

AGRICULTURAL TRANSFORMATION PROCESSES IN MYANMAR : FARMING OF INDUSTRIAL CROPS IN BAGO REGION (WEST)

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ABSTRACT

Major economic policy of Myanmar changed since the introduction of the market- oriented economy in 1988 carried out in the agriculture sector. Industrial crop farming of Bago Region(West) changed after 1988 in the transformation of agriculture. Spatial impacts of government policy on input costs, farm size, land tenure systems, labour supply, farmer decision-making and market opportunities were observed during the transformation processes. In this research, the controlling factors that caused changes of industrial crop farming are studied by using qualitative and quantitative methods. This research attempts to analyze the agricultural land use and changes in agriculture pattern in Bago Region (West) area by the case study on industrial crop farming villages of Pyay Township, Paukhaung Township and Monyo Township .Better and more feasible means for industrial crop farming are searched and recommended for further development .

Key words : Industrial Crop Farming , Policy Change , Market-oriented Economy

Introduction

Agricultural practices are in the process of transformation as a consequence of increasing population pressure, decreasing agricultural land, environmental constraints increasing market demand and globalization processes. Agricultural transformation is the process by which individual farms shift from a highly diversified, subsistence-oriented production towards a more specialized production oriented market or other systems of exchange (e.g., long-term contracts).The process involves a greater reliance on input and output delivery systems and increased integration of agriculture with other sectors of the domestic and international economies (Staatz, 1998).

Agriculture is the key sector of Myanmar's economy, contributing 40.2 per cent of the GDP, 12.14 per cent of the total export earnings in 2005-06

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and employing 69 per cent of the active labour force (Soe Soe Aye, 2006). Myanmar has laid down 12 political, economic and social objectives in its endeavours to establish a peaceful, modern and developed nation. One of the major economic objectives is development of agriculture as a base and all round development of other sectors of the economy. Since 1992-93, the Economic Development Year an integrated development strategy has been applied for agricultural development, with specific sector-objectives and policies. The main strategies of the plan relating to agricultural and agro-processing sectors are to increase production of the staple food crops to achieve regional self-sufficiency, to extend cultivation of industrial crops to fulfil domestic raw material requirements, to promote the diversification and expansion of exports, to achieve effective mobilization and utilization of productive resources, to increase the efficiency of investments and to improve production efficiency and cost effectiveness.

Major economic policies changed with the introduction of market-oriented economy in 1988. Private companies were allowed to import pesticides, insecticides and chemical fertilizers. Many land development permissions were given to private companies. Farm products were allowed to more free trade. Changes in agricultural policy could also generate some patterns of agriculture in the industrial crop farming areas. This research paper attempts to analyze the land use and agricultural pattern changes in Bago Region (West) area by the case studies of each industrial crop farming village.

Research Questions

The role of industrial crop farming in the process of agricultural transformation is empirically investigated for Bago Region (West). The research questions are:

- (1) How have industrial crop farming in Bago Region (West) changed in the transformation of agriculture?
- (2) What are the controlling factors of industrial crop farming?

Data and Methodology

Secondary data and factual materials are collected from respective Government Departments. Based on those data, representative villages are selected for each crop and interviews are conducted with crop cultivators. The above research questions, some villages located in Bago Region (West) where most villagers cultivated the industrial crops of sugarcane, jute and kenaf and cotton are selected as case studies. The farmers cultivating the industrial crops were interviewed. Open talks as well as structured interviews were conducted to obtain data on the controlling factors on industrial crop farming.

Geographical Background of Study Area

Industrial crop farming mainly depends on physical features such as relief, drainage, climate, geology and soils of the study area. The Bago Region (West) is located between north latitudes 17° 2' and 19° 1' and east longitudes 94° and 96° 10'. There are 14 townships in the Bago Region (West). The whole area is divided into two districts, Pyay and Thayarwady. The total area of the Bago Region (West) is 14384.43 sq-km (5553.86 sq miles). The study area is wide in the north and narrow in the south. It is 120.70 km (75 miles) from east to west in the widest part, about 80.47 km (50 miles) in the central part and about 64.37 km (40 miles) in the extreme south. It extends for 228.53 km (142 miles) from north to south. Therefore the north-south alignment of the study area is longer than the east-west alignment. The Bago Region (West) bordered by Magway Region in the north, Bago Yoma in the east, Yangon Region in the south, and Ayeyarwady Region and Rakhine State in the west (Figure .1).

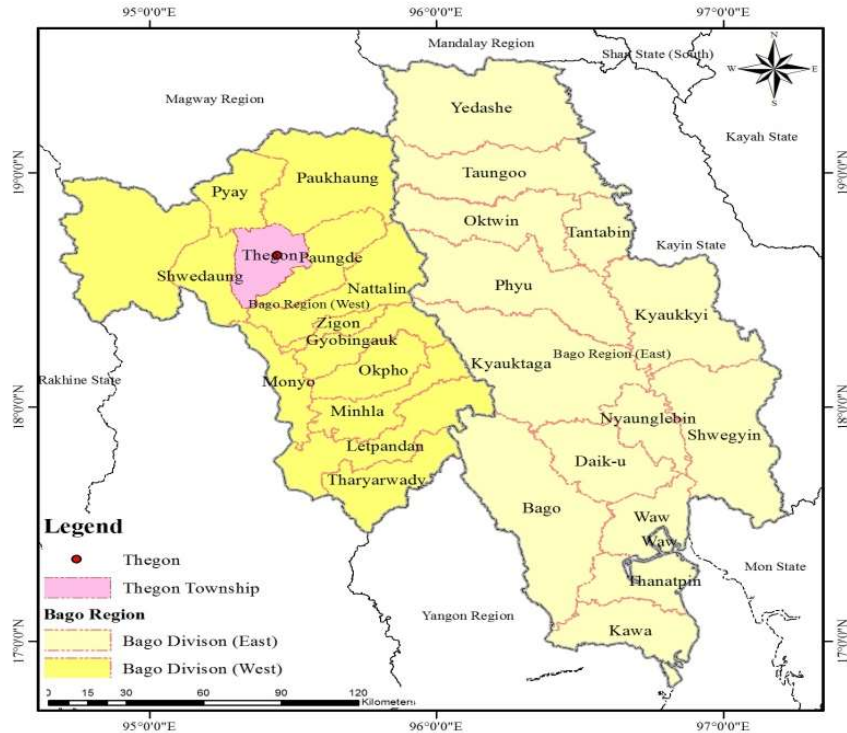


Figure 1. Location of Bago Region (West)

Source: Survey Department , Thegon Township

Industrial crop farming in Bago Region (West) is closely related to its relief. It lies between the Bago Yoma in the east and Rakhine Yoma in the west. The Ayeyarwady River is flowing through the area from north to south. It is gently sloping towards the south. Many streams and rivers originate on the Rakhine Yoma and Bago Yoma and flows into the Ayeyarwady River. The central part of the Bago Region (West) between Ayeyarwady River and Bago Yoma is flat land except Pyaytaungtan (Pyay Range) and Ayeyarwady uplands in the north. The rivers and streams take their sources on the Bago Yoma and flow from east to west into the Ayeyarwady River. Myitmakha an important river takes its source in the Inma-In extends 12.87km (8 miles) from north to south and about 3.21km (2 miles) from east to west, Myitmakha river flows parallel to the Ayeyarwady River course from north to south. Many streams that originated on the Bago Yoma, flow into Myitmakha River.

Agriculture is also dependent upon climate. Climatic conditions of Bago Region (West) is directly related to selection of crops and pattern of cropping. According to the 29 year average data (1988-2017), April is the hottest month with maximum temperature of 40°C in Pyay and 41°C in Thayarwady. The minimum temperature of the coldest month of January was 32° C and 35° C in Pyay and Thayarwady respectively. The annual rainfall is 116.84 mm (46.00 inches) at Pyay and 219.96 mm (86.60 inches) at Thayarwady. On the other hand, the rainfall of Pyay varies greatly from that of Thayarwady in amount. The study area, thus, experiences the Tropical Monsoon Climate type (Am) in the south, and Tropical Savanna Climate type(Aw) in the west and in the north. Soils consist of alluvium and sandstones at the foothills of the Rakhine Yoma. Alluvial soils occur along the Ayeyarwady River and streams. The Light Forest soils and Lateritic soils develop on the eastern uplands between the Bago Yoma and alluvial plain. Yellow Brown Forest Soils, Light Forest soils are developed in the Pyay Range area. The total population of Bago Region (West) in 2017 was 4,964,487 persons, the increase of 728,896 persons than that of 1983. The average rate of increase was 1.41 percent per year. Rural population of Bago Region (West) has gradually increased. The increase in rural area is greater than that of urban area. The relatively higher growth rate was due to the development of road network and road infrastructure, and increased economic activities (such as industries) which are favourable for immigration of population from outside of the study area. Bago is the Branch office of the Region.

Results and Findings

Agricultural Transformation Processes in Industrial Crop Farming in Bago Region (West)

Industrial Crop Farming

The main economy of Bago Region (West) is agriculture. Bago Region is the second most producer of rice. The other crops are oilseeds such as groundnut, sesame, sunflower and industrial crops such as sugarcane, cotton and jute. According to the agricultural census taken in 2001-2002, Bago Region as a whole, has the highest sugarcane net sown area(25%)

(while Bago Region (West) has 11% of net sown area). For cotton farming, Bago Region (West) ranks fourth, after Magway, Mandalay and Sagaing regions. Jute is cultivated mainly in the deltaic region. Ayeyarwady Region, currently, accounts for 85 per cent of the total crop production, with Bago and Yangon Regions contributing around 14 per cent and 1 per cent respectively (Soe Soe Aye, 2006). Sugarcane currently, accounts for some 45 percent of the total net sown area of industrial crops, with cotton and jute contributing around 33 percent and 22 percent respectively. Industrial crops are cultivated in Bago Region (West). Among these, Pyay District boasts the highest cultivated area for sugarcane and cotton, while Tharyarwaddy District mainly grow jute and kenaf crops.

Changes in sugarcane farming

Record of earliest sugarcane cultivation in Myanmar dates back to AD 800 and the art of manufacture of jaggery became well established during Inn-wa era in the 15th century. Crude sugar was manufactured in the 18th century and the first white sugar mill was established in Kyaik-kha-me in 1840. After subsequent attempts, modern sugar factories were firmly set from the year 1926 onwards. With the aim of scrutinizing both the sugarcane production and sugar processing by one sole agency, the Myanma Sugarcane Enterprise (MSE) was organized in 1994 under the Ministry of Agriculture and Irrigation (MOAI) and it took over all the responsibilities involved in sugar industry.

Changes in Cultivated Area and Yield

According to the Myanma Sugarcane Enterprise, Pyay data, sugarcane was grown in all townships. Paukkhaung, Thegon and Pyay Townships have large cultivated areas. Paukkhaung Township had the largest in acreage in Bago Region (West) (Figure 4). Within the period from 1988 to 2006, Paukkhaung Township occupied 40-60 per cent of the Region's net sown acreage. There were fluctuations in the net sown acreage during the period from 1988 to 1994 that increased due to high price of jaggery. Sugarcane need not compete with other crops. It is less infected by diseases. In 1994-95, Paukkhaung Township cultivated more than 90 per cent of the Region's acreage because of policy factors, replacement of other crops areas and the

other townships could not grow sugarcane in the irrigated area. After 1999, establishment of sugar mill, there was an increase of 19622.81 hectares in the region .In 2016-2017,the cultivated areas of sugarcane decreased 5958.59 hectares due to high price of crops, the soil was exhausted and lack of the interest of farmers who are more interested in other cash crops such as pulses.(fig(4)).

Figure (4) indicates the fluctuation in of yield per hectare changing from 1988 to 2017. According to the figure, there is a slight increase in production between 1988-89 and 1996-97. To compare with the yield per hectare it shows 19.40 tonne per hectare between 1988-89 and 19.57 tonne in 1996-97.In 2003-2004, the yield fell dramatically from 19.40 tonne to 14.99 tonne per hectare .In 2016-2017, the yield per hectare increases gradually up to 18.25 tonne per hectare. Generally, the yield was decreasing because the soil was exhausted and lack of the interest of farmer who are more interested in other cash crops such as pulses. Within the Paukkaung Township, 22 village tracts were cultivating sugarcane. In those village tracts, Dha-ma-thaw village tract covers large hectare as 20-25 per cent of the township net sown area .Therefore, Dha-ma-thaw village has long history and it is suitable for studying the sugarcane farming in the transformation process of agriculture.

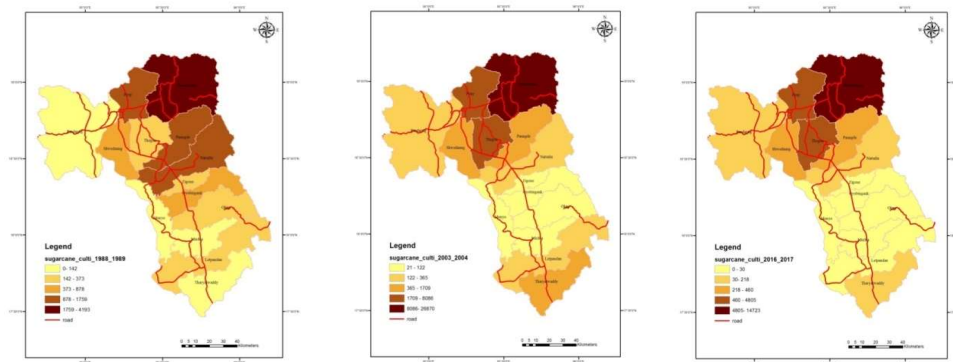


Figure 4. Sugarcane Cultivation in Bago Region (West) in 1988-89 , 2003-04 and 2016-2017

Source : Department of Settlement and Land Records, Pyay Township

The Case of Dha-ma-thaw Village Tract

Dha-ma-thaw village tract is located on the north of Paukkhaung Town. The terrain is mostly flat with nearly 40 years experiences of sugarcane growing the average annual rainfall is 1206.5 mm and the average maximum temperature is 34.9°C and minimum temperature is 21.6°C. Most of the area have silt, alluvial, cinnamon and dark brown savanna soils. Dha-ma-thaw village tract has an area of 3548.29 hectares. This village tract has six villages. There are 923.08 hectares of arable land. Sugarcane is mainly cultivated as 48 per cent in this village tract. Within the six villages, Dha-ma-thaw village was chosen to study the controlling factors in the transformation process of agriculture. In Dha-ma-thaw Village, there were 290 households living in this area and population was 1450 in 2006. There are 467 hectares of Le land, 456.08 hectares of Ya land and the main crops are paddy, groundnut, green gram, sesame, sunflower, long-staple cotton, sugarcane and vegetables. Prior to 1988, there were about 32.37 hectares under sugarcane. After 1989, the village tract had more than 242.81 hectares under sugarcane. Although sugarcane growing population is changing from over 100 farmers prior to 1988, 60 farmers in 2004-05, 86 farmers in 2006-2007 and 76 farmers in 2016-2017. Farm size for a farmer is divided into four stratum which are shown in table Table(1). Since sugarcane is a perennial crop, sugarcane cultivators grow not only sugarcane but also other crops for their subsistence. Only about fifty percent of their farms is devoted to sugarcane and other crops are cultivated on the remaining part of the farm. Until 1999, most of the farmers made jaggery, sugarcane syrup and alcohol. After the sugar mills came to be established in the villages (In-nga-gwa and Nawaday) farmers have to send their cane to the mills beginning from 2000-2001. Since Myanmar Sugar Enterprise (MSE) was established in 1994, MSE operated 17 sugar mills in Myanmar. Today 12 sugar mills are operation (Table.2). All sugar mills are private-owned.

Table 1. Stratum of farm size in Dha-ma-thaw Village Tract (2016-2017)

Stratum	Farm-size hectares	No.of.farmers 2003-2004	No.of.farmers 2004-2005	No.of.farmers 2006-2007	No.of.farmers 2016-2017
1	>8.09	3	7	1	1
2	4.45-8.09	4	17	3	2
3	0.8-4.04	55	50	61	51
4	< 0.8	35	12	21	22

Source : Village Administrative Office, Dha-ma-thaw Village Tract

Table 2. Operation of sugar mills under Myanma Sugarcane Enterprise (MSE)

Sr.	Name	Township	Capacity (ton/day)	Year of Commission
1	Pyinmana-3	Pyinmana	1500	1957
2	Shwe-Nyaung	Nyaung Shwe	300	1983
3	Pyinmana-2	Pyinmana	1500	1984
4	Kyauk Taw	Kyauk Taw	300	1985
5	Yedashe	Yedashe	1500	1991
6	Dahatkone	Takkone	1500	1999
7	Myo Hla	Yedashe	2000	1999
8	Oaktwin	Oaktwin	2000	1999
9	Yonzeik	Aung Lan	2000	1999
10	Duyingabo	Aung Lan	2000	1999
11	In-nga-gwa	Pauk Khaung	2000	1999
12	Nawaday	Pyay	2000	1999

Source : Myanma Sugarcane Enterprise

In-nga-gwa mill and Nawaday mill (JVC with Thailand) separately collected the cane from Pauk-khaung Township. The areas for collection of

cane are demarcated by authorities. Although Dha- ma-thaw village is located near In-nga-gwa mill, (at a distance of 13 km) the farmers must transport their sugarcane to Nawaday mill (at a distance of 64 km) that is located in Pyay Township. Thus, cane growers faced high production costs in addition to transportation problems. Net profit from sugarcane is lower than that from other crops especially groundnut. Labour for harvesting season is not sufficient because it coincides with the growing season of other crops. Thus, labour cost is also higher than that for other crops (Table 3.). Reduction of small farm size is caused by high production cost and they stopped growing sugarcane .Yield per hectare is 30000-75000kg/ha, because of land condition, lesser utilization of expensive inputs and decreasing soil fertility. Furthermore, availability of water for irrigation during hot season is not easily accessible. Government and private companies' assistance, price incentives and subsidies or credit system becomes a paramount importance to boost sugarcane production .In 2016-2017 cultivated area increased, resulting in higher yields and more income earnings, but they still faced many problems particularly labour shortage. The profit of 1 hectare of sugarcane was kyats138, 500 and that of groundnut was kyats 220,000 in 2006-2007. In 2016-2017, a farmer who has 1 hectare of sugarcane in Da-ma-thaw village received about kyats 622,500 per year. A farmer received kyats 294,000 from groundnut area within three months. Farmers were interested in cropping groundnut, which gain more profit (Table 3). Moreover, market price of sugarcane in the year 2000 was kyats 5275-6100 per ton but farmers had to sell their products to the government at a fixed price of kyats 2500 per ton. After 2014, private entrepreneurs owned all sugar mills and farmers can sell their products freely. Market prices changed yearly during the period from 2007 to 2010.It was kyats 13500 per ton. In 2014-2015 prices increased to kyats 30000 and prices reached a peak of kyats 45000 per ton in 2016-2017.

Table 3. Differences between returns from Sugarcane and that of other crops in 2006-07 and 2016-2017 (in kyats) (assuming an average yield of 25 tonnes/ hectare for sugarcane and 50 baskets/hectare for groundnut)

	Sugarcane (2006-07)	Groundnut (2006-07)	Sugarcane (2016-17)	Groundnut (2016-17)
Costs of input materials	77600	14400	210000	114500
Labour costs	71400	15600	292500	155000
Total estimated costs	149000	30000	502500	269500
Selling price	287500	250000	1125000	563500
Projected returns	138500	220000	622500	294000
Benefit-cost ratio	0.93	7.33	1.24	1.09

Source : Based on interviewed data, 2016-2017

Changes in Cotton Farming

In Bago Region (West), there are two cotton growing zones; Pyay District and Tharyarwady District. The former has more cotton growing areas than the latter. This is because Pyay District gets a mean annual rainfall of 1270 mm, and being irrigated areas of North Nawin Dam and South Nawin Dam. On the other hand, Tharyarwady District has a mean annual rainfall of 2286 mm. Thus cotton cannot thrive there. Cotton can only be grown on Ya lands.

Changes in cultivated area, seed, crop pattern and yield

Cotton cultivated areas in Pyay District have been increasing from 1988-89 to 2016-17. In 1989-90 the cotton cultivated areas were 4869 hectare and in 1995-96 these areas more than doubled to 12128 hectares. The Government projected a policy to grow cotton in cultivable land. At that time,

farmers received a government subsidy including fertilizers, good quality seeds, pesticides, and technology as well as methods for growing cotton by the staff members of responsible departments. Therefore, the farmers were interested in long-staple cotton cultivation. In that year, cotton production was 9841.25 tons. The cultivated areas dropped to 4980 hectares in 1996-97 as a result of irregular rains. The cultivated area increased to 12043 hectares in 2016-17 as a result of the replacement of long-staple cotton and mixed farming with groundnut, sesame and pulses. (see fig (5)). Wagyi (short-staple cotton) need long growing season and thus double cropping cannot be practiced. Long-staple cotton can be cultivated by irrigation in the pre-monsoon period before paddy and other crops are grown in the rainy season. Besides, it can be cultivated as a double crop with sesame, pedisein and other crops which need only a short growing season.

In 1988-89, the cotton yield was 1946.68 tons and the yield per hectare was 449 kg. The highest cotton production was in 1995-96 with 9841.24 tons and the yield per hectare was 820.96 kg. It was the result of the selection of good quality seeds, using the fertilizers, pesticides and good agricultural practices (GAP). Yield per hectare was changing during the period from 1988-89 to 2016-17. Although the cotton yield in 1988-89 was 178 kg, in 2016-17 the data showed a dramatic rise to 711 kg. The townships which had high cotton yields in Pyay District are Pyay, Paukhaung and Pandaung townships while those in Tharyarwady District are Nattalin and Minhla townships.

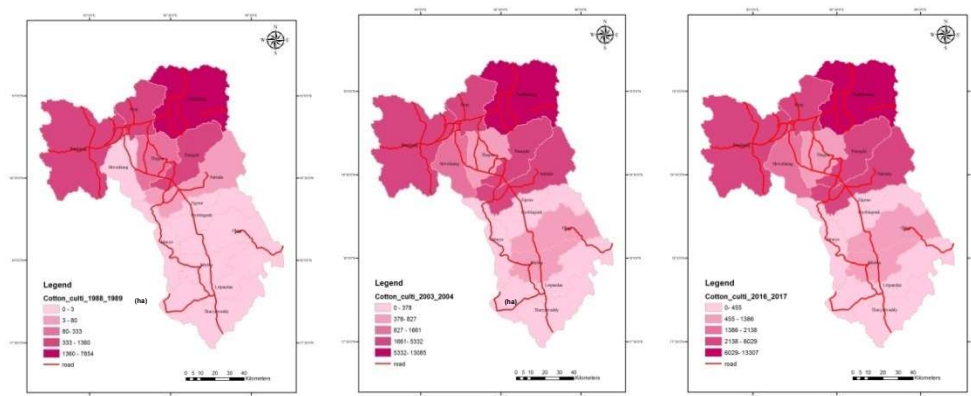


Figure 5. Cultivation of Cotton in Bago Region (West) in 1988-89, 2003-04 and 2016-17

Source: Department of Land Records, Pyay

The case of Thit-cho-pin Village Tract

Based on data obtained from the Myanma Cotton and Sericulture Enterprise, at Pyay the representative village was chosen to study of agriculture and controlling factors. The selection was based on the cultivated area of 40.46 hectares and more village tracts. In Bago Region (West), Thit-cho-pin village tract grows nearly 202.34 hectares and it received the government award for high production (Figure 6)

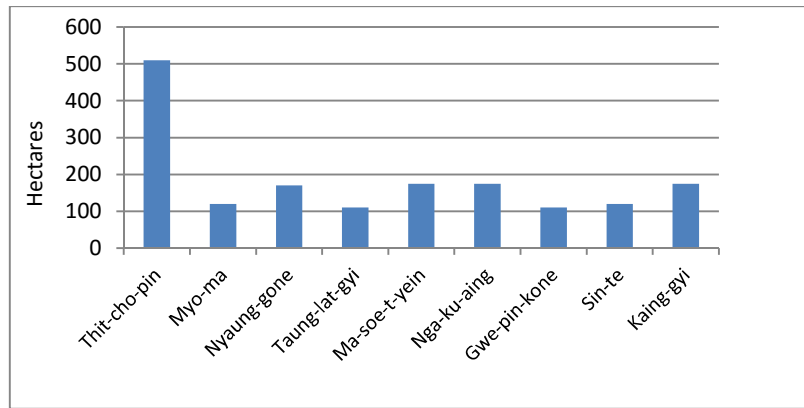


Figure 6. Cotton cultivation by village tracts in Bago Region (West) with 100 and more hectares of net sown area

Source: Myanma Cotton and Sericulture Enterprise(MCSE) Pyay

Thit-cho-pin village tract is located between North Nawin and South Nawin drainage area and within the Pyay Township. It receives an average annual rainfall of 1206.5 mm. The average maximum temperature is 34.9°C and minimum is 21.6°C .The soils are silt, alluvium, cinnamon and dark brown savanna. Thus, the soils and climate of this village tract are suitable for cotton cultivation. It consists of 6 villages. In those villages, Kan-su and Ein-kone villages are most favourable for cotton. The main crop of these villages is cotton and the secondary crop is pulses. Thit-cho-pin village tract has experienced cotton cultivation since 1978-79. Farmers have grown cotton as planned crop since 1977. At that time, farm- size was 4 hectares and yield was 1155 kg/ha. Farmers received the supply of loans, fertilizers, good quality seeds and pesticides from the government. The common fertilizers are Urea, T-Super and Phosphate. After 1988, the use fertilizers was changed to compound and pesticides from private companies. Farmers cannot use high

cost agro-input materials so the yield of cotton had dropped to about 660 kg /ha.

The size of farm was reduced from 4 hectares to 2.4 hectares as large farm size, from 2.02 hectares to 1.21 hectares as middle farm size and from 1.21 hectares to 0.8 hectares in small farm size. In this situation, beans and sesame replaced cotton growing areas and most of the cotton areas changed to pulses growing which get high profit (Table 4). A serious issue is that impure seeds are procured from farmers and imported seeds cannot be used easily. After 2002-03, cotton came to be traded freely in the domestic market. Since then, supply by the government is reduced and the private sector is emerging. In 2016-2017 sown hectares and yield (1141kg) increased and growers get high benefits but they still encounter many problems. In 2006-2007, the profits gained from 1 hectare of cotton (pure) area was kyats 113850 while kyats 329050 was received from cotton (mixed with groundnut). In 2016-2017, farmers who worked on 1 hectare of cotton in Thit-cho-pin village tract received about kyats 283000 and about kyats 712250 received from cotton (mixed with groundnut). Therefore, farmers were interested in the cultivation of cotton mixed with groundnut because the projected return is high and transformed to intensive cultivation of other cash crops. (table 4). Moreover, market price of cotton had changed from (1.63 kg) kyats 188 in 1988-89 to (1.63 kg) kyats 1000 in 2007-2010. The highest price was kyats 1300-1500 for 1.63kg in 2016-2017. Therefore, farmers were interested in growing mixed crops and changed to cotton mixed with groundnut which get high returns.

Table 4. Differences between returns of cotton (pure) and cotton mixed with groundnut in 2006-2007 and 2016-2017 (in kyats) (assuming an average yield of 400 viss /hectare for cotton (pure), 300 viss /hectare for cotton mixed with groundnut and 50 baskets/hectare for groundnut)

	Cotton(pure) 2006-2007	Cotton (mixed with groundnut) 2006-2007	Cotton(pure) 2016-2017	Cotton (mixed with groundnut) 2016-2017
Input material costs	26150	13450	72000	54000
Labour costs	60000	27500	165000	123750
Total estimated costs	86150	40950	237000	177750
Selling Price	200000	400000	520000	890000
Projected returns	113850	329050	283000	712250
Benefit-cost-ratio	1.32	8.04	1.19	4.0

Source: data obtained from open-talks and structured interviews

Since 1977, cotton became the planned crop and cotton had to be sold government procurement centres at Wethtikan, Pyay and Paungtale. In 1988, private merchants registered at Myanma Cotton and Sericulture Enterprise (MCSE) and they were permitted to procurement of cotton and 50 per cent of their cotton must be sold to the government and the rest must be traded in the domestic market. In 2002-03, cotton was liberalized as a free trade commodity in the domestic market. Cotton growers gained higher since then MCSE must also change their procurement price with competition of private merchants (Figure 7). After 2002-03, the supply of inputs such as fertilizers and pesticides was reduced and irregular.

Therefore cotton growers came to rely on private companies.

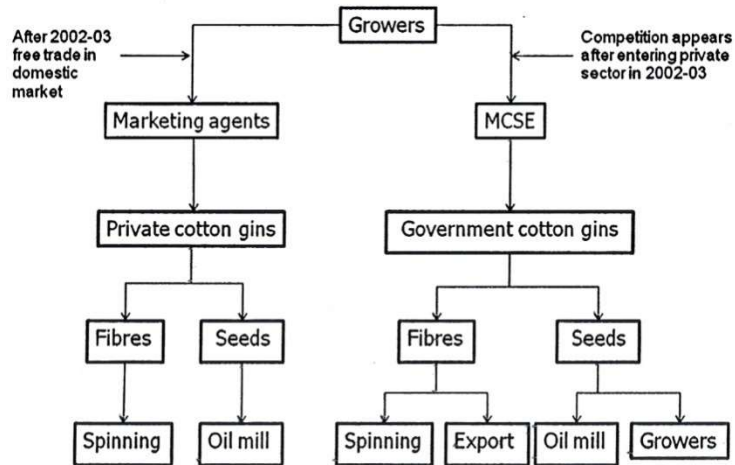


Figure 7. Marketing Chain of Cotton

At present, farmers faced the competition with other crops and difficulties in the availability of pure seeds. Some farmers obtained pure seeds and increased in yield per hectare. If farmers in Thit-cho-pin village tract can get pure seeds, high price of cotton and government supply, they are keen to grow cotton. Formerly, the harvested cotton are collected by brokers and sent to Pyay and Shwedaung (textile factory and oil mills). At present, textile factory and oil mill in Pyay and Shwedaung townships are not operating. As such, brokers stayed in the cotton growing areas, collected the harvested cotton and sent it to Aunglan and Mandalay.

Changes in Jute and Kenaf Farming

Myanmar is an agrarian country and its economy is largely dependent on agricultural products such as rice, pulses, etc. In order to export them, the farmers and producers need packaging materials such as gunny bags, hessian and twine. In the past, these packaging materials were all imported from India and East Pakistan (now Bangladesh). Market research reveals that it would be more beneficial to cultivate jute and to establish a jute mill in Myanmar.

Jute is cultivated mainly in the deltaic areas. Ayeyarwady Region, currently, accounts for about 85 per cent of total jute production, with Bago and Yangon regions contributing around 14 per cent and 1 per cent

respectively. Paddy is the primary crop in the deltaic area, with jute cultivated as one of the secondary crops. It is commonly sown as pre-monsoon and monsoon crop. There are two varieties of Jute. These are *Corchorus capsularis* (White Jute) (Thelonpu/short-pod) and *Corchorus olitorius* (Tossa Jute) (Thedaungshe/long-pod), *C. capsularis* is mainly grown in low-land areas while *C. olitorius* is cultivated in up-land areas. The maximum Jute production recorded in 1988 was 98643.16 tons.

In Bago Region (West), two kinds of jute are grown as pre-monsoon jute and monsoon jute. Thayarwady District has more jute growing areas than Pyay District. Jute requires a total annual rainfall of 2286 mm. *Kaing land* areas in Tharyarwady District get more annual rainfall than Pyay District. Although both Thelonpu and Thedaungshe varieties are grown in Bago Region (West), Thedaungshe which can tolerate waterlogged conditions is mostly cultivated during the monsoon in the lowlands.

Changes in cultivated area and yield

The cultivated area of Tharyarwady District was mainly analyzed. The jute growing areas in Tharyarwady District was 7386.32 hectares in 1988-89. It increased to 8458.74 hectares in 1995-96. Due to pump irrigation with the support of the government. However, it dropped to 6001.89 hectares in 1999-2000 as a result of less interest of farmers and the competition of other cash crops such as corn, sesame, pulses and etc. In 2003-2004, jute cultivation further dropped to 4711.35 hectares as a consequence of river flooding. In 2016-2017, the cultivated areas again dropped to 4118.89 hectares because farmers came to be more interested in other cash crops (Fig 8).

In 1989-90, the production of jute was 8112.32 tons and yield was 1142 kg/ha. The production and yield dropped to 3739.12 tons and 255 kg/ha in 2016-2017. The yield of jute and kenaf had dropped 211.9 kg/ha in 2016-2017. The rate of yield per hectare, the total production and the quality of jute depend on the use of fertilizers and pesticides, harvesting and retting of jute. In Tharyarwady District, jute cultivated area is found in every township. Among these townships, Monyo Township has the largest cultivated area. This is accounted for by the facts that this township gets enough rainfall for

jute cultivation and has favourable meadow soils, meadow clay soils and meadow alluvial soils.

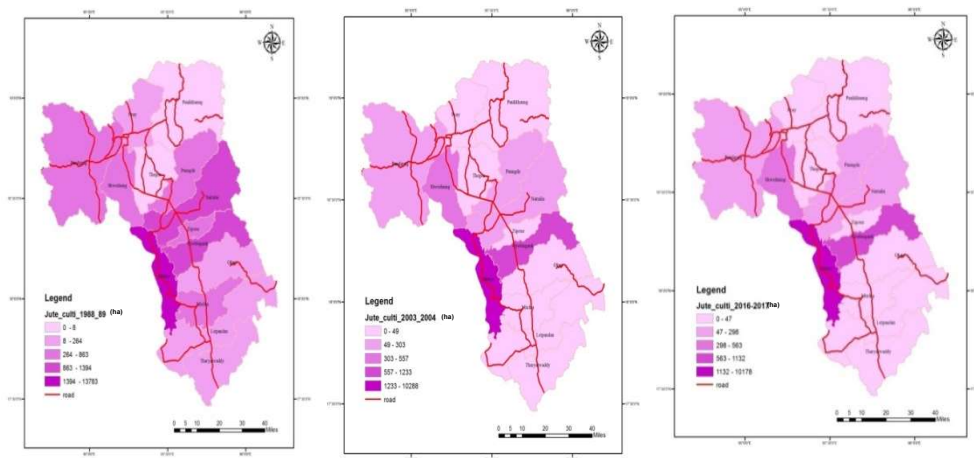


Figure 8. Jute Cultivation in Bago Region (West) in 1988-89, 2003-04 and 2016-17

Source; Myanma Jute Industries, Tharyarwady

The case of Pat-taw Village Tract

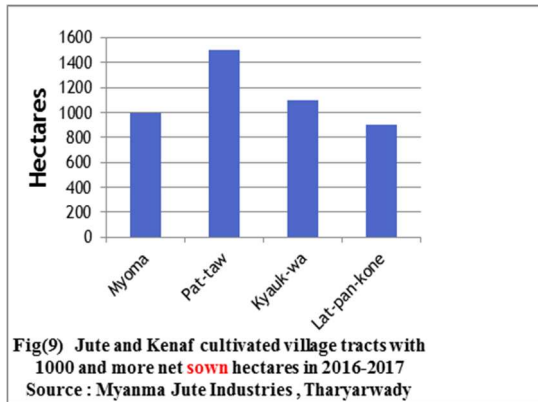
In Monyo Township, with 404.686 hectares and more cultivated village tracts, Pat-taw Village Tract is analyzed for investigation of the changes in agriculture and the controlling factors. Pat-taw village tract has experienced jute cultivation since 1963. This village tract is composed of 6 villages. It is located in Myintmakha river basin area and rich alluvial soils and cinnamon soils. The average annual rainfall is 2133.6 mm and the average maximum and minimum temperatures are 38.8°C and 17.5°C respectively. In Pat-taw village, there are 800 households with the total population of 3500. Jute cultivation area is 809.372 hectares, and that of sesame is 283.28 hectares. There are 300 jute growers. Thedaungshe is cultivated in pre-monsoon while Thelonpu is cultivated in the monsoon period. Large farm-size area was 7.28 hectares prior to 1988. The current size of farms are 3.23 hectares. This reduction is to result of less government support, high cost of production, especially after harvesting and construction of levees for protection from flooding. Ten acres are changed to other crops

such as sesame and paddy. After the year 2000, jute area declined because of the lack of support by the government. In 2016-17, jute growing areas are replaced by sesame.

Table 5. Condition of Jute/Kenaf cultivation in Pat-taw Village Tract in 2016- 2017

	2005-2006			2016-2017		
	Number of Farmers	Pre-Monsoon (hectares)	Monsoon (hectares)	Number of Farmers	Pre-Monsoon (hectares)	Monsoon (hectares)
Pat-taw	74	222	278	61	216	23
Gyo-kone	53	181	188	53	138	37
Payagyi-tan	44	118	137	42	104	36
Le-won-kwin	30	51	87	30	96	15
Htan-taw-kone	24	48	70	24	80	17
Payagyi-kone	44	55	184	44	95	12
San-pya	19	0	76	19	26	20

Number of jute farmers and cultivated area in Pat-taw village were decreasing. All villages from Pat-taw Village Tract’s monsoon jute area has dramatically declined in 2015-16. This is the result of the construction of embankments for prevention of flooding and profits from jute is relatively less than that of other cash crops.(Table 5). Therefore, Jute/Kenaf area had declined .It is a critical issue for the study area. The major problem is the imbalance in the relative advantages of other competitive cash crops. The cost and returns of jute and that of other major crops are compared in **Table 6**. For the crop season 2007-2008, purchasing prices of Jute and Kenaf encouraged farmers to produce more quantity as well as high quality.

Table 6. Benefit-Cost Ratio of Jute / Kenaf and other competitive crops

Source: Soe Soe Aye, MJI, 2007

Crops	Benefit-Cost Ratio
Paddy	1.85
Black gram	4.17
Green gram	1.94
Maize	1.60
Sesame	1.69
Chilli	8.97
Pre-monsoon jute	0.91
Monsoon kenaf	1.13
Kenaf (Bast fibre)	0.98
Jute (Whole plant)	1.10

Due to higher wages of labour, farmers can hardly offer to hire labour for cultivation and post-harvesting. This consequently resulted in shrinkage of cultivation areas. The remaining smaller plots could be managed by family members. This situation could have been better, if yield per unit area had improved. Pat-taw's Jute is collected from Myanma Jute Industries (MJI) and transported to Okkyin Jute Mill until 1972. Since then, harvested jute is transported to Pyay Jute Grading and Baling Factory. All of the markets for jute are controlled by government enterprise. After the introduction of summer paddy in 1992, the area under jute declined. Even if the farmers should get an incentive of high price, they would still force the quality issue.

Table 6. Differences between returns of jute/kenaf and other crops in 2006-2007 and 2016-2017 (in kyats) (assuming an average yield of 450 visses /hectare for jute/kenaf and 10 baskets/hectare for sesame)

	Jute and Kenaf 2006-2007	Sesame 2006-2007	Jute and Kenaf 2016-2017	Sesame 2016-2017
Input material costs	13000	19400	23000	58500
Labour costs	56700	28900	100000	148000
Total estimated costs	68700	48300	123000	206500
Selling Price	45000	200000	67500	400000
Projected returns	24700	151700	55500	193500
Benefit-cost-ratio	0.35	3.14	0.45	0.94

Source: interviewed data

Discussion and Conclusion

After 1988, the changes in cultivation of the industrial crops in Bago Region (West) depend on agricultural policy, kinds of crop, situation of markets and the decision- making of farmers. After 2002, industrial crops are replaced by other crops according to market-oriented economy. Prior to 1988, double cropping was practiced in this region, for example, the farmers grew cotton after paddy. The farmers gained profit in this period as a result of natural fertilizer use and labour costs were less than that after 2002 price. After 1988, pattern of agriculture was changed in accordance with the changing market economy of the country. Therefore, the industrial crops are substituted with other cash crops such as pulses. In addition, after 2002 the fertility of soils is degraded. Thus, the farmers use more chemical fertilizers for high yield. In addition, the farmers were faced with high labour costs, high input material costs (fertilizer, pesticides), problem of seeds and difficulties in transportation. The Sugar Mill No.12 (Nawaday) was constructed in 1997 in Pyay Township and Sugar Mill No.(11) (In- nga-gwa) was constructed in 1998 in Paukhaung Township. The farmers were faced with many problems. The major problems were related to transportation and the higher the labour changes. The shortage of labour is one of the problems because the growing season of summer paddy and harvesting period of sugarcane coincided.

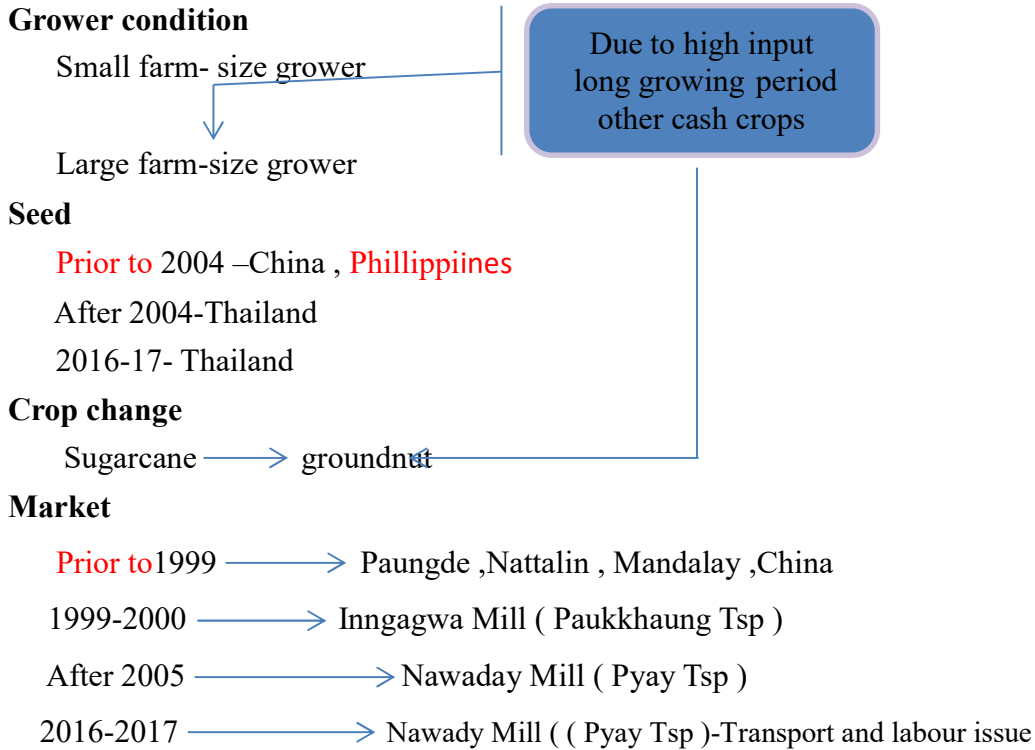


Figure 1. Changes in sugarcane farming and controlling factors

Cotton is permitted to free trade in the domestic market since the year 2002-2003. The cotton was procured by Myanma Cotton and Sericulture Enterprise and transported to the cotton mill in Aunglan. These were recontributed to Meikhtila. After 2002-2003, private merchants send the products to Mandalay, Meikhtila, Pakokku and Shwedaung. Cotton growing farmers grow cotton intensively on the fallowed land. Should the government contributing the pure seeds and necessary inputs, the acreage of cotton will be increased again.

In the growing of sugarcane, the contribution of high yield species, new method of growing and harvesting, the solving the labour shortage and transportation for sugarcane, are the ways to more interesting in sugarcane and more successful.

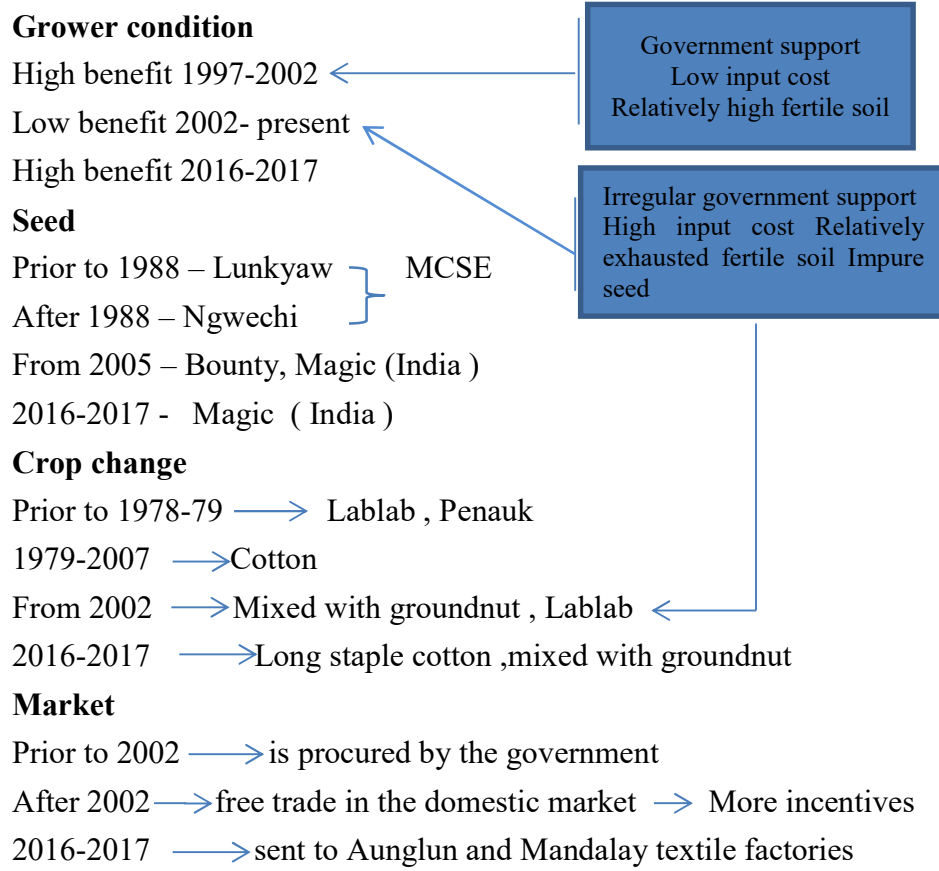


Figure 2 . Changing cotton farming and controlling factors

Jute ranks as the second highest production cost after sugarcane. The price of industrial crops is subject to yearly fluctuation. Prior to 1988, the government provided the necessary inputs for agriculture. At present, the inputs are more necessary since most of the farmers practice double-cropping and the degradation of soils for longer growing period of crops. Contribution of government support is decreasing and the role of private shops becomes more important. After the year 2000, the farmers changed to grow pulses, sesame and groundnut which give good returns. The decision of farmers for production of crops depend on the labour price and input for industrial crops. In jute cultivation, the first problem is higher labour price, second is less contribution of fertilizer, third is the difficulty of diesel for pump, and the last is decreasing of cultivated area since some areas are constructed as

embankments to prevent flooding. If the necessities for jute cultivation are well provided well, the farmers will try to increase the cultivated areas for jute.

Grower condition

Jute grower

Due to high production cost after harvested
High income from cash crops

Other cash crop grower

Seed

Prior to 2002-2003 – Thelonpu , Thelonshe (Bangladesh) via MIJ

After 2002-2003 – kenaf (Japan)

2016-2017 – Kenaf (Japan)

Crop changes

Jute → Sesame , paddy ← Embankment construction

Paddy and Sesame → (flooding)

Market

Have to sell to the government → Pyay

Fixed price

Figure 3. Changing jute and kenaf farming and controlling factors

If the government serves carefully to gain profits, to get high yield and to raise the production, the areas for industrial crops in Bago Region (West) will rise as in other regions. Similarly, the control of government on price should change and modify according to modern system and modern living standard.

From the study on the constraints in the development of the industrial crop farming in Bago Region (West), as well as other relevant issues affecting the agricultural sector, it is necessary to push for production of high-demand and high- value crops, to liberalize trade, to allow the state-owned enterprises to compete freely with the private enterprises, to upgrade the administrative and institutional efficiency and to raise capacity building.

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