

Spatial Analysis of Cropping Pattern in Thabeikkyin Township

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Abstract

In Thabeikkyin Township, majority of people live in rural areas and their main occupation is depending upon the crop cultivation. Therefore the development of crop cultivation is vital to the socio-economic development of Thabeikkyin Township. The main aim of this paper is to point out the improvement of crop cultivation which is essential for the economic development in Thabeikkyin Township. The spatial analysis on the crop cultivation is done by using J.C Weaver's crop combination method. It is found that, together with the development of crop cultivation, the development of other primary activities should be increasingly existed and proportionally carried out in Thabeikkyin Township. This research may partially contribute to the rural development and poverty alleviation schemes in Thabeikkyin Township as well as in other areas in Mandalay Region.

Introduction

As a branch of geography the focus of economic geography is spatial that is to describe and explain the location of phenomena. Economic geography is concerned with explaining the locational characteristics of things of utilitarian value to people, particularly the things people consider valuable enough to move from one part of the earth to another. The major premise in economic geography indeed is that, despite an uneven placement, people and their activities are distributed in an orderly and understandable manner. However, the underlying orderliness is usually not simple enough to be explained by a single factor such as environment. In fact, the explanation should base on a variety of factors since it involves as interplay among a number of variables of physical, social and economic character.

Thabeikkyin Township is a northernmost township of Mandalay Region. Myanmar's most important river, the Ayeyarwady enters Mandalay Region just north of Tagaung in Thabeikkyin Township. Agriculture has been practiced in Thabeikkyin

Township since very early days. Thus, the crop cultivation has been the main occupation and the mainstay of the economy of Thabeikkyin Township. Based on physical and socio-economic factors that affecting upon the crop cultivation, spatial analysis of crop cultivation in Thabeikkyin Township should be made.

Aim and Objectives

The main aim of this research is to point out the spatial variations of cropping pattern which are essential for the economic development in Thabeikkyin Township.

The objectives of this research are as follows:

- To examine the factors that affecting upon the cropping pattern in Thabeikkyin Township.
- To classify the crops grown in the study area.
- To identify the spatial variation of cropping pattern in the study area.

Data Collection and Methodology

Both primary and secondary data are collected from the various sources. Primary data are acquired by taking the field surveys. Questionnaires and interview are done with local people in Thabeikkyin Township. The essential information to the research problem and general background information of the study area are collected from Internet and Libraries.

Secondary data are collected from Myanmar Agriculture Service, Land Record Department, Meteorology and Hydrology Department, Immigration and National Registration, Township General Administration (Thabeikkyin) and from some Non-Government Organizations.

To analyze the cropping pattern of Thabeikkyin Township, J.C Weaver's crop combination method was used.

For purpose of clarity and comparability, the data are represented in varied forms of tables, maps, graphs and figures, supplemented by occasional photographs. Finally, geographical interpretations of the results have been done with the help of the maps.

Factors that affecting upon the Cropping Pattern

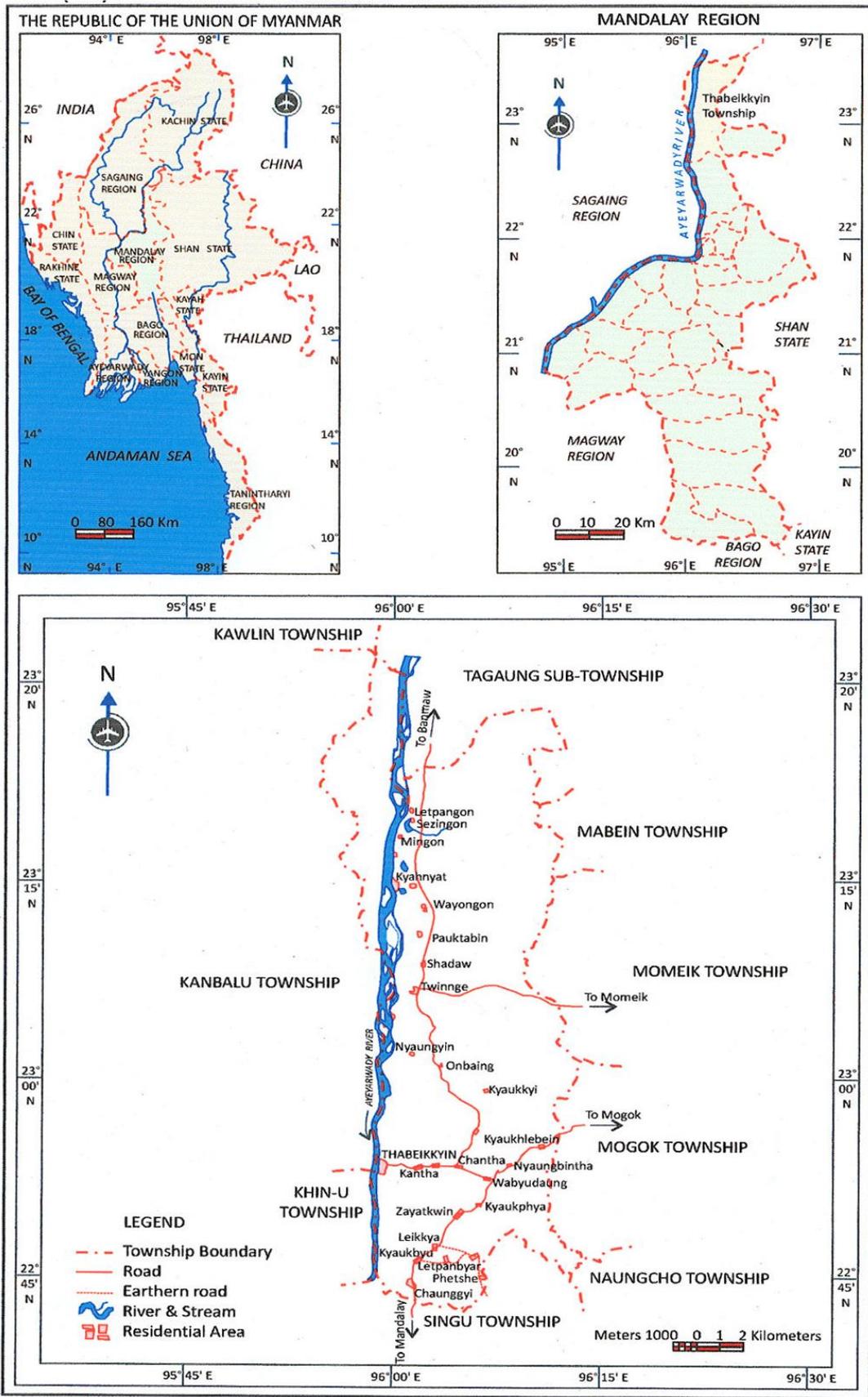
Thabeikkyin Township is a northern most township of Mandalay Region. It lies between latitudes 22° 45'N and 23° 20'N and longitudes 95° 45'E and 96° 30'E. The total area of Thabeikkyin Township is 697.11 square miles or 446,149 acres. Thabeikkyin Township is constituted of two urban wards and 15 village tracts and 30 villages. As Thabeikkyin Township is situated in the north-western extreme of the Shan Highland, it is a mountainous area. The crop cultivation of Thabeikkyin Township is carried out based on the topography, soil, climate and social factors. The topography of Thabeikkyin Township can be divided into plain area and upland area. The plain area was formed by the deposition of alluvium by Ayeyarwady River and the streams which flow into Ayeyarwady River. Thus the plain area was located along Ayeyarwady River. The alluvial islands are formed in Ayeyarwady River. It is found that as the plain area and alluvial islands are fertile lands they are favorable for agricultural activity.

The upland area can be subdivided into two parts as the eastern upland and the western upland. The eastern upland is mostly hilly and the ranges are the continuous part of Shan Highland. In general the ranges are aligned north to south. The western upland is located in the west of Ayeyarwady River. It is part of Minwun Range which runs parallel to Ayeyarwady River. It is found that as the upland area is covered with forests, forestry activity can be practised in the upland area. In studying the drainage of Thabeikkyin Township, it is found that the main Ayeyarwady River, drainage of the township flows from north to south in the western part of the township. Ayeyarwady River is favourable for transporting the products of the crop cultivation from Thabeikkyin Township to Kachin State and Mandalay Region.

According to Koppen's Climatic Classification, the climate of Thabeikkyin is found to be 'Aw' (Tropical Savanna Climate). The average annual rainfall of Thabeikkyin Township is 45.74 inches. The main soil types found in the Thabeikkyin Township are (1) Alluvial Soil (2) Meadow Soil (3) Red Brown Savanna Soil (4) Yellow Brown Forest Soil (5) Red Brown Forest Soil (6) Shallow Mountainous Red Earth Soil and (7) Mountainous Red Earth Soil.

According to 2014 population census data, the total population of Thabeikkyin Township is 127,832 persons. Thabeikkyin Town Proper has the total population of

LOCATION OF THABEIKKYIN TOWNSHIP



Source: Topographic Map No. 2295_13, 2295_14, 2296_01, 2296_02, 2395_14, 2395_15, 2395_16, 2396_03, 2396_04 and 2396_07.

5,630 persons which is 4.41 percent of the total population of the township. Most of the people are concentrated in the rural areas with 122,202 persons which constituted 95.59 percent of the total population of the township.

The distribution of the agricultural land is mainly controlled by topography and soil. The fertile agricultural land areas are found along the river banks, valley plains and small flat land areas in mountainous areas. The total township area is 446,149 acres out of which the agricultural land area is 50,338 acres accounting for 11.28% of the total township area.

The agricultural land can be divided into five types, namely, '*Le*' land, '*Ya*' land, '*Kaing-Kyun*' land, Garden land and '*Taungya*' land. The '*Le*' land is found along the bank of the Ayeyarwady River and low plain areas where the tributary streams enter the Ayeyarwady River. Most of the '*Le*' lands are found to be dependent on the rainfall. The '*Ya*' land is the most important and largest type of land. Due to irregularity of rainfall, the dry cultivation is carried on. '*Kaing-Kyun*' cultivation is an important cultivation in Thabeikkyin Township and it accounts for the second largest cultivation. It is found in the islands in the Ayeyarwady channel and the floodplains along the bank of the Ayeyarwady River. Garden cultivation forms the smallest cultivation in Thabeikkyin Township. It is not cultivated commercially. Garden crops are mostly grown in house compounds.

Thabeikkyin Township receives moderate amount of rainfall. There are paddy land areas depending on rainfall. In addition, paddy cultivation is also practised by the help of irrigation. There are only private irrigation works. Well irrigation, tank irrigation and pump irrigation are found to be worked in Thabeikkyin Township. Only paddy is cultivated by irrigation.

In Thabeikkyin Township '*Ya*' land cultivation and '*Kaing-Kyun*' cultivation are found to be the largest and the most important. The crops cultivated in the township are cereal crop, oil seed crop, industrial crop, pulses and other crop.

The cereal crop cultivated in the township are paddy and maize. Paddy is mostly cultivated on the Ayeyarwady floodplain and in the plain areas on the Shan Highland. Although paddy is the staple food crop, the sown acreage is found to be small.

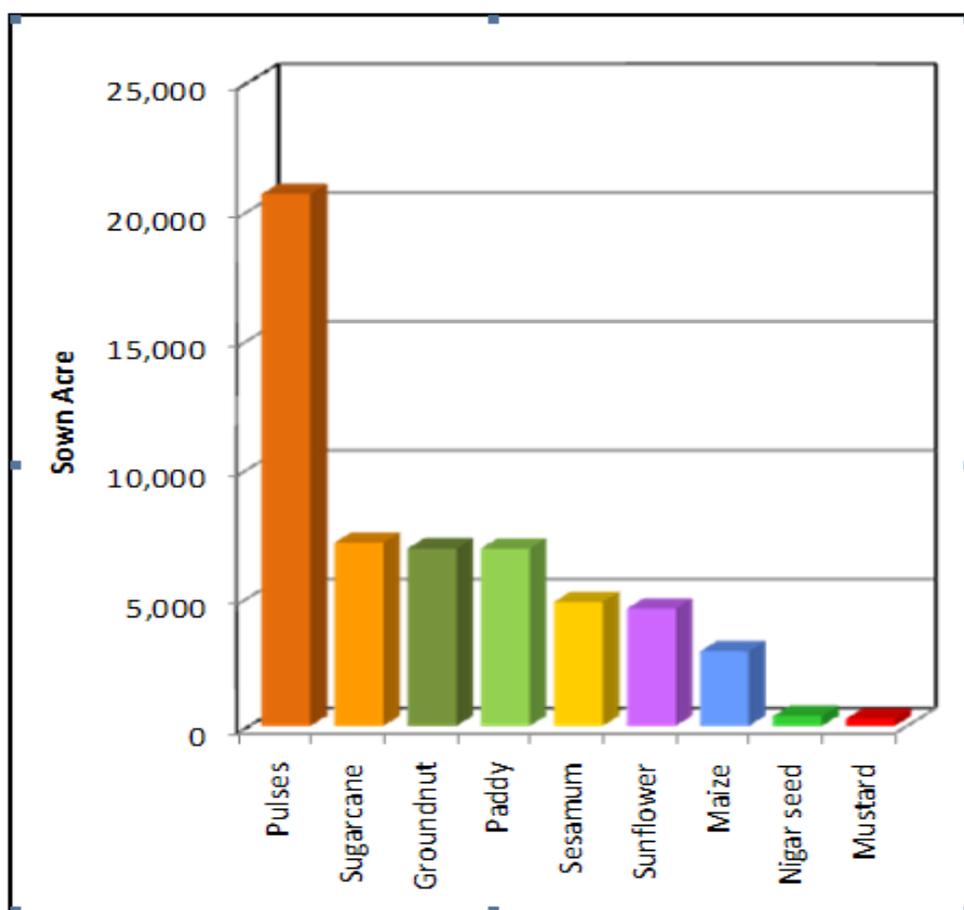
In Thabeikkyin Township, there are maize cultivation and millet cultivation. Maize is mostly cultivated.

Sown Acres of Various Crops in Thabeikkyin Township (2014)

No	Crop	Sown Acre	Percentage of Current Sown Area
1	Pulses	20,639	41.00
2	Sugarcane	7,115	14.13
3	Groundnut	6,887	13.68
4	Paddy	6,884	13.67
5	Sesamum	4,810	9.56
6	Sunflower	4,555	9.05
7	Maize	2,892	5.75
8	Nigar seed	382	0.76
9	Mustard	284	0.56

Source: Land Records Department, Thabeikkyin.

Sown Acres of Various Crops in Thabeikkyin Township (2014)



Source: Based on Table

Major Crops Cultivated in Thabeikkyin Township



Paddy (Kyaukbyu)



Maize (Gwebinhmaw)



Groundnut (Twinnge)



Sesamum (Sabenago)



Pulses (Kyahnyat)



Sugarcane (Thabeikkyin Town Proper)

Source: Compiled by Researcher

The oilseed crop cultivated in Thabeikkyin Township are mainly groundnut, sesamum, and sunflower. Nigar seed and mustard are also found to be cultivated. Groundnut is cultivated on meadow alluvial soil, sandy loam and '*Kaing-Kyun*' land areas. It is cultivated on alluvial islands and along streams.

In Thabeikkyin Township, sugarcane is commercially cultivated as industrial crop. Pulses are also cultivated on '*Kaing-Kyun*' land areas in the Thabeikkyin Township. The pulses cultivated in the township include gram, green gram, pigeon-pea, black gram, cow-pea, erect groundnut, butter bean, green-pea and other pulses. Of these pulses, pigeon-pea is the most predominant pulse. Green gram is the second most cultivated.

As to the cultivation of other crops in Thabeikkyin Township, chilli, onion, vegetables, fodder crops and other condiment crops are cultivated. Of these crops, onion is the most cultivated.

Cropping Pattern

Cropping pattern is the extent to which the arable land under different agricultural activities can put to use. Crop combination analysis is one of the most vital methods of studying agricultural patterns. Therefore the crop combinations of Thabeikkyin Township was first calculated by means of J.C Weaver's crop combination method.

J.C Weaver's Crop Combination Method

$$\delta^2 = \frac{\sum (d)^2}{n}$$

δ = standard deviation

d^2 = deviation from mean square

n = number of crops

\sum = summation of value of d^2 in an areal units

The crop combination of Thabeikkyin Township in 2014 is presented in table. According to table, there was no village tract in Thabeikkyin Township which was engaged in mono crop cultivation. Thabeikkyin Town Proper and three village tracts such as Kyaukkyi, Kyaukhlebein and Onzon village tracts cultivated crops on two-

crop combination system. In the cultivation of two-crop combination system paddy was grown together in combination with pulses and maize. Pulses was also grown together in combination with sesamum. Sugarcane was grown together in combination with pulses out of the village tracts which were engaged in the cultivation of two-crop combination system, village tracts where paddy was sown as first priority crop were Kyaukkyi and Kyaukhlebein village tracts. Onzon Village Tract grew pulses as first priority crop in the cultivation of two-crop combination system. In Thabeikkyin Town Proper, sugarcane was grown as first priority crop in the cultivation of two-crop combination system.

In Thabeikkyin Township, Kyaukbyu, Yehnyar-U and Kyaukphyar village tracts were engaged in the cultivation of three-crop combination system. In Kyaukbyu Village Tract, paddy was grown together in combination with pulses and sesamum. Yehnyar-U Village Tract was grown pulses as first priority crop in combination with paddy and sesamum. Kyaukphyar Village Tract cultivated pulses as first priority crop together in combination with sesamum and groundnut.

There was no village tract which was engaged in the cultivation of four-crop combination system. Pauktabin and Gwebinhmaw village tracts carried on the five-crop combination system. The first priority crop was pulses. Pauktabin Village Tract cultivated pulses together in combination with groundnut, sugarcane, paddy and sunflower. In Gwebinhmaw Village Tract, pulses was grown as first priority crop in combination with maize, sesamum, sunflower and groundnut.

Sezingon, Wayongon and Sabenago village tracts were practised in the cultivation of six-crop combination system. In these village tracts, sugarcane and pulses were cultivated as first priority crops together in combination with paddy, sesamum, groundnut, sunflower and maize as presented in table. There were two village tracts which were engaged in the cultivation of seven-crop combination system. These are Kyahnyat and Wabyudaung village tracts. In these village tracts, pulses was grown as first priority crop together in combination with paddy, groundnut, maize, sunflower, sugarcane and sesamum.

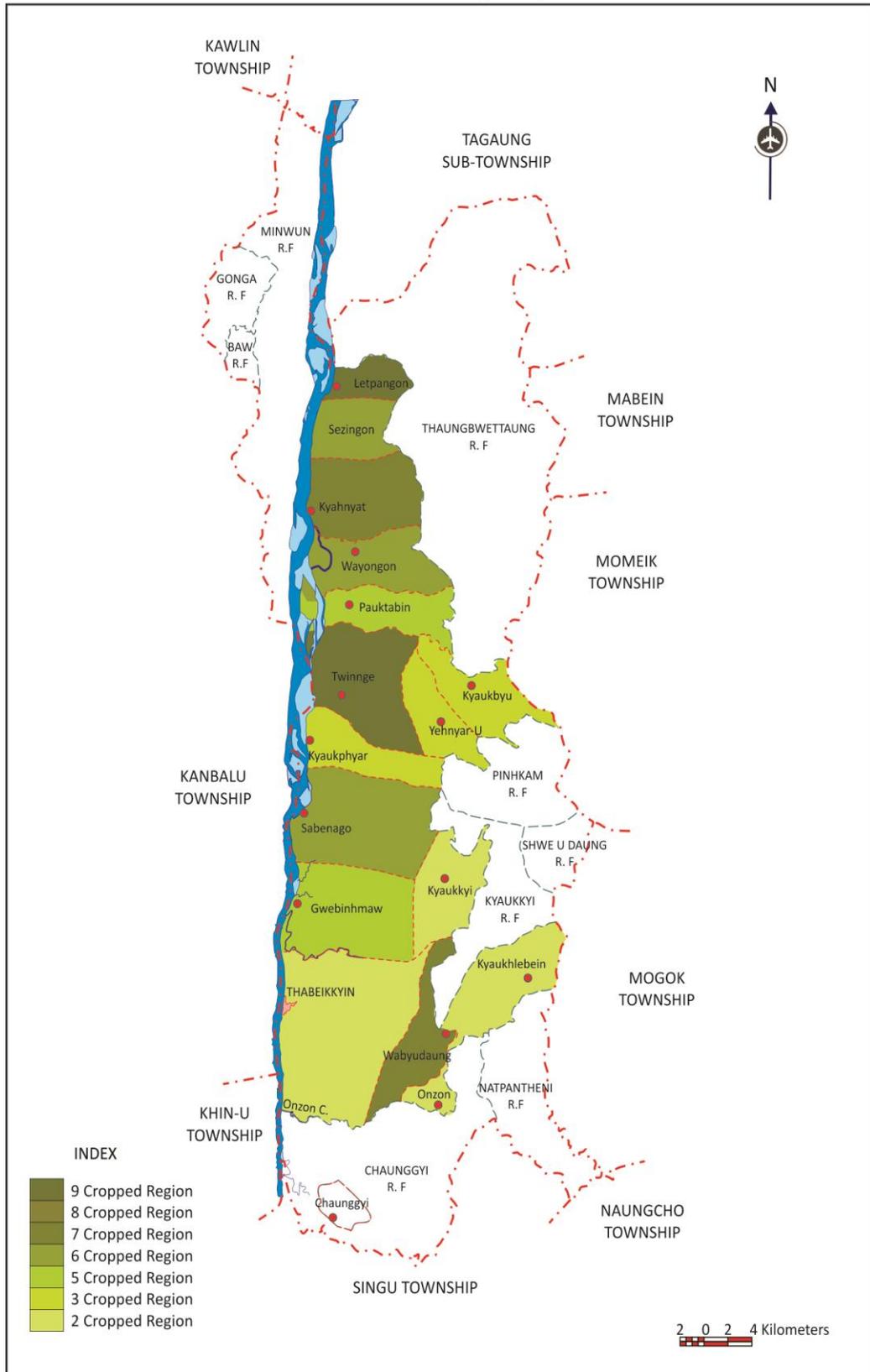
There was no village tract which was carried on the cultivation of eight-crop combination system. Letpangon and Twinngone village tracts were practised in the cultivation of nine-crop combination system. In these village tracts, sugarcane and pulses were grown as first priority crops in combination with groundnut, sunflower, sesamum, paddy, maize, nigar seed and mustard.

Crop Combinations of Thabeikkyin Township (2014)

No.	Crop Combination	Village Tract	Crop Ranking								
			1	2	3	4	5	6	7	8	9
1.	Two-Crop	Kyaukkyi	Paddy	Pulses							
		Kyaukhlebein	Paddy	Maize							
		Onzon	Pulses	Sesamum							
		Thabeikkyin	Sugarcane	Pulses							
2	Three-Crop	Kyaukbyu	Paddy	Pulses	Sesamum						
		Yehnyar-U	Pulses	Paddy	Sesamum						
		Kyaukphyar	Pulses	Sesamum	Groundnut						
3	Five-Crop	Pauktabin	Pulses	Groundnut	Sugarcane	Paddy	Sunflower				
		Gwebinhmaw	Pulses	Maize	Sesamum	Sunflower	Groundnut				
4.	Six-Crop	Sezingon	Sugarcane	Pulses	Paddy	Sesamum	Maize	Sunflower			
		Wayongon	Pulses	Paddy	Groundnut	Sunflower	Sugarcane	Maize			
		Sabenago	Pulses	Sesamum	Groundnut	Sunflower	Paddy	Maize			
5.	Seven-Crop	Kyahnyat	Pulses	Paddy	Groundnut	Sunflower	Sugarcane	Maize	Sesamum		
		Wabyudaung	Pulses	Paddy	Maize	Sunflower	Sesamum	Sugarcane	Groundnut		
6.	Nine-Crop	Letpangon	Sugarcane	Pulses	Groundnut	Sesamum	Sunflower	Paddy	Maize	Nigar	Mustard
		Twinngé	Pulses	Groundnut	Sunflower	Sesamum	Paddy	Maize	Sugarcane	Nigar	Mustard

Source: Compiled by Researcher

CROP COMBINATION OF THABEIKKYIN TOWNSHIP (2014)



Source: Based on Table.

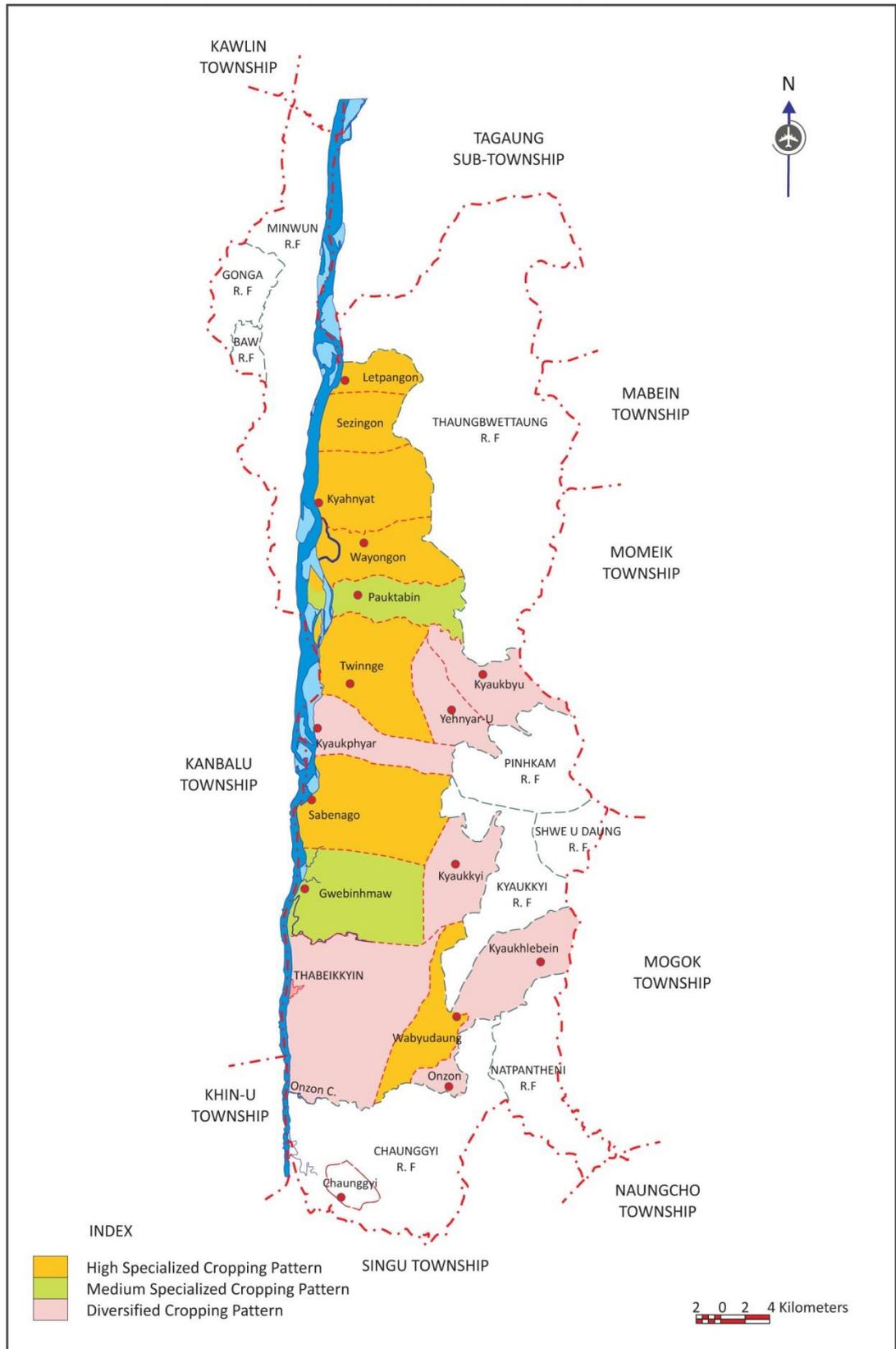
Findings

By basing on the crop combination system of Thabeikkyin Township and by applying Dr. M.Farooq Siddiqi's concept, the cropping pattern of Thabeikkyin Township had been classified into three types as High Specialized Cropping Pattern, Medium Specialized Cropping Pattern and Diversified Cropping Pattern. The cropping pattern of Thabeikkyin Township in 2014 is shown in Map.

According to Dr. M.Farooq Siddiqi's concept, the regions which were engaged in the cultivation of monoculture, two-crop combination system and three-crop combination system were classified as regions with High Specialized Cropping Pattern. In Thabeikkyin Township, seven village tracts had High Specialized Cropping Pattern and they amounted to 44 percent of the total village tracts of the township. Most of these village tracts can be found at the fringe of reserved forests. The cultivation of four-crop combination and five-crop combination systems were classified as Medium Specialized Cropping Pattern. Therefore Pauktabin and Gwebinhmaw village tracts engaged in the cultivation of Medium Specialized Cropping Pattern. These village tracts had good 'Ya' Lands.

The cultivation of six or more crop combination systems were classified as Diversified Cropping Pattern. In Thabeikkyin Township, seven village tracts were engaged in the cultivation of Diversified Cropping Pattern and they amounted to 44 percent of total village tracts of the township. These village tracts are located along the Ayeyarwady River where the fertile agricultural lands are concentrated. The agricultural activity was more developed in these village tracts than the other village tracts in Thabeikkyin Township.

CROPPING PATTERN OF THABEIKKYIN TOWNSHIP (2014)



Source: Based on Table (4.1).

Result

The majority of people live in rural areas in Thabeikkyin Township and their main economic activity is crop cultivation. Crop cultivation is engaged everywhere in the township. Therefore the development of crop cultivation is the main essential requirement for rural development and poverty alleviation in Thabeikkyin Township.

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