

POTENTIAL COFFEE CULTIVATION AREAS IN THANDAUNGGYI TOWNSHIP

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Abstract

Thandaunggyi Township. is situated in northern part of Kayin State, southeastern part of Myanmar. Being mountainous and hilly region with very few lowlands, agricultural activities especially cultivation of perennial crops is indispensable for the people of Thandaunggyi Township. Perennial crops such as tea, coffee, betel-nut palm, cardamon, rubber, durian, mangosteen etc. are widely grown in the study area. This paper mainly focuses on coffee cultivation. The objectives of this paper are to highlight the supporting factors of the coffee cultivation areas and to investigate the potential coffee cultivation areas. In Thandaunggyi Township, coffee cultivation was introduced since the British Colonial Period and still practiced in the present day. Coffee has become a vital cash crop for many developing countries. It is also imperishable, easy to transport and one of the world's market products. Majority of people consumed coffee and demand is greater day by day. Physical environment such as topography, climate, fertile soil, and vegetation are favourable conditions for the potential coffee cultivation areas in Thandaunggyi Township. About 70 percent of the people of Thandaunggyi Township are tied up with agricultural activities. Primary data are conducted by interviews and discussions with cultivators and the responsible persons of the department concerned. Secondary data applied in this paper are obtained from various department concerned. This paper attempts to explore the suitable areas for coffee cultivation in Thandaunggyi Township.

Key words: perennial crops, potential, coffee, favourable conditions

Introduction

In 2005-06, the area under coffee in Thandaunggyi Township was 2965.14 ha (7327 acres) and one viss of coffee was about 2000 kyats. In 2012-13, the total acreage of coffee in Thandaunggyi Township was 3860.30 ha (9539 acres) and one viss of coffee was about 2500 kyats. The area under coffee and price also increased. Therefore, it needs to examine whether it is beneficial to extend coffee cultivation.

Study Area

Thandaunggyi Township is located in the northern part of Kayin State, south eastern part of Myanmar (Figure. 1). Most of the area of Thandaunggyi Township is covered by the eastern mountain ranges (Ashay Yoma) and clothed with dense forest.

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Mathematically, Thandaunggyi Township lies between North Latitudes $18^{\circ} 36'$ to $19^{\circ} 30'$ and East Longitudes $96^{\circ} 22'$ to $97^{\circ} 4'$. It is bounded on the east by Hpasauing Township, on the north by Pekon Township, Lewe and Pyinmana Townships, on the west by Yedashe, Taungoo and Htantabin Townships and on the south by Kyaukkyi and Papun Townships (Figure.2). It has an area of 3659.3683 square miles (1412.89 square miles), composed of four towns and 59 village tracts (Figure.3).

Research Problems

1. What are the reasons for the extension of coffee cultivation?
2. Where are the potential areas for coffee cultivation?

Objectives

1. To highlight the supporting factors of the coffee cultivation areas
2. To investigate the potential coffee cultivation areas

Methodology

Primary data are carried out by interviews and discussions with the cultivators and the responsible persons of the department concerned.

Secondary data applied in this paper are obtained from the various department concerned.

In order to express the potential coffee cultivation areas, GIS method was applied.

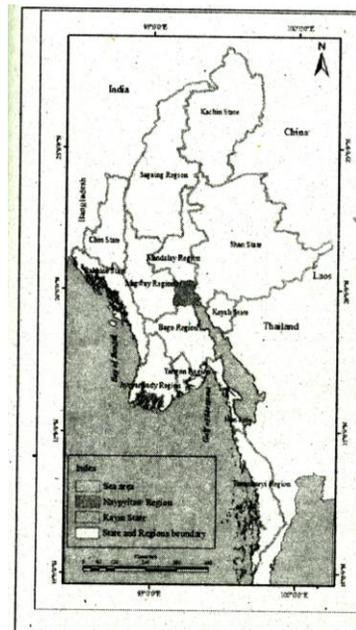


Figure 1. Ocation of Kayin State
Source: Landuse Department of Yangon

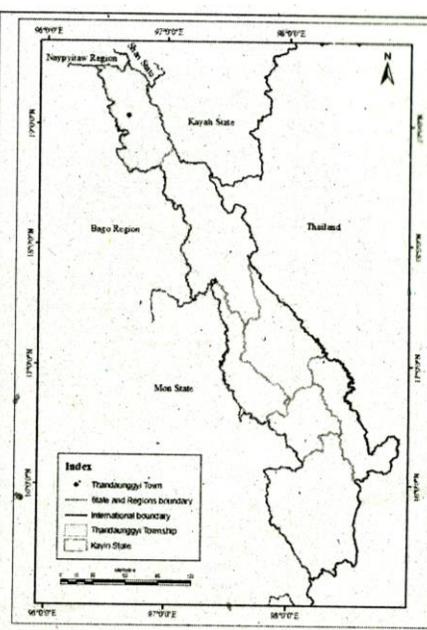


Figure 2. Location of Thandaunggyi Township
in Kayin State
Source: Landuse Department of Yangon

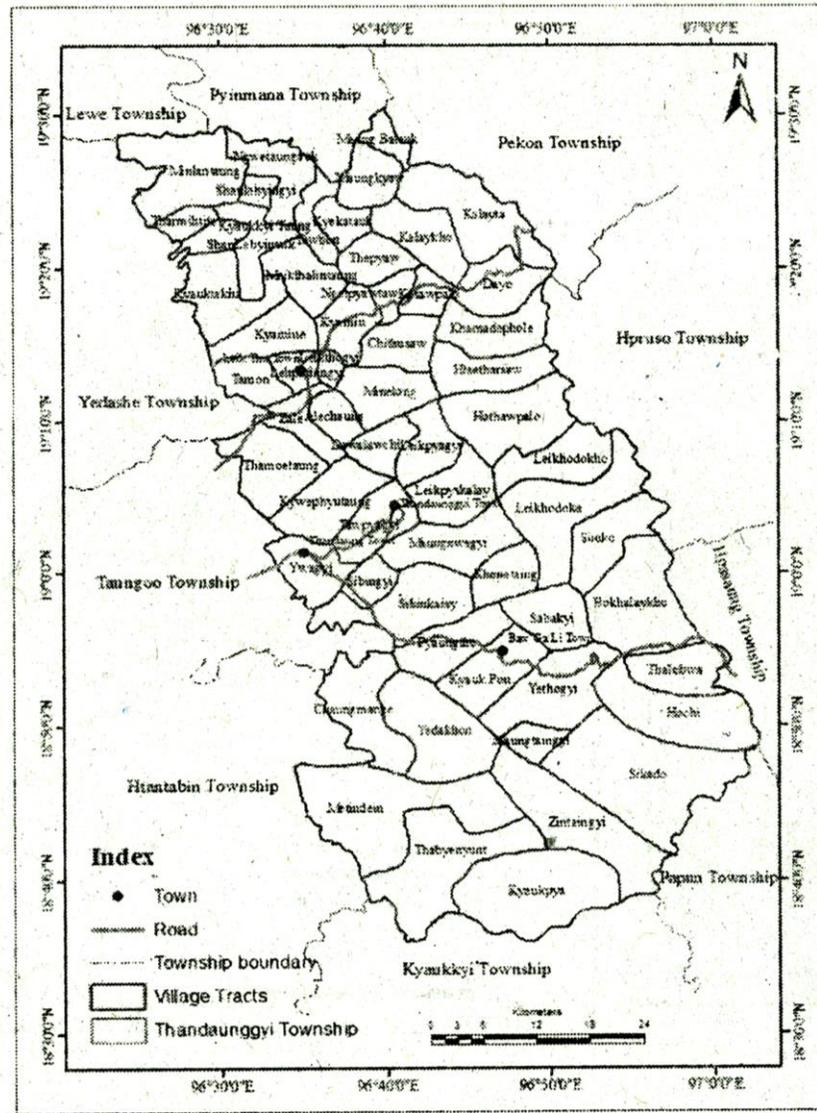


Figure 3. Village Tracts in Thandaunggyi Township

Source: Settlement and Land Records Department of Thandaunggyi Township

Types of coffee

There are two main species of commercial coffee, *Coffea Arabica* and *Coffea canephora* (robusta) and two minor species, *Coffea liberica* and *Coffea excelsa*.

Arabica is a higher quality and higher value coffee normally grown in cooler, elevated areas of the tropics and sub-tropics at 1000 m (3300 feet) or more above sea level. Arabica is used in the roast and ground coffee market and is added to blends of Robusta to improve quality of instance coffee.

Robusta is lower quality and prices are normally about 30 to 40% less than Arabica. Robusta is normally grown in warmer areas at lower elevation, up to

approximately 1000 m (3300 feet). Robusta is used mainly in instant coffee. Compared with Arabics, Robusta is generally more vigorous, more productive and considered resistant/tolerant to leaf rust.

Liberica and **Excelsa** are grown mainly in low, hot climate areas. Quality is poor and markets are limited. In Thandaunggyi Township, Arabica, Robusta and Excelsa coffee are widely grown.

Environmental conditions of the coffee cultivation

There are varieties of perennial crops in Thandaunggyi Township. Coffee plantation was started in Thandaunggyi Township since 1885, and it has increased to the present day. Generally, coffee can be successfully grown on high elevation with copious moisture content and high temperature. An elevation higher than 1000 meter (3000 feet) above sea level is required¹ for Arabica coffee.

Arabica coffee prefers a cool temperature i.e. an optimum daily temperature of 20° C to 24° C (68° F to 75° F). Temperature higher than 30°C (86° F) causes plant stress leading to a cessation of photosynthesis. Mean temperatures below 15° C (59° F) limit plant growth. The amount of rainfall between 1200 mm to 1500 mm (47 inches to 60 inches) is necessary and it should be evenly distributed over seven to nine months of the year.

Coffee can be grown on many different soil types, but fertile, volcanic red earth or deep, sandy loam soils are more suitable. A free draining soil with a minimum depth of 914 m (3 feet) is required for successful production. Coffee prefers a soil with pH 5 to 6.

An easterly or southern facing aspect with a slope less than 15 percent is preferable. Steeper slopes present a major erosion risk and require terracing or special management such as contour furrows or preferably grass strips.

Besides, genetics, environmental conditions and management are the vital factors for the quality and yield.

The supporting factors of the coffee cultivation

Physical factors

The main physical features relief, drainage, climate, soils and-vegetation are the supporting factors for coffee cultivation.

Relief

In general, the whole region of Thandaunggyi Township is hilly and mountainous with very few low lands. The eastern part is more dissected and rugged terrain than the western part. The physiography of Thandaunggyi Township can be divided into three parts as:

- The eastern mountain ranges
- The foothill in the west

- The narrow alluvial valley in the, south west.

Almost the whole area of Thandaunggyi Township is covered by the eastern mountain ranges (Ashay Yoma). In this region, Nattaung is the highest peak with 2620.37 meter (8597 feet) located on the boundary between Kayah and Kayin States. The border between Papun and Thandaunggyi Township is much higher in elevation than the surrounding area. This region is highly mountainous and densely forested. In the former days, where the slope gradient is very steep (such as southeastern part of the township), the area under perennial crops is very rare. Nevertheless, coffee cultivation is gradually increasing in this area due to accessibility and market demand.

The foothill region is located along the western boundary of the township. The elevation ranges between 76.2 meter (250 feet) and 304.8 meter (1000 feet) above sea level. The gentle slopes of these foothills are highly suitable for perennial crops cultivation.

The narrow alluvial covers a very small area. This alluvial land is located about 76.2 meter (250 feet) above sea level. Agriculturally, this alluvial valley is very important for other crops than coffee (Figure.4).

Drainage

In Thandaunggyi Township, almost all the streams take their source from high mountain ranges and flow between gorges. The Thaukyegat Creek is prominent and also one of the longest tributaries of the Sittaung River.

Other distinctive creeks are the Moksoma Creek, the Meikthalin Creek, the Kyi Creek, the Myitngan Creek, the Metindein Creek, the Yaukthawa Creek, the Nancho Creek, the Binbye Creek, the Kanni Creek, the Pathi Creek and the Pyu Creek. The presence of numerous creeks is one of the supporting factors for the cultivation of coffee.

Climate

Although Thandaunggyi Township lies within the tropical zone, its elevation is hilly and mountainous and higher than the Sittaung Valley (2141.54 mm (or) 84.31 inches -Taungoo) on the west. In general, the rainfall, of Thandaunggyi Township is higher than Sittaung Valley on the western side. It may be due to the ascending air from the west along the slope of hills and mountains and the cooling effect of forest.

Due to lack of weather station in Thandaunggyi Township, temperature and rainfall can not be expressed. However, Cwa and Cwb climatic types, according to Drummond (1958), classification of Myanmar, the average elevation of 1219.2 m (4000 feet) is assumed to be the dividing line between Cwa and Cwb climate areas.

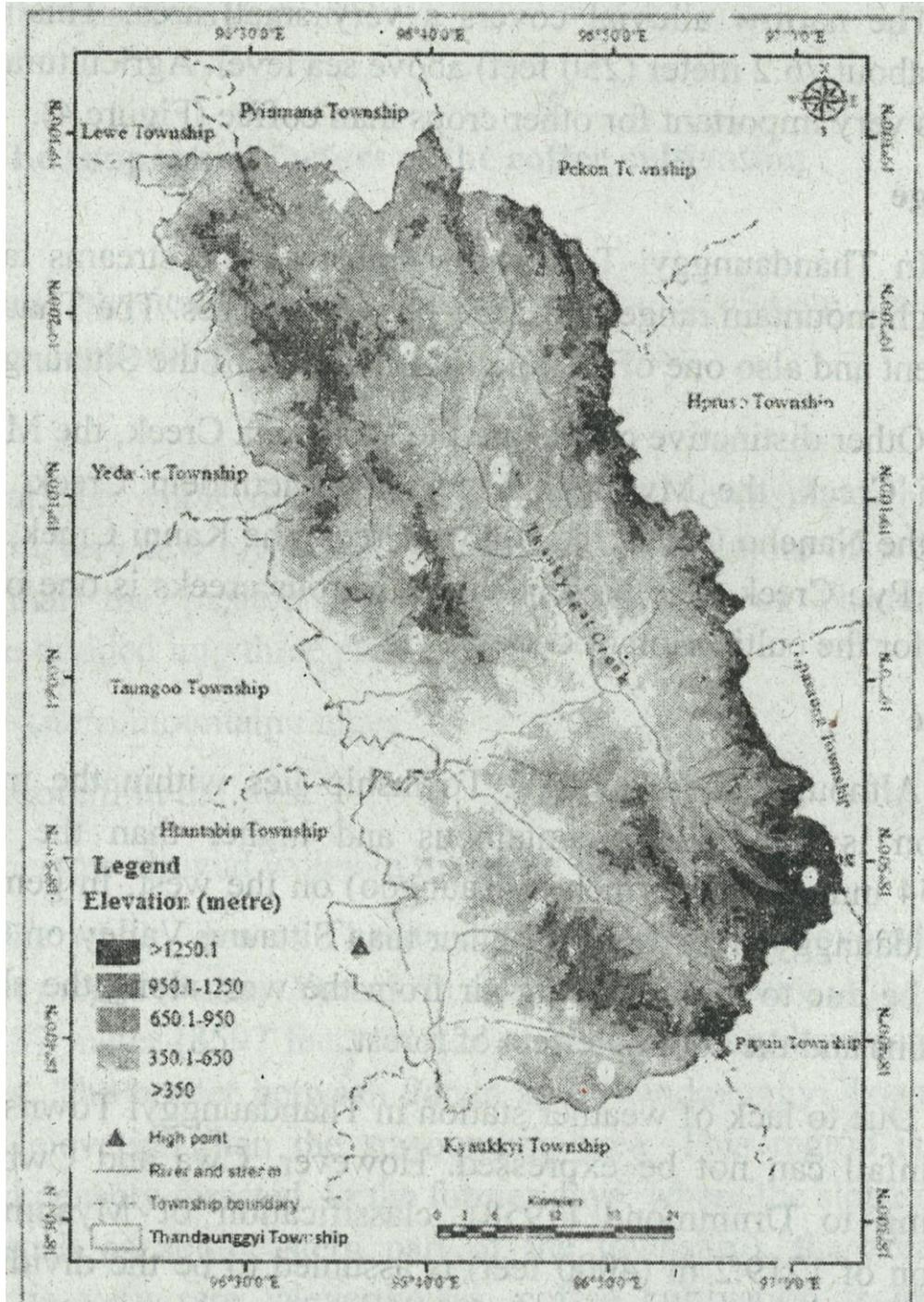


Figure 4. Physical Features in Thandaunggyi Township

Source: Department of Geography, Yangon University

Owing to the striking contrast in elevation, climatic condition as well as cultivation of perennial crops varies. Coffee enjoys cool climate, Tienvy rainfall and higher elevation. As a consequence, coffee cultivation can be found in every village tracts of the township.

Soils

Climatic condition, natural vegetation, parent material and relief play a crucial role for the development of soil. Soils of Thandaunggyi Township can be classified into

- (1) Red fearth and mountainous red earths [Acrisols (ferric) and Cambisols (chromic)]
- (2) Red brown forest soils [Ferralsols (rhodic)]
- (3) Yellow brown forest soils [Ferralsols (xanthic)]
- (4) Meadow and meadow alluvial soils [Gleysols and fluvisols]

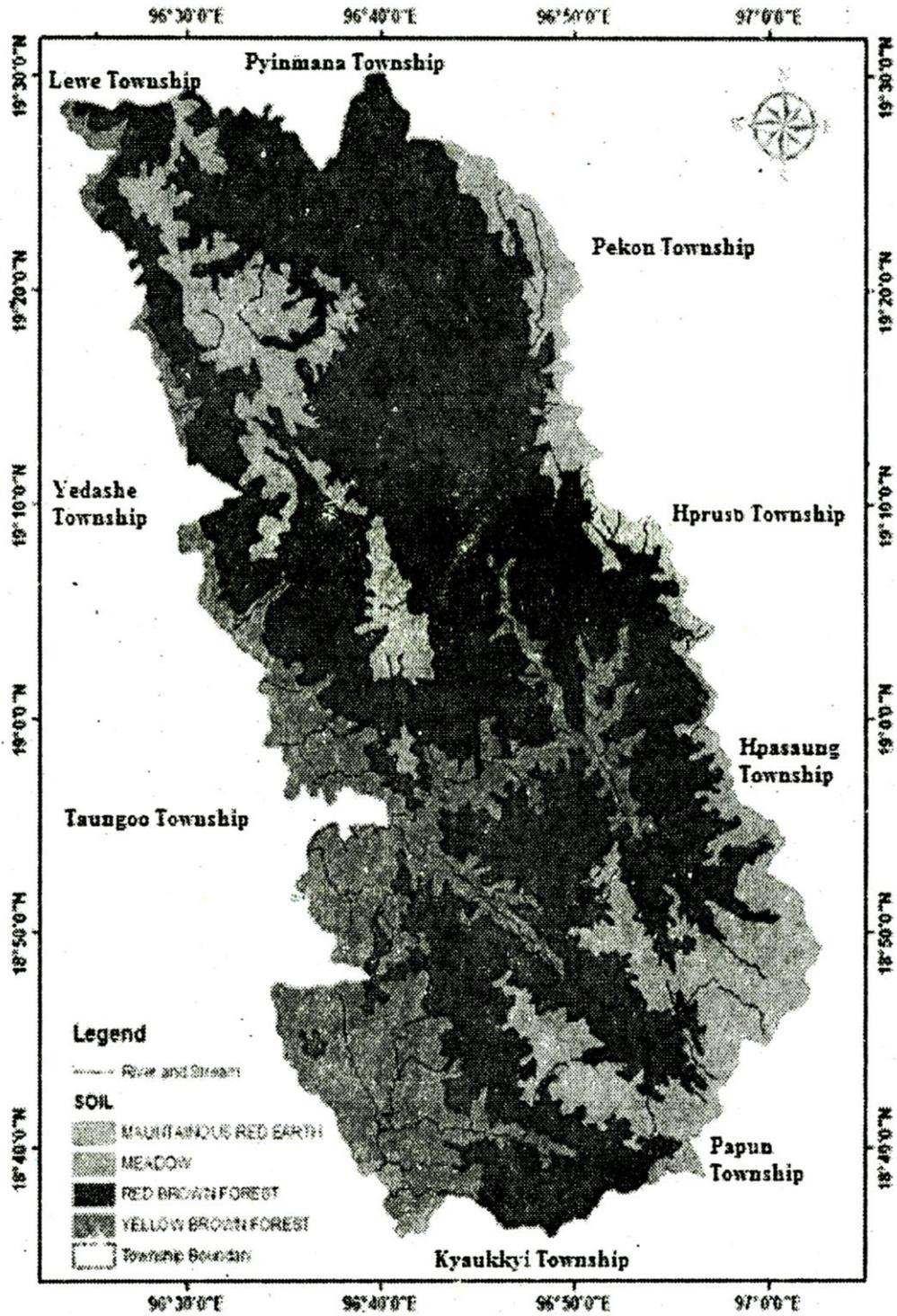


Figure 5. Soil of Thandaunggyi Township
Source: Landuse Department of Yangon

Red earths and mountainous red earths soils cover the eastern most and the north western part of Thandaunggyi Township.

Red brown forest soils can be found in the upper foothill zone of the eastern mountain ranges.

The lower foothill zone is occupied by yellow brown forest soils which are found in combination with red brown forest soils. These soils are acidic and the pH value ranges from 4.5 to 5.5.

Meadow soils are found in the valleys of some larger streams between mountain ranges. Meadow alluvial soils occupy along the narrow alluvial strip which runs on both sides of the rivers and streams, and form as thin ribbons along the valleys.

Except the meadow soils, all types of soils in Thandaunggyi Township are suited for coffee cultivation. The existing soils of Zale and Alechaung village tracts are mountainous red earths and red brown forest soils. As a result, these village tracts possess the largest coffee acreage (Figure 5).

Vegetation

Thandaunggyi Township is extensively clothed with dense forest. Much of the natural forests have been removed by shifting cultivation except on extremely steep, slopes and inaccessible areas. In 2012-13, the area under forest was 1271464 hectares (314185 acres). Depending on topography, underlying rock, soils and climatic condition, vegetation can be classified into three groups. These are

- (1) Hill evergreen forest
- (2) Riverine evergreen forest and
- (3) Moist upper mixed deciduous forest.

Generally, natural vegetation of the study area is dense. It provides cool effect and shade for the cultivation of coffee.

Peace and security factors

Peace and security factor is one of the factors that control the development of an area. In the former days, some of the places in the study area are inaccessible due to security condition. Accessibility is essential to extend the acreage and to send produces of coffee to the market. However, peace and security have prevailed in Thandaunggyi Township several years ago. Hence, the potential coffee cultivation areas increased.

Market factor

The production of coffee per acre of land was about 340 viss green coffee. Cost and benefit was calculated for only harvesting season. At the harvesting season labour fees per day was 1300 kyats per labour in 2005-06. Therefore labour fees for 25 days was 32500 kyats for each labour. In 2005-06, per viss of dried coffee was 2000 kyats. Transport cost from Thandaung to Taungoo was 50 kyats per viss of coffee. During the

harvesting season, labour fees (2 workers) and transport cost were 68000 kyats. The profit for coffee grower was 52000 kyats (120000-68000) for per acre of land if per viss of coffee was 2000 kyats for 60 viss (dried).

In 2012-13, per viss of coffee was about 2500 kyats. Labour fees per day was 2500 kyats per labour. Labour fees and transportation cost were 125000 kyats and 7000 kyats. Transport cost from Thandaung to jfaungoo was 100 kyats for per viss of coffee. The yield of coffee per acre of land was 70 viss of dried coffee. The profit for coffee cultivator was 57000 kyats (189000-132000) for per acre of land if per viss of coffee was 2500 kyats for 70 viss (dried). The cultivators in the study areas are rarely hired the labours. Therefore, the labour fees are also their profit.

Between 2005-06 and 2012-13, price as well as production increased. Hence, it is suitable for the cultivators to extend coffee areas (Table 1).

Table 1. Cost and benefit of coffee during harvesting season (per acre)

| | 2005-06 | 2012-13 |
|------------------------|----------------|----------------|
| Labour cost (Kyats) | 1300 | 2500 |
| Transport cost (Kyats) | 50 | 100 |
| Yield per acre (Viss) | 60 | 70 |
| Price (Kyats) | 2000 | 2500 |
| Total cost (Kyats) | 68000 | 132000 |
| | | |
| Profit (Kyats) | 52000 | 57000 |

Source: Interview and field survey

The areas under coffee cultivation in Thandaunggyi Township

Coffee cultivation was found in the whole township. In 2005-06, the total coffee area was 2965.14 ha (7327 acres) in Thandaunggyi Township. The largest coffee areas take place in Zale Village Tract 704 acres (284.89 ha) and Alechaung Village Tract 230.27 ha (569 acres) respectively. These village tracts are located in the western part of the study area.

According to the available data in 2012-13, total coffee cultivated area was 3860.30 ha (9539 acres) in the study area. The highest coffee acreage was found in Zale Village Tract 305.13 ha (754 acres) and Alechaung Village Tract was the second highest 246.45 ha (609 acres).

In 2005-06, coffee cultivation was nil in Hochi Village Tract but it grown 34.39 ha (85 acres) of coffee in 2012-13 as a result of accessibility (Figure 6 and 7).

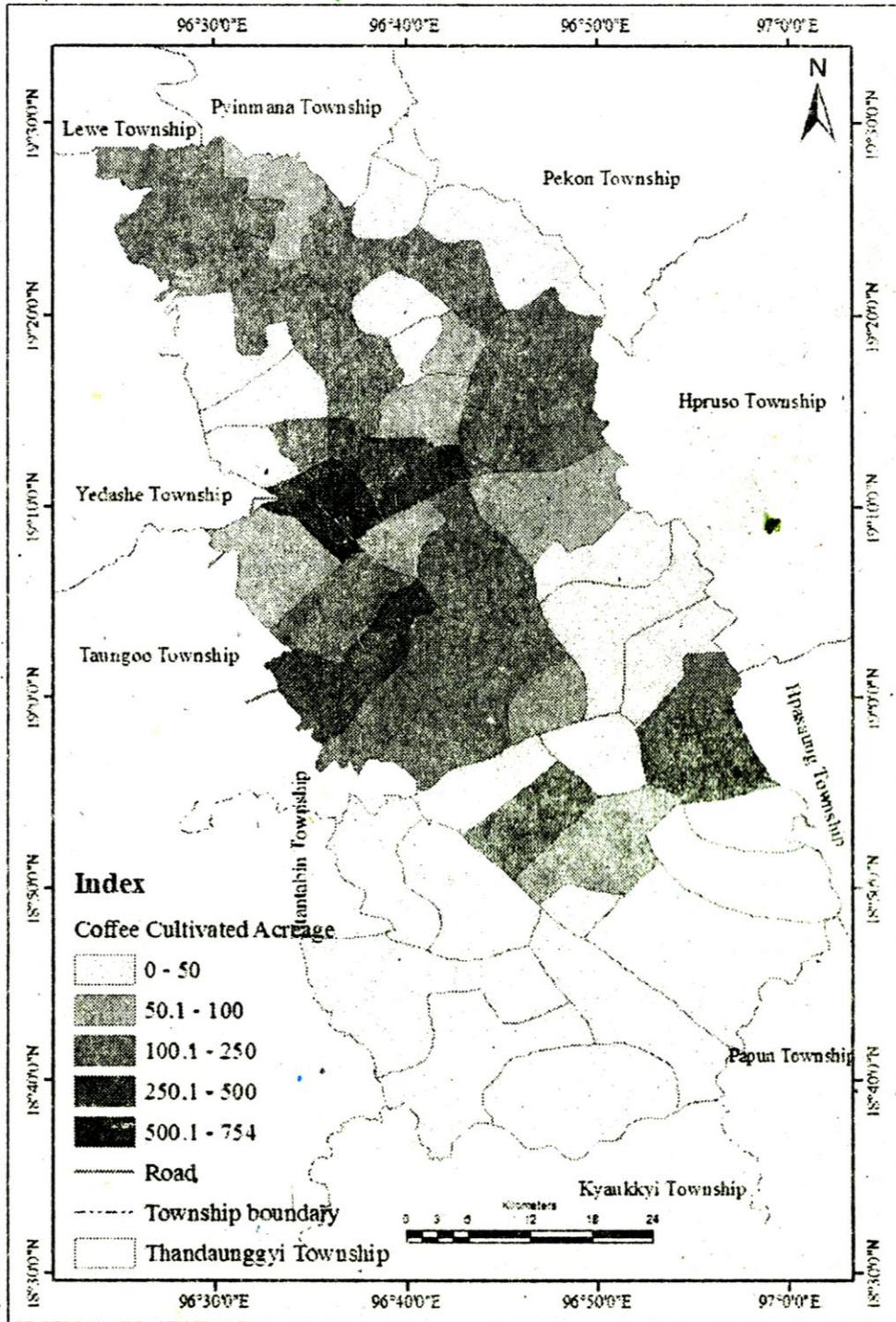


Figure 6. Distribution of coffee acreage by village tracts (2005-06)

Source : Based on data obtained from Settlement and Land Records Department of Thandaunggyi Township

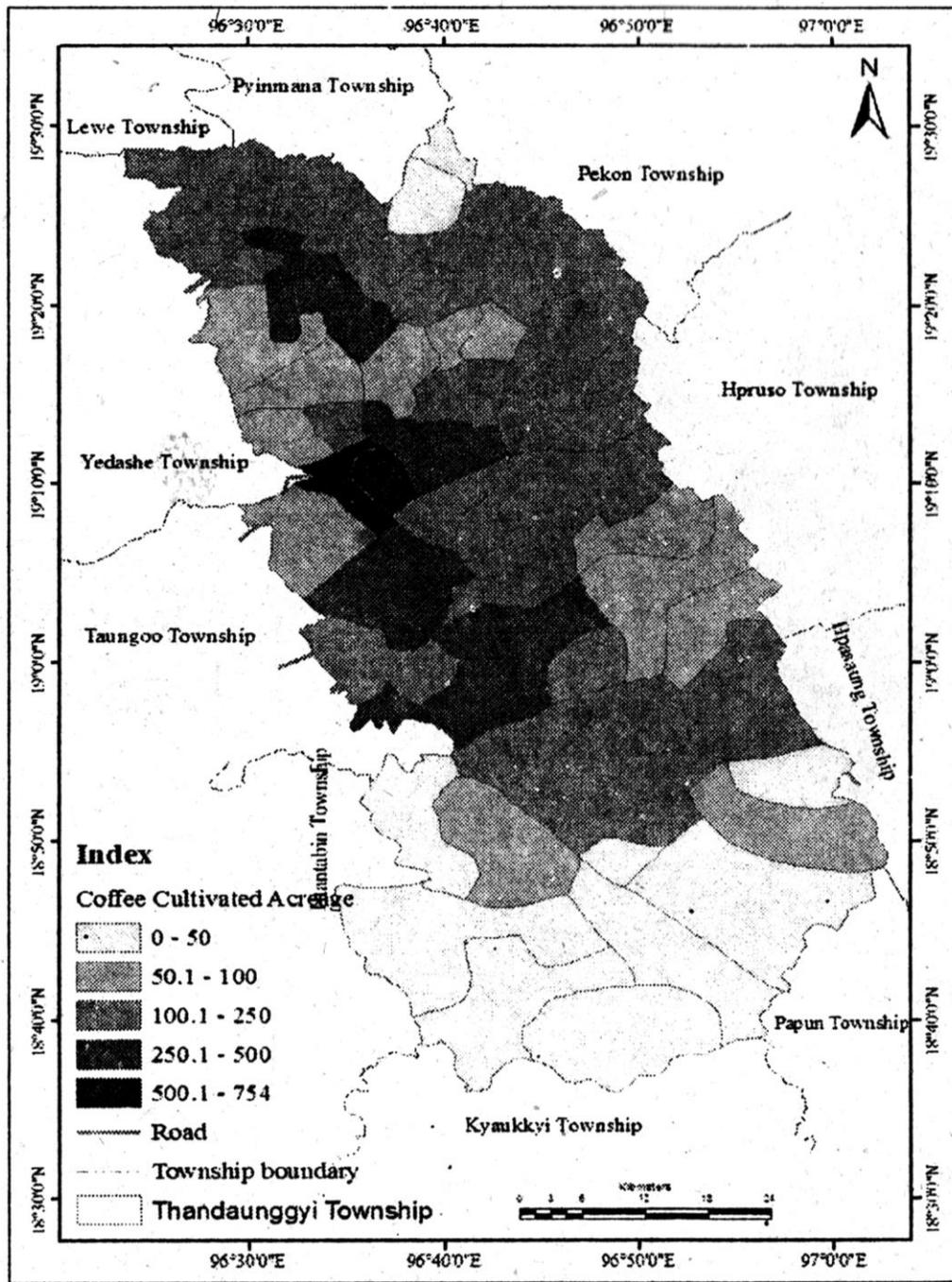


Figure 7. Distribution of coffee acreage by village tracts (2012-13)

Source: Based on data obtained from Settlement and Land Records Department of Thandaunggyi Township

Findings

Potential Coffee Cultivation Areas

Like other parts of Myanmar, agriculture especially perennial crops cultivation is the mainstay of Thandaunggyi Xownship. Hence, the areas under coffee cultivation steadily increased as a result of price, accessibility, market demand, security and peace and growing population.

Physical factors such as relief, climate, soil and vegetation are favourable for coffee cultivation. In order to realize the potential coffee cultivation areas climatic condition (rainfall and temperature) and land condition (soil pH, elevation and slope) are used to generate maps.

Potential coffee cultivation areas can be classified into three groups according to climatic condition: more suitable, moderately suitable and less suitable which represent 13.5% (48401.5 ha), 41.3% (151131.9 ha) and 45.2% (165403.4 ha) respectively. The northeastern most part is more suitable for potential coffee cultivation areas. The middle and western part of the study area is moderately suitable and the southern part is less suitable.

In land condition, more suitable areas for coffee cultivation are distributed in the western two third of the township. Moderately suitable areas for coffee cultivation can be found along the easternmost part of the township representing 61.95% (22697.8 ha) and 38.05% (139239 ha).

In considering both climatic and land condition, potential coffee cultivation areas can be grouped into two classes: moderately suitable and less suitable. Except most of the southern part, generally the whole township is moderately suitable for potential coffee cultivation areas accounting 75 % (274453.3 ha') and 25 % (91483.5 ha) (Figure 8).

The remaining areas for coffee cultivation

According to the available data in 2005-06, potential coffee cultivation areas are highest in Kalaykho, Ilothawpalo, Leikhodokho, Leikhodoka, Shokho, Bokhalaykho and Hochi village tracts which are located in the eastern and south eastern part of the township.

The second highest potential cultivation areas are found in Kyemine, Thamoetaung, Kwephyutaung, Leikpyagyi, Leikpyakalay, Maungnwegyi, Khonetaing, Sibinkalay and Sabakyi village tracts.

The lowest potential coffee cultivation areas are found in Ngwetaungauk, Maungbalauk, Maungkyaw, Tawbon and Shanlebyinaw village tracts which are located in the northern part of the study area.

Yedakhon, Maungtainggyi, Metindein, Thabyenyunt, Kyaukpya, Zintaingyi and Sikedo village tracts are located in the southern part (Figure 9).

In 2012-13, potential coffee cultivation areas are highest in Kalaykho, Hothawpalo, Leikhodokho, Leikhodoka, Shokho, Bokhalaykho, Khonetaing and Hochi village tracts which are located in the eastern and south eastern part of the township.

Coffee enjoys cool climate and high elevation and accessibility is better than before. As a consequence coffee cultivation is gradually increased and potential areas also increased.

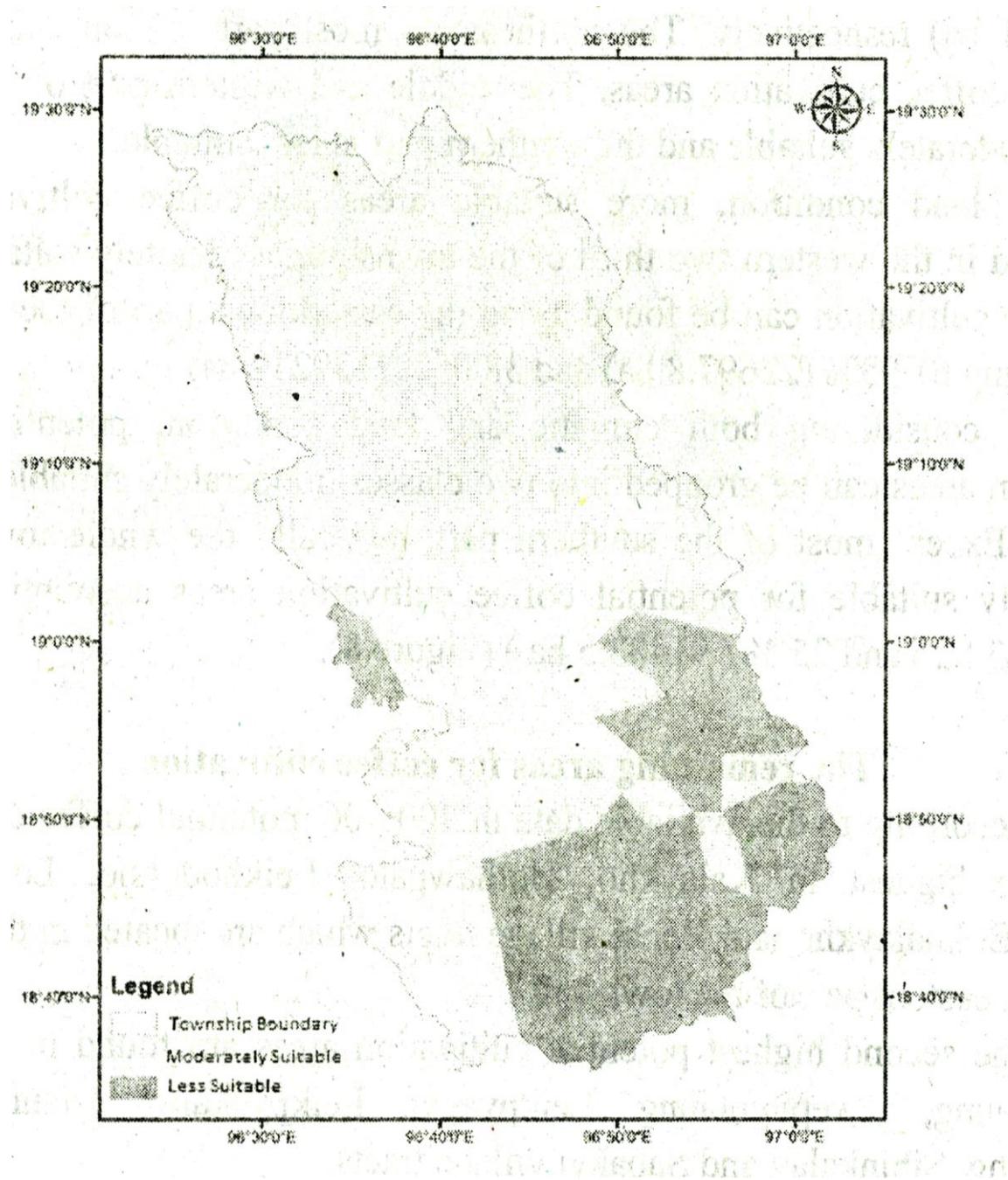


Figure 8. Suitable Areas for coffee cultivation in Thandaunggyi Township

Source: Based on the data obtained from Agricultural Atlas of the Union of Myanmar (2003), Landuse Department of Yangon and Digital Elevation Model.

The second highest potential cultivation areas are found in Kyamine, Thamoetaung, Kwephyutaung, Kalayta, Dayo, Leikpyagyi, Leikpyakalay, Dawalawchi, Maungnwegyi, Sibinkalay, Sabakyi and Thalobwa village tracts.

The lowest potential coffee cultivation areas are found in Ngwetaungauk, Maungbalauk, Maungkyaw, Tawbon and Lehpetingyi village tracts which are located in the northern part of the study area.

In the southern part, Kyaukpon, Yedakhon, Maungtaingyi, Sikedo and Thabyenyunt village tracts are the lowest potential cultivation areas. These village tracts are located in the alluvial plain. Being alluvial plain, this area is suitable for coffee cultivation than other crops (Figure 10).

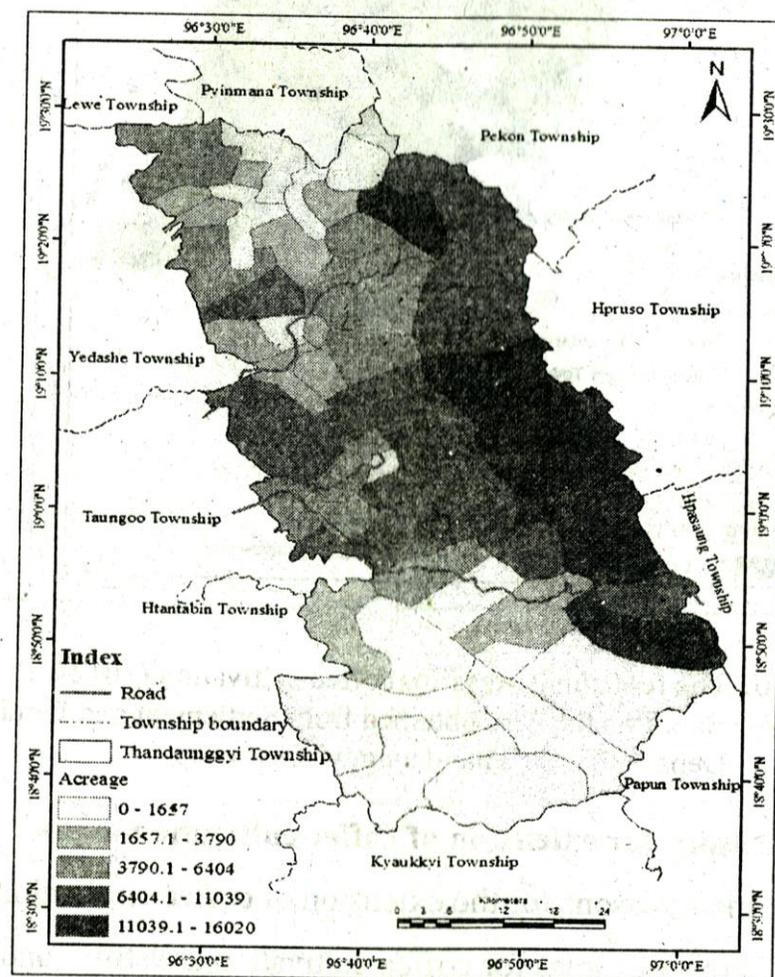


Figure 9. The remaining areas fore coffee cutivation (2005-06)

Source: Based on the data obtained from Settlement and Land Records Department of Thandaunggyi Township

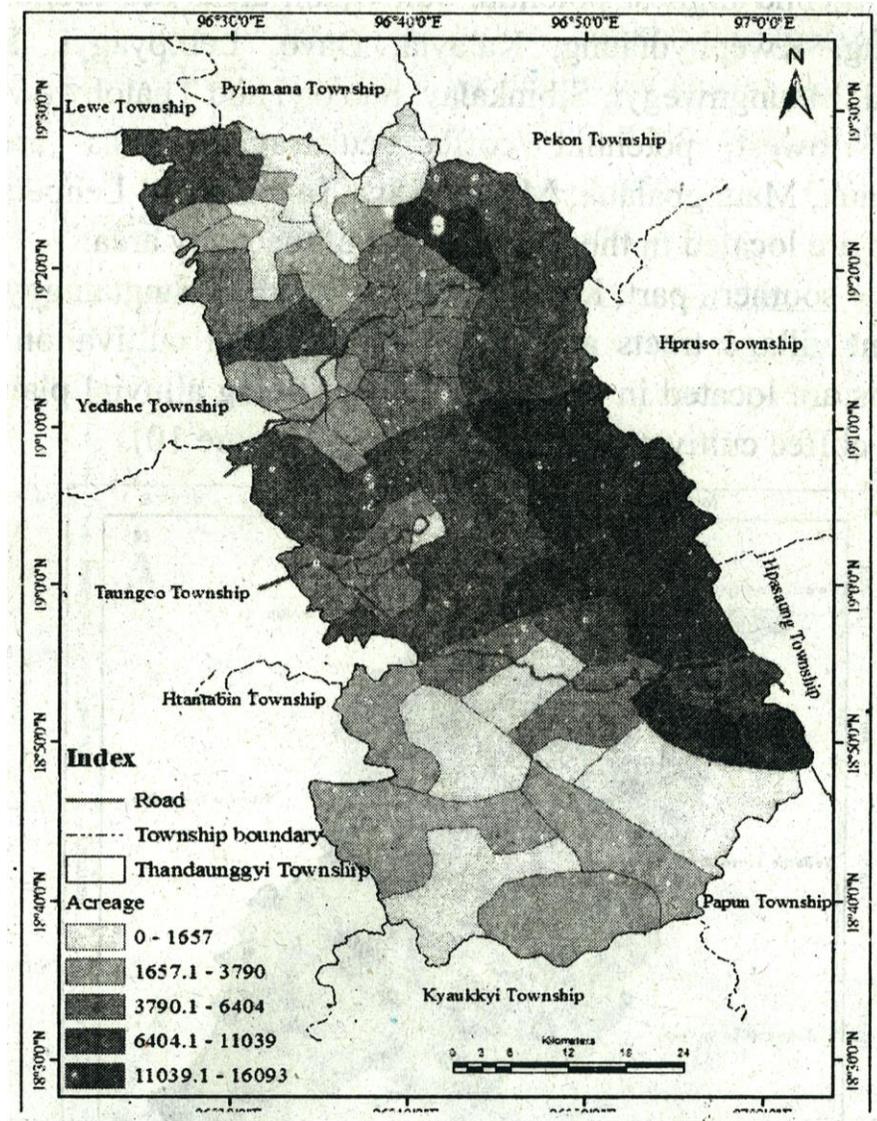


Figure 10. The remaining areas for coffee cultivation (2012-13)

Source: Based on the data obtained from Settlement and Land Records Department of Thandaunggyi Township

Reasons for extension of coffee cultivation areas

The main reasons for the extension of coffee cultivation areas are;

- Potential areas for coffee cultivation are still found in Thandaunggyi Township
- Peace and security have prevailed in this township
- The price of coffee in the market has risen

Potential areas for coffee cultivation

Potential areas for coffee cultivation depend on;

- (a) Physical factors
- (b) Peace and security factors
- (c) Market factor

Conclusion

Thandaunggyi Township is situated in northern part of *Kqym*. State. Due to mountainous and hilly region with ver, few lowlands, agricultural activities especially cultivation of perennial crops is the main occupation for the people of Thandaunggyi Township.

Physical environment such as topography, climate, fertile soils, and vegetation are favourable conditions for the potential coffee cultivation areas in Thandaunggyi Township. In addition, to accessibility, price, market demand and security and peace are the driving forces for the extension of the coffee cultivation areas. About 70 percent of the people of Thandaunggyi Township are engaged in agricultural activities. Coffee cultivation was found in every village tracts of the township. In the study area, arabica and robusta coffee are widely grown. .

In 2005-06, the total coffee area was 2965.14 ha (7327 acres) in Thandaunggyi Township. .The highest coffee areas are found in Zale Village Tract with 284.89 ha (704 acres) and Alechaung Village Tract with 230.27 ha (569 acres) respectively. These village tracts are located in the western part of the study area.

According to the available data in 2012-13, total coffee cultivated area was 3860.30 ha (9539 acres). The highest coffee acreage was found in Zale Village Tract with 305.13 ha (754 acres) and Alechaung Village Tract with 246.45 ha (609 acres). In 2005-06, coffee cultivation was nil in Hochi Village Tract but it grown 34.39 ha (85 acres) of coffee in 2012-13 -as a result of accessibility, price and market demand.

Depending on climatic and land conditions, the suitable areas for coffee cultivation can be classified into two classes: moderately suitable 75% (274453.3 ha) and less suitable 25% (91483.5 ha) of the study area. Generally, the whole township is moderately suitable for potential coffee cultivation areas except most of the southern part.

The available data obtained in 2005-06 and 2012-13 revealed that Kalaykho, Hothawpalo, Leikhodokho, Leikhodoka, Shokho, Bokhalaykho and Hochi village tracts which are located in the" eastern and south eastern part of the township are the largest remaining areas for coffee cultivation. This is^N largely due to accessible and security conditions better than before.

In 2005-06 and 2012-13, the lowest potential coffee cultivation areas are found in Ngwetaungauk, Maungbalauk, Maungkyaw and Tawbon village tracts which are located in the northern part of the study area. This is because coffee cultivation have been practiced in these village tracts. In the southern part, Kyaukpon, Yedakhon,

Maungtaingyi, Sikedo and Thabyenyunt village, tracts are the lowest potential cultivation areas. These village tracts are located in the alluvial plain.

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