Analysis and Decision Support System Using Myanmar Agricultural Census Data (MAC)

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Abstract

Every organization needs information to survive and thrive, to plan and to control. The Union of Myanmar is an agricultural country. To be a modern and developed country, the agricultural sector takes an important role. In laying down national plans the basic workers such as peasants and farmers have to be considered. The most fundamental system is to hold an agricultural census. The agricultural census means the organization of a nation's agricultural system and the statistical data are processed. In this paper is implemented the Multiple Regression Method to decision making for the Myanmar Agricultural Census.

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1. Introduction

The Union of Myanmar is an agriculture country with a population of about 54 million (2003) and a land area of 261,228 square miles or approximately 677,000 square kilometers. The more increased the population, the harder the people work and the more people raise the product [4].

Farmers and farmlands that constitute the heart of the agricultural sector of Punjab province are centered on the Molten and Faisalabad districts. Nationally, public and private extension services are the primary information sources for these farmers. Broadcast media, while effective, does not enjoy the same penetration as in urban areas. Thus, we need a better understanding of farmers' social and agricultural associations to exploit them for targeted advice giving and 'precision help'. This would not only result in better coordination of different public and private extension services currently going on, it would also help solve, or at least highlight, unaddressed problems of the sector [1].

In the past, agricultural censuses have focused on the collection of data for agricultural holdings. An agricultural holding is defined as an economic unit of agricultural production under single management [2]. The need to better integrate agricultural statistics is also of concern to many countries [3]. This system has been approached by using the Multiple Regression method to Decision Support for the Myanmar Agricultural Census Data.

The rest of the paper is organized as follows: Section 2 presents Motivation of the system. Section 3 presents Background Theory of Decision Support System. Section 4 describes Implementation of the system & Results. Section 5 gives Conclusion of the paper.

2. Motivation

This paper intends to analyze the Myanmar Agricultural Census Data (MAC) in order to provide current and reliable information to related natural resources managers, practitioners, academics, and the decision makers for Industry.

Nowadays, new developments in wireless communications, digital technology, fiber optic networking, and satellite technologies provide both opportunities and pressures for economies to upgrade their economic institutions and industries. Firms face the challenge of using IT as a management tool to enhance productivity, quality, speed, and flexibility of response to competitive dynamics.

In current practice of MAC, all the operational activities and decision making processes are done manually which take so much time and delay and overall performance is poor in accuracy. Due to an increasing need for a modern and comprehensive management tool for MAC, this thesis intends to help the strategic decision makers for sustainable MAC management.

3. Background Theory

Decision support systems are gaining an increased popularity in various domains, including business, engineering, the military, and medicine. They are especially valuable in situations in which the amount of available information is prohibitive for the intuition of an unaided human decision maker, and in which precision and optimality are of importance. Decision support systems can aid human cognitive deficiencies by integrating various sources of information, providing intelligent access to relevant knowledge, and aiding the process of structuring decisions. They can also support choice among well-

defined alternatives and build on formal approaches, such as the methods of engineering economics, operations research, statistics, and decision theory. They can also employ artificial intelligence methods to heuristically address problems that are intractable by formal techniques. Proper application of decision-making tools increases productivity, efficiency, and effectiveness, and gives many businesses a comparative advantage over their competitors, allowing them to make optimal choices for technological processes and their parameters, planning business operations, logistics, or investments [5].

3.1 Types of Decision Support System

There are a number of Decision Support Systems. These can be categorized into five types:

- Communications-driven DSS
- Data-driven DSS
- Document-driven DSS
- Knowledge-driven DSS
- Model-driven DSS

3.2 Method of analysis

The basic approach of this study to undertaken problem-solving research to seek solution for the identified problems. Questionnaire survey and checklist interviewing was used to collect information regarding users in Taunggyi Township. In addition, secondary data were collected on urban development, population, land use, animals, economic factors and other necessary data in order to achieve the objective goals

3.3 Definition of Regression Analysis

Regression is a forecasting technique used to establish the relationship between quantifiable variables. In regression analysis, data on dependent and independent variables is plotted on a scatter graph or diagram, and trends are indicated through a line of best fit.

There are two kinds of regression analysis.

1. Simple Regression Analysis,

The use of a single independent variable is known as simple regression analysis.

2. Multiple Regression Analysis,

The use of two or more independent variables is called multiple regression analysis.

3.4 Multiple Regression Analysis

Multiple regression is a method used to examine the relationship between one dependent variable **Y** and one or more independent variables $\mathbf{X_i}$. The regression parameters or coefficients $\boldsymbol{b_i}$ in the regression equation.

Multiple Regression Analysis Equation

$$\mathbf{Y = a + b_1 X_1 + b_2 X_2 + b_3 X_3 + ...+ b_i X_i} \quad (1)$$

b_1 equation

$$(\Sigma x_1^2)b_1 + (\Sigma x_1x_2)b_2 + (\Sigma x_1x_3)b_3 + \dots + (\Sigma x_1x_i)\, b_i = \Sigma x_1y$$

b_2 equation

$$(\Sigma x_1x_2)b_1 + (\Sigma x_2^2)b_2 + (\Sigma x_2x_3)b_3 + \dots + (\Sigma x_2x_i)b_i = \Sigma x_2y$$

b_3 equation

$$(\Sigma x_1x_3)b_1 + (\Sigma x_2x_3)b_2 + (\Sigma x_3^2)b_3 + \dots + (\Sigma x_3x_i)\, b_i = \Sigma x_3y$$

b_i equation

$$(\Sigma x_1x_i)b_1 + (\Sigma x_2x_i)b_2 + (\Sigma x_3x_i)b_3 + \dots + (\Sigma x_i^2)\, b_i = \Sigma x_iy$$

$$\Sigma x_i^2 = \Sigma x_1^2 - \frac{(\Sigma x_1)^2}{n}$$

$$\Sigma y^2 = \Sigma Y^2 - \frac{(\Sigma Y)^2}{n}$$

$$\Sigma x_1y = \Sigma X_1Y - \frac{(\Sigma X_1)(\Sigma Y)}{n}$$

$$\Sigma x_iy_j = \Sigma X_iY_j - \frac{(\Sigma X_i)(\Sigma X_j)}{n}$$

$$a = \overline{Y} - b_1\overline{X}_1 - b_2\overline{X}_2 - b_3\overline{X}_3 - \dots\dots\dots - b_i\overline{X}_i$$

$$\overline{Y} = \frac{\Sigma Y}{n}$$

$$\overline{X_i} = \frac{\Sigma X_i}{n}$$

$$\hat{Y} = a + X_1b_1 + X_2b_2 + X_3b_3 + \dots\dots\dots + X_ib_i \quad (2)$$

$$Y = \hat{Y} + \in$$

$$\in = Y - \hat{Y}$$

$\in$ = Residual Error

Y = Actual (true) Model

$\hat{Y}$ = Prediction (estimate) Model

3.5 Steps to develop a Multiple Regression

- Define the sales sample
- Select the appropriate property characteristics
- Code the property characteristics
- Create the model
- Analyze and calibrate the regression model
- Verify the regression model [3].

3.6 Census Items

The census items to be covered in the Census of Agriculture 2003 are in accordance with the recommended items to be covered under FAO's Programme of the World Census of agriculture 2000 considering that the Myanmar census is part of the World Census of Agriculture Programme.

Current agricultural information on crop production and yields, livestock production or quantities of fertilizer used and other input were excluded partly for reducing the incidence of the release of conflicting statistics and partly for these data were available from Settlement and Land Record Department.

Small holding which make a very small contribution to total agricultural production were also excluded because the inclusion in the census would greatly increase the workload of enumerator. The minimum size set in the census was 0.10 acre.

3.7 Scope of the Census

There are five questionnaires and a listing form that were designed to collect most of the data requirements of government. They are as follows:

Form 2003 MAC-1 Listing of Households
Form 2003 MAC-2 Agriculture Holding Questionnaire
Form 2003 MAC-3 Commercial Livestock and Poultry Questionnaire
Form 2003 MAC-4 Household Finishing Questionnaire
Form 2003 MAC-5 Aquaculture Questionnaire.

Among those five questionnaires, we used only form MAC-2 to collect acquire data on the agricultural holdings are analyzed by using multiple regression analysis model to provide necessary information to the decision maker.

FORM MAC-2

Agricultural Holding Questionnaires

- General demographic characteristics of the holder's household
- Education and economic activities of the household population.
- Land utilization and fragmentation of the holding.
- Permanent crops.
- Annual/temporary crops.
- Stock and disposal of livestock and poultry mainly for home consumption.

$$Y = a + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 \quad (3)$$

where,

Y is the percentage of Land In-density per holding, X_1 is the Area of Land Holding by Land use, X_2 is the number of Household per holding, X_3 is the number of Cattles-Draught and Buffaloes-Draught, X_4 is the number of Hired outside labour, X_5 is the percentage of Household number age between (16-60) and DM is the Dummy Values.

4. System flow of the System

Overview of the System Flow Diagram is described in Figure 1. The system is designed to process as follows: To enter this system, a user must enter the login process for checking Operator (or) Admin. For the Operator, the system provides to add input contents data, sub-contents data continuously step by step for each township to regression analyze. These input data's are stored into the Database. If an operator has registered with valid password, he/she can access his/her customized full page and can also change his/ her input data profile. If an admin has registered with own password, he/she can retrieve from the Database for Regression Analysis. And then he/she must adjust the percentage of area of land holdings, number of draught cattle and buffaloes, number of hired outside labor until nearly 100% output result. Finally, these results are very useful for decision making to development of the agriculture sector.

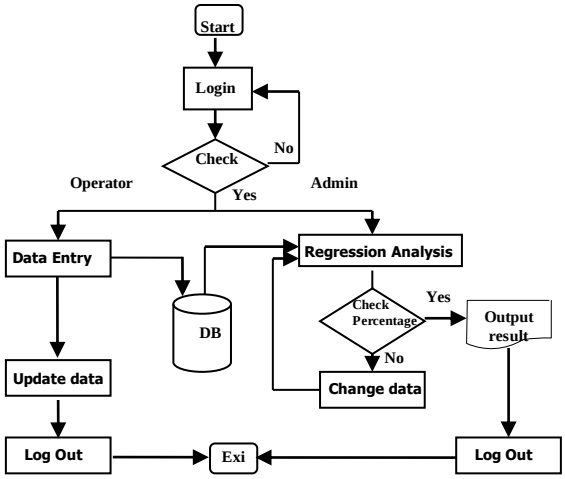
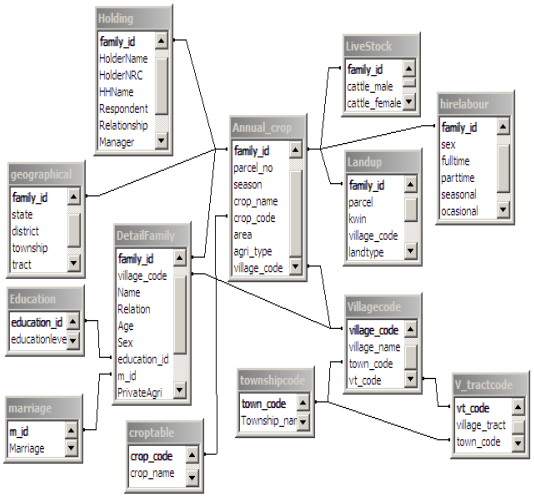


Figure. 1. System Flow of the System

Database Design of the system



5. Implementation of the System &Result

In this System, the DSS Model is implemented census data analyzed by using Multiple Regression Method from the Myanmar Agricultural Census. In this paper, census data was used from the Settlement and Land Records Department. It has been recorded from yearly 2003. All of the data used in this work are yearly data from South Shan State.

This System applied Data Entry and Update process, Regression process and Report Process. From these processes, the system shows output results for decision making. This system is implemented by using Java Language Programming. The implementation and the results of the recognition system are as shown in the following figures.

Figure 2 represents data entry log-in form of the Myanmar Agricultural Census.

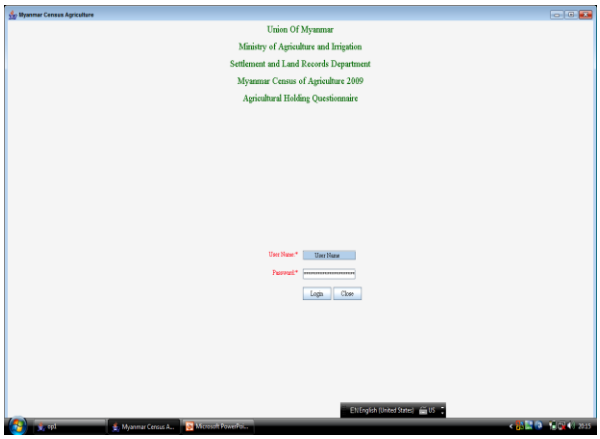


Figure. 2. Data Entry Log-in form of the System

In this menu, if the user clicks the Data Entry and Update Menu, it has four types of submenus, the New Entry, the Change Account, the Update and the Exit.

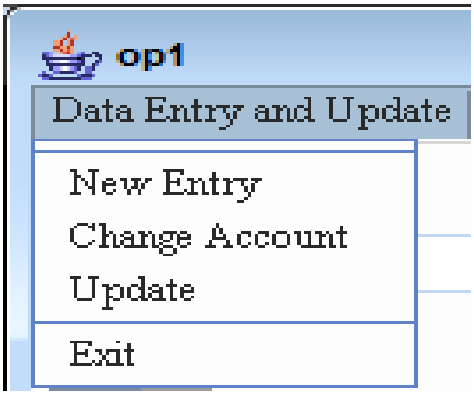


Figure. 3. Data Entry and Update Menu

In the New Entry Form, if the user enters the family name and age. After that the user chooses the relationship to household head, age, gender, education, marriage and job. After the detail number of family have been completed the user must choose the save button.

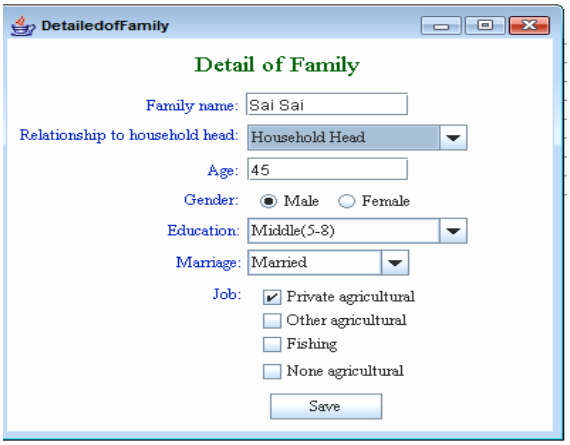


Figure. 4. New Entry Sub Menu with Detail Family

After saving completed data entry form according to above figure, the system automatically appeared Land Utilization form. If the user enters the Parcel No., Indicate Kwin No., Land Type (Code), Land under annual crops (acres) and Land under permanent crops (acres).

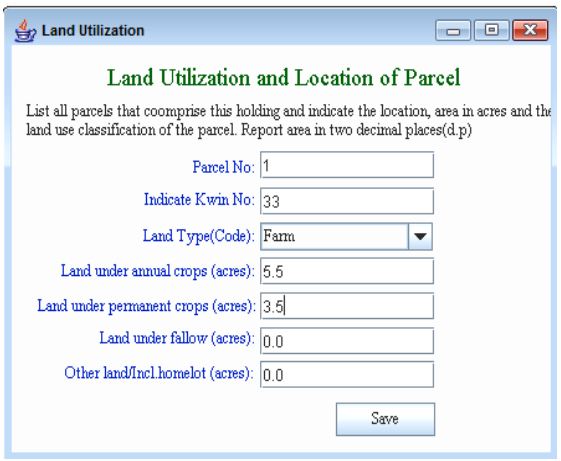


Figure . 5. New Entry Sub Menu with Land Utilization

After saving completed data entry form according to above figure, the system automatically appeared Annual Crops form.

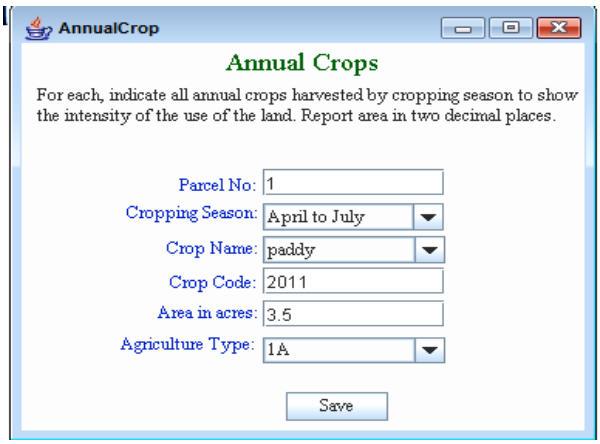


Figure. 6. Annual Crops Form

After saving completed data entry form according to above figure, the system automatically appeared Utilization of Livestock and Irrigation form.

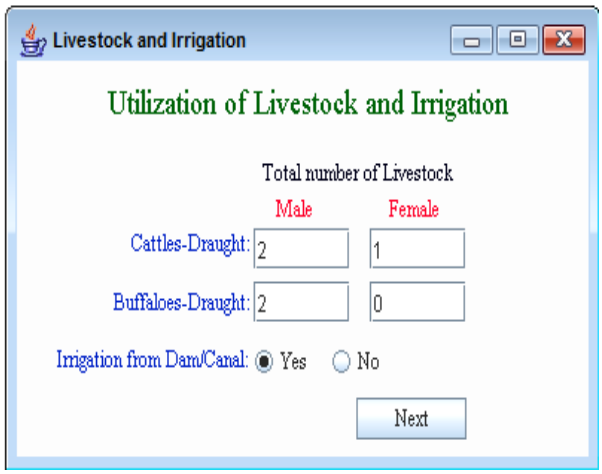


Figure. 7. Utilization of Livestock and Irrigation form

After making the operator proceedings, we will start administrator user process. this user acquired data from the operator's data entry by using regression analysis.

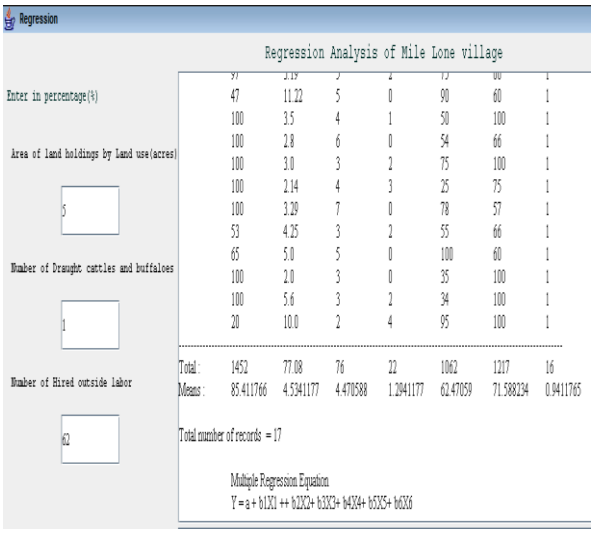


Figure. 8. Regression Analysis Form

According to output result from above figure, we must change area of land holding by land use, number of draught cattle and buffaloes and the number of hired outside labor until to get nearly 100 percentage. We can choose one of the optimal result is nearly 100 percentage upon the changes data to development of agriculture sector.

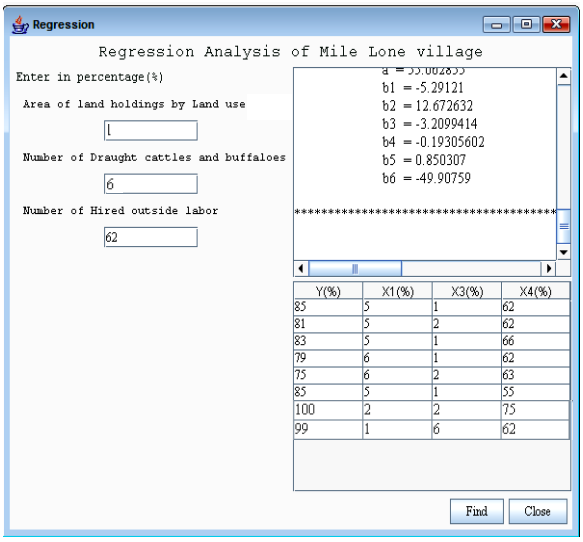
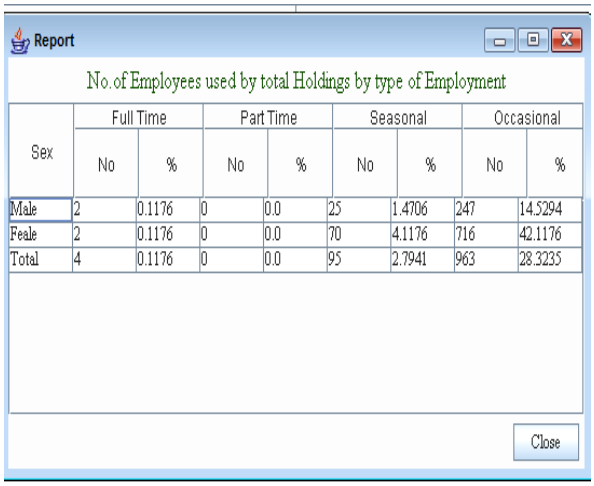


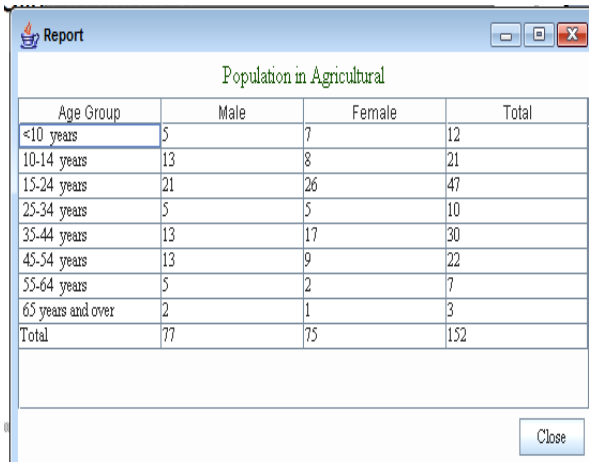
Figure. 9. Regression Analysis Form

After that, we showed other information form as the following figures.



Sex	Full Time		Part Time		Seasonal		Occasional	
	No	%	No	%	No	%	No	%
Male	2	0.1176	0	0.0	25	1.4706	247	14.5294
Feale	2	0.1176	0	0.0	70	4.1176	716	42.1176
Total	4	0.1176	0	0.0	95	2.7941	963	28.3235

Figure.10 . Search Result in Detail Family



Age Group	Male	Female	Total
<10 years	5	7	12
10-14 years	13	8	21
15-24 years	21	26	47
25-34 years	5	5	10
35-44 years	13	17	30
45-54 years	13	9	22
55-64 years	5	2	7
65 years and over	2	1	3
Total	77	75	152

Figure. 11. Population in Agricultural Form

6. Conclusion

Agricultural Census results are useful for many different ways, ranging from very general to very specific technical applications. An Agricultural Census can represent rural age structures in two different but complementary ways: for the population of members of holders' households and the sub-group of agricultural holders.

To develop Decision Support System for Myanmar Agricultural Census (MAC) using census database. By using this system, the user can get agricultural census knowledge and information can be retrieved in time. So, this will fulfill the need of Ministry of Agriculture and Irrigation.

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