

Agriculture Changes in Ywashe Village, Patheingyi Township: Nature, Policy and Farmer's Response

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Abstract

Many governments adopted agricultural development policies related to crops type, land use pattern, and market for agriculture products to get the agro-based economic development. Some policies could actualize their aim and objectives, while others failed to gain their goals. If agricultural development policies are not fitted to the nature of a given area, farmers gradually adjust the policies to the form that is suitable to the natural environment. Since Myanmar shifted to market oriented economic system, distinguished policy changes were carried out in the agriculture sector. This paper tried to analyze these policy changes and farmer's response to these changes in different natural environment from a case study of Ywashe Village, Patheingyi Township. The study emphasized on the agriculture changes between the 1976 and 2005. Data used in this study were derived from intensive open interviews conducted to 7 farmers during May 2005 and structured interviews conducted to 43 villagers (61% of farmers who owned their land in various amount) living in Ywashe during January and February 2006. The results revealed that farmers have done minor adjustments to the government policy to fit with given natural conditions. Some adjustment involved changes in crop type while others concerned with land use pattern change. Both types of changes are reflected from a combination of the conditions of nature, agricultural development policy, and farmer's response.

Key Words: Agriculture change, farmer's response, nature of environment, agriculture policy

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Introduction

Since Myanmar shifted to market oriented economic system, distinguished policy changes were carried out in the agriculture sector. Private companies are allowed to import pesticides and fertilizers. Many land development permits were given to private companies. Farm products are allowed to trade more freely than before as a part of market economy. In addition, distinguished infrastructure improvements were carried out during 1988 and 2006. Many cities and towns were expanded while some new towns were established throughout the country (Aung Kyaw and Khin Myat Myat Mon, 2006; Yin May, 2005).

The above agriculture policy changes and urban expansion could generate some pattern of agriculture changes and land use pattern changes in the peri-urban area. This paper tried to analyze the agriculture and land use and agriculture pattern changes of Mandalay City's peri-urban area from the case study of Ywashe Village, Patheingyi Township. This study will focus on the following problems?

Problems

- (1) How does agriculture pattern of Ywashe Village changed during 1970s and 2006?
- (2) What are the controlling factors that caused agriculture changes?

Data and Methods

To solve the above problems, Ywashe Village located at 30 minutes driving distance from the Mandalay City was selected as a case study. Preliminary open interviews were conducted to 7 farmers during May 2005. Then, structured interviews were conducted to 43 villagers (61% of farmer with owned land) living in Ywashe Village during January and February 2006.

Figure (1) was considered as a framework of agriculture change. Agriculture is a simple process of farming containing a land plot, labor, capital investment, farm inputs, and market. Land plots are varied according to its value and usage based on its locational advantage such as nearness to city, climate and soils, etc. Labor is also essential input in agriculture, since it

is difficult to conduct all agriculture processes by automatic machines. Capital investment is also important in agriculture, since all farm inputs and labor process are related to it. Some capital investments change into labor or machines while others involved as a physical farm inputs of pesticide, fertilizers and seeds. Although agriculture is conducted successfully it is impossible to make a good profit without proper market system.

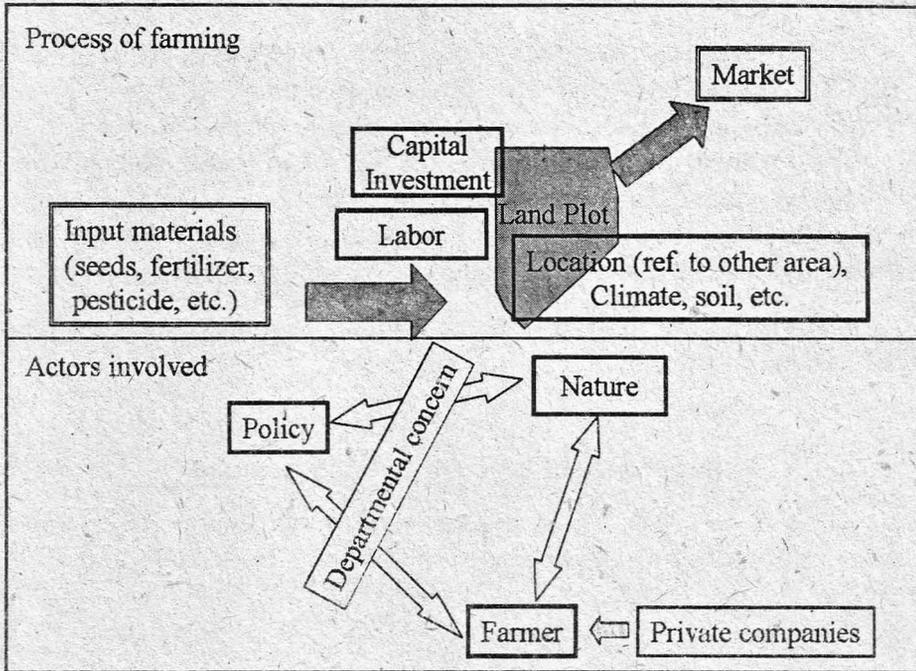


Figure (1) Framework of the Study

Some key actors are involved in the above farming process. Those are local land use policy, departmental concern, farmer, and private companies. It is impossible for a farmer to choose the crop freely and they have to grow crops designated by the government. Departmental concerns including local authority are involved as other key actors that control distribution and marketing of farm inputs. Therefore, both local land use policy and departmental concern could be mentioned as *policy*.

Farmer designated as a second actor was important in actualization of farming. It is the actor who actually practice farming on the land. The third actor is private companies that involved in the agriculture after economic system changed in 1988. Both farmer and private companies developed new farm land in many parts of the country. In addition, private companies help farmers in supplying farm inputs, and processing and marketing farm products. Therefore, it could be assumed as a supportive element of *farmer's response*.

Both local land use policy and farmer's responses are practicing on the land that has different characteristics in spatial terms. If crop or local land use policy does not fit the given natural condition of land, farmer will adjust the policy by mean of its response. On the other hand, the government considers the nature of land before determining the local policy for a region. If it is suitable for paddy it becomes a paddy region. If it is suitable for urban land use rather than agriculture, the land use becomes an urban area.

Therefore, to analyze the agricultural changes, present research emphasize on the farming process and key actors.

Geographical Background of Study Area

Study area is located at 30 minutes driving distance in the northern direction of Mandalay City. It is included in Thalegone Village Tract (Fig. 2), Patheingyi Township.

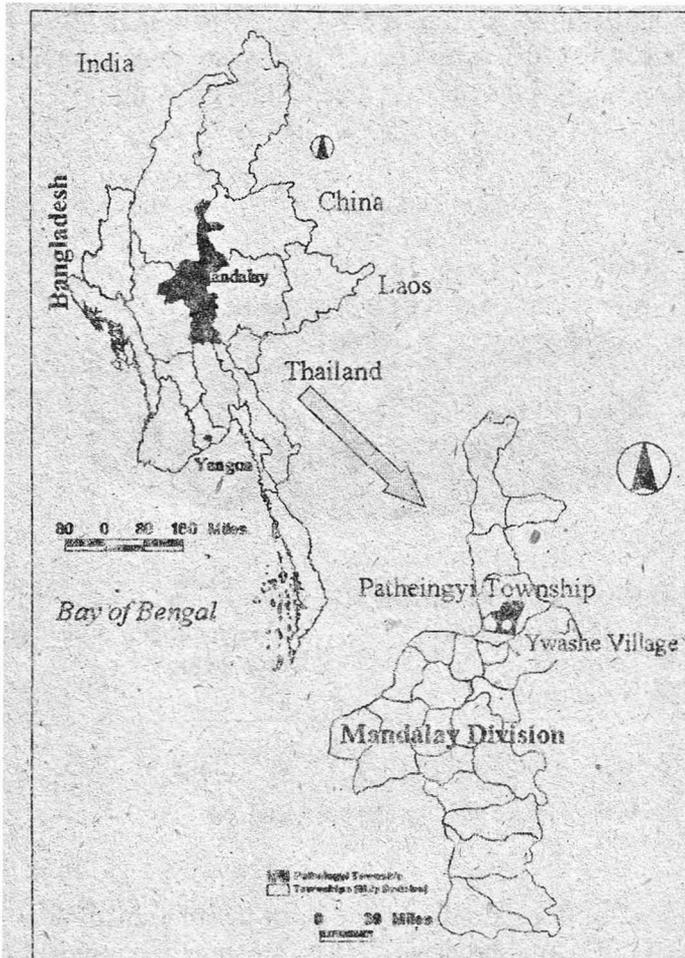


Figure (2) Location of Study Area

Source: Department of Geography, Yangon University.

Thalegone Village Tract that includes Thalegone Village and Ywashe Village has an area of 420 hectares (1037.89 acres). Since it is located on a flat land and all area is covered by Sedawgyi Reservoir's irrigation canal, majority of the area is used for special project purpose. Special project area covered about 75% of the total area in 2005. Vegetable like mustard, flowers like chrysanthemum, *Thapyay*, and jasmine covered about 4% of the village tract area. Many irrigation canals are seen interweaving in the area and it covers about 7%, while the residential area occupies 10% of the village tract.

Transportation and religious land use occupied less than 2 % of the area. Although 4.1 hectares (10.1 acres) or (1%) is waste land as mentioned in the data, it is totally used for plantation and vegetable growing (Fig.3).

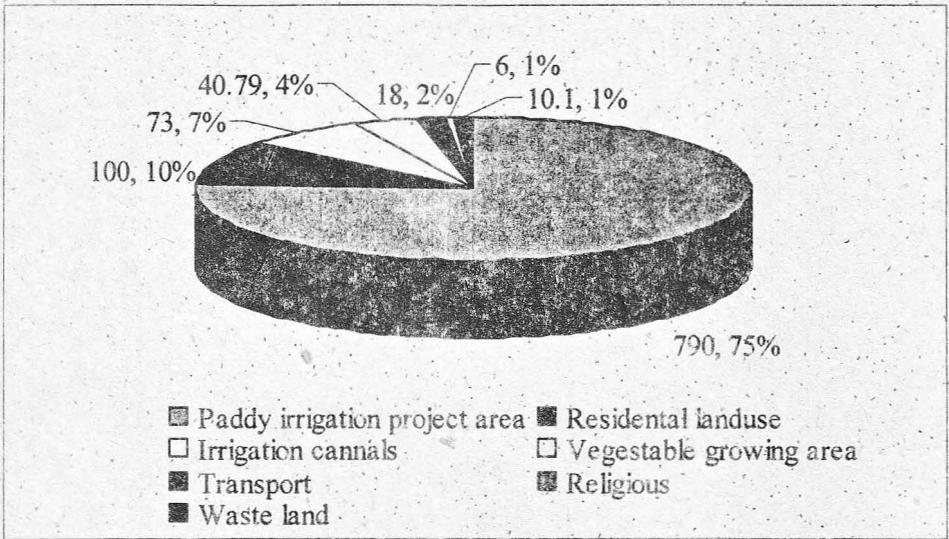


Figure (3) Land Use Pattern of Ywashe Village in 2005

Source: Ywashe Village Peace and Development Council.

There are 142 households with a total population of 616 in Ywashe Village in 2005. Of the total household 78 % are engaged in farming while the rest (22%) are non-farmers. Of 111 farming household 70 households have their own farm land while others are farm-hands.

Local Agriculture Policy and Farming Practices

In this section, changes of major agricultural policy and farmer's practices were examined based on interviews and questionnaires results.

Major Agriculture Policy Changes of Ywashe Village

The study area is located in the irrigation project area since the Myanmar kings. It receives irrigation water from the Sedawgyi Reservoir by means of irrigation canals. Rice is the major crop in the study area throughout the whole period. Therefore, major agricultural policy of the study area could only be divided into two periods based on second crop. As a second crop, cotton cultivation project was practiced before 1988 in the study area. After 1988 cultivation of rice becomes popular and the government encouraged three times of rice cultivation a year (Fig. 4).

Policy	Cotton project	Rice project
Farming	Rice, cotton	Rice, rice, rice
	Rice, gram, sesame	

Figure (4) Major agricultural policy changes and farmer's practices in study area

Source: Based on interview results.

Note: Cropping pattern changes usually take about 1 to 5 years to actualize.

Although regional agriculture policy is mainly divided into two periods, farmer's agriculture practices slightly changed during each period. Especially during the later part of cotton project, the farmers tried to cultivate other second crops instead of cotton. Major substitution secondary crops are gram and sesame.

Crop Change: from Cotton to Gram and Sesame

Rice as rain fed crop does not change in the area throughout the whole study period (1970s to 2006). Therefore, the name of the period will be mentioned after the secondary crop. During the cotton project (regional policy), government (departmental concern) supported farmers with techniques, agricultural loans, cotton seeds, fertilizers and pesticides for cotton cultivation. In addition, irrigation department supported with irrigation

water supply. Cultivated cotton products were also purchased by the agriculture department from the farmers. Therefore, farmers do not need to worry about the capital investment and market. The profits should be relatively high due to double cropping. However, the constraints lie on the nature of the crops. During 1970s, majority of the paddy grown were long-life species that needs more than 120 days. Cotton also takes a long time for full harvest. Since growing period of paddy and harvesting period of cotton were overlapping, farmers could not fully harvest the cotton. Therefore, the second crop (cotton) could not generate extra income for farmers.

Thus, although major agriculture policy does not change, farmers decided to cultivate gram and sesame instead of cotton at the local level during the late 1970s. There are many advantages for this paddy-gram-sesame cropping system. Government was still supporting the farmers with fertilizer, pesticide and agriculture loans for paddy. Nature also supported the cropping system, since three crops were fully occupied which is the year round schedule of farmers. Before the reaping of paddy, gram seeds were broadcasted in the paddy field (Fig.5). Then, gram seeds germinate and take the remaining fertilizer used by the paddy for their growth. Throughout the growing period, farmers do not need to take care of it. Broadcasting of seeds could also be done by one farmer alone. Labor is only needed for reaping of gram. Therefore, the cost was needed only in buying seeds and in hiring labor for reaping. On the other hand, income from the gram is high. Thus, net profit from the gram is relatively high.

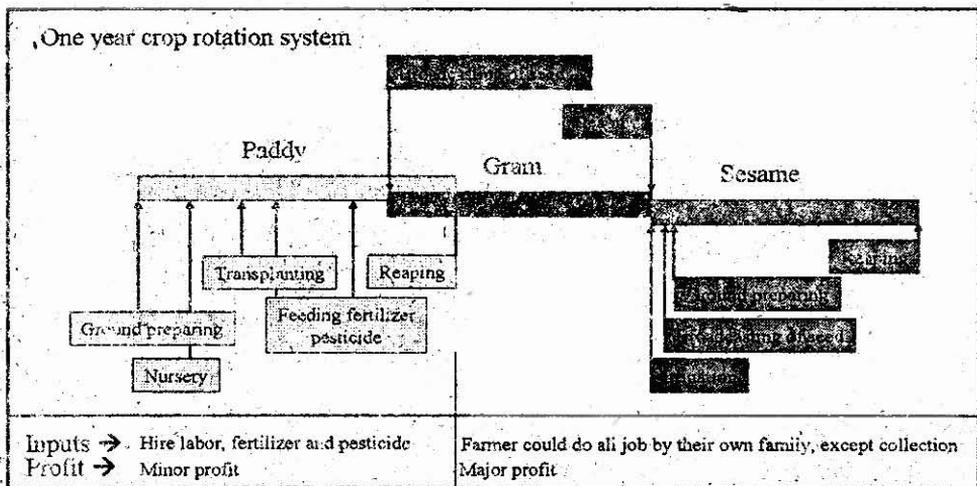


Figure (5) Crop growing system between 1976 and 1988

Source: Based on the interview results.

After reaping the gram, the farms were irrigated before broadcasting of sesame seeds. After the sesame seed are broadcasted, ground preparation is necessary for full germination of the sesame seeds. Then, it is not necessary to take care until reaping. Therefore, farmers could generate a large amount of benefit from the low cost of cultivation and high income from the output. This type of crop patterns was practiced until 1988.

Crop Change: from Gram and Sesame to Paddy after Paddy

After 1988, government changed its agriculture policy and encouraged farmers to grow paddy as a major, double, and triple crops in the study area. Although the major crop after 1988 was paddy after paddy, it could be subdivided into two based on the changes in input and market conditions. Before 1998, government supported some fertilizers, pesticides, and lend agriculture loan to the farmers. Agriculture department supplied irrigation water. However, the above agriculture input supplies were becoming rare after 1998. Instead, the role of private companies became more important. Farm inputs are allowed to import from the private companies since the early 1990s. So, private sector involvement becomes distinguishing factor in the later part of 1990s. The government loan system was changed in late 1990s. Government founded the Myanmar Agriculture Bank and loan and saving matters related to agriculture were handed over to it. Under this system farmers could lend or save money from the bank. In 2003, the marketing system of paddy was changed and government was no longer involved directly in rice marketing. Right of free trading is given to the farmers and now the farmers could freely sell their paddy to whom they would like to sell.

Process of Agriculture Changes

This section analyzed the changes of farming process during 1970s and 2006. As mentioned in Fig. 1 analysis was focused on labor process, seed, fertilizer, pesticide, technology and market changes.

Labor Process Changes

During the paddy-gram-sesame period, farmers needed labor mainly in paddy cultivation. During that time farm mechanization process was not well developed and labor requirement were higher than at present. Other two crops

(gram and sesame), however, did not need much care and as a consequence limited labor is needed. However, after 1988 mechanization process became advanced and some processes of farming were conducted by machines.

Figure (6) shows farming processes replaced by machines in Ywashe Village in 2005. During first 30 days, plowing, growing of nursery, carrying of small paddy plants, and transplanting are carried out. Of them, majority of the farmers conducted plowing by machines instead of buffalo or ox. Although mechanization was carried out for plowing some buffalo or cow are still necessary because the corners of the rectangle land plot could not be fully plowed with machines. Cattle are used to plow in these corners.

During the second 15 days period, it is necessary to feed fertilizer to the paddy plant. It could be done by farmer himself or with one or two of the hired labors. During the next 20 days, spraying of pesticide is necessary in case of the attack from insects or virus to the paddy plant. Pesticide spraying could be done by the farmer himself or with one or two hired labors.

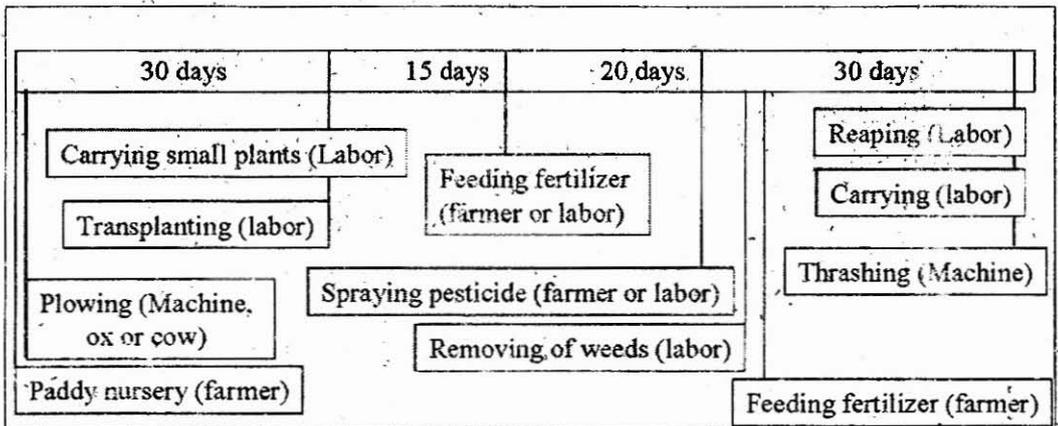


Figure (6) Nature of labor process under rice after rice project

Source: Based on personal interview.

During the last 30 days, removal of the weeds and the second time fertilizer feeding are necessary. Weed removing is necessary for paddy plant to be able to fully tap fertilizer from the soil. After removing the weeds, paddy plant are fed with fertilizer. Some labors should be hired for weed removing, while fertilizer feeding could be done by the farmer himself. When the paddy

plants are ripe (mature) reaping, carrying and threshing processes are waiting to be carried out. Although there are hand-carrying types reaping machines (6 acres per day per man) farmers from the Ywashe Village do not use these machines during the study period. They use migratory workers for these processes. They also carry the reaped paddy plants to the threshing ground and separate plant and paddy by threshing machines.

Table (1) shows the farming process and use of cattle, machine, family and worker in each farming process. It is distinguishable that mechanization is only seen in plowing and threshing. Still the farmers have to rely on the draught cattle for plowing the corners of farm plot. All other farming processes, with the exception of plowing, large number of workers is necessary.

Table (2) shows the type of job, labor requirement and wages for one acre of paddy land. For some processes like reaping and threshing, labor charges are paid by paddy. It is also distinguished that within the period of one year the labor cost for one man per day increased from 500 Kyats to 700 Kyats. Among the paddy cultivation process, transplanting and reaping still demands a large amount of labor. Since paddy after paddy project is practiced, the demand of labor increased nearly from 2 to 3 times than before the year 1988. Due to a large amount of labor demand, labor cost increased.

Table (1) Matrix showing the mechanization level of farming in Ywashe Village

	Drought Cattle	Machines	Family	Worker	Total
Distribution of natural fertilizer	0	0	19	20	39
Nursery	0	0		20	43
Plowing			4	9	73
Nursery pulling out	0	0	2	38	40
Nursery carrying	9	0	7	35	51
Transplanting	0	0	3	38	41

	Drought Cattle	Machines	Family	Worker	Total
Chemical fertilizer feeding	0	0	20	22	42
Pesticide spraying	0	0	20	18	38
Weed cleaning	0	0	6	34	40
Harvesting	0	0	3	39	42
Carrying of paddy plant	5	0	5	37	47
Threshing	1		5	22	58
Total	42	63	117	332	554

Note: Answers are based on multiple choices.

Source: Structured interview (n= 40).

Due to high labor demand, farmers have to rely on migratory labor. There are about 300 seasonal migratory labors in Ywaſhe Village. To secure the farming labor, farmers have to depend on the worker leader (founder). Worker leaders see to the arrangement of living, eating and advance payment for workers beforehand. Then, he/she controlled the labor and received some amount of money or paddy from both workers and farmers. Worker leader receives one day earning (700 Kyats in 2005) or paddy (0.5 baskets for paddy planting or reaping) from one worker and receives 8 worker's wages or paddy from farm's owner for introduction of 100 workers for one plantation or reaping. For example, the farmer uses 100 female workers in his farm for paddy transplanting. Daily wages of female worker is 500 Kyats and farmer has to pay 4000 Kyats to the worker leader for the introduction of the workers.

Table (2) Type of job, labor requirement and wages in for one acre of paddy cultivation

Type of Job	wages (per worker)	No. of worker/acre	Remark
Pulling out of small paddy plants and banding	700 Kyats/acre (M)	3	(last year 500 Kyats)
Carrying of small plant	700 Kyats/acre (M)		(last year 500 Kyats)
Transplanting	700 Kyats (M) /500 Kyats (F)/acre	12 to 15	Based on type of planting (Fig. 6)
Spraying pesticide or feeding fertilizer	700 Kyats/acre (M)	1	(last year 500 Kyats)
Reaping	0.5 basket of paddy/ acre (M,F)	12 to 18	Same for the whole period from 1976--
Preparing for threshing	0.5 basket of paddy/acre (M,F)	2	Based on how long thrasher is far away from paddy field

Source: Based on personal interview (2005).

Fertilizer Usage Change

During the early paddy-cotton period (up to 1976), farmers were not too familiar with fertilizers. However, personals from agriculture department encouraged the farmers to use the chemical fertilizers in the cotton cultivation. Government also supplied sufficient fertilizer at low price. Fertilizer was mainly used for cotton growing. Paddy cultivation used only a small amount of fertilizers, hence the fertilizer residual from cotton cultivations that still remains in the soil was used by the paddy.

During paddy-gram-sesame period fertilizers were supported by government and mainly used in paddy. Second crop (gram) and third crop (sesame) used the fertilizer residual from the paddy cultivation. In addition, due to crop rotation system, physical and chemical properties of soil were kept in healthy conditions.

During the early paddy after paddy. period, chemical fertilizer utilization greatly increased. Both usage per acres and total amount of annually fertilizer usages were increased. However, some fertilizers were still supported by the government at low price.

After 1998, the usage of chemical fertilizer in paddy cultivation was still high. Fertilizer, however, were not supported by the government. The role of private agro-chemical companies became important because farmers had to purchase some needed chemical fertilizers from private market. During the last 10 years, the kind (spray type, solid type, etc.) and brand (different countries with different name and quality) of fertilizer were greatly increased.

Table (3) Change in fertilizer usage and its source

	Urea	T_Super	Others	Total	Sample
Before 1976	1.56	0.90	1.07	3.53	26
1976-1988	1.30	1.01	1.08	3.39	32
1988-1989	1.24	1.25	1.14	3.63	35
After 1998	1.47	1.30	1.06	3.83	36

Source: Structured interview results.

Table (3) confirms the increasing usage of chemical fertilizer per each crop in each policy period. During 1976 and 1988, however, gram and sesame do not use chemical fertilizer. After 1988, the amount of chemical fertilizer usage increased in both per crop and per year since double and triple cropping system was practiced.

Due to high fertilizer demand, the price greatly increased in the recent years. As a consequence, fake fertilizer, and low quality fertilizers emerged in the market. Table (4) shows the percentage share of fertilizer in total cost of paddy cultivation in different periods. It is distinguished that it is increasing since 1970s. Therefore, two problems emerged concerning fertilizer. First problem was related to the availability of effective fertilizer, while the second one concerned with continuously availability of those effective chemical fertilizer in the market. Farmers said that "some fertilizers are not effective; some effective fertilizers were not available in the market".

Table (4) Change in percentage share of fertilizer in total cost of paddy cultivation

	Percentage	Sample
Before 1976	9.8	6
1976-1988	15.1	8
1988-1989	33.2	30
After 1998	48.1	30

Source: Structured interview (2005)

Pesticide Change

During the cotton project farmer used large quantity of pesticide supported from the government. Personal concerns from agriculture department went out into the field and demonstrated how to use pesticides. Facilities for spraying of pesticide were also sold by government at low price. However, the pesticide usage was mainly focused on cotton during that period.

In the paddy-gram-sesame cropping period they used pesticide only when there was disease in the plants (two or three year a time) supported by government. It seems that due to crop rotation system, insects and virus are not well developed. Insects that destroy the paddy are dormant during the gram and sesame periods and reproduction cycle is not too fast. Therefore, it is distinguished that the usage of pesticide in that period are very low.

In early paddy after paddy cropping period farmers used only when there was a disease in the plant. The frequency of disease outbreak or insect destruction, however, became higher than before. During that period pesticides were partly supported by government. However, government support did not cover the whole paddy land and farmers have to buy some pesticide at high price from private agro-chemical shops (Fig. 7).

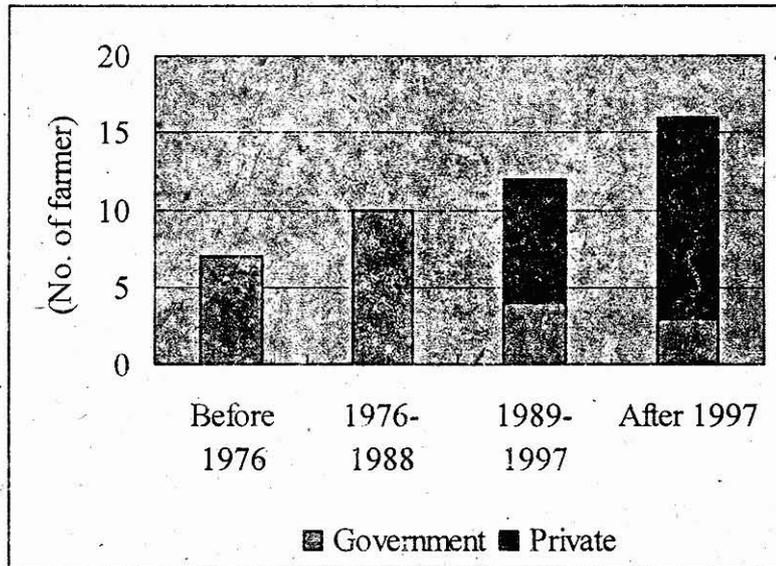


Figure (7) Source of pesticide in different period

Source: Structured interview results.

After 1998 there were many agro-chemical companies in Myanmar. They imported various types of pesticide and fertilizer from different countries. They went to the villages and made commercialization of their product. There is one agro-chemical shop in the Letkaung Village that is located beside the Mandalay-Pyin Oo Lwin Road at 0.5 mile away from Ywashe Village. Farmers from Ywashe Village mainly bought agro-chemicals farm inputs from that shop.

During 1998 and 2005 (late paddy after paddy period) many agrochemical shops emerged in both regional and local areas. In addition, agro-chemical shops assigned their representatives in the village (generally village head) to sell pesticides and fertilizers. Table (5) shows the change in percentage share of pesticide in total cost of paddy cultivation. Since farmers do not use pesticide regularly the sample size for this question is limited. Although it is fluctuated in different period, the percentage share occupation is not increased as fertilizer.

Table (5) Change in percentage share of pesticide in total cultivation cost of paddy

	Percentage	Sample
before 1976	-	0
1976-1988	10.0	2
1989-1997	9.3	14
After 1997	12.3	14

Source: Structured interview results

Market Change

During cotton project period, certain amount of paddy (about 30 baskets per acre) and cotton have to be sold to the government since government supported many farm inputs. In the paddy-gram-sesame period, only designated amount of paddy have to be sold to the government and gram and sesame were free for marketing. From 1988 to 2003 government bought designated amount of paddy with the designated price from farmers. The government support agricultural loans and other farm inputs such as fertilizer, pesticide and hybrid seeds by selling in low price up to the late 1990s. After 2003, farmers could sell their paddy in the market freely.

As a consequence, the rice mills where farmers used to process their paddy became more important. Farmers send their paddy to the rice mill and have to leave their rice there until the miller negotiates with the rice brokers. The owner of the rice mill generally has connection with the rice wholesaler or rice broker. If the rice is in good condition or/and rice prices are higher, they could sell within 3 or 4 days. Sometimes farmers have to wait about 40 days to sell their rice (owner of rice mill get money for milling only after the rice was sold) and face difficulty for the investment in input of next crop. Therefore, all 30 farmers respond to market related function, that they sold their paddy in the village. Of them, 22 farmers sold to brokers while others sold to rice millers.

The price of the rice is falling just after the reaping of paddy, because many farmers sell their paddy so as to be able to reinvest for the next crop. When there is no paddy in the hand of farmers the price of rice rise.

Sometimes farmers have to buy the rice for their own consumption by giving high price from the market. Of the 27 farmers, 21 farmers sell their all paddy just after harvesting so that they could invest for next crop. Other 6 farmers sold some of their paddy just after reaping or when they are in need of money.

Seed Change

Since the cotton project period, paddy and cotton seeds were distributed by the government through Myanmar Agriculture Service. According to interviews, farmers from Ywashe mainly grow upgraded seed call "*Machandoe*" since 1988. Although *Machandoe* is more resistant to pest and climatic changes, yield per acre is relatively low with an average of 70 baskets per acre. Instead, it get higher price in the market due to superior quality of rice. Many farmers who conduct double paddy cropping use this species for its resistant on environmental stress and very low fertilizer input in combination with HYVs seeds (Such as "*Shwewartun*").

HYV seeds produced from the agriculture department were used up to 3 three-generations. After 3 generations the seed are no longer usable due to lowering of yield per acre and rice quality. HYV seeds need large amount of fertilizer and pesticide usage and yield 100 baskets per acre in average. In Ywashe, farmers generally, set aside their seeds after the first reaping and used up to 3 generations. After three generation, they bought new seeds from the seed warehouse of agriculture department located in Mandalay or from other farmers.

Of the 37 interviewed farmers in 2005, 26 farmers grow *Machandoe*_HYVs crop combination system while other 12 farmers prefer to grow HYVs in all crops.

Technology and Agricultural Loan

Technology in this paper refers to the use of knowledge in paddy planting and reaping. The most visible measurement is use of machinery in farming. Some farmers have their own power-tiller (hand tractor) for plowing and all farmers use machines for plowing (some by means of rental).

There are 4 threshers for all farmers in the village. Farmers have to carry the reaped paddy plants from the paddy field to the thresher. They could not thresh near the paddy field because it is muddy and also due to high

moisture. Large labor cost for carrying of reaped paddy from the field to the nearest threshers is observed.

Although a systematic planting (in row) and small number of plant in each group (Fig. 8) could make high yield per acre, many farmers still practice old methods of paddy cultivation (6 inches \times 8 inches distance between the group of plant and planted 7 to 10 plants in one group) for cultural and economic reasons.

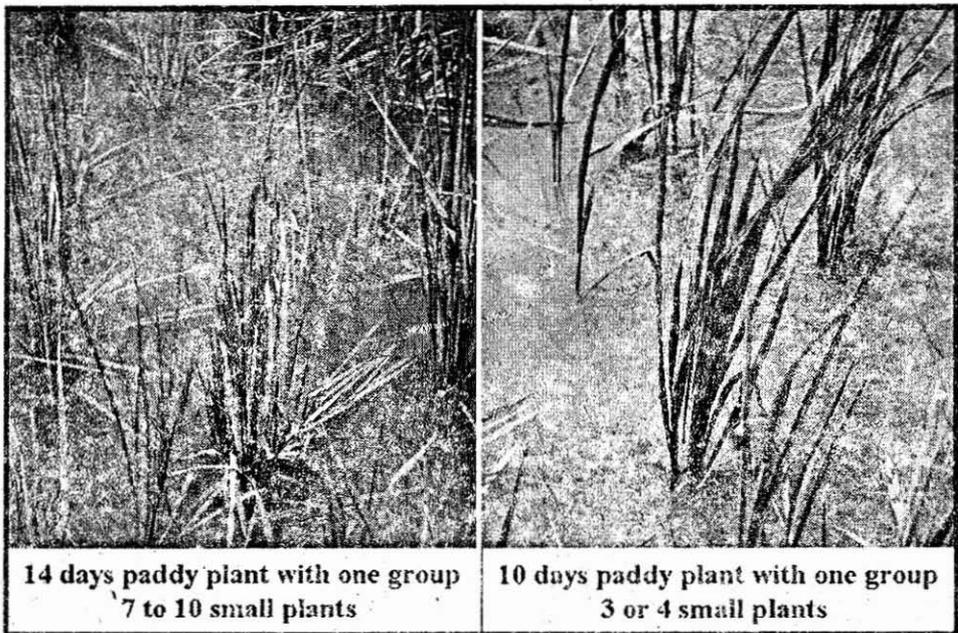


Figure (8) Different technology and paddy plant growth in Ywashe Village

Source: Photographed by author (May, 2005)

Quality of paddy is higher if it fruits from branches of paddy rather than from the main stem. If the plants are close together the number of branch that could stretch out from each plant is highly limited. Planting of paddy with new techniques uses 10 inches \times 12 inches distance between the plant group and 2 or 3 plant in each group. Inter group distance of plants and number of plant in each group is related to the quality of rice. Although the yield per acre in new method is not higher than the old method it can reduce the cost of seed. In old method, 4 to 5 baskets of seeds per acre are necessary

while new method need only 0.5 to 1 basket of seed per acre. According to the village head, the yield per acre for the new method is not too different from that of the old one, but his rice fetch a higher price than that of the same rice type of the other farmer due to its superior quality.

Out of the 35 responses 27 (77%) answered that they grow 4-5 plants and more in each plant group (Table 6). Only 8 farmers (23%) use 3 plants per group. Village head said that he is starting to practice 3 plants per group system since last two years and he said he could reduce the cost of seed, transplanting and fertilizer. Although the cost is reducing there is no difference in the yield per acre from the traditional planting (more than 4 plants per group). Therefore, it is distinguished that the technology of the village is generally low and it is necessary to distribute new technology of planting to the farmer. In addition, farmers who grow a large amount of plant in one group answered that it could contribute to high yield. This answer also reveals that those farmers are used to the old methods of planting.

Table (6) Number of plant per one group and their planting reasons

	3 Plants	4 -5 plants	5-6 plants	> 6 plants	Total
High Yield	4	3	4	2	13
Low cost	0	4	0	0	4
Tradition	1	6	2	5	14
Others	3	0	0	1	4
Total	8	13	6	8	35

Source: Based on structured interview result.

Table (7) shows the system of planting and their reasons for these planting methods based on the data derived from structured interview. More than half of the interviewed farmers used one line planting method where only one line of rope is used in systematic planting and second line is based on the farmer's guess. Nearly all farmers (22 out of 26) practicing this system knew that this planting method could make higher yield per acre. Nearly 30 percent (7 out of 30), however, still practices free planting method where they use no rope and the lines depend on the farmer's guess or they

just broadcast the paddy seed instead of planting. The reasons for this practice are due to high yield (no match with the fact that agriculture department's comment); low planting cost and traditional practices. Therefore, it is reasonable to conclude that farmers from Ywashe are adjusting their farming practices between knowledge and planting cost.

Government lent agriculture loans to the farmers until the late 1990s. Farmers have to pay back the loan in terms of paddy. This system, however, changed since 2000. Government established Myanmar Agricultural Bank to lend the money to the farmers and to be able to save the money of the farmer. Money is lent to the farmers with very low interest rate (1% interest for one month). Farmers, however, have to save some money (5%) when they return their loan in the bank. The amount of loan is varied with the type of crop and limited to certain amount. Out of 40 interviewed farmers 14 took agricultural loan last year. The loan range between 2500 and 5000 per acre based on the amount of farm land they possess.

Table (7) System of planting in Ywashe Village

	Free	One line	Two line	Total
High Yield	7	22	1	30
Low cost	4	2	0	6
Tradition	3	1	0	4
Others	0	1	0	1
Total	14	26	1	41

Source: Based on structured interview result.

Farmer's Conditions throughout the Four Periods

Comparison of economic conditions of farmers throughout four different periods is shown in Fig. (8). Farmer's benefit is mainly dependent on the paddy and they could not make profit from cotton due to overlapping of cotton harvesting and paddy growing in the early cotton period. Although inputs costs are high in the cotton the return is very limited, because cotton could be collected only once or twice.

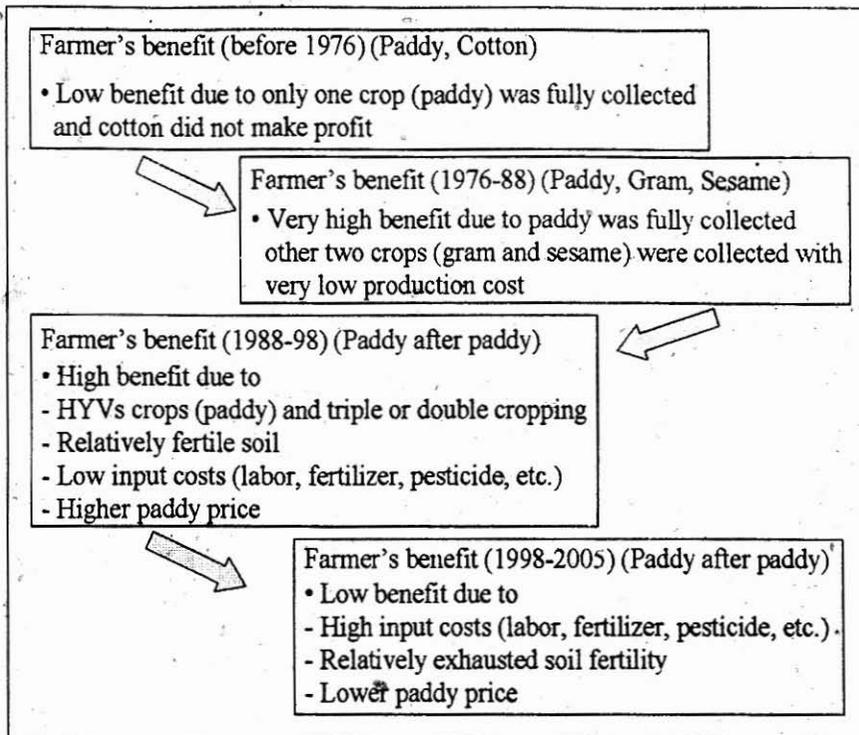


Figure (8) Farmer's economic conditions in Ywashe Village through out four periods

During the paddy-gram-sesame period farmers made great amount of profit. Farm inputs are mainly concentrated on paddy, while gram and sesame do not need farm inputs. Labor input for gram and sesame is not comparable to that of cotton and paddy. In addition, gram and sesame products could be sold freely in the market. As a result farmers in this period received relatively high income.

During early paddy after paddy period, government is still supporting some important farm inputs (like fertilizers and pesticides). Soil fertility remains relatively high due to mix cropping practices of paddy-gram-sesame. Since paddy after paddy project started in the existing irrigated area labor cost and labor availability is not a problem. But since it spread throughout the country it starts to form problems. Paddy price drastically increased in the late 1990s. In addition due to introduction of High Yield Varieties (HYVs) and double and triple cropping of paddy, a large amount of income could be generated from the paddy cultivation.

After 1998, formerly fertile soils became exhausted and inputs costs (labor, pesticide, fertilizer) became higher as explained above. In addition, paddy price is not regular in terms of seasonal and annual. In other words, it needs a comparatively more investment with higher risk to grow paddy. If a farmer fails to yield in one crop due to climate or/and insect reasons he/she will face difficulties in the investment of next crop. The agriculture loan is not too much and farmers have to sell out all of their paddy before starting a next crop. At that time the price of paddy is relatively low due to surplus of paddy in the market. After completion of crop planting the farmer has to buy rice at the higher price for his family. This poverty cycle could continue until high profit cycle encounter again.

Conclusion

In the introduction section, two major questions are raised to answer through this study. The first question is how does agriculture pattern of Ywashe Village changed during 1970s and 2006? The second question is what are the controlling factors that caused agriculture changes?

It is distinguished that agriculture of Ywashe is changing through time. Since the 1970s farmers changed their paddy-cotton crop pattern to paddy-gram-sesame pattern (although the projected crop is paddy-cotton). The changing processes are dependent on the regional agriculture policy, nature of crop, nature of land, and practices of the farmers. Again, the regional policy changed from paddy-cotton to paddy after paddy after 1988. At the early period of this project, that nature of soil is in favor of agriculture since soil fertility was maintained through crop rotation in paddy-gram-sesame period. Then government continued to support some farm inputs such as fertilizer and pesticide. Mechanization was also advanced in some process during this period. Labor cost is not too high and it is easy to hire workers since only selected areas where irrigation water is available could practice double and triple cropping. The price of rice is also high compared to cost in the late 1900s. As a result farmer benefited from this project. Therefore, the development of project in that period depends on the nature of soil, regional policy and support, nature of labor market and market.

Since the late 1990s, exhausted land demand large amount of fertilizer to be able to produce high yield. Table (8) shows the response of farmers in concerned with increasing fertilizer and pesticide usage and swamping due to

continuous farming (paddy after paddy). All 40 farmers agreed that the usage of pesticide is gradually increasing. Pesticide usage however, did not show increasing trend. They answered that pesticide is used only when it is affected by insect and virus. Concerning swamps 36 out of 42 (86%) answered that it is due to lack of dry period in the paddy field so that it gradually become swampy and they have to use water buffalo instead of bull or cow for plowing.

Table (8) Perception of farmer on pesticide and fertilizer usage, and soil degradation

	Yes	No change	No	Total
Increasing use of fertilizer	40	0	0	40
Gradual swamping	36	0	6	42
Increasing use of pesticide	4	4	25	33

Source: personal interview, 2005.

Labor cost became high and availability of labor relatively became difficult. At present major farm inputs are not supported from the government and the farmers have to rely on the private agro-chemical shops. Due to lack of knowledge related to the pesticide and fertilizer, farmers sometimes are faced with difficulties. In 2003 government stop buying paddy and the farmers have the right to sell their paddy freely in the market. Both seasonal and annual paddy price become more fluctuated. These changes are dependent on the nature of land, regional policy, market changes and changes of input factors due to involvement of private sector.

have to adjust or decide based on the regional policy and other input factors such as labor. Their decisions emerged as practice. Since the late 1990s, government linkages are gradually weakening. Instead, the role of private companies became more important. Private companies participated in four major channels: as agro-chemical shop, money lender, farmers, and rice mill. Their involvements are strengthening in the relative agriculture processes. Therefore it could be concluded that recent agriculture changes are reflected from combination of the conditions of nature, agriculture development policy, and farmer's response.

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