Factors Affecting the Mechanization Situation of Agricultural Land

Amin Reza Jamshidi and Ali Afrous

Department of Engineering, Andimeshk Branch, Islamic Azad University, Andimeshk, Iran

ABSTRACT

Low cost use of car to the use of labor, improving the quality of its products and operations and easier management for machines makes the mechanization as an integral part of agriculture. In this study, the factors affecting the efficiency of mechanization and its management in the region include: indicators of the degree and level of mechanization, land and machine use system, economic characteristics, social and individual of farmers and problems and barriers to use the technology of mechanization were studied and identified. Among farmers' level of education, household size, type of property of machinery, acreage, yield performance, number of participants in courses, social communication, satisfaction, technical skills, and proper use of available machines and the degree of mechanization of farming there was a significant and inversed relationship. Between age and help of family members with the degree of mechanization of farming there was significant and inversed relationship. The results of the stepwise multiple regression analysis showed 80 percent of the variation in the dependent variable was predicted by independent variables entered into the regression equation includes participation in courses, technical skills, increase in the minimum distance between the parts and the parts sizes of the crop.

INTRODUCTION

Mechanization puts new services for the farmer such as culture jamming, the timeliness of the production process, improve the quality of agricultural operations, prices setting and marketing of products such as the use of improved seeds by what is called the Green Revolution has made a quantum leap in agriculture [9]. Increasing output per worker in agriculture using the machine which as a result reduced the production costs, benefit of the Mechanized agricultural sector and use of social welfare through increased income for the farming community are made possible.

Evaluation of mechanization has already been conducted low and only in a few cities. The results obtained from these studies are also witness of the different mechanization. For example, according to a study by Afshar at the level of mechanization was obtained 0.64 hp per hectare, while in Savojbolagh the index for Qazvin, is calculated about 1.15 horsepower per hectare by Salehi and this shows the dramatic differences in the two regions situations and also reflect differences in the decisions of these two areas[7].

Alamasi, in the article titled "fundamental indicators in planning for the development of agricultural mechanization" and "effective and basic factors in the agricultural mechanism development program" knows the National Development along with the development of industrial and more importantly agricultural development, for example, the industrialized countries of the West, Japan and even China are also discussed. In other words, agricultural development is the context of each country economic and social development. Development of agricultural is attributable to more production that can be achieved in two ways:

• Increased production with quantity expansion of production level
• Quantitative and qualitative increase of production based on available resources [1]

Farsi presented a report on the status of agricultural mechanization in Hamedan province and in addition to present the relevant data, the effect of mechanization on the production processes of crops such as: corn, wheat, sugar beets, alfalfa, sunflower, potato evaluated them positive and introduces it as increase reason for the area under different products cultivation [6].

Corresponding Author: Amin reza Jamshidi, Department of Engineering, Andimeshk Branch, Islamic Azad University, Andimeshk, Iran
Bayati and Ghorbani studied a research entitled "The companies offering agricultural mechanization- strong arm of agricultural mechanization, capabilities and Shortcomings- Case Study of Khorasan," on the 73 companies of mechanized agriculture services and 222 benefited farmers from the services of these companies. In this study using the non-parametric tests the relationship of inter-structure variables of companies were measured [4].

The general purpose of this study was to evaluate the management of agricultural mechanization in the city of Nishapur, and the factors affecting it. To achieve the above objective, the following specific objectives were investigated:
1. Definition of evaluation indicators to calculate the area of mechanization
2. to estimate the deficit of mechanization capacity with respect to the existing productivity.
3. Definition of farming system in the region and classification of the exploitations units based on of their properties
4. Access to strategies to improve mechanization.
5. Investigation of the socio-economic and demographic characteristics of farmers and their relationship with mechanization index.

MATERIALS AND METHODS

The research in the aspect of gathering information was the survey, since it seeks to identify and describe the conditions in the field of mechanization technology. Also according to the study purpose, which ultimately seeks to identify factors influencing the use of mechanical technology, it was correlation.

This study was a cross-sectional in view of the time because in order to collect data on the number of characters in a period of time was performed through the sampling and finally, this research based on the supervision and degree of control was field research.

In order to optimize the management of the research statistical sampling was conducted. The sample size using Cochran formula was calculated 150.

To collect data of the statistical population a questionnaire was used, which consists of 3 parts:
1) demographic, social and economic characteristics of Farmers
2) characteristics of the production unit and the mechanization of the region
3) difficulties and obstacles to the use of mechanization technology and

Finally The questionnaire consists of 145 closed and 5 opened questions.

To calculate the internal coordinate, measuring tools (questionnaires), the Cronbach's alpha was calculated for a set of questions of 0.74 Likert that was acceptable.

In this study the indicator and quantitative, qualitative and comparative bases were used. To quantitatively evaluate the degree of mechanization in the region of quantitative major factors means the level of mechanization of major products of the region and the level of mechanization, the relationship between these parameters and the characteristics of the economic, social, and individual of farmers were used.

Definitions of indicators of calculated mechanization level and degree in the research are as follows:
Degree of mechanization of agriculture= performed mechanization operations value / total mechanized needed operations *[100]
Level of mechanization = [ total tensile power × FCR ] / cultivation [1].

To test the hypothesis, Pearson correlation coefficients, Spearman and finally to explain the variability in the independent variables through independent variables, multiple regression using stepwise analysis of Data summarization and statistical analysis by software Excel. 2003 and SPSS. 15 were used.

The results:

Personal characteristics:

Given the importance of individual characteristics on the adoption of technology and exploit of the tools, these features include the number of households, number of boys and girls, age, education level, help of the family members and job satisfaction, were studied.

One of the affecting factors in the use of machinery and inputs is the parts size.

According to Table (1). Distribution of farmers in the area under cultivation was found that 30 % of farmers are working in the area less than 5 ha of agricultural land. The use of mechanization in the land faces trouble and increases the production costs and depreciation of equipment is more.

Degree of mechanization:

Determination of the operations mechanized conduct as the dependent variable was of the purposes of this study in the form of regional products (wheat, barley, corn, canola, alfalfa, beet) at various stages of production, including preparation (plowing, disc, leveling, Line drawing), found (spraying and weeding), implant (centrifuges or seed), irrigation (Crete, row, pressure) and harvestin the city of Nishapur was calculated.

Technical skills:
Effective use of mechanization in the form of technical skills is crucial, therefore, some of the technical skills markings of farmers as improved farming procedures performance degree and farmers’ knowledge of production factors was measured.

Social relationship:
The communication way and the level of cooperation with relevant organizations are of the effective factors in the use of agents and farmer’ harmony with its environment.

The social status of studied farmers indicated that the relationship with rural cooperatives (54%) and bank (60%) of the farmers was moderate and low.

The mean study showed that the relationship of about 36% of farmers with different institutions was too low. This rate of farmers' knowledge of new technology and facilities provided by the state has a negative impact on providing them.

Frequency of Participation in the courses of training classes in Agriculture Organization was studied and according to 61 percent of class respondents became high and very much helpful.

Used machines and equipment:
Machinery and widely used equipment in the region, including tractors, combines, rowing machine, chopper, plow, sprayer, in the issues of ownership (private, rental, cooperative), the rate of exhaustion, adjustment and kind of machines of combines and tractors (used to calculate the Mechanisation level) were investigated.

Level of mechanization:
As shown in Figure 4 show, the total area of cultivated land in the farming season 85-86, has been obtained about 5537 hectares and with regard to the running machines power calculated 5378 hp the level of (coefficient) mechanization in the region was obtained.

<table>
<thead>
<tr>
<th>Table 1: Mechanization level.</th>
</tr>
</thead>
<tbody>
<tr>
<td>The nominal level of mechanization</td>
</tr>
<tr>
<td>The actual level of mechanization</td>
</tr>
</tbody>
</table>

Problems:
Most of the problems of farmers in the use of mechanization in agriculture recorded as the prices for equipment and lack of access to the machine in the required time (46 and 33%) and based on the opinions expressed 21% of farmers in receipt of services and 35% had a little problem in the field of existence of skilled driver. In terms of services of training and promoting about the agricultural machines for about 38 percent of them were faced with no difficulty.

Inferential statistics:
Test hypotheses:
To test the hypothesis spearman-Pearson correlation coefficient with respect to the distance or examined numerical variables of the research were used that at 95 and 99 percent significant level the research hypothesis was confirmed.

Multi-variable Regression:
Regression analysis is one of the most widely used methods in social - economic studies. This method is closely related to correlation coefficient and generally simultaneously used in the studies. Regression analysis provides conditions for researchers to predict changes in the independent variables through the dependent variable and determine the contribution of each independent variable on the explained dependent variable.

Independent variables entered into the regression equation are as follows:
- The number of personal devices, satisfaction, social, technical skills, age, education, family size, number of courses, the total area under cultivation, the number of pieces, the size of the land, crop yield, helping of family members, optimal use of available agricultural machinery.

In this study Stepwise multiple regression method was used. stepwise method, is a method in which the strongest variables entered in to the equation One-to-one, and it continues until the significance test error is 5%.

The variables entered into the regression equation respectively included: participation in courses, technical skills, Number of pieces, distance of pieces, the pieces size.

The regression equation using column B (Figure 6) was calculated as follows.
Y = a + bx
The regression equation is as follows:
Y = 0.855+134A+3.456B+1.675C+987D
Y = the degree of mechanization of farming
A = participation in training classes  
B = technical skills  
C = number of pieces  
D = distance spare parts  
E = size of pieces  

The adjusted $R^2$ (0.809) showed that 80 percent of dependent variable is anticipated with independent variables entered into the regression equation that due to the significance of the relationship between the dependent and independent variables on the probability of 99% regression equation can be written as follows.

Table 2: Show general information of the estimated regression model.

<table>
<thead>
<tr>
<th>Sig.</th>
<th>$t$</th>
<th>S. coefficients</th>
<th>Non standard coefficients</th>
<th>Constant value</th>
<th>model</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>6.977</td>
<td>1/219</td>
<td>8/500</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>6.188</td>
<td>1/567</td>
<td>0/551</td>
<td>0/331</td>
<td>5</td>
</tr>
<tr>
<td>0</td>
<td>4.92</td>
<td>0/491</td>
<td>0/056</td>
<td>0/334</td>
<td>5</td>
</tr>
<tr>
<td>0.079</td>
<td>-1/786</td>
<td>-0/132</td>
<td>0/105</td>
<td>-0/187</td>
<td>5</td>
</tr>
<tr>
<td>0</td>
<td>4/55</td>
<td>0/34</td>
<td>0/344</td>
<td>0/459</td>
<td>5</td>
</tr>
<tr>
<td>0</td>
<td>4/257</td>
<td>1/006</td>
<td>0/111</td>
<td>0/472</td>
<td>5</td>
</tr>
</tbody>
</table>

Table 3: Summary of regression model of factors affecting the degree of mechanization of farming.

<table>
<thead>
<tr>
<th>Estimation error standard deviation</th>
<th>R$^2$</th>
<th>R$^2$</th>
<th>R$^2$</th>
<th>R$^2$</th>
<th>model</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/55831</td>
<td>0/6323</td>
<td>0/6339</td>
<td>/8003(a)</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>1/382591</td>
<td>0/7112</td>
<td>0/7231</td>
<td>/8493(b)</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>1/31622</td>
<td>0/7382</td>
<td>0/7513</td>
<td>/8637(c)</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>1/28059</td>
<td>0/7522</td>
<td>0/7683</td>
<td>/8736(d)</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>1/1522</td>
<td>0/8092</td>
<td>0/8243</td>
<td>/938(e)</td>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>

Description of variables in five steps are as follows:

a participation in the courses,  
b attendance in training courses, technical skills  
c attendance in courses, technical skills, the number of components  
d participation in courses, technical skills, the number of parts, components distance  
e attendance in courses, technical skills, number of pieces, distance pieces, the pieces size

The results of the regression equations and tables show that participation in training courses, technical skills, reducing the distance between the parts and the size increase the degree of mechanization of farming.

REFERENCES