Research Article

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Assessment of the factors contributing to the lack of agricultural mechanization in Jiroft, Iran

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Abstract: Agriculture and its development are the foundations of development in Iran as a developing country. So, this sector can be regarded as the foundation of economic and social development. The capabilities of the agriculture sector are limited, and its efficiency is trivial because of neglecting agricultural development and depriving this sector of real functional supports instead of slogans. The transformation of agriculture to a developed, dynamic, and efficient environment depends not only on appropriate climate and natural resources but also on human resource development in the relevant sector. Hence, in the present study, the causes of the underdevelopment of mechanization in rural areas of Jiroft which has a significant contribution to agricultural production in the area are investigated. Library and field methods have been used to collect information. The statistical population includes 1,324 farmers in Jiroft villages. According to Cochran's formula, in order to complete the questionnaires, the required quantity as the sample was about 300 farmers. To determine the validity of the content, the experts used Cronbach's alpha (0.81) to verify the reliability of the instrument. In the present study, the collected data were analyzed by statistical package of Social Sciences 22 and LISREL9 using Pearson correlation through exploratory and confirmatory factor analysis. The results of exploratory factor analysis showed that five factors, Supportive – research oriented and promotional, market and product, technical and technological, and cultural-social, respectively, were 19.9, 18.6, 14.5, 10.4, and 7.3 percent of the variance. Creating a national document in the field of sustainable development in agriculture, codification of supportive policies, and required laws for this sector are very impressive to improve the process of agricultural mechanization development in Jiroft.

Keywords: challenge, commercial production, dynamic agriculture, problems

1 Introduction

Through the growth in the population and increase in the demand for more food, it is required to make more investments in the agricultural sector. The investment acquires using mechanization in agricultural activities. The development and application of technology is one of the most important and necessary factors which is needed for the integration of modernization and agriculture [1]. In order to present a successful plan for the development of agricultural mechanization, the prevention factors must be identified and discussed before any action [2]. Agricultural development is a process that is directly affected by variables such as environmental conditions and social, economic, and cultural factors [3]. Monitoring changes in these factors is the result of the use of technology in the production of agricultural products, including mechanization [4]. The speed of mechanization depends on the general characteristics of agriculture such as the number of farms, size of farms, and their morphology (morphology) of crops, cultivation pattern, production method, consumption and production, farm machine power level, agricultural budgets, and also depends on the income level of farmers and the non-agricultural income of their exploiters [5]. Figure 1 shows the factors affecting agricultural mechanization and its effects in the agricultural sector (Figure 1).

Studies show that it is difficult to analyze and identify the factors affecting the acceptance of new technologies by farmers [6]. In Munshi's studies [7] and Zhang et al.'s [8], agriculture is a group of factors affecting the acceptance of new technologies by farmers. Research by Sinki Barman et al. in India showed that the younger generation of farmers was more supportive of mechanizing the farm than ever before [9]. Mrema et al. in examining the

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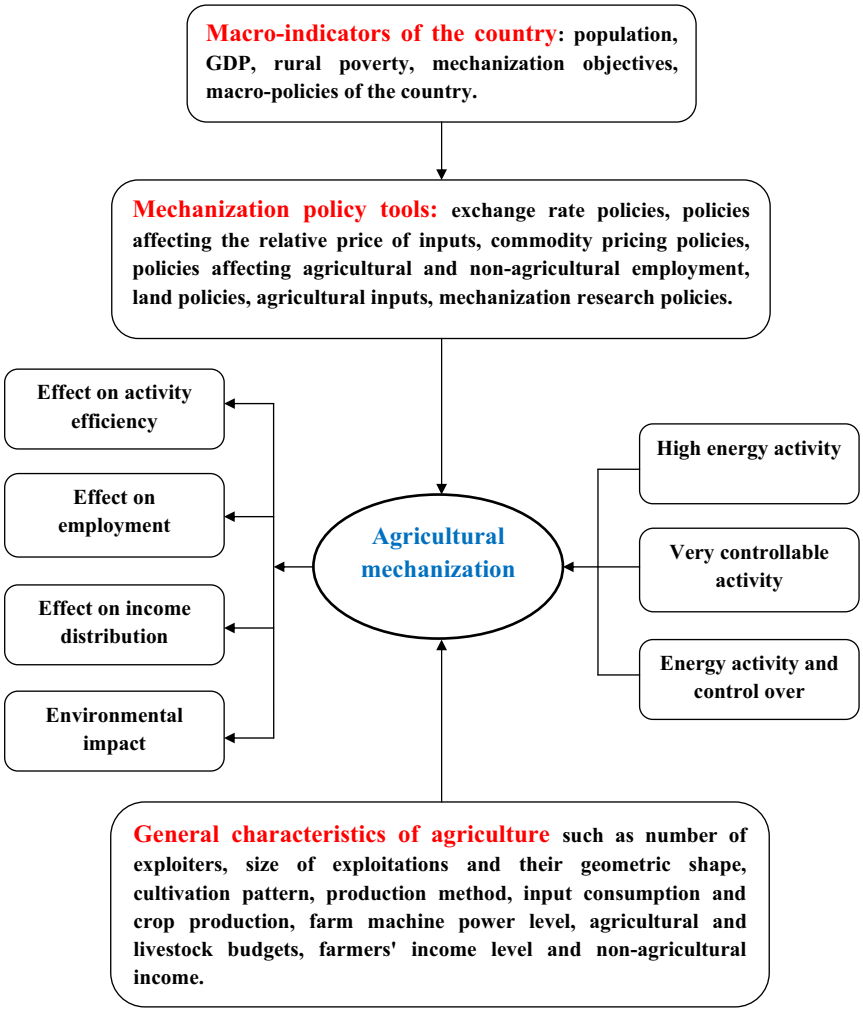

Figure 1: Factors affecting agricultural mechanization and its effects in the agricultural sector.

current situation and future prospects of agriculture and mechanization in sub-Saharan Africa found that most agricultural work relies on human muscles and the usage of tractors and other mechanized devices is low. For mechanization, the supply of agricultural equipment and machinery must be the priority [10]. Average annual production, history of agricultural activity of farmers, history of cultivation of various products, and creating a border on land are effective methods of accepting new technologies [11]. Chi's findings in Vietnam show that among the effective factors in agricultural mechanization, participation in mechanization training, increasing farmers' knowledge in knowing machinery, investment potential in regional agriculture, increasing workers' knowledge, and the policy of the Mechanization Development Organization are one of the most important factors affecting the promotion of mechanization [12]. The development of agriculture as an integral part of the national economy and the axis of development requires new methods and using appropriate tools to maximize production efficiency. It should be noted that agricultural mechanization on a national scale and a regional scale faces several problems such as land dispersion, capital constraints, and shortage of skilled manpower [13]. Agricultural mechanization in Iran has many capabilities and limitations and addressing them will undoubtedly improve the progress of mechanization goals. Among the capabilities of agricultural mechanization, some of them are mentioned below: production of the most agricultural machines in the country, the existence of favorable conditions for the transfer and use of desirable technologies, and the existence of specialized and educated university graduates in the agricultural sector. Testing, evaluation, and standardization of agricultural machines and tools are also recommended. On the other hand, the existing obstacles in the mechanization sector prevent the optimal use of the mentioned capabilities; some of them are mentioned here as follows: Insufficient investment in the development of agricultural mechanization, low financial capacity of farmers in providing

the necessary agricultural machinery, lack of economic justification for the use of agricultural machinery and equipment due to the dispersion, small and traditional crops, lack of technical knowledge in agricultural activities, necessity of using new machines, insufficient development in the industrial development planning of the country in order to meet the machine needs of the agricultural sector, lack of proportion between the price of agricultural products and the price of agricultural machines, lack of proper structure and legal requirements for mechanization development, ignorance and lack of necessary planning to boost the agricultural machinery market in the country's trade policies, lack of sufficient support of banking systems to provide the necessary facilities for the development of mechanization, and the lack of necessary trade unions related to mechanization.

In order to achieve the goals of agricultural mechanization in Iran, first of all, measures should be taken to eliminate bottlenecks and restrictions in order to make the best use of the existing capabilities in the country and then develop these capabilities to improve the country's mechanization [14]. Various factors such as structural, technical, and mechanical barriers, agronomic and climatic factors affect the development of mechanization [15]. However, with the transition from traditional agriculture to advanced and mechanized agriculture, the role of man and his needs in the production of agricultural products is gradually being changed. In traditional agriculture, man is considered the main input of production, and his physical strength is used to perform various agricultural operations, but in the semi-mechanized and fully mechanized agricultural system, the man manages and plans activities and performs more controls [16]. Overall, many of the goals of sustainable rural development, such as sustainable growth, economic diversity, increasing efficiency, environmental sustainability, and increasing income, depend on achieving agricultural development. In this context, the main objective of the study was to assess the factors contributing to underdevelopment of agricultural mechanization in Jiroft, Iran.

2 Materials and methods

2.1 Description of the study area

The geographical location along with the topographic condition has made Jiroft a diverse climate. Climatic conditions, fertile soils, and surface and groundwater resources have provided the basis for the production of millions of tons of tropical and cold products; So that, since a long time ago, Jiroft has always been a very important center of agriculture in the country.

The existence of vast and fertile plains and lack of industrial growth and limited service at the same time has turned this region into a special and unique position in Iranian agriculture. Referring to the opinions of FAO experts around the talents and exceptional characteristics of this region can be sufficient. According to these experts, Jiroft is a small India and in terms of agricultural talent is comparable to the Nile Delta, southern Spain, and California (Figure 1) [17]. Jiroft with an area under greenhouse cultivation of 1,845 ha is in the third rank and the production of 305,753 tons of greenhouse products is in the second rank (Table 1). Therefore, considering the volume of agricultural activities in Jiroft on one side and the negative effects of the indiscriminate usage of foreign inputs on human health, environment, and natural resources on the other side, the need for attention and planning for agricultural development in this area is highly reminded. Therefore, the purpose of this research is to assess the factors contributing to underdevelopment of agricultural mechanization in Jiroft, in eight villages of the city (sample) with the largest population compared to other villages (Sahibabad, Mijan, Khizr Abad, Darb-e Behesht, Razi Abad, Benstan, Blouk, and Karimabad) done (Figure 2).

The results of the present article can be used by regional and national managers and policymakers in order to improve agriculture and develop agricultural mechanization in Jiroft.

2.2 Data collection

The current research has two documentary and quantitative parts, which were designed and implemented to

Table 1: Production status of products in Jiroft

Row	Product	Area under cultivation		Manufacturing	
		Amount (ha)	Rank in Iran	Amount (tons)	Rank in Iran
1	Cucumber	1,407	1	280,105	1
2	Tomato	14,208	1	449,794	3
3	Potato	11,177	4	268,566	5
4	Maize	12,520	5	688,865	5
5	Citrus	34,000	3	450,000	3
6	Date	30,774	3	193,523	3

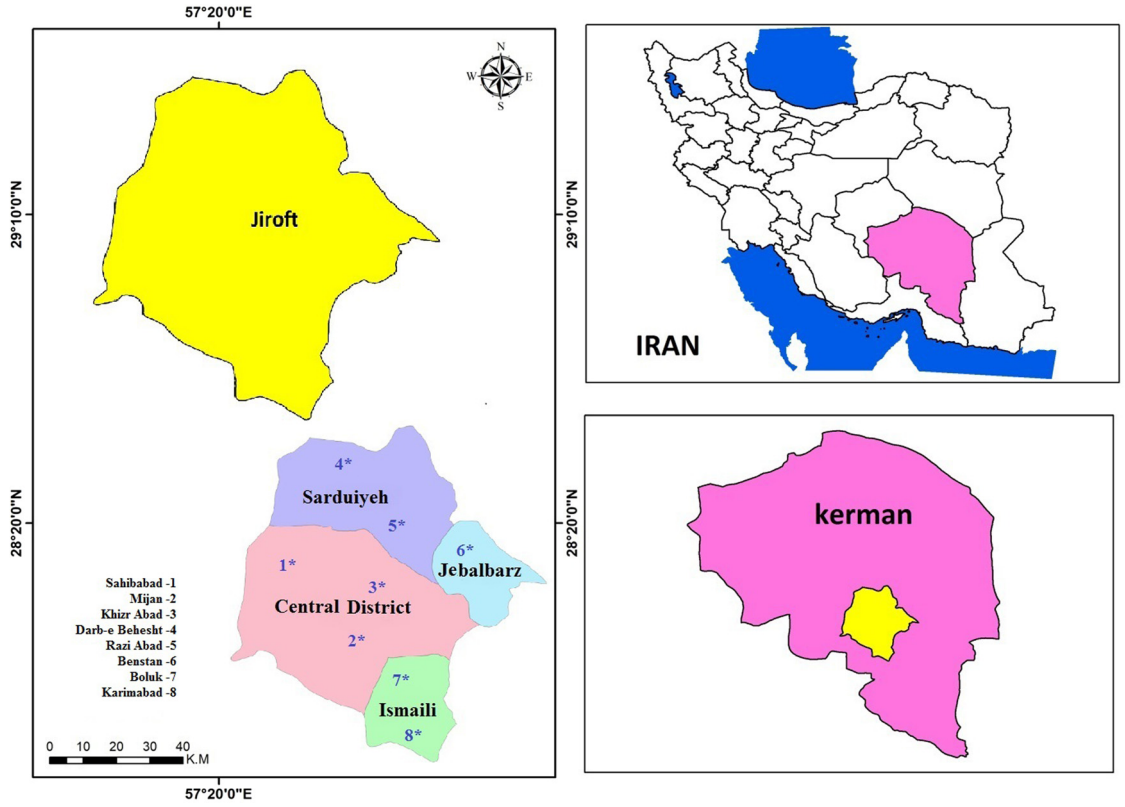

Figure 2: Geographical location of Jiroft.

investigate and analyze the obstacles to the development of agricultural mechanization in Jiroft. In the documentary section, the collection of written studies and research history was accomplished through the library study method. In the quantitative part that includes the field survey, the data collection tool was a questionnaire covering 44 questions that includes two categories of descriptive questions including age, gender, literacy level, land area, and used machinery, and also questions related to the most important obstacles to the development of mechanization in agriculture. The content of the initial questionnaire was given to the experienced experts of the Agricultural Jihad Organization, the professors of agriculture at Jiroft University and a group of skilled farmers, and the necessary comments and corrections were applied. In order to calculate the reliability of Cronbach's alpha method, the pre-test of the mechanization barrier scale was calculated as 0.81, which indicated the appropriate reliability of the research tool.

The statistical community of the research includes the villages of Jiroft, and the multi-stage stratified sampling method was used to select the samples because stratification is an efficient sampling plan in the research. It means that classification provides more information about given sample size, and it also follows parallel contents that are proportional to the research questions.

Therefore, based on the geographical areas of Jiroft and considering the existence of its four parts (Central, Ismaili, Sardoiye, and Jabalbarz), the parts of Jiroft were mentioned in the first class and each to be studied sample was obtained according to the population of each part.

In the next stage, according to the number of farmers in each rural district from each part, the assigned sample per section is divided between the rural districts in proportion to their population. In the last stage, due to the vastness of the studied area, and in order to increase the accuracy of the study, eight villages (Sahibabad, Mijan, Khizr Abad, Darb-e Behesht, Razi Abad, Benstan, and Blouk, Karimabad) having the population of 1,324 people were selected in the next step, by using Cochran's formula, (Formula (1)) and according to the number of the farmers in the populated rural districts, 300 farmers (45 farmers from Sahibabad, 33 farmers from Mijan, 36 farmers from Khizr Abad, 51 farmers from Darb-e Behesht, 27 farmers from Razi Abad, 33 farmers from Benstan, 36 farmers from Blouk, and 39 farmers from Karimabad) were involved in the questionary's process, and

their responses actually were the main part of the essay's goals. Each interview lasted about half an hour, during which enough time was given to the interviewees to explain what they thought was the most important discussion about it and to answer the questionnaire questions. After getting extracted, in order to determine the reliability coefficient of the research questionnaire, the data were entered into SPSS. As a result of using Cronbach's alpha method, the reliability of the questionnaire was 0.75.

$$n = \frac{\frac{z^2pq}{d^2}}{1 + \frac{1}{N}\left(\frac{z^2pq}{d^2} - 1\right)}, \quad (1)$$

where n is the sample size, N is the statistical population volume (population volume of the city, province, etc.), z is the value of the normal variable of the standard unit, and p is the value of the attribute ratio in society. If it is not available, it can be considered 0.5. In this case, the amount of variance reaches its maximum value. q is the percentage of people who do not have that attribute in society ($q = 1 - p$). d is the desired degree of certainty or possible accuracy or the amount of error allowed. We usually consider p and q equal to 0.5. The value of z at the 95% confidence level is 1.96. d can be 0.01 or 0.05

$$n = \frac{\frac{(1.96)^2 \times 0.5 \times 0.5}{(0.05)^2}}{1 + \frac{1}{1324}\left(\frac{(1.96)^2 \times 0.5 \times 0.5}{(0.05)^2} - 1\right)} = 300. \quad (2)$$

Informed consent: Informed consent has been obtained from all individuals included in this study.

Ethical approval: The conducted research is not related to either human or animal use.

2.3 Data analysis

The statistical package of Social Sciences 22 was used to investigate the relationship between the development of agricultural mechanization with defined variables. LISREL9 software was used to evaluate the validity of the questionnaire and analyze the relevant measurement model and the investigation of factors affecting the lack of development of mechanization in Jiroft; exploratory factor analysis (EFA), and confirmatory factor analysis (CFA) methods were used. Pearson's correlation was used to investigate the relationship between individual characteristics (age, education, and work experience), economic (income), and land (ownership type and size) characteristics.

3 Results

The results of the study of individual and social characteristics of Jiroft farmers (Table 2) showed that most of the studied farmers were male (92.8%). The median age of the surveyed farmers in Jiroft was 41.65 years, and respectively, the youngest and oldest were 22 and 70 years. The average of their agricultural work experience was 7.18 years. It was also found that 27.5% of farmers had

Table 2: Population characteristics of the sample from Jiroft

Variable		Abundance (%)
Gender	Man	92.8
	Female	7.2
Age	20–30 years	19.1
	31–40 years	36.9
	41–50 years	22.2
	Over 50 years	21.9
Education	Lower than diploma	24.7
	Diploma	29.7
	Associate degree	18.1
	Bachelor's degree and higher	27.5
Work experience	Average	7.18
Type of ownership	Personal	62.1
	Rented	37.9

Table 3: Bartlett test, KMO, and significance level

Collection to be analyzed	KMO	Bartlett	Significance level
Analysis of effective factors on underdevelopment of mechanization	0.760	1756.35	0.000

Table 4: Relationship between the development of agricultural mechanization with the studied variables

Variables studied	Correlation coefficient	Meaningful level
Age	−0.167	0.120
Education	0.465	0.002**
Work experience	0.559	0.006*
Income	0.785	0.000*
Type of ownership land	0.608	0.000*
Size of land	0.698	0.000*

**Meaningful level: 5%; *Meaningful level: 1%.

Table 5: Extracted factors with eigenvalue, percentage of variance, and cumulative percentage of their cumulative variance

Factors	Special amount	Special value variance %	Cumulative variance %
Support	6.3	19.9	19.96
Research – Extension	5.9	18.6	38.58
Market input and product	4.6	14.5	53.08
Technical and technological	3.3	10.4	63.57
Sociocultural	2.3	7.3	70.90

Table 6: Items related to each of factors and the amount of coefficients obtained from the rotated matrix

Agent name	Variables	Factor load
Support	Lack of proper insurance system for agricultural products	0.828
	Lack of incentives for farmers to use mechanized agriculture	0.842
	Poor performance guarantee for programs developed in the agricultural mechanization	0.832
	Improper import of agricultural products with domestic production	0.845
	Failure to pay bank facilities with appropriate conditions to farmers in order to mechanize	0.854
	Insufficient budget and credits to mechanize agriculture	0.826
	Non-allocation of subsidies to the mechanization department in order to cover some of its costs	0.864
	Management instability and constant attention to mechanization-related programs	0.819
	Lack of macro and comprehensive view of agricultural mechanization programs in agricultural planners and managers	0.813
Research – extension	Low number of agricultural mechanization promoters	0.867
	Low level of knowledge of farmers in the field of mechanized agriculture	0.879
	Low level of awareness of consumers and the general public about the goals of agricultural mechanization	0.870
	Lack of structures and research centers in the field of mechanized agriculture	0.824
	Lack of appropriate promotional activities in order to improve farmers' knowledge and awareness about mechanization	0.849
	Lack of proper information program in the agricultural sector	0.820
	Lack of proper database in the agricultural sector	0.860
	Lack of proper cooperation of farmers with promoters and agricultural experts	0.858
Market input and product	High price fluctuations and product in the market	0.855
	High input prices, which ultimately reduce risk acceptance in agriculture	0.797
	Lack of pricing of inputs in accordance with agricultural criteria and standards	0.822
	Lack of development of agricultural exports	0.829
	Failure to include environmental criteria in pricing	0.823
	Low economic efficiency in sustainable agriculture due to high production costs	0.762
	Marketing of conventional production products with high chemical inputs	0.772
Technical and technological	In some cases, the difficulty of implementing mechanized agriculture for farmers	0.856
	Lack of production of technologies appropriate to local environmental conditions	0.817
	Lack of proper system for farmers to access appropriate technologies	0.836
	Lack of equipment and hardware facilities related to mechanized agriculture	0.780
	The inattention of the country's researchers to the localization of machines	0.772
Socio-cultural	Farmers' beliefs about making more profit	0.871
	Lack of participation and social trust in the farming community	0.860
	Poverty and low economic status of farmers	0.873

associate degrees or higher, indicating that a small percentage of Jiroft farmers were university graduates. Also, more than 62.1% of the surveyed farmers were the owner of their lands.

In the present study, in order to investigate the relationship between the development of agricultural mechanization with the defined variables to answer the second question and in order to determine the effective

variables and determine the amount of variance explained with each of the variables in the form of factors, EFA was used (Tables 3–5). In order to determine the appropriateness of the collected data in the field of factor analysis of mechanization underdevelopment from the perspective of Jiroft farmers, Kaiser–Meyer–Ulkin coefficient (KMO) and Bartlett statistics were used. The value of this coefficient was 0.76, Table 3, which indicates the appropriateness of the correlation between the data for factor analysis. On the other hand, the value of Bartlett statistic was 7640.133 which was significant at the level of 1% (Table 3), so the data were suitable for factor analysis.

Examining the Pearson correlation coefficient, it was found that there is a significant relationship between personal characteristics (age, education, and work experience), economic (income), and land (type of ownership

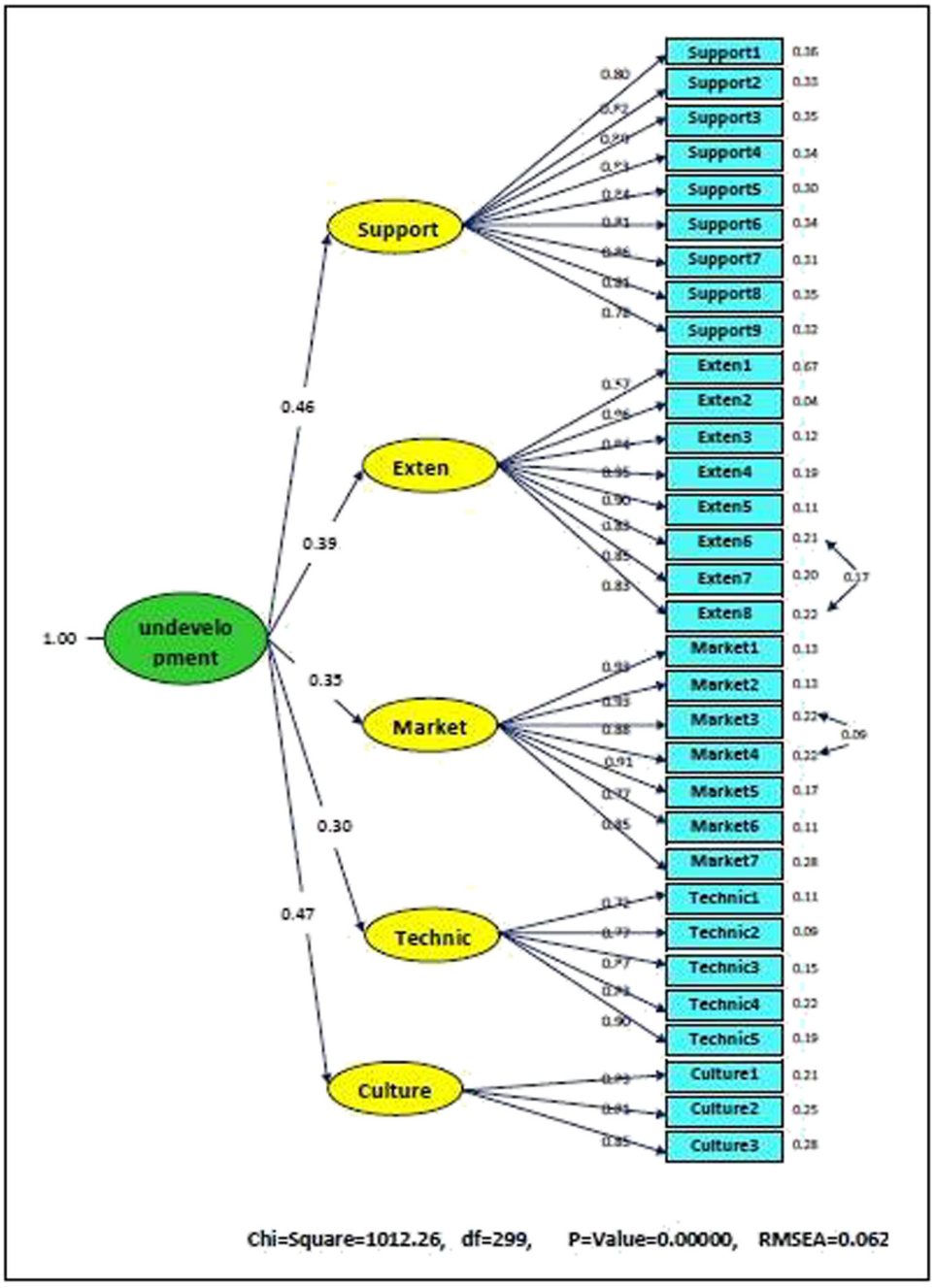

Figure 3: Confirmatory factor analysis (CFA) model with standardized factor loads display (LISREL software output image).

Table 7: Results of the degree of compliance of the research model with fitness indicators

Fitness Indicators	Acceptable Criteria	Observed Value
X^2/df	≤3	2.21
Normed fit index (NFI)	≥0.90	0.95
Non normed fit index (NNFI)	≥0.90	0.97
Comparative fit index (CFI)	≥0.90	0.97
Compliance rate index	≥0.90	0.93
Standardized root mean square residual (SRMR)	≤0.05	0.053
The second root of the mean approximation error	≤0.08	0.062

and size). The results show that the development of agricultural mechanization has been effective in sustaining income and increasing land area (Table 4).

In order to classify the factors, the eigenvalue criterion was used. The eigenvalue represents the share of each factor in the total variance of the variables; And the larger the value is, the greater its importance and impact belong to that factor. In this survey, the considered factors included a specific value greater than one. After processing the data and placing the factors affecting the underdevelopment of mechanization in each factor, the obtained factors were named (Table 5).

Most of the specific value is related to the Supportive factor and is about 6.3, which is actually 19.9% of the explained variance. Therefore, the Supportive factor is the most important factor affecting the underdevelopment of mechanization in Jiroft. Research oriented– promotional factors, Input and product market, technical and technological, and cultural and social problems with specific values of 5.9, 4.6, 3.3, and 2.3, respectively, each explained 18.6, 14.5, 10.4, and 7.3% of the total variance. Totally, these five factors were able to explain about 70.9% of the total variance of mechanization underdevelopment from the perspective of Jiroft farmers (Table 5).

Table 8: Factor analysis of questionnaire approval

Agent name	Mark on the model	Standard agent load	Amount of *t*	*P*-Value	Cronbach's alpha
Support	Support 1	0.80	—	—	0.82
	Support 2	0.82	16.82	0.00	
	Support 3	0.80	16.44	0.00	
	Support 4	0.83	17.31	0.00	
	Support 5	0.84	17.45	0.00	
	Support 6	0.81	16.65	0.00	
	Support 7	0.86	18.19	0.00	
	Support 8	0.81	16.49	0.00	
	Support 9	0.78	15.84	0.00	
Research – extension	Exten 1	0.57	—	0.00	0.78
	Exten 2	0.96	12.7	0.00	
	Exten 3	0.94	11.94	0.00	
	Exten 4	0.95	11.02	0.00	
	Exten 5	0.90	11.64	0.00	
	Exten 6	0.83	11.15	0.00	
	Exten 7	0.85	11.29	0.00	
	Exten 8	0.83	11.14	0.00	
Market input and product	Market 1	0.93	—	0.00	0.86
	Market 2	0.93	31.19	0.00	
	Market 3	0.88	25.96	0.00	
	Market 4	0.88	26.06	0.00	
	Market 5	0.91	28.70	0.00	
	Market 6	0.77	19.11	0.00	
	Market 7	0.85	23.69	0.00	
Technical and technological	Technic 1	0.72	—	0.00	0.75
	Technic 2	0.77	13.55	0.00	
	Technic 3	0.87	15.17	0.00	
	Technic 4	0.83	14.49	0.00	
	Technic 5	0.90	15.75	0.00	
Socio-cultural	Culture 1	0.83	—	0.00	0.91
	Culture 2	0.81	15.46	0.00	
	Culture 3	0.85	16.07	0.00	

The entered variables in the factor analysis by the Varimax method were rotated, so that any of the factors and variables related to each factor were identified along with their factor load (Table 6).

To evaluate the validity of the questionnaire and the fit of the measurement model related to the factors affecting the underdevelopment of mechanization in Jiroft, data were analyzed by CFA using LISREL software (Figure 3 and Table 7). Figure 3 and Table 7 show the results of CFA. Researchers have provided various statistics and indicators to measure the fit of the model. In this study, the indicators provided by Hooman, Avkiran, Hair Jr., and Kalantari were used [18–21].

The obtained fit indicates Table 7) shows the fit of the studied model with the observed data. Chi-square index with a degree of freedom with a value of 2.21 and a significant level of $P = 0.001$ and T values at the significant (level of 0.05) indicate the absence of a significant difference between the observed data and the model [19,24]. The closer the Fitness Index (GFI) 0.93 and Modified Goodness of Fit Index (GFI) 0.91 are to one, the better the fit of the model is [19], which in the present study also confirms the appropriateness of the obtained model (Table 6). Also, as shown in Table 5, the Root Mean Square Error of Approximation (0.62), which is an indicator for measuring the residual mean, was confirmed in the present study. The smaller the index, the better the fit of the model becomes [21].

As it can be considered from the fit model factors affecting the underdevelopment of Jiroft mechanization, Figure 3 and Table 6 measuring tools have good validity. The results also showed significant coefficients, Table 8, in which the obtained value of T for all studied variables was greater than 1.96, and as a result, the relationship between these variables and related factors was significant. Based on this, it can be indicated that the mentioned factors "Supportive – research oriented and promotional, market and product, technical and technological, and cultural-social" measure the factors affecting the underdevelopment of mechanization.

4 Discussion

In recent decades, humans have made great strides in the world, using new technologies and relying on cheap natural resources to feed the world. In some cases, these achievements have come at a high social, economic, and environmental cost.

Today, with the introduction of sustainability in all human issues, mechanization in the agricultural sector has also been considered by many thinkers and policymakers [22]. Agricultural mechanization is one of the efforts to accelerate agricultural development through technological changes in agriculture [23].

According to the present study, the aim was to identify the factors affecting the underdevelopment of agricultural mechanization in Jiroft. This study was finally able to identify five important factors that about 70.9% of the total variance explains the factors affecting the underdevelopment of mechanization in Jiroft.

The results of the present study indicate that illiteracy and lack of sufficient knowledge among farmers is one of the obstacles to the development of agricultural mechanization in Jiroft. In the present study, more than 52% of the studied farmers do not have academic education. This situation is recognized as one of the causes of the underdevelopment of agricultural mechanization in most parts of Iran. Several conclusions can be drawn from this issue; although some provinces and cities are more developed than others, there is also a lack of sufficient knowledge as an obstacle to the development of sustainable agricultural mechanization in the country.

The existence of scientific nature in development mechanisms can be calculated as a negative factor in the implementation and application of these mechanisms. It also reduces the tendency of people to get aware of the related topics to mechanization and their willing to get functionally involved in this sector. This factor has been also observed in foreign studies too; for example, Powers [24] has also mentioned this factor.

In the present study, challenges such as lack of proper insurance system for agricultural products, lack of incentives for farmers to use the principles of sustainable agriculture, and uncontrolled import of agricultural products were identified as the most important factors affecting the underdevelopment of mechanization in Jiroft. All mentioned factors were categorized in a more general factor named the Supportive factor.

Adenel et al. [25] also stated that the most important factor in the development of mechanization is the policies and programs of governments and regional managers to implement and support agricultural mechanization [26]. Therefore, it can be concluded that many of the challenges of agricultural mechanization development originate from the macro levels of planning and policy and are common throughout the country.

In the present study, some challenges such as lack of promoters aware of mechanized agriculture, low level of knowledge of farmers around mechanized agriculture, low level of awareness of consumers and the public about the goals of mechanized agriculture, and lack of

structures and research centers studying mechanized agriculture were identified as the second category of the challenges in agricultural mechanization development.

These challenges, along with other challenges, were categorized in a more general factor named the research oriented and promotional factor. Daneshdour and Ranjbar have also mentioned the low level of knowledge and awareness of farmers and consumers about the principles and benefits of mechanized agriculture as one of the negative factors in the development of agricultural mechanization [27,28]. Since knowledge, attitude, and behavior are closely related to each other, and with the increase in personal awareness, his attitude toward the subject changes and as a result, the intention to perform the action and finally the behavior of the person changes [29], it can be claimed that by investing in research, promotion, and education, it is possible to create the knowledge, attitude, and behavior of using machines in farmers.

In the present research, issues related to marketing and pricing of products obtained from sustainable agriculture have been emphasized in the third component (market and input). This reminds us of the need to pay attention to this sector in the process of mechanized agricultural development. In the present study, challenges such as the complexity of implementing the principles of mechanized farming for farmers, Lack of production of technologies appropriate to local environmental conditions, and lack of a proper system for farmers to access appropriate technologies to produce products were identified in the form of technical and technological factors as part of the factors affecting the underdevelopment of mechanization in Jiroft.

Understanding the degree of ease or difficulty in implementation of principles and methods of mechanized agriculture such as pest control methods is effective in the attitude and ultimately acceptance of agricultural mechanization. Jamshidi et al. in their research among greenhouse owners in Alborz province in Iran concluded that currently in Iran in the field of production of technologies appropriate to the indigenous conditions no necessary measures have been taken, and considering that mechanized agriculture has a great emphasis on the use of local and regional resources and infrastructure, this can be one of the effective mechanisms in the development of agricultural mechanization [26]. Citing research on improving participation, trust, and social communication among farmers [30] can help mechanize the agricultural sector. Increasing their participation and involvement in all matters related to agriculture can increase sustainability in this sector. Lack of participation in the present research and social trust among farmers is one of the obstacles to the development of agricultural mechanization, which is located in the fifth factor (socio-cultural). On the other hand, the unfavorable economic situation and the existence of a limited good culture, and getting the maximum possible profit from the agricultural activity are among the obstacles that in a few previous studies as an obstacle to acceptance the proposed mechanized agriculture [31] that these cases were also emphasized in the fifth factor (cultural-social) in the present study.

5 Conclusion

Agriculture is mechanized when it is technically possible, economically justifiable, socially acceptable, and environmentally friendly [32]. In the present study, as mentioned at the beginning, the cause of the underdevelopment of agricultural mechanization in Jiroft was identified. Jiroft has a significant share in agricultural production in the country and in this regard is a strategic and sensitive area for the health of the environment and society. Identifying and introducing obstacles and challenges in the development of agricultural mechanization can be used as a standpoint for policymakers and planners in this field, considering the global need to move beyond conventional agriculture and achieve mechanized agriculture; therefore, according to the obtained results in this study, supportive, research oriented and promotional, and market and product factors can be introduced as more important obstacles and challenges to the development of mechanized agriculture in Jiroft, which need the attention of officials and planners. The field of environment and agriculture in the country and the study area in this field are still left. Activities such as informing country and regions' policymakers and planners, creating a national document in the field of agricultural mechanization development, and supporting required policies and laws for this sector to improve the process of mechanized agricultural development in Jiroft can be effective.

Also, according to the obtained results, providing the necessary background for upgrading mechanized agricultural knowledge by providing the necessary extension training such as holding short-term training courses and printing educational publications and brochures, etc., is recommended for both the technical field and the field of product marketing in which the farmers would receive a practical and continuous training about the development of agricultural production cooperatives. Besides the

increase in the education for the use of mechanization, the development of extension programs to expand the awareness and knowledge of farmers would increase too that can lead to the development of mechanization. Lack of capital credits has been identified as a factor in reducing the use of mechanization in the study area. Therefore, increasing capital credits along with improving consumption monitoring can be effective in expanding the use of mechanization.

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