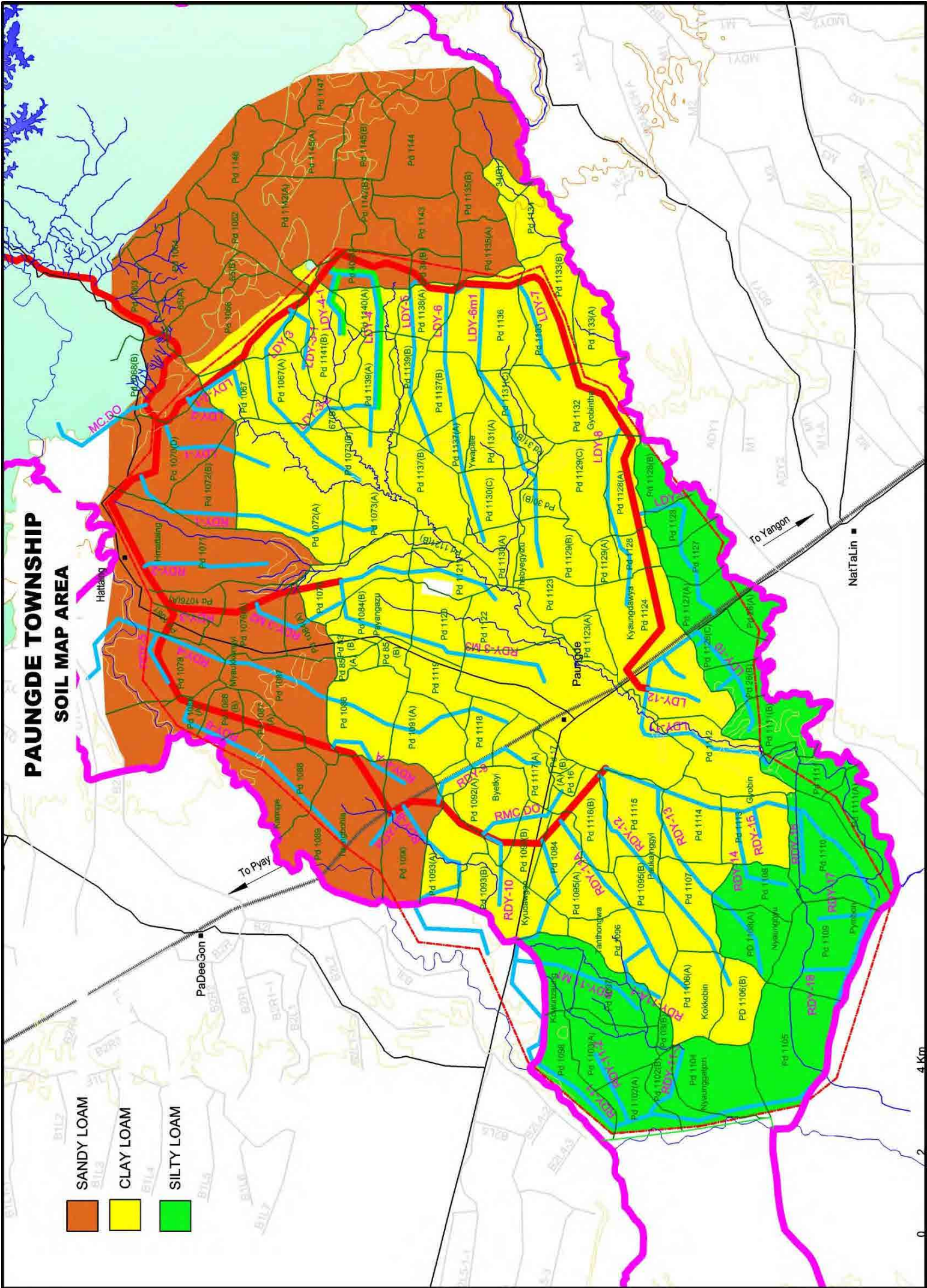
SOUTH NAWIN SOIL MAP AREA



LEGEND	
—	MANAGED BY ID
—	MANAGED BY WUA
—	PILOT WUA DY
	SANDY LOAM
	SILTY LOAM
	CLAY SOIL

PAUNGDE TOWNSHIP SOIL MAP AREA

- SANDY LOAM
- CLAY LOAM
- SILTY LOAM



TAUNG NYO SOIL MAP AREA

