

A STUDY OF THE SPATIAL DISTRIBUTION AND CONCENTRATION OF AGRICULTURAL LAND BASED ON RELIEF IN KYAUKSE TOWNSHIP (2021-2022)

Lei Lei Win¹, San San Mu², Moh Moh Aye³, Wah Wah Phy⁴, Htet Htet⁵

Abstract

Kyaukse Township is located in Kyaukse District, Mandalay Region. It is irrigated area, Kyaukse Plain. This township has a total area of 464178 acres, of which 111446 acres are agricultural land. In the studying the spatial distribution and concentration of agricultural land based on relief in Kyause Township, the findings are (1) 103064 acres or 92.48% of total area is found on the even terrain (below 750 feet and, below 750 feet-1500 feet) in the western part of this township as the agricultural land, (2) Only 8382 acres or 7.52% of the total area is available for agriculture, where the terrain is uneven area (below 750feet- over 3000 feet) and the forest area is covered about 53.45%. Generally, most agricultural lands are found below 1500 feet in elevation. It is found that there is a higher concentration of agricultural land in 60 out of 87 village tracts, 13 village tracts with median rank concentration and one village tract with lower rank concentration in the even terrain, which is an altitude of below 750 feet. In uneven terrain, there are 4 village tracts with median rank concentration and 5 village tracts with lower rank concentration, without any higher rank concentration of agricultural land. Therefore, the spatial distribution and concentration of agricultural land is found significantly influenced by the relief or topography of an area. Since the amount of wildland area 1645 acres is not large enough to be profitable use for expending agricultural land, and it is not possible to expand forest land as agricultural land, it is important to sustainable use existing. Therefore, we hope that this research paper will be a local need for Kyaukse Township and present suggestions for the sustainable use of agricultural land: (1) To supply the requirements of agricultural inputs to grow seasonal crops regularly (especially to solve the labour shortage obstacle); (2) To expand the livestock breeding sector; (3) To continuously discuss and conduct awareness training courses on agricultural farming systems.

Keywords: Kyaukse Plain, even and uneven terrain, livestock breeding.

Introduction

Agricultural land, which is a natural resource, is very important for this region, which has agriculture-based regions. The supports of other natural resources (e.g. soils, rivers and streams etc) are also important to ensure proper utilization of agricultural land. Therefore, the study is analyzed from a geographical point of view under the title of “Studying the Spatial Distribution and Concentration of Agricultural Land based on relief in Kyaukse Township” with the aim of supporting the agricultural sector of Kyaukse Township. Through the study of this research paper, it

¹ Professor, Dr, Department of Geography, Kyaukse University

² Lecturer, Dr, Department of Geography, Kyaukse University

³ Tutor, Daw, Department of Geography, Kyaukse University

⁴ Tutor, Daw, Department of Geography, Kyaukse University

⁵ Tutor, Daw, Department of Geography, Kyaukse University

is studied the influencing factor according to relief or topography on the distribution of agricultural land by village tract, and then objectives are (1) studying the distributed acreage according to the intensity of agricultural land in the village tracts, (2) analyzing the concentration of agricultural land of village tracts by Bhatia's Method and (3) studying the agricultural land ownership of circuits by Spearman's Rank Correlation Coefficient Method for this township. And then Overlaying Maps and other Geographical Statistics Methods are assessed based on the primary data and secondary data (2021-2022).

Study Area

Kyaukse Township is located in Kyaukse District, Mandalay Region, Kyaukse Plain. It has even terrain and uneven terrain as relief or topography. Although this region is situated a tropical climatic zone, it is agriculture based-region, an irrigated area and good transportation, so seasonal crops can be grown on agricultural land. The area of agricultural land (111446 acres) is 24% of total area of township (464178 acres).

Aim and Objectives

The aim of this research is to study the spatial distribution and concentration of agricultural land based on the relief by village tract in Kyaukse Township. The objectives of this research are as follows:

- Studying the distributed acreage according to the intensity of agricultural land in the village tracts.
- Analyzing the concentrated acreage of agricultural land for village tracts by Bhatia's Concentration Method.
- Studying the agricultural land ownership by circuit for this township.

Data Collection and Methodology

This research paper was preceded by theoretical references, primary data and secondary data collection and a study of farmer's difficulties. The concentration of agricultural land use is calculated by Dr.Bhatia's Concentration Method and Spearman's Rank Correlation Coefficient Method for landownership is used in this research paper. And then Method of Overlaying Maps and other Geographical Statistics Methods are assessed based on the primary data and secondary data (2021-2022).

Physical Bases of Kyaukse Township

Kyaukse Township is situated in Kyaukse District, Mandalay Region. It is located in the Dry Zone of Central Myanmar, between north latitudes $21^{\circ} 26'$ and $22^{\circ} 02'$, between east longitudes $95^{\circ} 57'$ and $96^{\circ} 58'$. This township includes (10) proper town and (87) village Tracts. It has an area of 725.278 square miles (464,178 acres) and east-west elongated shape. Kyaukse Township is bounded on the east by Pyinoo Lwin Township and Yatsauk Township, on the south by Myittha Township, on the west by Tata- U Township, and on the north by Sintgaing, Pyinoo Lwin Township. Administrative boundaries have been demarcated in the areas bordering the Sintgaing, Myittha and Ywangan Townships. The mountains of the Shan Highlands, which are the natural boundaries of Pyin Oo Lwin, Yaksauk and Naungcho Townships, are the natural boundaries of Kyaukse Township.

The topographic divisions of Kyaukse Township in Kyaukse Plain have been divided into three parts as the western part, the central part and the eastern part. It is located 270 feet above sea level. In terms of elevation, the relief of Kyaukse Township has been studied in five groups as (1) below 750 feet,(2) between 750 and 1500 feet,(3) between 1500 and 2250 feet,(4) between 2250 and 3000 feet,(5) above 3000 feet.

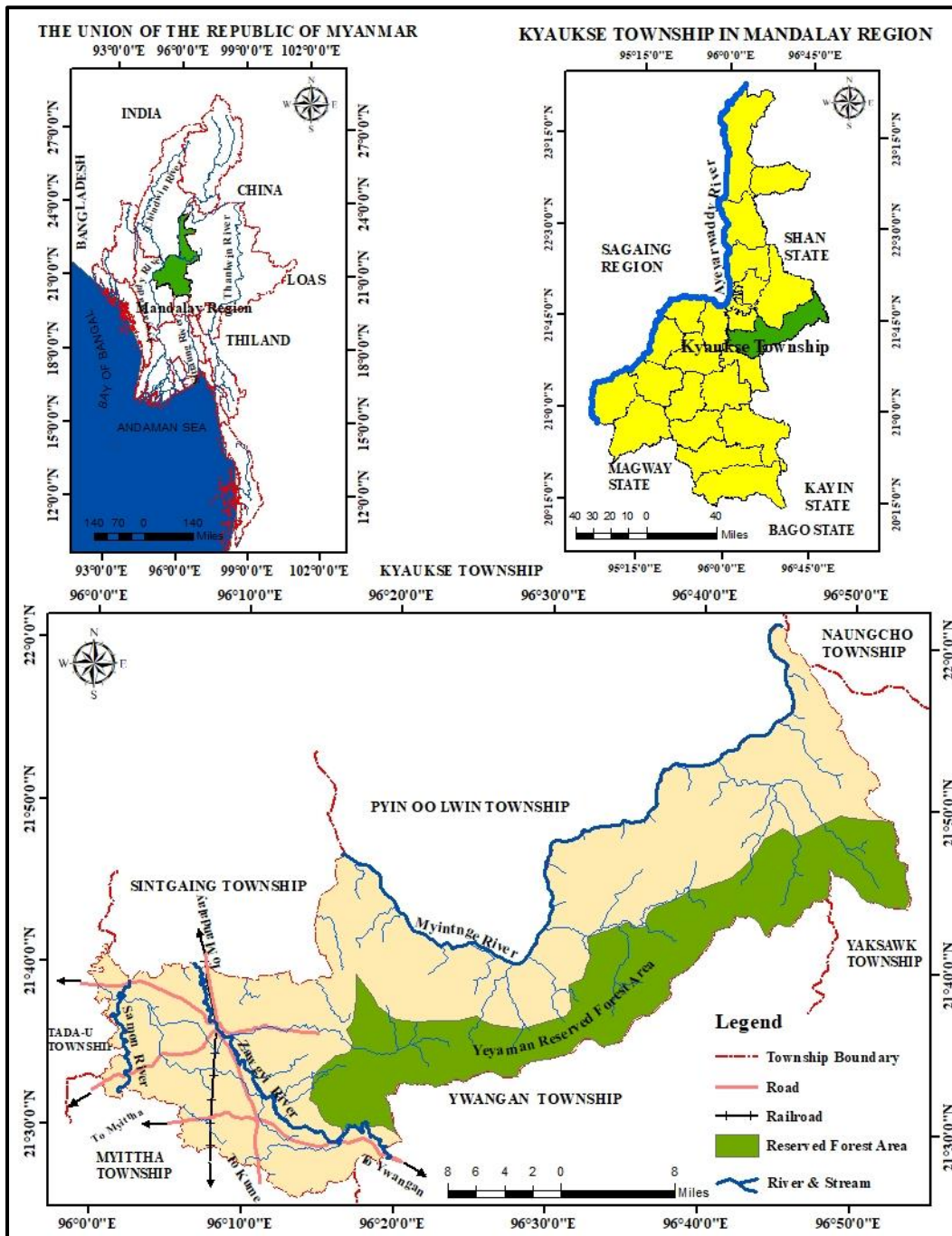
Most of the region with an altitude of below 750 feet is found in the western part, there are also even terrain and the lowest part of Kyaukse Township. But Shwetha Lyaung Taung (1053 feet), Newla Gauk Taung (1246 feet) and Taunggyi Ma Taung (2028 feet) are also found in this part. At an altitude of 2014feet, Hpaungdaw Oo Pagoda is found in western part. Panglaung and Samon Rivers flow in this part.

In the central part, uneven terrain is found, below 750 feet in altitude along Myitnge Rivers and streams in the northern part, between 750 and 2500 feet in the central part, and in areas between 1500 and over 3000 feet in elevation in the southern part.

In the western part, along the Myitnge River, there are only a few places with an altitude of less than 1500 feet, and many places between 1500 and above 3000feet. This region generally enjoys a Tropical Climate with Dry Zone of Central Myanmar.

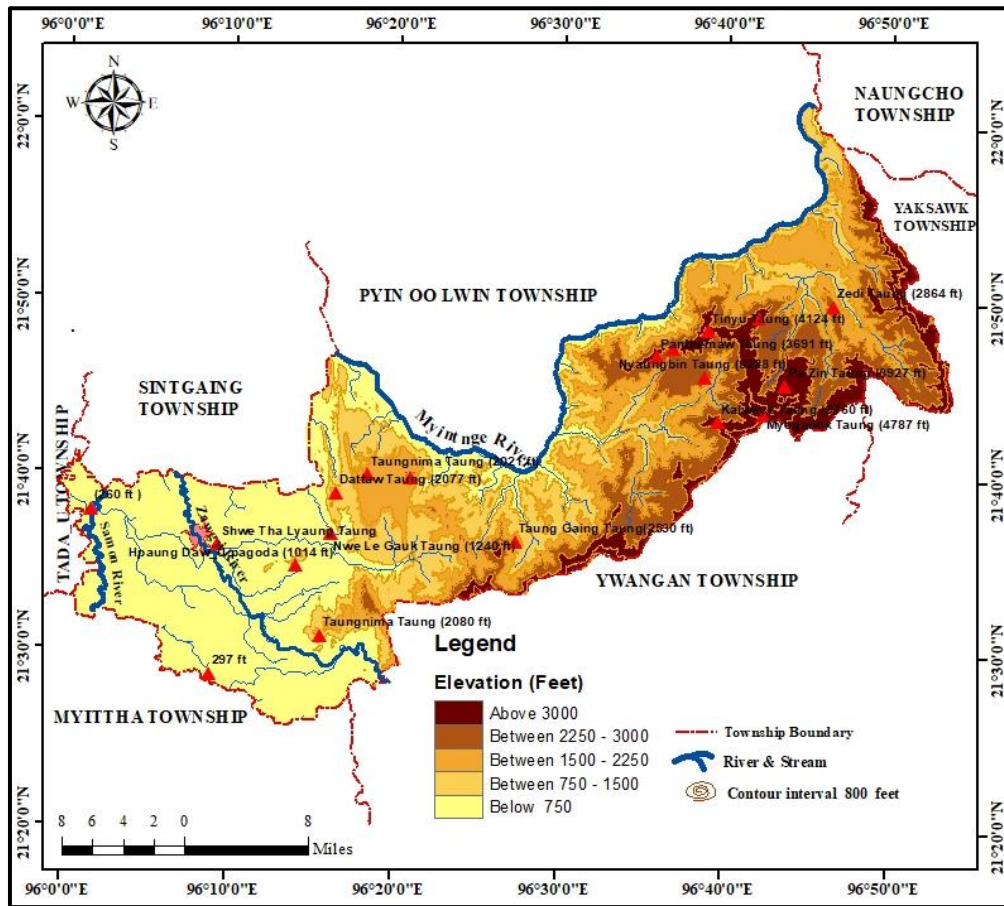
According to Koppen' Climatic Classification Method, it has been received Tropical Steppe Climate (BSh) in this region. Soil is very well known that soils play a key role in agriculture. The major types of soil in Kyaukse Township are Red Earth

Map 1 Location of Kyaukse Township



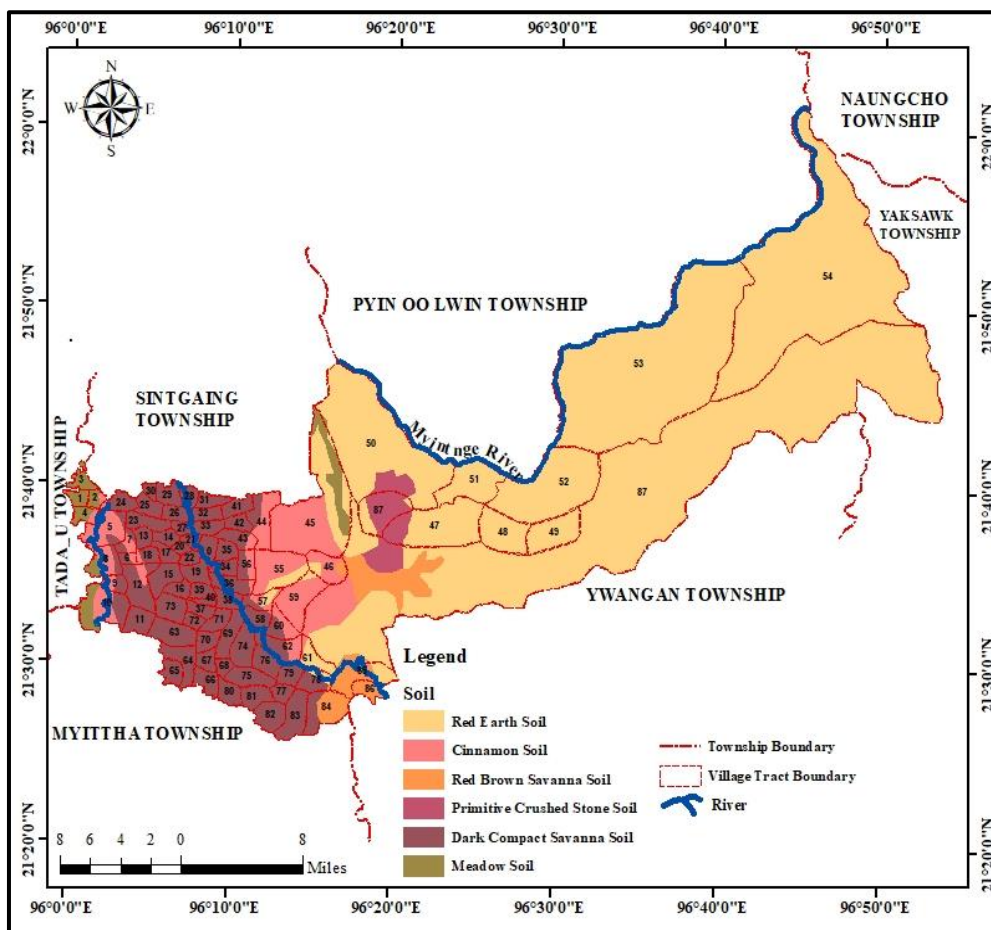
Source: Land Records Department, Kyaukse and UTM Maps No. 2196-02, 2196-03, 2196-05, 2196-06, 2196-07, 2196-09, 2196-10, 2196-13, 2196-14, 2296-12, 2296-16.

Map 2 Topographic Division of Kyaukse Township



Source: Digital Elevation Model (DEM) 90 Meter Resolution and UTM Maps.

Map 3 Types of Soil in Kyaukse Township



Source: Land Use Bureau, Yangon.

Soil, Cinnamon Soil, Red Brown Savanna Soil, Primitive Crushed Stone Soil, and Dark Compact Savanna Soil, Meadow Soil and Savanna Soil.

In Kyaukse Township, as natural vegetation, most deciduous forest is found on Yeyaman Range; but are scattered on the undulating lowland. The area of forest is 58% of the township's total area. There is reserved forest (53% or 244778 acres), and unreserved and protected forest (1% or 3317 acre) in 2022. The natural vegetation is grown teak, hardwood and medical plants. Shade seeding is also being cultivated in this area.

Socio-economic Bases of Kyaukse Township

Kyaukse Township has a total population of 248,477 people in 2022, with an urban population of 37,546 and a rural population of 210,931. The highest density of population is Letpan Village Tract and the least is Zeyitkhe Village Tract.

Kyaukse Township is an irrigation area and many farmers make a living from agriculture. The Zawgyi River, Zawgyi system can irrigate to 56207 acreage of earmarked irrigation in Kyaukse Township and Samon River flow through the western part of the township, while the Myitnge River flows as a natural boundary in the northern part In Kyaukse Township, the acreage of agricultural land use is 111446 acres in 2022. The main cultivated seasonal are rice, groundnuts, sunflowers, beans and peas, sugarcane and corn. Perennial crops palm, betel leaves and betel nut, fruits and other marketable crops (watermelon, cucumber, dragon fruit, white hemp and onion) grown in this region. It has forest area of 248095 acres.

Livestock, industry, cottage industry gasoline and diesel stores and shops, printing etc: are found in Kyaukse Township. According to the 2014 census, there are 150417 persons employed and 12512 persons unemployed people. In term of roads, there are Kyaukse-Taunggu-Mandalay Road, Kyaukse-Tada-U Roads, Township Collector Roads, District Collector Roads, Villages Collector Roads, Zawgyi Bridge and other bridges, so it is a township with accessibility. It is being and located in the Yangon-Mandalay Highway Old Road and Railway that is a focal point for trading agricultural products.

The Spatial Distribution and Concentration of Agricultural Land Based on Relief in Kyaukse Township

The spatial distribution and concentration of agricultural land is influenced by a variety of factors but the distribution and concentration of agricultural land in Kyaukse Township has been analyzed based on the relief (Table .1).

In the studying the intensity of agricultural land for distributed acreage of agricultural land, two proper towns (Kyetminton and Phaungywa wards) and 8 village tracts were included in lower level. These village tracts are Thungetaw (48.36%), Hngetkataung (41.89%), Kularchaung (35.12%), Kyetthahin (3.55%), Thayetpin (13.17%), Ye (8.71%), Kyaung (2.09%), Zeyitkhe (0.22%) and Ohnkyaw (0.32%) village tracts. The total acreage of agricultural land (111446 acres) is 24% of total area of township (464178 acres). In general, usually fertile, well drain, very suitable for cultivation of seasonal and perennial crops.

According to the intensity of distributed acreage of agricultural land, Yanbetlo, Ywarnan, Ah Shey Ngetoe and Paunglaunggyi Village Tracts are the most intensive village tracts (over 90%). The areas with the lowest intensity (less than 50%), such as Khetminton (urban), Phaungywa (urban), Hngetkataung, Ye and Kyattharhin Village Tracts, are found on even terrain, while thayetpin, Kyaung, Zeyitkhe and Ohnkyaw Village Tracts are found on uneven terrain. This research paper analyzes the concentration of agricultural land using the Bhatia's method, 10 lower rank places are two proper towns (urban area) and eight village tracts in uneven area (below 750 feet - over 3000 feet). As for the soil, in the two proper towns have dark compact savanna soil, but they are settlement area and there is only a small amount of agricultural land. Red earth soil, red brown savanna soil, and primitive crushed stone soil are found in the lower rank concentrated village tracts. Hngetkataung Village Tract village tract is a lowland area below 750 feet and the soils are dark compact savanna soil and cinnamon soil is lower rank concentration because there is reserved forest area of 1137 acres. In Zeyitkhe Village Tract, it has the least agricultural land, lower rank concentration and uneven terrain and red earth soil.

The 13 village tracts out of the 17 village tracts that are median rank concentration are low-lying areas below 750 feet and have dark compact savanna soil. The remaining 4 village tracts (below 750 and between 750 and 2250 feet) have

Table 1 The Distribution and Concentration of Agricultural land in KyaukseTownship

Sr. No	Circuits	Village/ Tracts	Agricultural Land(Acres) X	Area (Acres) Y	%	$\frac{X1/X}{Y1/Y}$	Rank	Relief (Feet)	Soil
1	Circuit (1)	Dwayhla	688	832	82.69	3.44	H	Below 750	Meadow
2		Ngarsu	788	943	83.56	3.48	H	Below 750	Meadow, Cinnamon
3		Sharpin	822	1030	79.81	3.32	H	Below 750	Meadow
4		Kyeeeik	1725	2144	80.46	3.35	H	Below 750	Meadow, Cinnamon
5		Thinpyo	859	973	88.28	3.68	H	Below 750	Dark Compact Savana, Cinnamon
6		Pankhwar	1032	1221	84.52	3.52	H	Below 750	Dark Compact Savana, Cinnamon
7		Kyeepya	1744	1961	88.93	3.70	H	Below 750	Dark Compact Savana, Cinnamon
8	Circuit (2)	Sinkun	1840	2365	77.80	3.24	H	Below 750	Meadow, Dark Compact Savana, Cinnamon
9		Bonkwın	1011	1249	80.94	3.37	H	Below 750	Dark Compact Savana, Cinnamon
10		Dantaing	3529	4169	84.65	3.53	H	Below 750	Meadow, Dark Compact Savana, Cinnamon
11		Yanbetlo	1348	1472	91.58	3.81	H	Below 750	Dark Compact Savana
12		Paytawgyi	1639	1992	82.28	3.43	H	Below 750	Dark Compact Savana, Cinnamon

Table 1 The Distribution and Concentration of Agricultural land in Kyaukse Township

Sr. No	Circuits	Village/ Tracts	Agricultural Land(Acres) X	Area (Acres) Y	%	$\frac{X1/X}{Y1/Y}$	Rank	Relief (Feet)	Soil
13	Circuit (3)	Puttaing	1831	2129	86.00	3.58	H	Below 750	Dark Compact Savana
14		Myaung U	681	771	88.33	3.68	H	Below 750	Dark Compact Savana
15		Ah Nauk Thargaya	1752	2157	81.22	3.38	H	Below 750	Dark Compact Savana
16		Ywarpale	848	1010	83.96	3.50	H	Below 750	Dark Compact Savana
17		Katei	1083	1249	86.71	3.61	H	Below 750	Dark Compact Savana
19		Tansoe	430	505	85.15	3.55	H	Below 750	Dark Compact Savana
20		Letpanpin	208	314	66.24	2.76	M	Below 750	Dark Compact Savana
21		Meizeipin	354	497	71.23	2.97	M	Below 750	Dark Compact Savana
22		Thungetaw	251	519	48.36	2.01	L	Below 750	Dark Compact Savana
23		Circuit (4)	Nyaunwun	1223	1520	80.46	3.35	H	Below 750
24	Kyaungpankone		1074	1383	77.66	3.23	H	Below 750	Dark Compact Savana
25	Nyaungshwe		569	669	85.05	3.54	H	Below 750	Dark Compact Savana
26	Thinboke		1022	1273	80.28	3.34	H	Below 750	Dark Compact Savana
27	Zayathpyu		517	629	82.19	3.42	H	Below 750	Dark Compact Savana
28	Letpan		660	913	72.29	3.01	M	Below 750	Dark Compact Savana
29	Ywarnan		773	835	92.57	3.86	H	Below 750	Dark Compact Savana
30	Ngaroe		325	372	87.37	3.64	H	Below 750	Dark Compact Savana

Table 1 The Distribution and Concentration of Agricultural land in Kyaukse Township

31	Circuit (5)	Taungnauk	513	781	65.69	2.74	M	Below 750	Dark Compact Savana
32		Thintaung	870	1224	71.08	2.96	M	Below 750	Dark Compact Savana
33		Indaing	1133	2026	55.92	2.33	M	Below 750	Dark Compact Savana
34		Pyipan	663	822	80.66	3.36	H	Below 750	Dark Compact Savana
		Kyetmintun(Urban)	93	299	31.10	1.30	L	Below 750	Dark Compact Savana
		Hpaungywa (Urban)	29	214	13.55	0.56	L	Below 750	Dark Compact Savana
35		Pattar	986	1515	65.08	2.71	M	Below 750	Dark Compact Savana
36		Pintalel	1186	1389	85.39	3.56	H	Below 750	Dark Compact Savana
37		Montpaung	520	862	60.32	2.51	M	Below 750	Dark Compact Savana
38		Letpanzin	571	847	67.41	2.81	M	Below 750	Dark Compact Savana
39		Myinkabet	509	663	76.77	3.20	H	Below 750	Dark Compact Savana
40		Thamantalin	970	1207	80.36	3.35	H	Below 750	Dark Compact Savana
		Myoma	0	598	0.00	0.00		Below 750	Dark Compact Savana
41		Circuit (6)	Ah Shey Ngetoe	2075	2253	92.10	3.84	H	Below 750
42	Htanzintaw		214	254	84.25	3.51	H	Below 750	Dark Compact Savana
43	Hngetkataung		1053	2514	41.89	1.74	L	Below 750	Dark Compact Savana, Cinnamon
44	Shwedat		815	1067	76.38	3.18	H	Below 750	Dark Compact Savana, Cinnamon
45	Yebawgyi		8832	10249	86.17	3.59	H	Below 750, Between 750-1500	Cinnamon, Red Earth, Meadow

Table 1 The Distribution and Concentration of Agricultural land in Kyaukse Township

46	Circuit (7)	Hpyaukseikpin	3383	4267	79.28	3.30	H	Below 750	Cinnamon, Red Earth, Red Brown Savana
47		Ywarthit	478	641	74.57	3.11	H	Between 750-1500, Between 1500-2250	Primitive Crushed Stone, Red Earth
48		Yaethayauk	341	629	54.21	2.26	M	Between 750-1500, Between 1500-2250	Red Earth
49		Chaungsone	369	632	58.39	2.43	M	Between 750-1500, Between 1500-2250	Red Earth
50		Thayetpin	2055	15609	13.17	0.55	L	Below 750, Between 750-1500, Between 1500-2250	Primitive Crushed Stone, Red Earth
51		Ye	1522	17474	8.71	0.36	L	Below 750, Between 750-1500	Red Earth
52		Kyaung	336	16082	2.09	0.09	L	Below 750, Between 750-1500, Between 1500-2250	Red Earth
53		Zeyitkhe	111	51432	0.22	0.01	L	Below 750, Between 750-1500, Between 1500-2250, Between 2250-3000, Above 3000	Red Earth
54		Ohnkyaw	560	176779	0.32	0.01	L	Between 750-1500, Between 1500-2250, Between 2250-3000, Above 3000	Red Earth

Table 1 The Distribution and Concentration of Agricultural land in Kyaukse Township

55	Circuit (8)	Kularchaung	1889	5379	35.12	1.46	L	Below 750, Between 750-1500	Cinnamon, Red Earth
56		Puhtoeni	738	867	85.12	3.55	H	Below 750	Dark Compact Savana, Cinnamon
57		Shantaung U	1296	1609	80.55	3.35	H	Below 750	Dark Compact Savana, Red Earth, Cinnamon
58		Pyitawthar	1195	1426	83.80	3.49	H	Below 750	Dark Compact Savana, Cinnamon
59		Hmaingpan	4331	5167	83.82	3.49	H	Below 750	Cinnamon, Red Earth
60		Kalay	1569	1858	84.45	3.52	H	Below 750	Dark Compact Savana, Cinnamon
61		Thingaton	923	1132	81.54	3.40	H	Below 750, Between 750-1500	Cinnamon, Red Earth
62		Ah Shey Thargaya	668	822	81.27	3.38	H	Below 750	Dark Compact Savana, Cinnamon
63		Circuit (10)	Minsu	1773	2207	80.34	3.35	H	Below 750
64	Sabaitaw		1135	1622	69.98	2.91	M	Below 750	Dark Compact Savana
65	Shewinn		1109	1312	84.53	3.52	H	Below 750	Dark Compact Savana
66	Laysekone		1004	1281	78.38	3.26	H	Below 750	Dark Compact Savana
67	Circuit (9)	Yemaau	1318	1510	87.28	3.64	H	Below 750	Dark Compact Savana
68		Saingmalan	946	1065	88.83	3.70	H	Below 750	Dark Compact Savana
69		Koepin	859	1156	74.31	3.09	M	Below 750	Dark Compact Savana
70		Inyaung	1033	1264	81.72	3.40	H	Below 750	Dark Compact Savana
71		Kalaingkyaw	1315	1536	85.61	3.57	H	Below 750	Dark Compact Savana
72	Circuit (10)	Tawtwin	999	1319	75.74	3.15	H	Below 750	Dark Compact Savana
73		Myaysopeilaysal	2297	2677	85.81	3.57	H	Below 750	Dark Compact Savana

Table 1 The Distribution and Concentration of Agricultural land in Kyaukse Township

74	Circuit (11)	Hanmyintmo	930	1252	74.28	3.09	M	Below 750	Dark Compact Savana
75		Lelgyi	1417	1763	80.37	3.35	H	Below 750	Dark Compact Savana
76		Ponehnyetkyay	2115	2522	83.86	3.49	H	Below 750	Dark Compact Savana
77		Kyarkar	1490	1792	83.15	3.46	H	Below 750	Dark Compact Savana
78		Thanywa	1852	2378	77.88	3.24	H	Below 750	Dark Compact Savana, Red Earth
79		Khatetkone	486	630	77.14	3.21	H	Below 750	Dark Compact Savana
80	Circuit (12)	Sulaykone	2174	2648	82.10	3.42	H	Below 750	Dark Compact Savana
81		Paukpinkwayt	1236	1452	85.12	3.55	H	Below 750	Dark Compact Savana
82		Myaysomoekaung	1795	2125	84.47	3.52	H	Below 750	Dark Compact Savana
83		Pekhin	1852	2261	81.91	3.41	H	Below 750	Dark Compact Savana
84		Paunglaunggyi	3036	3271	92.82	3.87	H	Below 750	Red Brown Savana, Dark Compact Savana
85		Taungtaw	2296	3558	64.53	2.69	M	Below 750, Between 750-1500, Between 1500-2250	Red Brown Savana, Red Earth
86		Kin	850	1033	82.28	3.43	H	Below 750	Red Brown Savana
87	Circuit(7)	Kyattharhin	1836	51726	3.55	0.15	L	Between 1500-2250	Primitive Crushed Stone, Red Earth
		Total	111446	464178	24.01				

Source: Settlement and Land Record Department, Kyaukse Township and Digital Elevation Model

Primitive crushed stone soil, red earth soil, red brown savanna soil and dark compact savanna soil.

The 62 village tracts that are at a higher rank are below 750 feet and between 750-1500 feet in elevation. Yebawgyi Village Tract is below 1500 feet and has cinnamon soil, red earth soil and meadow soil. The agricultural land in higher rank concentration is 92.48%, showing a good concentration of agricultural land in Kyaukse Township. There are meadow soil, cinnamon soil, dark compact savanna soil, red earth soil and red brown savanna soil.

Agricultural Land Ownership

The amount of agricultural land owned by a household is an important basic factor for an agricultural- based economy. Spearman's Rank Correlation Coefficient Method is used to assess the amount of agricultural land owned by each household according to the circuit. Data for that assessment is presented in the following table.

Table 2 Agricultural land ownership

Sr.No	Circuits	Agricultural Land (X)	Household (Y)
1	Circuit (1)	7658	2481
2	Circuit (2)	9367	3225
3	Circuit (3)	8309	3837
4	Circuit (4)	6163	4555
5	Circuit (5)	7921	6447
6	Circuit (6)	12989	3385
7	Circuit (7)	10991	3267
8	Circuit (8)	12609	4153
9	Circuit (9)	5471	2602
10	Circuit (10)	8317	3267
11	Circuit (11)	8290	4294
12	Circuit (12)	13239	6276
	Total	111324	47789
Land Ownership by household = 2.33 acres (23.3%)			

Source: Department of Agricultural Land Management and Statistics, Kyaukse.

The total agricultural land and household in Kyaukse Township are 111446 acres and 47789 households respectively. So on average, each household owns about 2.33 acres. According to Spearman's Rank Correlation Method, as the correlation degree is +0.85, high degree and positive correlation coefficient is obtained.

According to the correlation determination, 72% is found only at the intermediate level. Therefore, farmers the agricultural land ownership of farmers is not in a very good condition.

Findings, Results and Suggestions

Kyaukse Township is located in the Dry Zone of Central Myanmar and 270 feet above sea level. The western part is a plain area (even terrain) with an altitude of below 750 feet, and the central and eastern parts are uneven terrain (below 750-above 3000 feet). As for the climate, a Tropical Climate (BSh) has high temperature and low rainfall.

The total acreage of agricultural land (111446 acres) is 24% of total area of township (464178 acres). In general, usually fertile, well drain, very suitable for cultivation of seasonal and perennial crops.

According to the spatial concentration of agricultural land by using the Bhatia's Concentration Method, 10 lower rank places are two proper towns (urban area) and eight village tracts in uneven terrain (below 750 feet -over 3000 feet).

The 17 village tracts are median rank concentration in even terrain (below 750 feet and between 750-1500 feet) and have Meadow, Cinnamon, and Red Earth and dark compact savanna soils. The remaining 4 village tracts are located (750 and 2250feet) have primitive crushed stone soil, red earth soil, red brown savanna soil and dark compact savanna soil.

The 62 village tracts that are at a higher rank are below 750 feet and between 750-1500 feet in elevation a. No Primitive Crushed Stone soil, there are found only suitable types of soil for cultivation. The agricultural land in higher rank concentration is 92.48%, showing a good concentration of agricultural land in Kyaukse Township.

And then, the agricultural land ownership is generally only found in the intermediate level of correlation coefficient. Now, expansion of residential areas in two urban areas (Kyatminton and Phaungywa wards) with a small amount of agricultural land and some other agricultural land can be changed into residential areas and areas of cultivated instant cash crops and flowers due to climate change and the higher costs of agricultural inputs (including labour cost and labour shortage) for seasonal crops and the higher price for land.

Livestock farming should be expanding widely, both as a job opportunity and as an alternative source of income.

It is suggested that if the agricultural sector becomes more successful by providing more employment opportunities and by expanding the seasonal irrigation sector, testing the properties of the soils and choosing suitable crops, supporting the knowledge to farmers, support agricultural needs and make use of areas that cannot be used for agriculture, it will be possible to prevent the potential for agricultural land to decrease and be sustainable use the agricultural land. 58% of the township’ area is covered the forests and the wild and waste lands (0.1% or 47337 acre) are found in Thayetpin, Ye, Kyaung and Kyatthahin village tracts with red earth soil areas. It is also suggested that pasture lands should be systematically developed in order to expand the livestock farming or cultivation of perennial crops in these wild land areas Therefore, it is hoped that these suggestions will be able to support the development of Kyaukse Township.

Acknowledgements

First and foremost, we would like to gratefully acknowledge our indebtedness to Dr. Yee Yee Oo, Rector, Kyaukse University. In addition, I would like to thank Dr. Win Min Thein, Pro-Rector, Kyaukse University and Dr. Seine Nyoe Nyoe Ko, Pro-Rector, Kyaukse University for their permission on this research. We would also like to express our deepest gratitude to Dr. Thet Khaing (Professor, Head of Geography Department, Kyaukse University) for guiding us in the research of this paper. We would like to express our special thanks to Daw Khin Myo Thin, Associate Professor and Head of English Department, Kyaukse University and Daw Moe Moe Myint, Associate Professor, English Department, Kyaukse University. We also wish to express our thanks to the departmental staff in Kyaukse Township who provided the necessary information and all staff of the Geography Department, Kyaukse University for their kind help in writing this research paper.

References

Mallikarjuna Raju: Climate Change and Agricultural Production, ADYA YAN PUBLISHERS & DISTRIBUTORS New Delhi-110002 (Email: adhyanpublishers@yahoo.com)

ကျမ်းကိုးစာရင်း

စိုက်ပျိုးရေး၊ မွေးမြူရေးနှင့် ဆည်မြောင်းဝန်ကြီးဌာန၊
လယ်ယာမြေစီမံခန့်ခွဲရေးနှင့်စာရင်းအင်းဦးစီးဌာန၊
မြို့နယ်လယ်ယာမြေစီမံခန့်ခွဲရေးနှင့်စာရင်းအင်းဦးစီးဌာန၊ ကျောက်ဆည်မြို့နယ် -၂၀၂၁)
(၂၀၂၂။
သင်းကြည်၊ ဒေါက်တာ၊ ပထဝီဝင်ပါမောက္ခ၊ ဝိဇ္ဇာနှင့်သိပ္ပံတက္ကသိုလ်၊ ရန်ကုန်၊ မြန်မာနိုင်ငံ၏
မြေဆီလွှာနှင့် မြေအသုံးချခြင်း၊ တက္ကသိုလ် ပညာပဒေသာစာစောင်၊ အတွဲ ၅၊ အပိုင်း ၄၊
၁၉၇၀။