

## A Geographical Analysis of Betel Leaf Cultivation in Ayadaw Township

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### Abstract

Ayadaw Township is located in Monywa District, Sagaing Region, and an economically developed township. It is one of the four most agricultural townships in Monywa District. Ayadaw Township is one of the famous areas of betel leaf cultivation in the Sagaing Region because of its relief and climate conditions. Betel leaf is grown in wet and hot seasons a cash crop in nearly all parts of Ayadaw Township. With the increasing population in the study area, more people are engaged in agricultural activities including betel leaf cultivation. Betel leaves are commercial products, mainly used for chewing, besides having significant medicinal properties and ceremonial events. Although betel leaf cultivation can provide a relatively sustainable income for local people in the Ayadaw Township, it can damage indirectly human health. Therefore, this paper presents betel leaf cultivation in Ayadaw Township which has the largest agricultural area from a geographical point of view. In the study area, betel leaf cultivation is a type of agricultural activity that provides livelihood for rural farmers. Farmers collected seasonal income from other crops, while betel leaf cultivation produced income throughout the year from a small piece of land. The main aim of this paper is to analyze betel leaf cultivation in the study area. The betel leaf cultivation of the study area is found to be the result of the varies with natural factors and social factors. To assess the regional differences in betel leaf concentration in indices it, have been calculated in all the regional units with the help of Dr.S.S Bhatia's Index of Concentration Method. To develop Ayadaw Township, it is necessary to find ways to irrigation and cultivate manpower, machinery, and inputs. Spatial distribution pattern of betel leaf cultivation in Monywa District, the total of betel leaf cultivated area was (4,192) acres, comprising (2,437) acres of Ayadaw Township in (2022–2023).

**Keywords:** Betel leaf cultivation, Distribution pattern, Agricultural, Ayadaw Township

### 1. Introduction

Betel leaf is popularly known as “Paan” in India and the scientific name of betel leaf is “Piper Betel Linn”. Betel leaf has a deep green color and is widely used in Myanmar. Betel leaf is a commercial product, mainly used for chewing, besides having significant medicinal properties. Betel leaf cultivation is an important economic activity of Ayadaw Township. Betel leaf cultivation is a type of agricultural activity that provides a livelihood for rural farmers. Betel leaf cultivation is highly labor-intensive and particularly suited to small holdings. Betel leaf becomes a perennial source of employment and income for farmers to meet their daily requirements. So, it could be a good option for landless farmers to go for leasing and cultivation which could provide them a good return on income. Betel leaf cultivation area largely depends on its terrain, climate, soil conditions, and economic factors.

Betel leaf is perennial and it is twice a monthly economic return product. Betel leaf must be at least three or four months old before it is considered maturing enough to produce high-quality plucking. In comparison of income from betel leaf and other crops such as cereal crops and oil seeds, it must be taken into account the economic return period. The cultivated acres and production of betel leaf vary spatially and also the economic returns differ from place to place.

The betel leaf is an evergreen; shade-loving perennial root climber with glossy heart-shaped leaves and white catkin. Betel leaf has an important socio-cultural and ceremonial uses, besides having significant medicinal properties and nutritional values. It is a popular mastication, usually chewed with a slice of betel leaf and lime, widely popular among the

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of Myanmar. Betel leaf is beneficial to the throat and removes viscosity in human beings. It helps in digestion and removes the bad smell in the mouth.

It is also good for the respiratory system and used in treatments of various diseases such as bronchitis, cough, and cold. Betel leaf cultivation has vast potential as it plays an important role in the economics and livelihood of people in Ayadaw Township.

However, betel leaf is sensitive to pest diseases and weather, which requires intensive care, management, and high inputs. Betel leaf grows well under shade with low light intensity, mild temperature (15°C to 30°C) high humidity 90%, and 1900 mm annual rainfall. In an area with lower rainfall, however, betel leaf can be grown with frequent irrigation throughout the growing period. Betel leaf is constructed with locally available materials like bamboo stems, jute sticks, paddy straw, petioles, and leaves of banana, etc.

Ayadaw Township is located in Monywa District, Sagaing Region. The type of agricultural land and betel leaf cultivation vary from place to place, in the Township. The product of betel leaf is mainly transported to Monywa Township, Shwebo Township, and Mandalay Township. Besides, the irrigation works play an important role in the production of betel leaf in the study area.

### 1.1 Study Area

Ayadaw Township is located in the southern part of Sagaing Region. It lies between latitudes 22°00' N and 22°30' N and longitudes 95°15' E and 95°40' E. In general, the study area can be divided into two parts: the western hilly region and the eastern plain region. Mu River flows as the east boundary. It comprises 3 wards of Ayadaw Town and 39 village tracts.

### 1.2 Aim and Objectives

The main aim of this paper is to study the betel leaf cultivation of Ayadaw Township. The objectives of the study are:

1. to analyze the betel leaf concentration by village tracts in Ayadaw Township.
2. to determine the cost and benefit of betel leaf cultivation in Ayadaw Township.

### 1.3 Scope and Methods of Study

Secondary data on this research were obtained from the various township offices such as the Meteorology and Hydrology, Department of Agricultural Land Management and Statistics, Ayadaw Township, and Monywa Township.

Based on process information, graphs, and maps, the analysis was made geographically. The local differences of betel leaf concentration indices have been calculated in all the village tracts with the help of Dr. S.S. Bhatia's (1965) Location Quotient Method. The method is as follows:

$$\text{Index for the determination of crop concentration} = \frac{\frac{\text{Area of x crop in the component areal unit}}{\text{Area of all crop in the component areal unit}}}{\frac{\text{Area of x crop in the entire region/country}}{\text{Area of all crop in the entire region/country}}}$$

#### 1.4 Problem Statement

Betel leaf cultivation held many problems faced by cultivators like production problems, marketing problems, financial problems, and many others. The high cost of production, insufficient price, insufficient water, and high fertilizer cost are the problems faced by the farmers in betel leaf cultivation. The farmers are unorganized and not used to maintaining proper production and marketing statistics for their products.

Since prices of betel highly fluctuate, farmers and traders are unable to provide accurate data on benefits and profit earned from its production and trade. Critical marketing problems of the betel industry are fluctuation, low prices, and high cost of production. Farmers encountered various problems in cultivating betel leaf such as lack of soil moisture (drought), lack of suitable technology and management, disease and pest infestation, insufficient inputs, etc.

Farmers faced various problems such as infection of leaf rot disease, high price of role materials, lack of capital of betel leaf, low price of betel leaf, and high price of various fertilizers. Betel leaf cultivation is a traditional activity in the study area. On the other hand, it may indirectly cause health damage to the chewers. This is a great problem of this specific economic activity of the study area.

#### 1.5 Literature Review

The literature review is essential to work on before analysing and doing proper research. Depending upon the nature of the research, the researcher has found various relevant to confirm the validity of measurement for their studies. It may be supported for guiding decisions about farmer interviews, studies, or research and providing a context for interpreting new findings.

On the other hand, betel leaf cultivation is agriculture; here the people are engaged in one of the chief cultivation in the sense. For any agricultural activity, land is the most important input required. But for betel leaf cultivation, the less amount of land is required for cultivation as compared to other crops like paddy and wheat. Farmers collected seasonal income from other crops, while betel leaf cultivation produced income throughout the year from a small piece of land.

Betel leaf is an extremely common leaf. Betel leaf has a deep green color with heart-shaped. Betel leaf is popularly known as "Paan" in India. Betel leaf cultivation is highly labour intensive and particularly suited to small holdings.

And then, "Economics" is a social science concerned with the production, distribution, and consumption of goods and services. An economic impact analysis (EIA) examines the effect of an event on the economy in a specified area, ranging from a single neighborhood to the entire globe. It usually measures changes in business revenue, business profits, personal wages, and Jobs. (Economic Impact Analysis-Wikipedia)

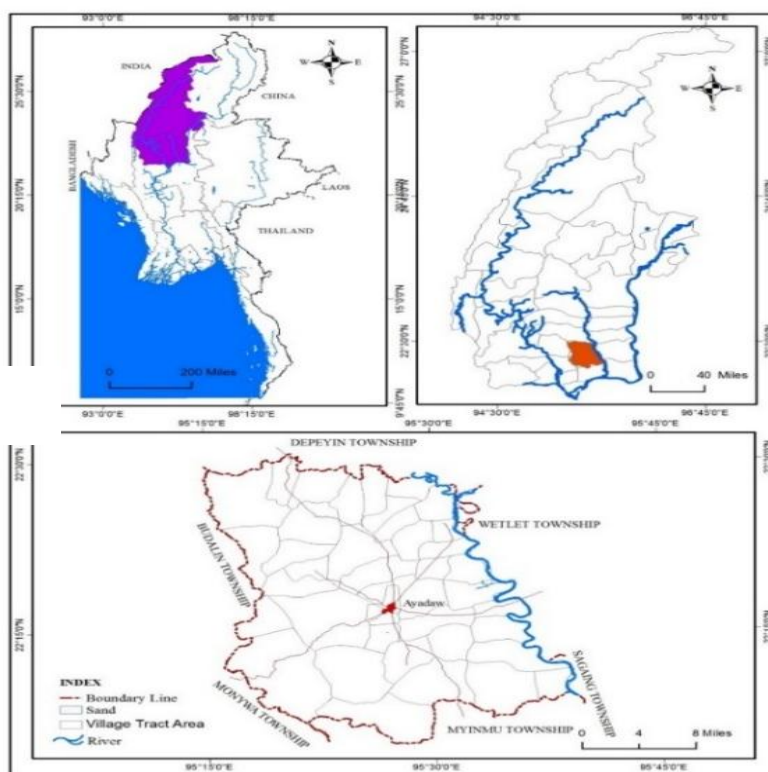
## 2. Geographical Background of the Study Area

### 2.1 Location, Size, Shape and Boundary

Ayadaw Township is located in Monywa District, Sagaing Region. It is located in the Central Dry Zone of Myanmar. It lies between latitudes 22°00' N and 22°30' N and longitudes 95°15' E and 95°40' E. Map (2.1)

The Township has an area of (302,400) acres or (471.74) square miles which accounts for (35.22) percent of the total area of Monywa District. The Township extends from north to south for about (24) miles and from east to west for about (20) miles. The shape of the township is an irregular trapezium. The Township is constituted of three wards of Ayadaw Town and (39) village tracts composed of (155) villages.

Ayadaw is bounded by Depayin on the north, by Wetlet Township divided by the Mu River on the east, by Myinmu Township on the South, and by Monywa and Budalin Township on the west.



Source: UTM Map No. 2285\_06, 07, 08, 11 and 12

Map (2.1) Location Map of Ayadaw Township

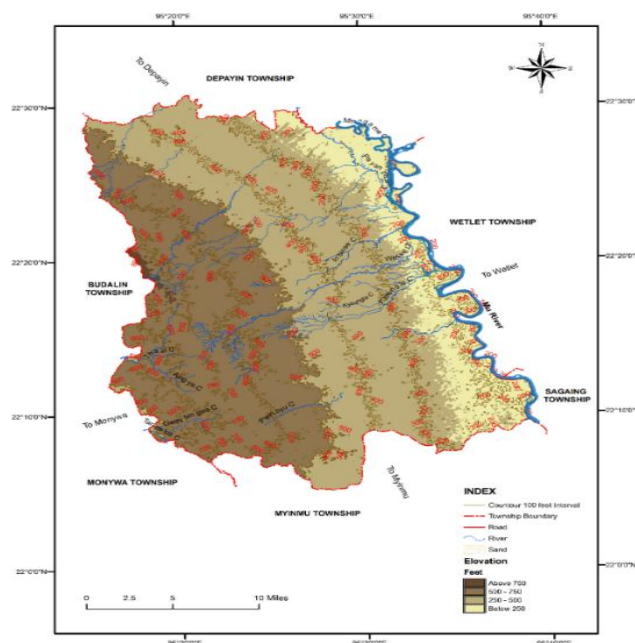
## 2.2 Topography

The betel leaf concentration is dependent mainly on the condition of terrain, topography, and altitude. The “Le” cultivation or paddy cultivation requires level fields and “Ya” cultivation or pigeon pea cultivation requires the undulating or well-drained topography. The amount of rainfall received in a region, directly and indirectly, affects agriculture. Apart from altitude, terrain, aspect of slope and the nature of the surface also affect agricultural activities.

In general, topographic features in Ayadaw Township are low hills and undulating terrain in some village tracts. The hills gradually decline towards the Mu River to the east. The eastern part of the township is level plain. The topography of Ayadaw Township can be divided into two parts based on the (500) feet contour. These two parts are (1) the western hilly region and (2) the eastern plain region.

The western hilly regions are covered on the eastern flank of the Kyaukka range. The hills are the continuation of Kyaukka Range which is about (900) feet (274.32) meter above

sea level. The hilly portion gradually slopes down towards the east and becomes narrow towards the north. In this portion occupies “Ya” land. The eastern plain is the east portion of Ayadaw Township. It is relatively wide in the northern part and it declines slightly to the Mu River. The plain is formed of very fertile alluvium deposited by annual floods and is used as cultivated fields, irrigated by Karbo Dam. Most of the cultivable lands and most of the irrigation works of Ayadaw Township are found in this plain. Map (2.2).



Source: UTM Map No.2295\_06, 07, 08, 11 and 12.

Map (2.2) Topography and Drainage of Ayadaw Township

### 2.3 Drainage

The main drainage in Ayadaw Township is the Mu River and its tributaries. Mu River running in the east of the township flows from north to south. In Ayadaw Township most of the streams take their sources in the Kyaukka range and flow toward the east as intermittent streams into the Mu River.

The Kyaukka range exists as a watershed between the Chindwin River on the west and the Mu River on the east. Many streams entering the Mu River from the west are Baungkya Chaung, Wetkhae Chaung, Mahura Chaung, Kanponi Chaung, Minngame Chaung, Bayanbaga Chaung, Guebingwa Chaung and Thazi Chaung. There is also man-made drainage as canals of dams and river water pumping sites.

### 2.4 Climate

Ayadaw Township is located in Monywa District, Sagaing Region. The township is hot throughout the year and it receives a small amount of annual rainfall. As there is no Department of Meteorology and Hydrology in Ayadaw, the temperature and rainfall of Monywa are used for this township because it is (23) miles far from Monywa. According to Köppens Climatic Classification, it experiences a Tropical Steppe climate (BSh). By having a dry climate, the irrigation plan for successful agriculture is essential in the study area.

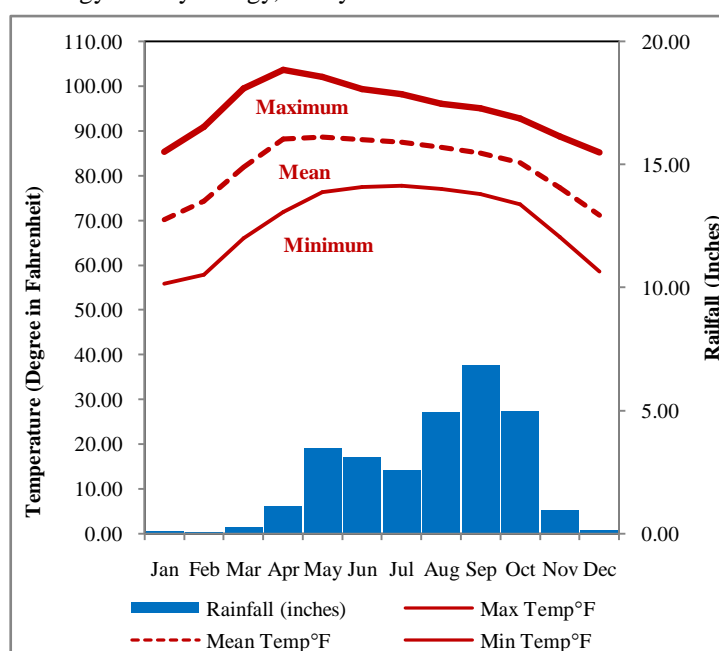
During the (35) years from 1988 to 2022 data, the annual average mean temperature is 81.77°F with an average maximum temperature is 94.75°F and an average minimum temperature is 69.55°F. During this period, the average annual rainfall is about (2.45) inches.

According to the average monthly temperature, the hottest month is May with a mean temperature of 88.59°F. The coldest month was January with a mean temperature of 70.15°F. The range of temperature is 18.44 °F. See table (2.1) and figure (2.1).

Table 2.1 Temperature and Rainfall Conditions of Ayadaw Township from 1988 to 2022

Months	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average /Total
Max Temp(°F)	85.36	90.90	99.55	103.63	102.08	99.34	98.22	96.08	94.99	92.79	88.76	85.24	94.75
Mean Temp(°F)	70.15	74.25	81.89	88.19	88.59	88.11	87.53	86.30	84.97	82.85	77.27	71.16	81.77
Min Temp(°F)	55.88	57.93	66.03	71.88	76.24	77.50	77.80	76.99	75.88	73.54	66.37	58.54	69.55
Rainfall (inches)	0.09	0.06	0.25	1.13	3.49	3.10	2.59	4.92	6.86	4.97	0.97	0.12	2.45

Source: Department of Meteorology and Hydrology, Monywa



Source: Department of Meteorology and Hydrology, Monywa

Figure (2.1) Climograph of Ayadaw Township (1988 - 2022)

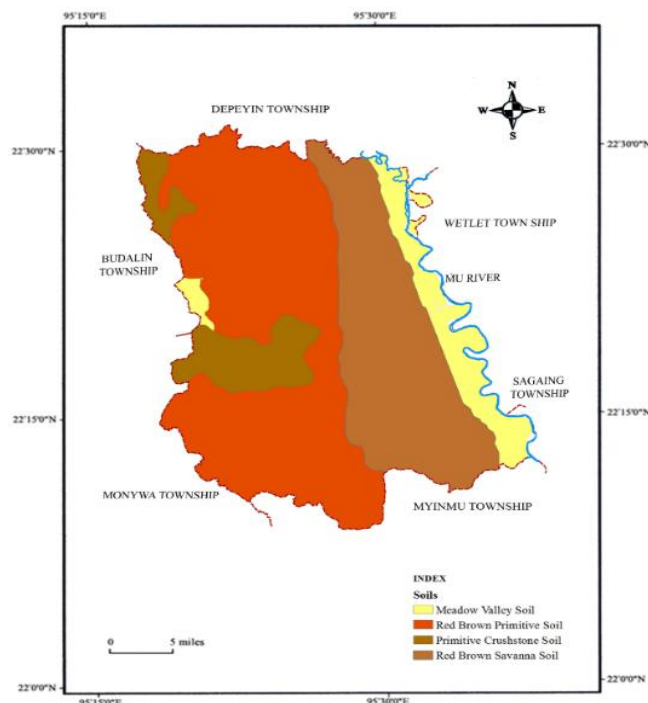
## 2.5 Soils

Soils presented in the study area are varied by topography, climate, rock type, and natural vegetation. It is the most important factor for the accumulation and storage of groundwater. According to the soil type, groundwater can be extracted with different storage capacities. The soil types found in the township are meadow valley soils, primitive crushed stone soils, red-brown primitive soils, and red-brown savanna soils.

Meadow valley soils are found in the easternmost part of the Mu River. Along the Mu River, the soils are fertile and the groundwater is plenty for betel leaf cultivation. Therefore, they are the most fertile and rich in soil moisture.

Primitive Crushed Stone soils are found in the westernmost part where the highest land area of the township. These soils experience high erosion and are composed of crushed stones.

Red Brown Primitive Soils are found in the largest area in the western part of the township. If the irrigation works are engaged, the cultivation of various crops will be successful. Red-brown savanna soils are found in the eastern part of the township. Map (2.3).



Source: Department of Geology, University of Monywa  
Map (2.3) Soils Map of Ayadaw Township

### 3. Analysis of Betel Leaf Cultivation in Ayadaw Township

#### 3.1 Betel Leaf Concentration by Village Tracts in Ayadaw Township

The distribution of betel leaf concentration shown in Table (3.1), (3.2) and map (3.1), shows clearly that the concentration of betel leaf occurs mainly in almost all parts of the study area. There are three wards and (39) village tracts in Ayadaw Township. But betel leaf cultivation can be found in two wards and (34) village tracts.

Table 3.1 Betel Leaf Concentration by Ward / Village Tract in Ayadaw Township (2022-2023)

No	Ward / Village Tract	Betel Leaf Acres	Total Sown Acres	Concentration
1	Ayadaw-1	3	1811	0.00
2	Ayadaw 2	0	782	0.00
3	Ayadaw-3	1	1935	0.00
4	Yathit	4	16017	0.00
5	Ngapyawgyan	4	2634	0.00
6	Naunggyiaing	8	11781	0.00
7	Oakshitgyi	5	4324	0.00
8	Leinhla	23	4987	0.00
9	Chinbin	0	9200	0.00
10	Yeyo	8	8196	0.00
11	Wadawma	0	4080	0.00
12	Thitkyingyi	167	9834	0.02
13	Wadan	32	11605	0.00
14	Pyawpone	34	11028	0.00

15	Kanbyu	0	15940	0.00
16	Wayaug	32	12886	0.00
17	Magyigan	20	16105	0.00
18	Yegyin	16	11765	0.00
19	Hmawdaw	0	7061	0.00
20	Neyagin	17	4917	0.00
21	Kaingywa	4	5007	0.00
22	Oakshingyi	3	3626	0.00
23	Khintha	93	5053	0.02
24	Kyundaw	13	3347	0.00
25	Shagone	41	6010	0.01
26	Baungkya	150	1410	0.11
27	Aungtha	39	3423	0.01
28	Taungmwa	7	3730	0.00
29	Wetkhae	5	3538	0.00
30	Kantha	0	10329	0.00
31	Kyaukpyauk	7	5345	0.00
32	Thaukhutpinle	33	6090	0.01
33	Dondit	2	5721	0.00
34	Zayit	3	3576	0.00
35	Magyisauk	1	5244	0.00
36	Ngwedwin	250	6688	0.04
37	Myaynet	3	8782	0.00
38	Minywa	182	10772	0.02
39	Maletha	1218	19068	0.06
40	Thaleba	4	5243	0.00
41	Sintale	3	3052	0.00
42	Naungchaytauk	2	8687	0.00
	Total	2437	300629	0.01

Source: Department of Agricultural Land Management and Statistics, Ayadaw Township

According to table 3.1, it can be found Maletha Village Tract is the largest betel leaf cultivation with (1,218) acres. The second largest cultivation in Ngwedwin Village Tract, betel leaf acre was (250) acres. Magyisauk Village Tract is the lowest betel leaf cultivation with one acre.

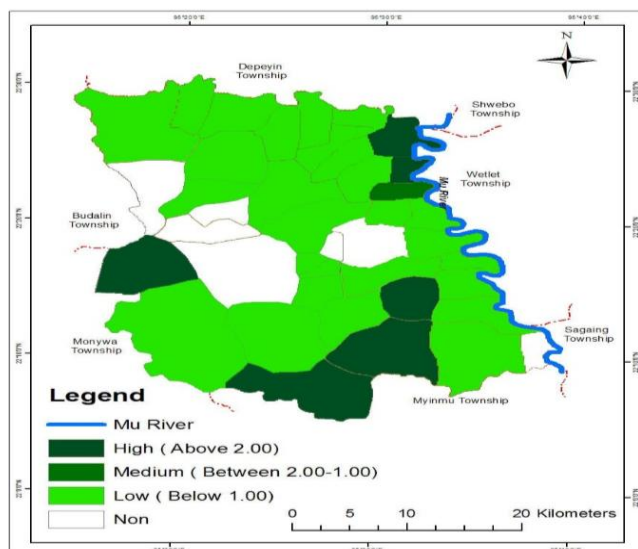
Table 3.2 Betel Leaf Concentration by Wards / Village Tracts in Ayadaw Township (2022 -2023)

No.	Class	Number	Name of Ward / Village Tract
1	High (above 2.00)	6	Baungkya, Maletha, Ngwedwin, Khintha, Thitkyingyi an Minywa
2	Medium (between 1.00- 2.00)	1	Aungtha
3	Low (below 1.00)	29	Shagone, Thaukhutpinle, Leinhka, Kyundaw, Neyagin, Pyawpone, Wadan, Wayaug, Taungmwa, Ayadaw-1, Ngapyawgyan, Wetkhae, Yegyin, Kyaukpyauk, Magyigan, Oakshitgyi, Sintale, Yeyo, Zayit, Oakshingyi, Kaingywa, Thaleba, Naunggyiain, Ayadaw-3, Dondit, Myaynet, Yathit, Naungchaytauk, Magyisauk
4	No	6	Kantha, Hmawdaw, Kanbyu, Wadawma, Chinbin and Ayada 2

Source: Department of Agricultural Land Management and Statistics, Ayadaw Township

According to the above table 3.2, it is found that Betel leaf concentration can be observed as a high concentration above (2.00) was found in six village tracts. They are Baungkya,

Maletha, Ngwedwin, Khintha, Thitkyingyi and Minywa village tracts. Where the area can be supplied by the irrigation. Medium concentration between (2.0-1.00) was found at Aungtha Village Tract. There are two wards and (27) village tracts in low concentration below (1.00) categories. Ayadaw (2) ward and Kantha, Hmawdaw, Kanbyu, Wadawma, and Chinbin village tracts do not have a concentration in the township. Because these village tracts are very difficult to dig underground water and pool.



Source: Based on Table (3.2)

Map (3.1) Betel Leaf Concentration in Ayadaw Township (2022-2023)

### 3.2 Input Cost and Benefit of Betel Leaf Cultivation in Ayadaw Township

Betel leaf is an important cash crop in Ayadaw Township and is considered to be one of the ingredients for traditional entertainment. It has also a sharp taste and good smell, improves taste and appetite, is tonic to the brain heart, and liver, strengthens the teeth and clears the throat.

The cost of betel leaf cultivation depends on the input cost and labor cost, using fertilizer, disease problems and commodity flows. Input costs include bamboo poles, betel species, copper wire, sunshade, wages of labor, fertilizer and pesticides, bamboo baskets and transportation. In a farm which is one acre wide, to cultivate (5,000) betel species, (7,500) bamboo poles, (420) trees, (75) vissees cooper wire, (15) curl sunshade, (17) car soil, fertilizer and pesticides and (880) persons human labor are necessary. Bamboo poles are usually bought from Mandalay Township and Monywa Township. Betel species are available from Monywa Township. Each betel species' price is (500) or (1,000) kyats. The price of betel species can vary depending on the price of betel leaf. For the construction of a betel farm, labor is essential. The wages are different from place to place in the Ayadaw Township. The labor is also hired to pluck betel leaf which costs (4,000) or (7,000) kyats a day per head. Beginning in the first year cultivation, the investment is heavy, but three or four years later the investment costs are gradually decreased. The longer the plant grows the more profit is received.

To cultivate (5,000) betel plants, the average expense is about (8,747,375) kyats in the cultivated period. Fertilizer and disease problems pesticides regular feeding and watering will

keep the betel leaf growing very lush. The application of chemical fertilizer is essential for higher yield and better growth. Chemical fertilizer is fed once every (10 – 12)days.

The use of various soils in intensive betel leaf cultivation was found to deplete soil fertility and crop productivity. However, farmers got a substantial amount of income and benefit from betel leaf cultivation, which was very helpful for their livelihood and subsistence.

Most of the farmers in the research area reported that their most frequent expenses were food, clothes, children’s education, repaying loans, buying animals, and buying machines. When their income increased, they also allocated it to other assets, such as buying farmland, upgrading dwellings, constructing toilets, and acquiring other output items.

Human labor was required for betel leaf cultivation, application of manures, fertilizing, spraying, weeding, and irrigation and harvesting. The number of human labor varied from one year to another year due to changes in the number of weeding, spraying insecticides, irrigation and harvesting. The use of human labor was the highest in two or three years.

**3.3 Economic Impact in Ayadaw Township**

The impact on the product of betel leaf is an economic factor and it is mainly referred to market. Most of the people gradually increased betel leaf cultivation in the study area. Because the local people largely depend on that cultivation for their subsistence and livelihood. Farmers could get a substantial amount of income from betel leaf cultivation with low investment. The study examined the impact of betel leaf farming on livelihood and income generation in some parts of Ayadaw Township.

Table 3.3 Average Economic Profit of Betel Leaf Cultivation in Ayadaw Township

No.	Sown Acre	Income/Acre (Kyats)	Cost/Acre (Kyats)	Profit (Kyats)
1	one acre	54,560,000	8,747,375	45,812,625

Source: Calculation by Survey Data, 2024

Above the table (3.3) the cost of one acre (8,747,375) kyats is less than the income of one acre (54,560,000) kyats. Therefore, the profit is received (45,812,625) kyats of one acre. So, the betel leaf cultivator has more advantages than any other crop cultivation.

Photo (3.1) The Processes of Prepare in the Cultivated Area of Betel Leaf

(a)



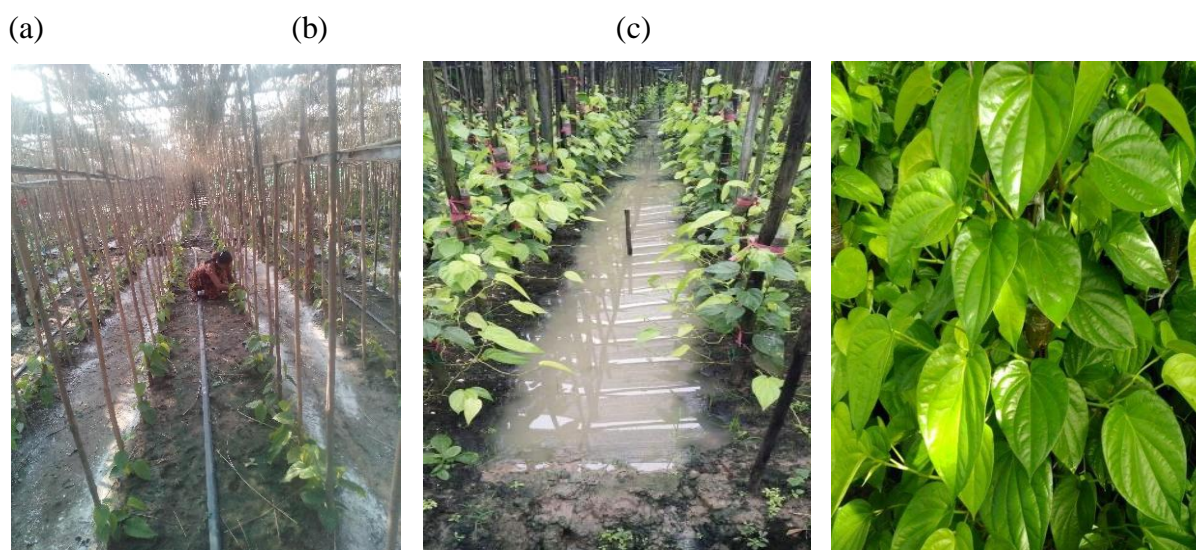
Source: Department of Agricultural Land Management and Statistics, Ayadaw Township

(b)



Source: Department of Agricultural Land Management and Statistics, Ayadaw Township

Photo (3.2) Periods between Two Months and Nine Months and Irrigation



Source: Photo 3.2(a,b,c) from Department of Agricultural Land Management and Statistics, Ayadaw Township

Photo(3.3) Plants Tide, Cutting and the Finished Product of Betel Leaf



Source: Photo 3.3(a,b,c) from Department of Agricultural Land Management and Statistics, Ayadaw Township

#### 4. Findings and results

The total area of Ayadaw Township was (302,400) acres. The research paper found that betel leaf cultivation and economic impact are related to be influenced by geographical factors. The main findings are differential cultivated distribution, the effect of the economic impact within the study area, and the profit structure.

Betel leaf concentration can be observed as high concentration above (2.00) found in six village tracts. They are Baungkya, Maletha, Ngwedwin, Khintha, Thitkyingyi, and Minywa village tracts. Where the area can be supplied by the irrigation. Medium concentration between (2.0-1.00) was found Aungtha Village Tract. There are two wards and (27) village tracts in low concentration below (1.00)categories. Ayadaw(2) ward and Kantha, Hmawdaw, Kanbyu, Wadawma, and Chinbin village tracts do not have a concentration in the Township.

There are three wards and (39) village tracts in Ayadaw Township. But betel leaf cultivation can be found in two wards and 34 village tracts. In Ayadaw Township, the total cultivated acreage of betel leaf is (2,437) acres. Betel leaf cultivation varies from village tract to village tract and from time to time as well as the economic impact of betel leaf cultivation differs annually in the study area. The spatial pattern of betel leaf cultivation by village tracts in the study area varies from village tract to village tract ranging from one acre to (1,218) acres. Maletha Village Tract is the largest betel leaf cultivation with (1,218) acres. The second largest cultivation in Ngwedwin Village Tract, betel leaf acre was (250) acres. Magyisauk Village Tract is the lowest betel leaf cultivation with one acre.

In analyzing betel leaf cultivation by type of agricultural land, most betel leaf plants are grown on red-brown savanna soils, but these soils are a mixture of alluvial soil from other places. The betel leaf output is varied from acre to acre. Some acres, one acre with (5,000) plants and output of (5,456) visses, some are (6,000) visses, and some over. According to the data collected, the average market price is (15,000) kyats (one viss). Beginning in the first year cultivation is the investment cost, is heavy but three or four years later the investment costs are gradually decreased. The longer the plant grows the more profit is received.

If the distance of the plant is (2'x3'), there are (5,000) plants per acre. It can be concluded that the more betel leaf cultivated acreage, the higher the betel leaf plant has. Therefore, the number of betel leaf cultivated village tracts is increasing within Ayadaw Township. More betel leaves will be provided more than income to cultivators. However, the market price of betel leaf differs depending on the size, quantity, and quality of betel leaves. It is noted that the economy of cultivation mainly depends upon the number of products in marketable size of betel leaf.

The result of the study showed that as a cash crop, the continual production of betel leaves throughout the year ensures a minimum level of return to most of the farmers. The farmer of the broad livelihood outcomes can be seen through aspects, like shelter, economic security, nutritional security, health security, sanitation security, education security, communication participation and access to institutions and services.

All the farmers do not have the same access to land, labour, capital, and other opportunities. Thus, not everyone has the same income. This study found that the output of betel leaves had an impact on the farmer's financial situation.

Thus, it can be assumed that betel leaf cultivation has depended on physical factors such as soil, climate and topography and human factors such as skill labour. If the transportation facilities are more convenient, then the present, forms of betel leaf cultivation can be changed in Ayadaw Township. If the underground water is available within the non-irrigated areas; betel leaf cultivation area will increase in Ayadaw Township.

## 5. Conclusion

Ayadaw Township is located in Monywa District, Sagaing Region. It is located between latitudes of 22°00' N and 22°30' N and between longitudes of 95°15' E and 95°45' E. Like other townships within the Sagaing Region, the economy of Ayadaw Township is based on agriculture. The agricultural sector is controlled by physical and human factors.

Ayadaw Township is located in Monywa District, Sagaing Region in suitable condition for agriculture. That means it is located on the west bank of Mu River, receives renewed land along the river, and has the lowest capacity for soil erosion and the highest capacity for soil moisture maintenance. In the western area, there are hills and then the hilly part gradually slopes towards the east. These areas have a high rate of soil erosion depleting the rich mass of the soil. The physical character of Ayadaw Township except for less rainfall encourages to create intensive agriculture for some village tracts within irrigated area. In contrast, social features except irrigation facilities have not effectively supported crop development.

The betel leaf is an evergreen, shade-loving perennial root climber with glossy heart-shaped leaves and white catkin. Betel leaf has important socio-cultural and ceremonial uses, besides having significant medicinal properties and nutritional values. Betel leaf cultivation has been expanded tremendously in the study area.

Farmers encountered various problems in cultivating betel leaf such as lack of soil moisture (drought), lack of suitable technology and management, disease and pest infestation, insufficient inputs, etc. The use of various soils in intensive betel leaf cultivation was found to deplete soil fertility and crop productivity. However, farmers got a substantial amount of income and benefit from betel leaf cultivation, which was very helpful for their livelihood and subsistence. It was found that family members were engaged in various activities in betel leaf cultivation.

Most of the farmers in the research area reported that their most frequent expenses were food, clothes, children's education, repaying loans, buying animals, and buying machines. When their income increased, they also allocated it to other assets, such as buying farmland, upgrading dwellings, constructing toilets, and acquiring other output items.

The study has estimated the betel leaf productivity and return to investment in betel leaf cultivation profitability and constraints to its cultivation at the farm level. The benefit-cost ratio, net present worth, and internal rate of return indicate that betel leaf cultivation is profitable. Although betel leaf cultivation is profitable, farmers face various problems such as infection of leaf rot disease, high price of raw materials, vine lack of capital, low price of betel leaf, and high price of various fertilizers.

The study area, temperature condition, and soil types are permitted for the whole year of crop cultivation. Now, Ayadaw Township grows various types of crops. At present, the population increase in agriculture is gradually raising in Ayadaw Township. Along, with the increasing population, it is needed to change the farming system.

### **5.1 Suggestion and Future Prospect**

The development of Ayadaw Township also depends on betel leaf cultivation. Betel leaf cultivation in Ayadaw Township is also dependent on the relationship between physical and human factors. To develop Ayadaw Township, it is necessary to find ways in irrigation and cultivate manpower, machinery, and inputs.

If irrigated agriculture is to be successfully implemented from the Mu Valley River Project, about half of the agricultural land in Ayadaw Township will be irrigated. In addition,

village tracts along the Mu Valley should rely on water from the Mu to grow major irrigated crops.

When cultivation betel leaf in Ayadaw Township, it can be suggestion to access technology, encourage to knowledge sharing program. Need to systematically for soil texture.

So, the exploration of new irrigation methods and mechanized farming systems are become for crucial betel leaf cultivation in Ayadaw Township. By performing the above mentioned activities, Ayadaw Township will be a developed Township in the Sagaing Region.

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ကျမ်းကိုးစာရင်း

ဝင်းအောင်မောင်။ (၁၉၉၂-၉၃) ။အရာတော်မြို့နယ်၏ဒေသန္တရပထဝီဝင်။  
ဖရက်သိန်းဖေဦး။ ။ ကွမ်း(၄) ။ အိန္ဒိယနှင့်သီရိလင်္ကာနိုင်ငံတို့၏ကွမ်းခလေးနှင့် ကွမ်းစိုက်ပျိုးရေး။  
အရာတော်မြို့နယ်။ (၂၀၁၉) ။အရာတော်မြို့နယ်၏အထွေထွေအုပ်ချုပ်ရေးဦးစီးဌာန၊စက်တင်ဘာလ၊  
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အရာတော်မြို့နယ်။ (၂၀၂၂) ။အရာတော်မြို့နယ်လယ်ယာမြေစီမံခန့်ခွဲရေးနှင့်စာရင်းအင်းဦးစီးဌာန၊အရာတော်မြို့။