ANALYSIS ON PATTERNS OF CROP CONCENTRATION IN SINGU TOWNSHIP

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Abstract

The research paper is about "Analysis on Pattern of Crop Concentration in Singu Township". Cropping Patterns are extent to which the arable land under different agricultural activities can be put into use. The main aim is to analyze the crop patterns of Singu Township and its village tracts with a view to bringing out the areal concentration. By using the method developed by Bhatia (1965), the indexes of concentration for crops grown are calculated and the results are analysed. The existing agriculture complexes are also analyzed by comparing with the distribution of physical and economic conditions. It is found that the types of cultivated crop mainly vary with types of agricultural land and many different types of crops are found in different parts of Singu Township. The results show the physical factors are still dominating the distribution of crops grown and also influences upon decision making of farmers to some extent.

Keywords: Crop Concentration, agriculture complex, cultivated crops

Introduction

Cropping patterns are the extent to which the arable land under different agricultural activities can be put to use. It becomes possible for the farmer to replace less profitable crops or enterprises with more profitable ones and also enhance the intensity of the use of the available land by growing two or even three crops on the same field in a year.

The cropping system of a region are decided more or less by a number of soil and climatic conditions which determine the overall agro – ecological setting for a crop or set of crops for cultivation. However, at farmer's level, potential productivity and monetary benefits play as guiding principles for choosing a particular crop and cropping system.

These decisions with respect to choice of crops and cropping system are further narrow down under influence of several other factors related to infrastructure facilities, socio – economic factors and technological developments.

The 20th century has seen the intensification, concentration and specialization of agriculture relying on new technologies of agricultural chemicals, mechanization and plant breeding. In the few decades ago, a move towards sustainability in agriculture has developed integrating ideas of socio- economic justice and conservation of resources and the environment in the farming system.

Aim and Objectives

The main aim is to analyze the crop patterns of Singu Township and village tracts with a view to bringing out the areal concentration.

The major objectives to be carried out the present research work are as follow:

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(a) To investigate quantitatively the regional character of crop distribution

(b) To determine the dominance of crop

Hypothesis

There are significant changes in the patterns of crop cultivation in Singu Township.

There are significant relationships between the existing socio - economic conditions and the crop cultivation in Singu Township.

Materials and Methods

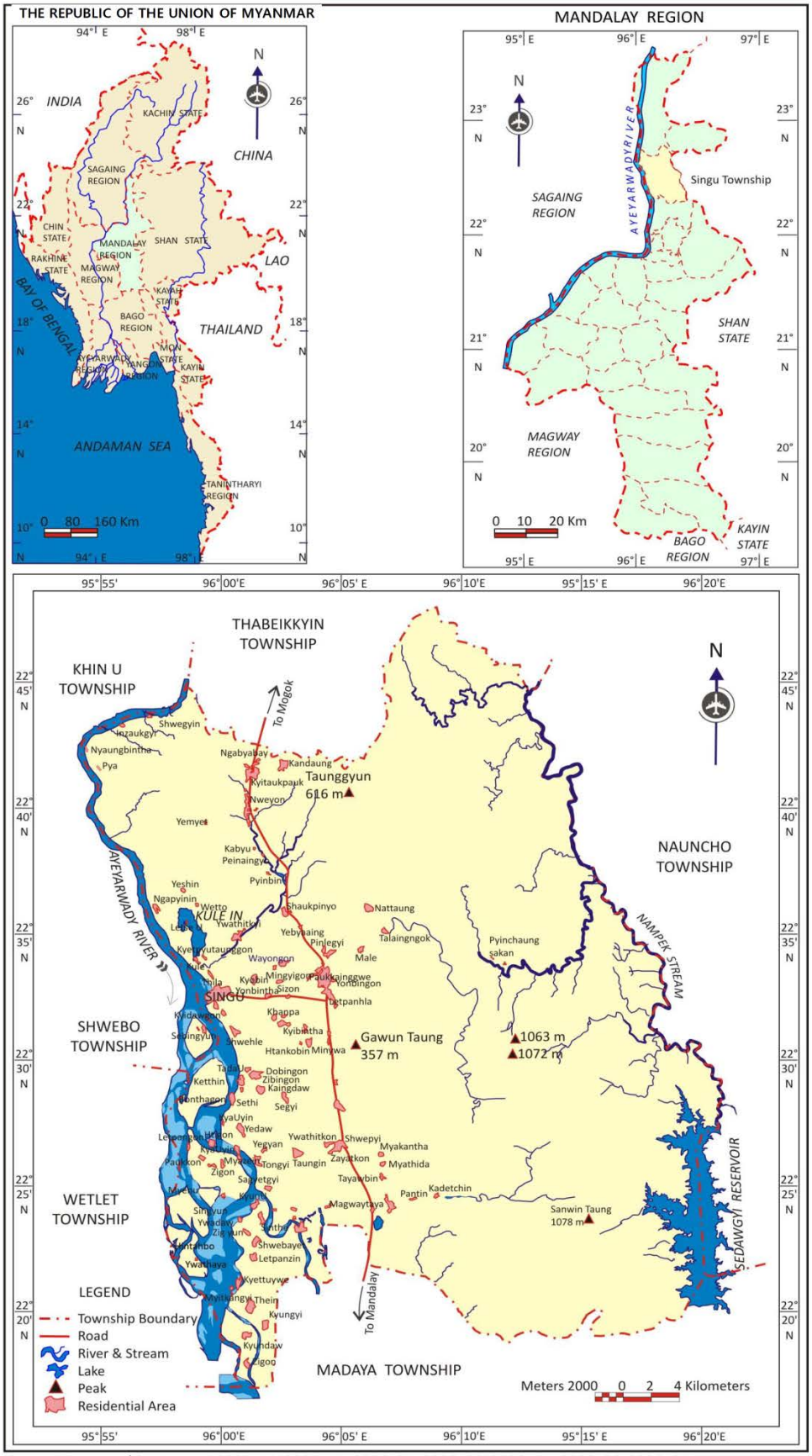
The researcher apply the following, methodologies to carry out this research work; the search of theoretical background through literature review, collection of primary and secondary data through field survey, personal interview, the structured questionnaires and collection from respective offices and other sources, application of the appropriate statistical method in analyzing the collected data, application of remote sensing, computer mapping and G.I.S to identify various land use and land cover changes, deductive and inductive approaches to arrive at the necessary conclusion with respect to the promotion and development of agricultural production and socio-economic status of the people of Singu Township.

The Study Area

Singu Township is one of the five townships of Pyin Oo Lwin District in Mandalay Region in Central Myanmar, lying between 22° 17' and 22° 40' North Latitudes and between 95° 54' and 96° 20'East Longitudes with a total area of about 544.03 square miles (348,179 acres) . The township is composed of the Eastern Hilly Region with 305m (1,000 feet) – 915m (3,000 feet) elevation, and the Western Plain Region with over 82m (270 feet) elevation (A.S.L) (see Map 1)

The Ayeyarwady River and its tributaries are the major drainage features of Singu Township and floods occur annually in the Western Plain Region. Singu Township receives Tropical Savanna Climate with about 1016 mm (40 inches) of the annual rainfall and 27.75°C (82° F)of the average temperature. It is covered by relatively large area of forests including mixed deciduous and indaing forests in the Eastern Hilly Region and dry and swamp forests in the Western Plain Region. Alluviums, meadows forest soil and red earths are the major soil types distributed from west to east in Singu Township. Therefore, agriculture has between the dominant economic activity of Singu Township and various crops are cultivated under the influence of its natural, physical and socio- economic conditions.

Map (1) Location of Singu Township



Source: Topographic Map No. 2295_14, 2295_15, 2296_01, 2296_02, 2296_01, 2296_06, 2296_07.

Analysis on Patterns of Crop Concentration

After 1988, the State Government introduced the market oriented economic system and then emerged agricultural reforms which allowed the farmers more liberalization in the selection of crop cultivation. As a result the types of cultivated crops have been changed very greatly and the cropping pattern of Singu Township have also changed depending on the types of agricultural lands, soil and relief conditions, climatic conditions, and market condition. By using the method developed by Bhatia (1965), the indexes of concentration for crops grown are calculated and the results are analyzed here.

Spatial Variation in Cropping Pattern

Type of cultivated crop varies from one place to another mainly in accord with variations in the types of land as *le, ya, kaing-kyun,* and garden lands. As the human settlement and agricultural lands are concentrated in the western alluvial plain area which is underlain by recent alluvial soils and meadow soils, the cultivated crops are less different in most of the village tract along the Ayeyarwaddy River. Therefore, only a number of major crops dominated as ranking crops in Singu Township and they include paddy, groundnut, various kinds of pulses, sugarcane and other crops. It is found that the types of cultivated crops mainly vary with types of agricultural land and many different types of crops are found in different parts of Singu Township.

For administration purposes, Singu Township is subdivided into five circles depending upon their location and different kinds of crops are cultivated in these circles leading to different concentration of cropping patterns. Among various scholars who formulated models to analyze various agricultural pattern, the present research has been applied Bhatia (1965) methods to determine the regional concentration of crops.

Distribution of Ranking Crops

Although many varieties of crops are cultivated in Singu Township, there are only a few number of crops which dominate in regional distribution with respect to their sown acreage and proportion to total cultivated. Therefore, on the study period basis, types of crops can be classed as paddy with sown area of 11,984 hectares(29,616 acres) forming about 23.94% various kind of pulses with 11,612 hectares (28,694 acres)or about 23.19% of total crop area groundnut with 8,892 hectares (21,972 acres) and about 17.76% of the total crop area ,sugarcane with 6,386 hectares (1,5776 acres) or about 12.76% of total crop area and 5,629 hectares (13,912 acres) of maize forms about 11.25 % of the total crop areas .

Among various types of crop cultivated in these Circles are paddy, groundnut and various kinds of pulses appeared as the first ranking crops whereas pulses, paddy and sugarcane appeared as the second ranking crops see Table (1).

Table 1 Ranking Crops of Singu Township in 2017-2018

No.	Circles	Paddy		Groundnut		Pulses		Sugarcane		Maize		Other		Total
		Hectares	%	Hectares	%	Hectares	%	Hectares	%	Hectares	%	Hectares	%	
1	Myoma	2,660	32.89	1,113	13.76	2,118	26.18	216	2.66	867	10.73	1,113	13.76	8,156
2	Kokko	2,162	22.21	1,085	11.10	2,233	22.85	2,427	24.83	619	6.34	1,246	12.76	9,772
3	Lepanhla	3,045	34.66	893	10.67	2,083	23.72	1,354	15.41	493	5.61	917	10.43	8,784
4	Sethe	2,835	25.21	3,538	31.46	2,149	19.11	0	0	2,283	20.30	441	3.92	11,247
5	Shwepyi	1,282	10.54	2,263	18.59	3,029	24.98	2,384	19.63	1,369	11.24	1,836	15.09	12,166
T	Total	11,984	23.94	8,892	17.76	11,612	23.19	6,386	12.75	5,629	11.25	5,553	10.09	50,056

Source: Department of Agriculture Land Management and Statistic, Singu

First Ranking Crops

Among the major crops the first ranking crops are paddy in Myoma and Letpanhla Circles, groundnut in Sethe Circle, pulses in Shwepyi Circle and sugarcane in Kokko Circle.

Paddy is cultivated in *le* lands and it is also cultivated under double cropping system where irrigation supply is available. Therefore, its sown area is the highest in Myoma and Letpanhla Circles where the area of *le* lands is the largest in Singu Township. Although the paddy area in Sethe Circle is larger than that of Myoma Circle, large area of *Kaing-kyun* land area in this Circle lead to the dominance of groundnut cultivation and paddy remained as the second ranking crop as there are no *ya* lands in this areas.

With the largest sown area in a single Circle, groundnut is the first ranking crop of Sethe Circle where 4,508 hectares (11,139 acres) of *kaing-kyun* land area is about 87.19% of its net sown area. In this Circle, pulses and maize are grown as mixed crops and they, therefore have large sown areas.

Pulses are the first ranking crops of Shwepyi Circle where 3,028 hectares (7,484 acres) of *ya* lands forms about 47.03% of its net sown area. Besides growing in *ya* lands as major crops pulses are also grown in *kaing-kyun* lands which form about 42.28% all its net sown area under mixed cropping system.

Sugarcane is the first ranking crop of Kakko Circle with 2,427 hectares (5,996 acres) forming about 24.83% of total cultivated areas. In this area, *ya* land areas is the largest agricultural lands and it is cultivated mainly as rain fed crop. However, the areas of paddy and pulses are not greatly less than sugarcane area in this Circle.

Second Ranking Crops

The second ranking crop of Singu Township is pulses in Myoma, Kokko and Letpanhla Circles, paddy in Sethe Circle and sugarcane in Shwepyi Circle.

Pulses are cultivated in various kinds of agricultural lands second crop in *le* lands as mixed crops in *kaing kyun* or as a major crops *ya* lands. Therefore, the areas of pulses are larger in all Circles. In Myoma, Kokko, and Letpanhla Circles the areas of pulse sown acreages are 2,118 hectares (5,233 acres), 2,233 hectares (5,517 acres) and 2,083 hectares(5,147 acres) forming about 26.18%, 22.85% and 23.72% of the respective total cultivated areas.

Paddy is the second ranking crop of Sethe Circle where *kaing kyun* lands form about 87.2% of total agricultural lands. As the stable islands are formed in the Ayeyarwaddy River, paddy cultivation can be carried out on higher land surfaces and it became the second ranking crop in this area.

Sugarcane is the second ranking crop in Shwepyi Circle where majority of *ya* and *kaing kyun* lands form about 89.25% of net sown area. In this Circle, all major crops are cultivated to some extent, but *ya* lands are cultivated mostly under sugarcane.

Pattern of Crop Concentration

Ranking crops are only the general patterns of crop dominance and it is necessary to determine the area concentration of individual crop and study the character of their dominance location quotient method is supplied in this analysis which applied crop area and net sown area for the individual Circle and for the whole township by using the following formula-

$$\text{Index of Crop concentration} = \frac{\text{Area of Crop in Circle}}{\text{Total sown area of Circle}} \div \frac{\text{Area of Crop in the township}}{\text{Total sown area of Circle}}$$

The first ranking crops of paddy, groundnut, pulses and sugarcane are analyzed in this parts >1.09=High, Medium 0.75-1.09, Low<0.75

Paddy

Paddy is concentrated highly in Myoma and Letpanhla Circles in the western portion of settlement and agricultural land areas of Singu Township and in the east central portion of this area where irrigation supply is possible. Medium concentration is found in the central portion mainly along the middle and southern part of the Ayeyarwaddy River in this township. Low concentration is found in southwestern portion of the township where land surface is more hilly and water availability is difficult see Table (2) and Map (2).

Table 2 Paddy Concentration of Singu Township in 2017-2018.

	1	2	3	4	5	6
No.	**Circles**	**Paddy Area (Hectares)**	**Total Crop Area (Hectares)**	**% of total crop area**	**Crop Concentration**	**Remark**
1	Myoma	2,660	8,156	0.33	1.37	High
2	Kokko	2,162	9,772	0.22	0.92	Medium
3	Letpanhla	3,045	8,784	0.35	1.45	High
4	Sethe	2,835	11,247	0.25	1.05	Medium
5	Shwepyi	1,282	12,166	0.11	0.44	Low
T	Total	11,984	50,056	0.24		

Source: Agricultural Land Management and Statistics Department, Singu

Groundnut

High concentration of groundnut is found in west central portion of Singu Township which is surrounded on both sides by medium concentration. Low concentration of groundnut is found in the eastern portion of this township, Table (3) and Map (3). From the distribution map

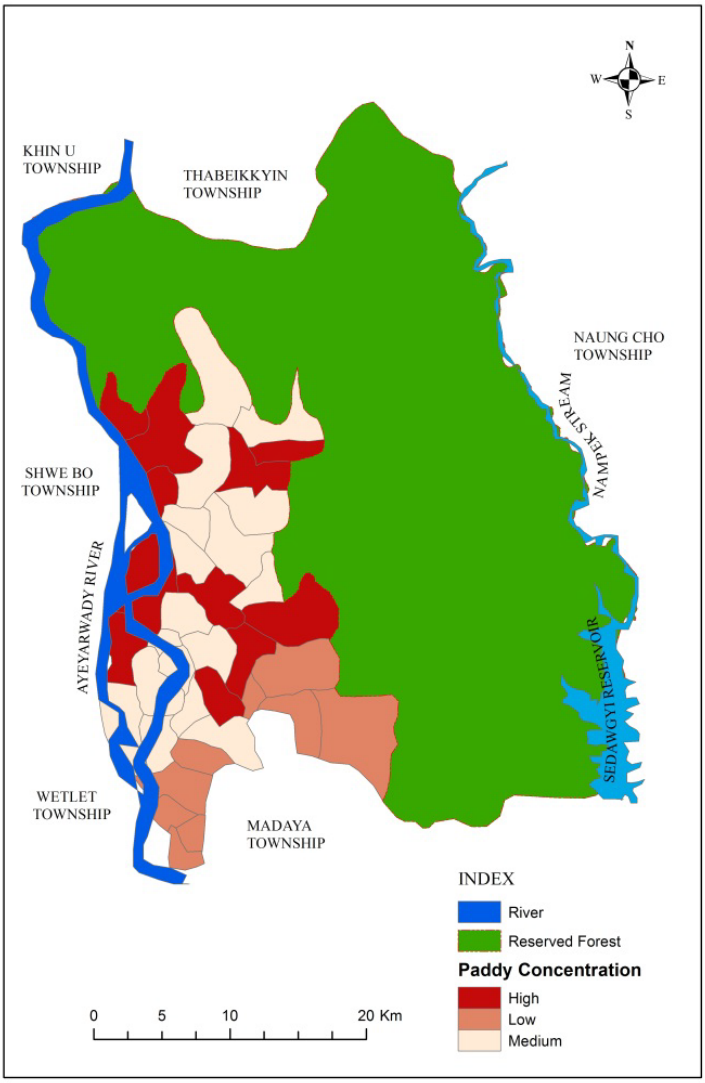
of groundnut concentration it can be considered that groundnut cultivation is concentrated along the Ayeyarwaddy River.

Table 3 Groundnut Concentration of Singu Township in 2017-2018.

No.	circles	Groundnut Area (Hectares)	Total Crop Area (Hectares)	% of total crop area	Crop Concentration	Remark
1	Myoma	1,113	8,156	0.14	0.77	Medium
2	Kokko	1,085	9,772	0.11	0.63	Low
3	Letpanhla	893	8,784	0.10	0.57	Low
4	Sethe	3,538	11,247	0.31	1.77	High
5	Shwepyi	2,263	12,166	0.19	1.05	Medium
T	Total	8,892	50,056	0.18		

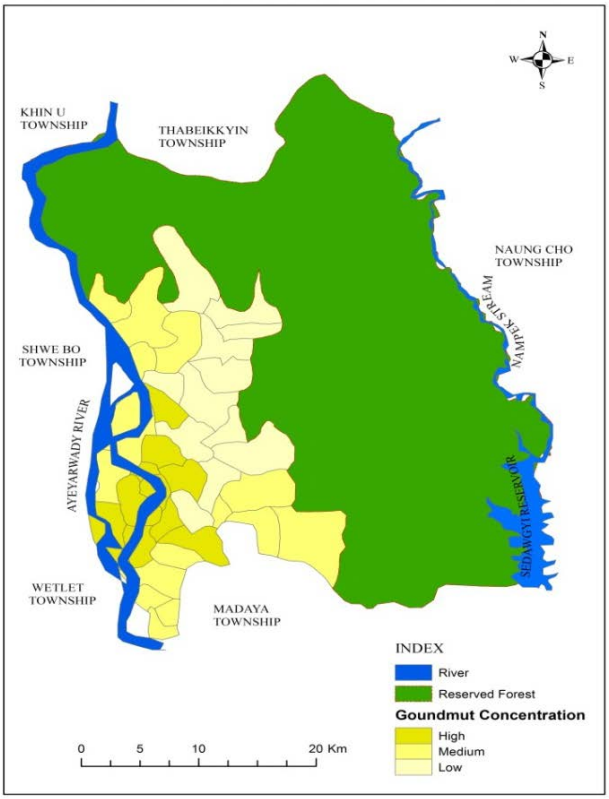
Source: Agricultural Land Management and Statistics Department, Singu

MAP - 2 PADDY CONCENTRATION OF SINGU TOWNSHIP (2017-2018)



Source: Based on table - 2

MAP - 3 GROUNDNUT CONCENTRATION OF SINGU TOWNSHIP (2017-2018)



Source: Based on table - 3

Pulses

Pulses are evenly distributed in all Circles with the high concentration in Myoma and medium concentration in the remaining parts of the township. From this distribution, it can be considered that pulses are suitable for cultivation in all Circles of Singu Township as soil and climatic condition are favourable for their cultivation. Therefore, one can successfully grow various kinds of pulses under various cropping systems see Table (4) and Map (4).

Table 4 Pulses Concentration of Singu Township in 2017-2018.

No.	Circles	Pulses Area (Hectares)	Total Crop Area (Hectares)	% of total crop area	Crop Concentration	Remark
1	Myoma	2,118	8,156	0.26	1.13	High
2	Kokko	2,233	9,772	0.23	0.98	Medium
3	Letpanhla	2,083	8,784	0.24	1.02	Medium
4	Sethe	2,149	11,247	0.19	0.82	Medium
5	Shwepyi	3,029	12,166	0.25	1.07	Medium
T	Total	11,612	50,056	0.23		

Source: Agricultural Land Management and Statistics Department, Singu

Sugarcane

Sugarcane is highly concentrated in Kokko and Shwepyi Circles with fairly high concentration in Letpanhla Circle. Sugarcane concentration in the remaining Circles is low. Therefore, high concentration of sugarcane is found in the eastern and southern parts of Singu Township whereas it is lower in the west and north western portion of this township see Table (5) and Map (5).

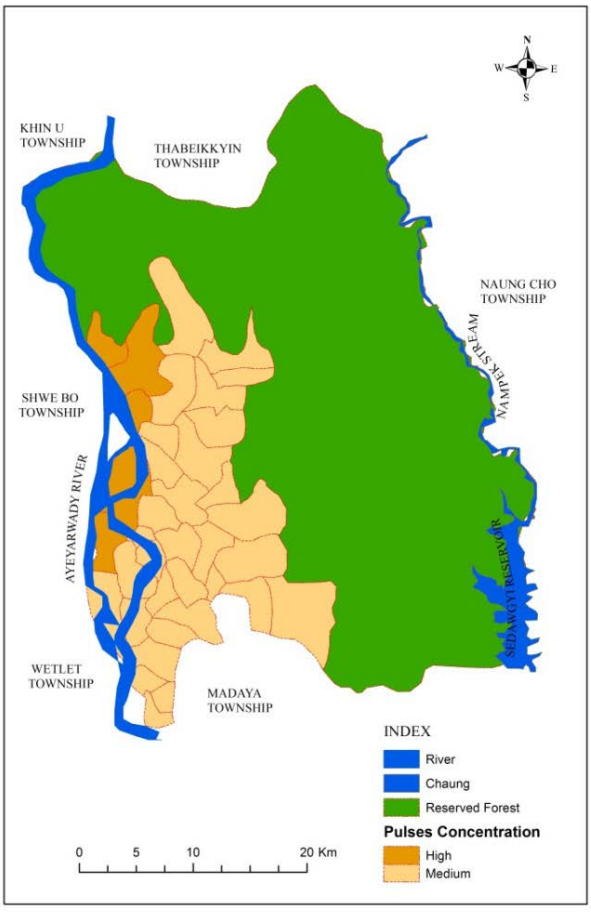
Table 5 Sugarcane Concentration of Singu Township in 2017-2018.

No.	Circles	Sugarcane Area (Hectares)	Total Crop Area (Hectares)	% of total crop area	Crop Concentration	Remark
1	Myoma	216	8,156	0.03	0.21	Low
2	Kokko	2,427	9,772	0.25	1.95	High
3	Letpanhla	1,354	8,784	0.18	1.44	High
4	Sethe	-	11,247	0	0	Low
5	Shwepyi	2,389	12,166	0.20	1.54	High
T	Total	6,386	50,056	0.13		

Source: Agricultural Land Management and Statistics Department, Singu

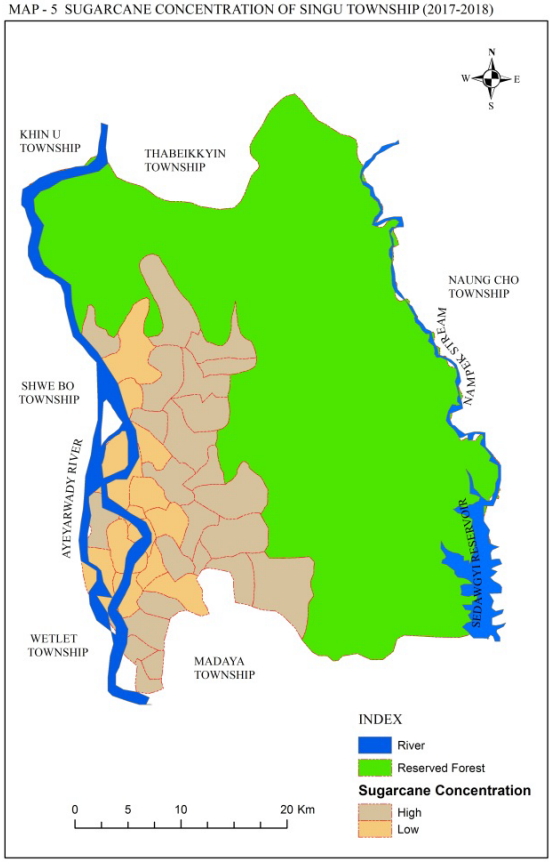
From this analysis one can easily understand that if regional concentration is larger than the whole area concentration, crop concentration is high and if they are about the same, regional concentration is medium and when regional concentration is less than total concentration, the regional concentration is low. From this point of view regional advantages and disadvantages can be considered into crop cultivation and necessary arrangements can be prepared for successful crop production.

MAP - 4 PULSES CONCENTRATION OF SINGU TOWNSHIP (2017-2018)



Source: Based on table - 4

MAP - 5 SUGARCANE CONCENTRATION OF SINGU TOWNSHIP (2017-2018)



Source: Based on table - 5

Findings and Results

According to the analytical results of the field observations, personal interview and of the data from Agricultural Land Management and Statistics Department, Singu, crop cultivation in Singu Township is mostly carried out under single cropping, double cropping and mixed cropping patterns.

It is found that single cropping system is practiced only in sugarcane cultivation which requires about one year period for harvesting. It is found that sugarcane cultivation is performed in *ya* lands as rain fed crops.

Double cropping system is practiced in all *le* lands with paddy cultivation accompanied by paddy, pulses, sesame or maize as post monsoon or winter crops. Normally pulses and sesame cultivations are performed under mixed cropping system with sunflower or maize.

In *kaing-kyun* lands, groundnut is the dominant crops and it is cultivated as winter crop under mixed cropping system with maize or sunflower.

Among various kinds of pulses, most of the varieties except pezingon are cultivated in *kaing-kyun* lands under mixed cropping system with maize or sunflower.

For this reason, cropping intensity in *kaing-kyun* cultivation is usually high in Singu Township particularly when double cropping system is practiced. It is due to high fertility of *kaing-kyun* lands which are annually renewed by the Ayeyarwaddy River floods.

Pezingon is ya crop and it is usually cultivated in monsoon periods with mixed cropping system with sunflower. This is followed by cultivation of groundnut, pulses and vegetables as cool season crops.

Vegetables are particularly grown in *kaing-kyun* land as cool crops under mixed cropping system with maize.

In garden lands, perennial crops such as banana, mango, Jack fruit, etc. is grown. However, mixed cropping with seasonal crop such as vegetables and flowers is a normal practice. Moreover, the area of garden land is relatively small and therefore only seasonal crop cultivation becomes the only dominant cropping pattern of Singu Township and it can be stated in the following crop combination patterns.

1. Paddy + Pulses or Sesame mixed with maize
2. Pezingon + Pulses, groundnut or vegetables
3. Groundnut mixed with maize + vegetables
4. Pulses mixed with maize or sunflower + vegetables or sesame
5. Sesame + paddy
6. Sesame + pulses mixed with maize

As soil, relief and climatic conditions are favuorable in Singu Township various crops can be grown with success and the farmer used to select their desired crops depending upon the market condition and the above crop combination patterns are found in all Circles and all village tracts depending upon the types of agricultural lands.

In *le* lands paddy of sesame is the first crops whereas paddy, groundnut or vegetables and pulses are the first crops and *kaing-kyun* lands.

Although the areas of total cultivated crops have increased year after year, the major crops of Singu Township are the same in the study. Although there are variations in cultivated areas of major crops, all variations lie between (+) and (-) two standard deviation and as a result, their cultivated areas can be considered as a normal distribution pattern and the only variations in cropping patterns of Singu Township are the application of improved seeds, machines, fertilizers and pesticides and modern cultivation techniques, harvesting and storage methods which resulted in increased crop maturity and success and increased acreage yield.

Conclusion

Being located in the northern portion of Central Dry Zone of Myanmar, Singu Township has favorable conditions for crop cultivation. However, the location at a distant away from the major markets especially Mandalay and other ancient royal capitals, caused agricultural activities to be traditional practice which was further supported by central planned economic policies before 1988. After 1988, the state has practiced the market oriented economic system and then emerged agricultural reforms which allowed the farmers more liberalization in crop cultivation. In this way the roles of farmers have been higher than the former in economic life of the country and their economic lives have also a changed greatly.

Acknowledgements

First and foremost, I would like to express my gratitude to Dr. Nyo Nyo, Professor, Head of Department of Geography and Environmental Studies, University of Mandalay, for her guidance, editing and valuable advices about this paper. I also would like to express my thanks to Dr. Nay Aung and Dr. Soe Sandar San, Professor, Department of Geography and Environmental Studies, University of Mandalay for their encouragement.

I am greatly indebted to all of my teachers and colleagues who have help me with great kindness and patience.

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