American Journal of
Biomedical Science & Research

www.biomedgrid.com
ISSN: 2642-1747

Research Article

Factors Affecting the Decision of Using Machinery for Harvesting Products of Rice Farmers in Chiang Rai Province

Sathinee Jongdoen[1], Wongchai Anupong[2] and Peng Ke-Chung*[3]

[1]*Department of Tropical Agriculture and International Cooperation, National Pingtung University of Science and Technology, Taiwan*

[2]*Department of Agricultural Economy and Development, Chiang Mai University, Thailand*

[3]*Department of Agribusiness Management, National Pingtung University of Science and Technology, Taiwan*

***Corresponding author:** Peng Ke-Chung, Department of Agribusiness Management, National Pingtung University of Science and Technology, Taiwan.

To Cite This Article: *Peng Ke-Chung, Factors Affecting the Decision of Using Machinery for Harvesting Products of Rice Farmers in Chiang Rai Province. 2020 - 10(1). AJBSR.MS.ID.001477.* DOI: 10.34297/AJBSR.2020.10.001477.

Received: July 29, 2020; **Published:** August 26, 2020

Abstract

This research aims to study the behavior of rice farmers affecting the mechanization of harvesting and analyze the factors that influence the decision to use the machinery to harvest rice products in Huai Sak, Chiang Rai Province. The selected group is considered as 100 samples. The sample group used in this study is rice farmers and agricultural machinery are used to harvest rice products in the area. The samples and data were collected using questionnaires. The results show that most respondents have their own land. The physical characteristics of the rice fields are mostly flat land, which is necessary for the use of agricultural machinery. Kubota is the most popular brand of rice combine harvester. In addition, most respondents do not have agricultural machinery to harvest their own rice. Therefore, there are services from those who have agricultural machinery to harvest the rice which is more expensive than before. The farmers who responded agreed that the factors affecting the decision to use rice combine harvester were the efficiency of the machinery, personal, people around and neighbors who have a high level of importance, market, social, culture are important at a high level.

Keywords: Agricultural Machinery; Crop Harvesting; Factors Influencing Decision Making; Rice Growers

Introduction

Thailand is an agricultural country that plays an important role in all regions and is a source of raw materials for production. There are diverse agricultural products that can be developed into the industrial sector a lot to develop the economy of Thailand by focusing mainly on exports of agricultural products [1]. In this regard, most of the population of Thailand has a lot of agricultural occupation and expertise in agriculture such as cultivation, animal husbandry and fishery. As a result, agricultural products from the agricultural sector are the main source of income for the country. In the past, agriculture was self-reliant and produced for subsistence, which mainly focused on agriculture that uses human labor and animal labor [2]. However, when economic development has focused on trading for maximum profits, resulting in a greater role affecting agriculture, resulting in increased technological dependency such as chemical fertilizer, pesticide, and agricultural machinery etc.

Most of the agricultural areas of Thailand are used for rice cultivation which is the most important which is widely grown in all regions and covers about half of the country's cultivated area [3], so the factors used in production are mainly used for farming and there are still important factors such as Cultivated land, labor, and agricultural machinery. In which the proportion of labor in the agricultural sector has decreased due to the change of labor in the agri-

cultural sector of Thailand. The data [4,5], shows that the number of labor force in agriculture is smaller and less than non-agriculture, which will be significantly different agriculture tends to continually decline. In 2017-2019, the proportion of labor force decreased almost around 50 percent, resulting in the use of machinery. More agriculture to meet the needs of the market, thus changing the production process from the former used human and animal labor to use almost all agricultural machinery stages of production, such as using harvesters to harvest onwards. For this reason, the use of agricultural machinery is widespread and increasing every year. According to the data [6], the development of farm mechanization in Thailand started with small-scale machines [7,8], such as irrigation pumps, power tillers, and threshers.

There are also more domestic producers, which the agricultural machinery used to harvest rice is the most popular type of combine harvester today that is imported. The combine harvester is an agricultural machine that combines harvesting and kneading systems into one machine, which works quickly and saves a lot of labor, which is in demand among rice growers the machinery can enable farmers to grow more than one crop a year. The rate of imported rice combine harvesters from foreign countries has increased. The use and types of mechanization are expanding (Table 1). The rice planting areas in the northern region are distributed in all 17 provinces. Chiang Rai Province is considered one of the important rice growing areas in the northern region of Chiang Rai, with a total area of 1,167,836.96 hectares, which is an agricultural area of 482,435.04 hectares which is divided into 72,669.92 hectares of rice and 69,172 hectares of harvested land. From Table 1, Chiang Rai province has an average yield of rice in the year 2019 is 4,087.50 kilograms per hectare and the storage of rice is 4,293.75 kilograms per hectare. Mueang District, Chiang Rai is the district that has the most rice farming area, which has an area of farming in 2019, equal to 5,558.72 hectares and 5,504.96 hectares of harvesting area. Which will receive rice production equal to 4,318.75 kilograms per hectare and rice harvesting equals 4,362.50 kilograms per hectare, in which Huai Sak sub-district has 31 villages. Most of the population in each village is mainly rice farming cultivation. Because the area is characterized as a river basin and some are plains on hills that are suitable for agriculture [9].

This study found that Chiang Rai Province is one of the important rice-growing areas of the upper northern region, coupled with a large area of Chiang Rai's rice farming and rice cultivation in every household, most of which have problems is using the cost of harvesting the products, labor shortage, wages expensive, and less popular with harvest rice. Therefore, farmers want to reduce the steps in post-harvest management, which motivate farmers to rely more on agricultural machinery for harvesting or rice harvester, but there are still factors in agricultural machinery in many harvesting products such as the harvested products that do not meet the needs of farmers. Therefore, the researcher is interested in studying the behavior of farmers and analyzing the factors that influence the decision to use agricultural machinery to harvest the products of rice growers in Huai Sak Subdistrict, Mueang District, Chiang Rai Province. In order to be able to be part of the guidelines for the development and improvement of technology related to agricultural machinery by the government or related business sectors to suit the needs of farmers and to benefit farmers in making machinery decisions in the harvest of rice. This study focuses on farmers' behavior that affects the use of machinery for harvesting products to analyze factors that influence the decision to use machinery to harvest the products of a group of rice farmers: Huai Sak Subdistrict, Mueang District, Chiang Rai Province.

Methods

Population sampling: Sampling was conducted by rice farmers using agricultural machinery for harvesting rice products, Huai Sak Sub-district, Mueang District, Chiang Rai Province. With a randomized sampling without knowing the number of rice growers who use agricultural machinery to harvest real rice products by calculating the sample size, then using the formula of [10,11]. The research needs a comprehensive number of samples for analysis and in accordance with the data collection period, therefore specifying 100 sample and the sampling study uses the purposive sampling method. The sample group will be determined by the decision of the researcher. The characteristics of the selected group are in accordance with the objectives of the research. The cattle are grain growers Huai Sak district, Chiang Rai.

The concept of this research is to study the factors that influence the decision to use the machine to harvest the products of rice growers, Huai Sak Subdistrict, Mueang District, Chiang Rai Province. The reason for choosing Huai Sak Subdistrict, Mueang District, because there are a lot of areas for agriculture or farming, and the use of agricultural machinery has an increasing role in the present. The objective of this research is to consider the behavior of farmers and factors that influence the decision to use the machine in the harvest of rice growers, including factors: the performance of the machines, personal factors, market factors, social and cultural factors. The factors used in the analysis are tools used for data analysis, including descriptive statistics and Chi-Square tests, because they want to know the problems and obstacles in using agricultural machinery to harvest the most products of rice growers and factors to be analyzed include general information of farmers, behavior regarding the use of agricultural machinery.

Data collection

A primary data collection was conducted by interviewing farmers based on questionnaires from mechanized rice growers uses

agricultural machinery to harvest rice products. The sample sizes are 100 rice farmers in Chiang Rai Province.

Tools used in the study: Questionnaire was used as the main tool in the study by dividing the content into four parts.

Part 1 General information of rice growers, such as gender, age, status, education level, average monthly income, area for farming, number of household labor, experience or duration of farming, physical characteristics of rice fields etc.

Part 2 Behavior of farmers using agricultural machinery for rice farmers, comments on the use of agricultural machinery for harvesting products, what are the benefits? 3. reasons for choosing by using to check the list of 12 items.

Part 3 Factors that influence the decision to use agricultural machinery for agriculture of rice growers, Factors of machinery efficiency, Personal factors, Market factors, and Social and cultural factors. In which the characteristics of the questionnaire are divided into, most agree, very agree, agree with moderate, and least agree. In this regard, the scoring has been assigned to each value as a rating feature of Likert Scale which divides the scoring criteria as follows:

Comment level	Score
Most agree	5
Very agree	4
Moderate agree	3
Less agree	2
Least agree	1

Part 4 Additional recommendations, which are the characteristics of farmers' comments, in addition to the above 3 questionnaire sections, to provide general opinions on the use of agricultural machinery for agriculture of rice growers.

Data Analysis

This study analyzed data by studying agricultural machinery use behavior of rice farmers in Huai Sak Subdistrict, Mueang District, Chiang Rai Province. By using the data in Part 1 and Part 2 to analyze by using descriptive statistics and to analyze factors that influence the decision to use agricultural machinery to harvest the products of rice growers in Huai Sak Subdistrict, Mueang District, Chiang Rai Province. By using the data of Part 3 for analysis by using the frequency, percentage, average value and the interpretation criteria, which has determined the criteria for dividing the scores from the grade level to 5, and calculated using the formula [12]. The average score level from the above leveling can be shown as follows:

Rating range	Priority
Average score 4.21 - 5.00	Highest
Average score 3.41 - 4.20	High
Average score 2.61 - 3.40	Moderate
Average score 1.81 - 2.60	Less
Average score 1.00 - 1.80	Least

Data were analyzed using frequency, percentage, and average in analyzing factors affecting the decision to use agricultural machinery to harvest the rice of farmers who interviewed and answered the questionnaires. In addition, there is a Chi-square test for each part of the questionnaire which is specific to only those parts that are related to each other.

Results

Data analysis using descriptive statistical tools and data analysis by Chi-Square test, which will be divided into three parts: general information of farmers and the behavior of farmers towards the use of machinery in harvesting farmers products and factors influencing the decision to use machines for harvesting of rice farmers in Huai-Sak District Mueang District, Chiang Rai Province Which has the following details

General information for farmers

From Table 2, most of them are male more than female is 70% and female 30%. The farmers are generally between 40-49 years old, accounting for 35 percent, followed by aged between 50-59 years, accounting for 32 percent, and farmers aged 60 and over are equivalent to 17 percent and are between 30-39 years, equivalent to 15 percent. Farmers under the age of 20 percent, representing one percent, which is the least. According to the survey found that those under 20 years of age are those who do not continue to graduate due to many reasons. As for the family status of the farmers, most of the respondents found that their marital status is 77%, most of them have primary education level 52%, followed by high school or vocational certificate Vocational certificate (21%) and junior high school (11%), high vocational certificate (diploma) or diploma (10%) and high-level BA accounted for six percent.

From Table 3, it can be found that the farming areas of farmers are their own land. Representing 96% of the total land between 0.48-1.60 hectares. Followed by four percent is land leased for agriculture, with 30 acres of land leased for agriculture, and the largest number of labor force in the household, three people accounting for 47 percent, followed by two people representing 29.00% had more than three people in the household, representing 18%, and the smallest number of households was only six percent. In addition, most respondents have an average income from rice farming. 961-1595 USD or 47 percent, followed by the average income from rice farming is equal to 1,596-2,230 USD, equivalent to 29 percent, and farmers with an average income from farming 320-960 USD, representing 23 percent and more than 2,230 USD, representing one percent. Which is considered the smallest because the farmers keep the produce mainly in the kitchen without being sold to

the entrepreneurs dealing with buying and selling rice, thus having the least average income. Most of the farmers have experience or period of farming the most, between 11-15 years, accounting for 43 percent, followed by 16-20 years, accounting for 22.00 percent. Farmers with experience or period of farming between 6-10 years, representing 14 percent and from 21 years or more, representing 20 percent. As for the farmers who have experience or duration of doing less than 5 years, representing one percent, which is the least group. From the inquiry, it is found that the farmers who have the most experience in doing the longest are due to the young age and have been laborers in the industrial sector for a long time. Regarding the physical characteristics of rice fields, most of them were flat rice, representing 55%, followed by the physical characteristics of rice fields being Na Don, accounting for 21%.

Behavior on the mechanization of harvesting of rice farmers.

From Table 4, the behavior of the farmers has an attitude about using a rice harvester, considering that it is necessary as a percentage 89.00 which the reason of choosing is found to help reduce the cost of labor employment as a percentage 38.80 which is considered the highest level of reason as most respondents lack of labor in farming and harvesting, resulting in increased dependence on agricultural machinery to be able to harvest rice in time. Next, agricultural machinery can help shorten the time for rice harvesting 20.90 percent, in order to get an increase in production, representing 16.70 percent and to achieve the quality of the rice harvest is of standard quality, equivalent to 14.40 percent. In addition, there is a reason to choose which is that farmers have the area to have a lot of farming, representing 8.40 percent and can be employed to harvest rice to increase income for the family as a percentage. 5.70 this is the smallest level because most of the respondents use agricultural machinery to harvest the produce in their area.

From Table 5, the person who is the most involved in deciding to use the machinery to harvest the rice products of the rice growers is decide for yourself, representing 50%. Next, family members is 44 percent and neighbors or farmers together are 4 percent, and the least decision-makers are companies that sell agricultural machinery or agents, representing 2 percent.

From Table 6, it can be found that in the aspect of the attitude of farmers, respondents about the popularity of combine harvesters, there are 3 brands which are 1. Kubota brand KUBOTA, representing 93 percent, 2. Brand Class CLAAS is five percent, and 3. Yanmar is two percent. All the farmers use the machines to harvest the rice and most of the farmers use different agricultural machines according to their work characteristics. It was found that the farmers use rice harvester for 62 percent, followed by the small rice combine harvester at 32 percent and others are six percent. This means that some households still prefer to use traditional harvesting methods mainly by using labor to harvest rice and in addition to having a small rice field area. In addition, before selecting machinery, farmers have studied methods by inquiring from neighbors, representing 47 percent, and farmers inquiring from representatives of agricultural machinery distribution centers, representing 43 percent. Study on the internet (Internet), equivalent to 10 percent. Farmers have agricultural machinery for harvesting rice in their households, found that farmers do not have their own, representing 60%. Followed by agriculture, some households have a rice harvester, accounting for 33 percent. Small rice harvester accounts for seven percent by using services from people with agricultural machinery to harvest rice, which is more costly than old accounting for 56 percent and being a less expensive expense Equivalent to 44 percent (Table 7).

Table 1: Rice planted area, rice production and yield per hectare by the year of rice cultivation in 2019.

Region/Province/ District	Rice Planted Area (Ha)	Rice Harvesting Area (Ha)	Rice Production (Ton)	Rice Production/Ha (kg) (15%)	
				Plant	Store
All Country	1,759,275.84	1,747,589.92	7,170,258.00	4,075.00	4,100.00
North	720,129.92	712,606.40	2,884,488.00	4,006.25	4,050.00
North east	224,967.52	223,287.68	782,108.00	3,475.00	3,500.00
Central	795,163.20	793,434.40	3,441,193.00	4,325.00	4,337.50
South	19,015.20	18,261.44	62,469.00	3,287.50	3,418.75
Chiang Rai	72,669.92	69,172.00	296,970.00	4,087.50	4,293.75
Mueang District	5,558.72	5,504.96	24,015.00	4,318.75	4,362.50

Source: Office of Agricultural Economics [8].

Table 2: Number and percentage of respondent farmers classified by gender, age, status, education level, and the average monthly income.

Classification	General Information for Farmers	Sample Amount (n = 100) / Percent Number
Sex	Male	70
	Female	30

Age	Under 20 years	1
	Between 20-29 years	0
	Between 30-39 years	15
	Between 40-49 years	35
	Between 50-59 years	32
	Over 60 years old	17
Status	single	12
	Marry	77
	Divorce	11
Education Level	Primary	52
	Junior high school	11
	High school / Vocational certificate	21
	Diploma / Diploma	10
	Bachelor's degree	6

Source: Calculated

Table 3: Number and percentage of respondents, which are classified by farming areas, number of household labor, experience or duration of farming, and physical characteristics of rice fields.

Classification	Production Information	Sample Amount (n = 100)/ Percent Number
Farming areas	Own land	96
	Agricultural land for rent	4
Number of household labor	One people	6
	Two people	29
	Three people	47
	More than three people	18
Average income from farming	320-960 USD	23
	961-1595 USD	47
	1596-2230 USD	29
	More than 2230 USD	1
Experience or duration of farming	Less than 5 years	1
	Between 6-10 years	14
	Between 11-15 years	43
	Between 16-20 years	22
	21 years old or more	20
physical characteristics of rice fields	Highland	11
	Nadon	21
	Lowland	13
	Rice field	55

Source: Calculated

Table 5: Number and percentage of mechanization behavior in harvesting of rice farmers, classified by those who are involved in deciding to use machinery to harvest rice.

Mechanization Behavior in Harvesting or Rice Combine Harvester		Sample Amount (n = 100) /Percent Number
Attitude that is necessary to use a combine harvester	Yes	89
	No	11

Reasons to use	Helps reduce the cost of labor	33.8
	To get more productivity	16.7
	Help shorten the time for rice harvesting	20.9
	To ensure that the products obtained from the rice harvest are of standard quality	14.4
	There are a lot of farming areas.	8.4
	Can be employed to harvest rice to increase income for the family	5.7

Source: Calculated

Table 4: Number and percentage of mechanization behavior in harvesting products of rice growers, classified by attitude and reason for choosing to use.

Mechanization Behavior in Harvesting or Rice Combine Harvester		Sample Amount (n = 100) / Percent Number
Those who are involved in the decision to use machinery to harvest rice products	Decide for yourself	50
	Family member	44
	Neighbors / farmers together	4
	Agricultural machinery distribution company / Agent	2

Table 6: Number and percentage of mechanics' behavior in harvesting products of rice growers, classified by machine selection and purchase.

Mechanization Behavior in Harvesting or Rice Combine Harvester		Sample Amount (n = 100) / Percent Number
Attitude towards the use of agricultural machinery for harvesting rice products under the brands	KUBOTA	93
	CLAAS	5
	YANMAR	2
Farmers have used agricultural machinery to harvest rice.	Yes	100
	No	0
What kind of agricultural machinery are used by farmers in the process of harvesting products?	Combine Harvester	62
	Small rice combine harvester	32
	Other	6
You have methods to study before choosing the machine.	Study by inquiring from neighbors	47
	Study on the internet	10
	Inquire from representatives of agricultural machinery distribution centers	43
Farmers have agricultural machinery for harvesting their own rice in their household.	-None of my own	60
	-Combine Harvester	33
	-Small rice combine harvester	7
The attitude about using the service from the company or those who have the agricultural machinery to harvest the rice produce is free of charge.	Cost little	44
	Cost more than before	56

Table 7: Average and importance levels of factors affecting the decision to use agricultural machinery to harvest the products of rice growers.

Factors Influencing the Decision to Use Agricultural Machinery to Harvest the Products of Rice Growers	Average	Priority Level
Machine Efficiency	3.63	high
Privacy	3.9	high
Market	3.61	high
Society and culture	3.48	moderate
Total	3.67	high

Factors influencing the decision to use machinery to harvest the products of rice growers

From Table 7, farmers attach importance to the factors that influence the decision to use agricultural machinery to harvest the products of the rice growers at a high level, with a total average of 3.67. The farmers give importance to the efficiency factor of the machines with an average of 3.63, the personal factors have an average of 3.90, the market factors have an average of 3.61. In addition, the farmers also emphasize on social and cultural factors at a moderate level, with an average of 3.48.

Conclusion

From the study of mechanization in harvesting the products of rice growers in Huai Sak Subdistrict, Mueang District, Chiang Rai Province, the study results and suggestions can be summarized as follows:

Part 1 General information of rice growers

Most of the respondents are male than females, with the oldest age being between 40-49 years. As for the family status of the farmers, most of the respondents are married, which have education level at primary level. Most of the land for farming is own land, with the total land area between 0.48-1.60 hectares. Most of the respondents and the average income from rice farming are equal to 961-1,595 USD. The maximum number of labors in the household is three people and the physical characteristics of most rice fields are flat land.

Part 2 Behavior of rice growers on mechanization of harvesting products

Most of the agriculturalists have an attitude about using a combine harvester, considering that it is necessary and rational to use because it helps to reduce the cost of hiring a lot. The attitude of the respondents of farmers about the use of rice combine harvester which is the most popular brand of Kubota. Most of the farmers use agricultural machinery to harvest the rice products. Farmers use the agricultural machinery to harvest the harvested rice combine harvester. Farm machinery selection is studied by asking from neighbors. In addition, it was found that the respondents do not have agricultural machinery to harvest their own rice. Therefore, there are services from those who have agricultural machinery to harvest the rice which is more expensive than before. The person who is the most involved in the decision of the rice growers is to decide by themselves.

Part 3 Factors Influencing the decision on the use of agricultural machines to harvest products of rice farmers

The farmers who responded agreed that the factors affecting the decision to use agricultural machinery for harvesting rice were the efficiency of the machinery, personal, market, social, culture is important at a high level. The efficiency factor of the machine is of high importance, with the emphasis on the high durability of the machine and the fast operation, the machine operation is not a problem and there is no frequent repair, all three aspects Will be at a very high level. Factors affecting the efficiency at a moderate level are the ability to be used versatile and able to harvest rice in all conditions of the rice field. As for personal factors, they are of high importance, which the respondents give the highest level of importance to the amount of agricultural land and have a lot of experience in farming. Personal is important at a high level, it is the use of machinery to reduce the heavy burden and increase revenue from the use of machinery. Using machinery makes the standardized rice production more than labor.

The marketing factors are of high importance, with the farmers placing the highest importance on the wages of the workers in harvesting the products, the high rate of employment and the high level of importance. The use of machinery can help to save on labor costs and the lack of labor in their own households, therefore relying on machinery to harvest products. In addition, the farmers have given importance to the medium level by using the machine to get the products or return as the target and because of the current promotion of cheap agricultural machinery purchase. Social and cultural factors are of medium importance. It consists of the farmers who have an attitude that the people around them suggest causing them to want to try for example, neighbors are more likely to use machines to harvest their products, which makes them want to experiment at a high level. In addition, farmers have a moderate level of attitude that easy access to funding means they have enough money to buy or test the use of agricultural machinery easily, and nowadays they need to store products quickly and get large quantities. Therefore, it is necessary to rely on increasing agricultural machinery and the current value of buying agricultural machinery.

Testing for the relation of factors that influence the decision to use machines to harvest the products of rice growers. The analysis of the correlations of factors that influence the decision to use the machine to harvest the products of the rice growers with the significance level at 0.05. It was found that the physical characteristics of the paddy fields affected the use of agricultural machinery during the harvesting process, the yield level of significance was 0.01. The test to find the relationship between the number of labors in the household affects the use of machinery to help save the cost of labor, with the significance level of 0.03. The testing of the relationship between the attitudes of the agricultural machinery brand to the harvest of rice affects the present day, wanting to harvest the produce quickly and in large quantities. Therefore, it is necessary to increase the dependence on agricultural machinery with the significance level of 0.03 which is less than the significance level of

0.05. Therefore, the hypothesis is rejected and shown that there is a significant relationship.

Suggestions

Farmers in the group who have machines have given priority, machine efficiency, personal, the marketing level is very high, and social and cultural factors at a medium level. Therefore, there should be an improvement in the efficiency of the machine and the marketing should have different sources of funds or promotions. So that farmers can access. Public relations should be chosen through farmers' groups or agriculture directly so that information can be distributed quickly and thoroughly within the farmer's area.

Acknowledgement

The authors would like to thank Department of Agribusiness Management, Department of Tropical Agriculture and International Cooperation, National Pingtung University of Science and Technology for supporting, and Department of Agricultural Economy and Development, Faculty of Agriculture, Chiang Mai University in Thailand.

References

1. Salim Z (2006) Thailand's Agricultural Sector and Free Trade Agreements. APTIR (2): 58-59.
2. Food and Agriculture Organization of the United Nations (FAO) (2017) The Future of Food and Agriculture–Trends and Challenges.
3. Chavalvut C, Withaya A (2001) Crop Diversification in Thailand, Thailand.
4. National Statistical Office (NSO) (2019) Labor and Changes in the Thai Agricultural Sector.
5. National Statistical Office, Inc (NSO), Thailand - Agriculture Employment.
6. World Bank Unlocking the Potential of Agribusiness Annex 1.
7. Aungsumalin S, Kornyuenyong N (2017) Rice Combine Harvester Industry in the Central Region of Thailand. The 9th ASAE International Conference: Transformation in agricultural and food economy in Asia Bangkok, Thailand pp. 749-769.
8. Office of Agricultural Economics Inc. (OAE). Rice Planted Area, Rice Production and Yield Per Hectare by the Year of Rice Cultivation in 2019.
9. Chiang Rai Provincial Agricultural Extension Office (2019) Planting areas in Mueang Chiang Rai, Thailand.
10. Media Exposure, Behavior and the Impact of Online Gaming in MMORPG (Massively Multiplayer Online Role-Playing Game) of High School Students in Bangkok, Thailand.
11. Weissman DR (2017) Impacts of Playing Massively Multiplayer Online Role-Playing Games (MMORPGs) on Individuals' Subjective Sense of Feeling Connected with Others. PsyD Program in Clinical Psychology Doctoral Dissertations, Antioch University, Santa Barbara, California, United States.
12. Oranong P Data collection methods.