In Press, Pre-Proof

# The role of extension and educational programs in development of organic farming dimensions in vegetable and summer crops cultivation in Lorestan Province, Iran

Jahanbakhsh Beiranvand[1], Ahmad Reza Ommani[1], Azadeh Noorollah Noorivandi[1], and Mohammad Reza Ardakani[2]

1. Department of Agricultural Extension and Education, Shoushtar Branch, Islamic Azad University, Shoushtar, Iran
2. Professor, Department of Agronomi, Karaj Branch, Islamic Azad University, Karaj, Iran.
***Corresponding author, e-mail: ar.ommani@iau.ac.ir**

**Abstract**

One of the most important environmental hazards that has created many challenges in recent years is the development of inorganic farming and the excessive use of chemical inputs in the agricultural sector. The purpose of this research was to evaluate the role of extension and educational programs on the development of organic farming in vegetable and summer cultivation in Lorestan Province, Iran. This research is quantitative in nature and applied research in terms of purpose. The population consisted of vegetable and summer crop farmers in Lorestan (N= 3500). The sample size was determined based on Morgan table (n= 384). In order to determine the validity and reliability of the questionnaire, a panel of experts and Ɵ= 0.85 were used. According to the results, the dimensions of organic farming were not optimal. From the ecological, health, fairness, care, social-cultural and production-economic aspects, there was a significant difference between the current and desired conditions at the level of 1%. Farmers who participated in programs of extension and educational class, field day, extension exhibitions, farmer field school, scientific seminars and demonstration farms had a significant difference at the 1% level in terms of all aspects of organic farming with those who did not participate. By factor analysis, the most important factors affecting the development of organic farming dimensions include: (1) Development of technical knowledge and empowerment of farmers in the field of organic farming, (2) Government support for the use of organic farming methods and development of its dimensions, (3) Application of legal instruments for the development of organic farming and (4) Changing consumers' views towards the use of organic foods.

**Keywords:** Agricultural Development, Environmental hazards, Organic Matters, Sustainability.

## Introduction

Agriculture, as the main source of food security, is the main economic foundation of many developed and developing countries. Modern agricultural practices have a destructive effect on the environment such as water and nutrients cycle, soil erosion, forest destruction, carbon sequestration and other ecological patterns (Gamage *et al*., 2023). Organic farming is an effective way to reduce the harmful environmental and ecological effects of development programs and projects in the agricultural sector. Using more organic inputs in agricultural activities can reduce adverse effects on the environment by protecting natural cycles and guarantee the health of humans and the environment (Zhou and Ding, 2022). Reducing poverty and hunger in the world, improving food security and extending sustainable agriculture are the main goals of the Sustainable Development Goals (SDGs) (Lu and Wu, 2022). Improving food security is not achieved by increasing the quantity of food. Paying attention to the quality of food and producing healthy food is of great importance. Organic farming plays an important role in this regard. Organic farming helps humans in producing healthy food and reducing environmental pollution (Rani *et al*., 2023). Organic farming plays an effective role in increasing farmers' resilience against adverse climate changes (Lu and Cheng, 2023). Organic farming emphasizes soil and water conservation and increases flexibility (Couthouis *et al*., 2023). Organic farming strategies that are compatible with environmental conditions are used and protection of natural cycles are emphasized (Figure 1) (Gamage *et al*., 2023). With the expansion of conventional agriculture, the emphasis on the indiscriminate use of chemical fertilizers, herbicides and insecticides has greatly expanded. One of the consequences of this overuse is the environmental crisis, which has become very dangerous at the present time. (Raven and Wagner, 2021). Organic agriculture is one of the important ways to protect people and the environment against risks (Lu and Cheng, 2023). This strategy is used to improve ecological performance, biodiversity, increase water quality, improve soil quality, increase productivity, human health and environment, human welfare, respect ethics with animals and plants, and other things related to the ecosystem (Couthouis *et al*., 2023).

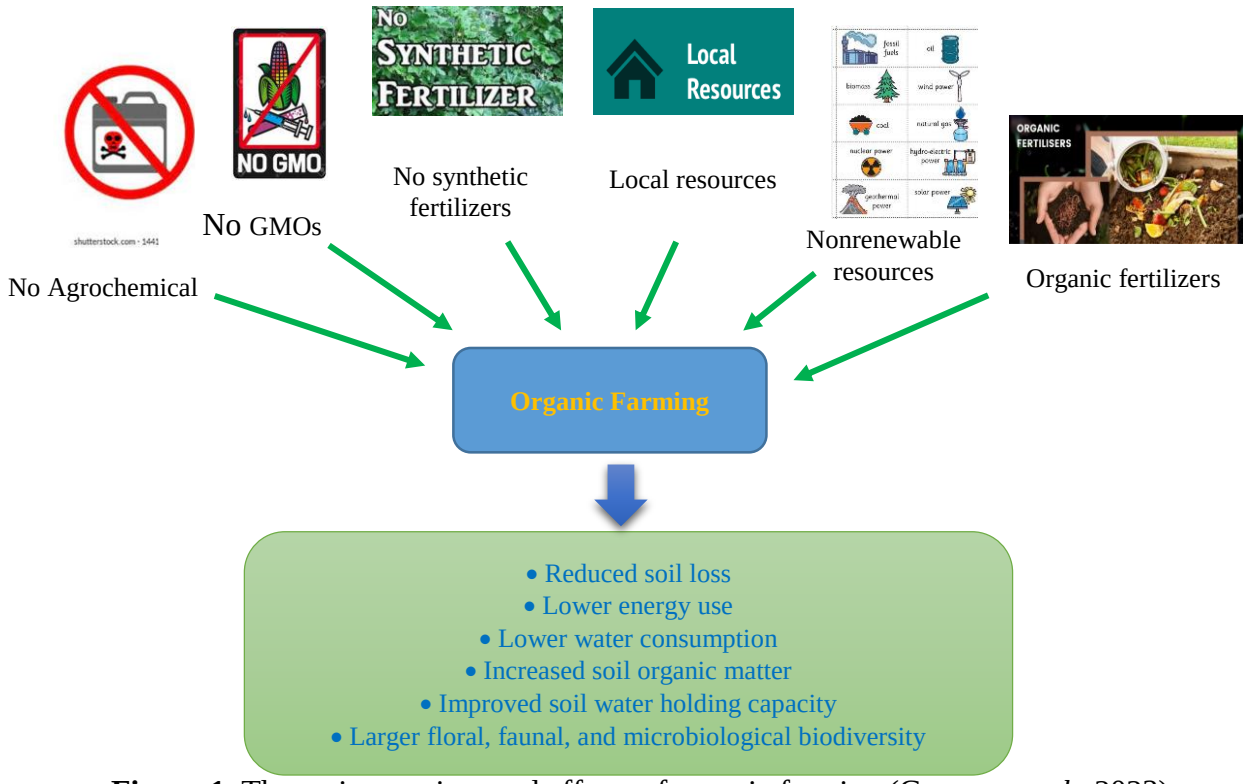


**Figure 1**. The main practices and effects of organic farming (Gamage *et al*., 2023).

Due to the environmental, social and economic benefits, there is a global trend towards the extension of organic agriculture (Thapa and Rattanasuteerakul, 2011). In various studies, many researchers emphasized several indicators in the field of organic farming and results of them, which are mentioned in Table 1.

**Table 1**. Indicators in the field of organic farming and results of them.

| Indicators | Sub indicators | Results | Resources |
|---|---|---|---|
| Ecological | Conservation of Biodiversity: Plant and animal<br>Environmental cycles: Nitrogen cycle, Phosphorus cycle, Water cycle | Clean water, ecotourism, nutrition, food security and sustained livelihoods, N surplus, P surplus | Lu and Cheng (2023); Rotchés-Ribalta *et al.* (2023) |
| Health | Conservation of production<br>Use of manure,<br>Use of green manure,<br>Use of biological fertilizers,<br>Use of crop rotation<br>Use of zero tillage | Water and soil health, plant health, animal health and livestock welfare, attention to human health and well-being, attention to the integrated ecosystem | Yang *et al.* (2023); Chausali and Saxena, (2021) |
| Fairness | Considering fairness and ethics and not harming animals<br>Considering fairness and ethics and not harming plants | No beating, no kicking, no hitting, no small cages or boxes, no with tied legs no shout at animals. Give animals' shelter, shade, access to water and feed, and protect them from enemy animals. Let mother animals be with their offspring as long as possible. Transport animals | Rizzo *et al.* (2020); Krieger *et al.* (2020) |

| | | | |
|---|---|---|---|
| Care | Caring for plants<br>Caring for animals<br>Caring for basic resources<br>Caring for people's health | calmly. Never move an animal from light into darkness.<br>Do not break the new branches of plants<br>Not turning the forest into a farm<br>Not cutting down living trees, which have the right to life<br>Caring for plants such as feeding and preserving the life of different plant species<br>Caring for different animal species and dealing with them appropriately<br>Taking care of basic production resources such as water, soil and ecosystems<br>Taking care of human health in the current and future generations | Łuczka *et al*. (2021); Kowalska and Matysiak (2023) |
| Social-cultural | Social participation<br>Social justice<br>Social Welfare | Participation in decisions, implementation and evaluation of agricultural affairs<br>Justice between producers and consumers, between humans and the environment, between humans and plants and animals<br>Providing conditions for human life | Damayanti *et al.* (2018); Kociszewski *et al.* (2020) |
| Production-economic | Increase profitability<br>Increase productivity<br>Reducing production costs<br>Optimal use of resources | Efficient use of water, nutrients, fuel, labor and capital<br>Increase income<br>Reaching the current production capacity to nominal<br>Increasing the output of the production system to the input | Durham and Mizik (2021); Raimondo *et al.* (2021); Reddy *et al.* (2022); Javier and Sison (2023); Scuderi *et al.* (2023) |

Nowadays, it is not a secret to everyone, agricultural extension and education is necessary to empower farmers and transfer useful information to them. It plays an important role in convincing farmers to apply technology and agricultural innovations (Alotaibi *et al.*, 2021). Qiao *et al.* (2022) concluded agricultural extension programs play a significant role in organic farming development. This programs by improving farmers' awareness can stimulate farmers' willingness to green production. Kassem *et al.* (2021) explained that agricultural extension programs play an important role in developing farmers' knowledge and skills to move from conventional to organic farming. Mancini *et al.* (2008) stated that farmer field school (FFS) was an effective educational approach among farmers to accept organic farming.

Unfortunately, one of the problems that exists in the researched area is the uncoordinated implementation of educational and extension programs in the field of organic farming development. For this reason, the necessity of carrying out this research with the purpose of evaluating the role of extension and educational programs in development of organic farming dimensions in vegetable and summer crops cultivation in Lorestan Province, Iran is very important.

## Methodology

The purpose of this research was to evaluate the role of extension and educational programs on the development of organic farming dimensions in vegetable and summer cultivation in Lorestan Province, Iran. This research is quantitative in nature and applied research in terms of purpose. The method used it was a descriptive and correlation. The population consisted of vegetable and summer crop farmers in Lorestan (N= 3500). The sample size was determined based on Morgan table (n= 384). In order to determine the validity of the questionnaire, a panel of experts was used. The members of panel of experts included 30 experts and faculty members of agricultural extension and education discipline. The dimensions and variables mentioned in the text were chosen based on the literature review and experts view. Also, to determine the reliability the Ɵ= 0.85 was used. The Wilcoxon test was used to evaluate the significance of the difference between the ecological, health, fairness, care, socio-cultural and production-economic indicators between the current and desired conditions. The meant by desirable status of the dimensions was what it should be. The distance between what is and what should be, which is expressed according to farmers' opinion, indicates the unfavorable status of organic farming dimensions. This issue adds to the need to pay attention to agricultural extension and education activities. The data collection tool in this research was a questionnaire that had 4 sections: demographic characteristics, current and desirable status of organic farming development indicators, participation in extension and educational programs and role of extension and educational programs on the development of organic farming. Also, the mentioned indicators were compared through the Mann-Whitney test among farmers who participated in the extension and educational programs and those who did not participate. For correlation analysis between the variables, the spearman correlation coefficient was used. In addition, ordinal regression was used to measure the role of the independent variables of the research on the dependent variable that had an ordinal scale. In order to summarize the variables raised in the field of factors affecting the development of organic farming dimensions, factor analysis was used. The value of KMO in this research is 0.896, which indicates the suitability of the data for factor analysis (Shrestha, 2021). Also, the significance of Bartlet's test with a value of 4.564 shows that the correlation matrix has significant data and the necessary conditions for factor analysis exist (Rossoni *et al*., 2016).

## Results and Discussion

### Demographic characteristics of vegetable and summer crop farmers

As shown in Table 2, the average age of selected farmers in the study areas was 41.25 and the standard deviation was 5.89. The average level of education was 2.6. Also, the average farm size was 4.9 hectares. The main occupation of all of them was farming and 65 farmers had a second job in addition to farming. Their average income from agricultural activities was 2480 dollars per year. The mean rank of organic farming awareness, attitude toward organic farming, organic farming knowledge, access to information sources, willingness to creativity and risk oriented respectively were, 2.243, 2.109, 2.542, 3.541, 2.952 and 2.064.

**Table 2.** Characteristics of vegetable and summer crop farmers.

| Personal and economic characteristics | | Mean | SD |
|---|---|---|---|
| Age (Year) | | 41.25 | 5.89 |
| level of education[a] | | 2.6 | 0.83 |
| Farm size (Hectares) | | 4.9 | 1.09 |
| Income (Dollar) | | 2480 | 53.24 |
| Personality and cognitive characteristics | Items | Mean of total items | SD |
| Organic farming awareness[b] | 10 | 2.243 | 0.65 |
| Attitude toward organic farming[c] | 10 | 2.109 | 0.79 |
| Organic farming knowledge[b] | 10 | 2.542 | 0.81 |
| Access to information sources[b] | 5 | 3.541 | 0.84 |
| Willingness to creativity[b] | 5 | 2.952 | 0.79 |
| Risk oriented[b] | 6 | 2.064 | 0.82 |

[a] 0= Illiterate, 1= Preliminary, 2= Guidance school, 3= High school, 4= Diploma and above.
[b] The Domain of Each Item: 0= None; 1= Very low; 2= Low; 3= Average; 4= High; 5= Very High.
[c] The Domain of Each Item: 1= Strongly disagree, 2= Disagree, 3= Unsure, 4= Agree, 5= Strongly agree.
Source: Research findings (2022).

### Evaluation of the current and desirable status of organic farming development indicators

In order to evaluate the current and desirable status of indicators and sub-indicators of organic farming development in Lorestan Province, the status of the mentioned indicators was evaluated. The results are shown in Figure 2 and Table 3. According to the average of each indicator, it is clear that there is a gap between the two mentioned situations. Wilcoxon test was used to evaluate the significance of this difference. Based on the results from the ecological, health, fairness, care, social-cultural and production-economic aspects, there was a significant difference between the current and desired conditions at the level of 1%.

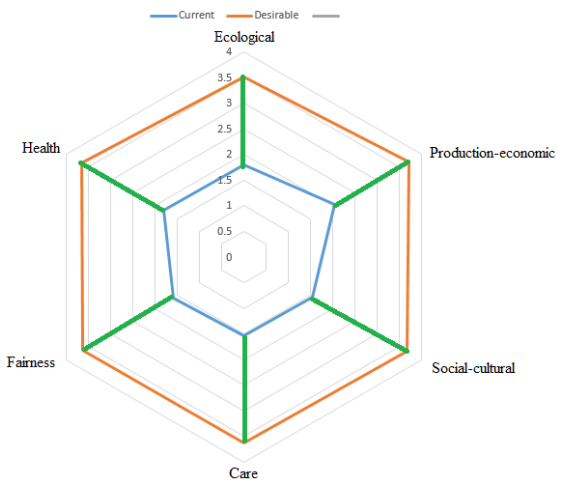


**Figure 2.** Current and desirable status of organic agriculture development indicators.

**Table 3.** Comparative analysis of the current and desirable status of organic agriculture development indicators.

| Indicators | Number of sub-indicators | Current status | | | Desirable status | | | Z | Sig |
|---|---|---|---|---|---|---|---|---|---|
| | | Mean | SD | CV | Mean | SD | CV | | |
| Ecological | 4 | 1.80 | 0.30 | 0.169 | 3.51 | 0.42 | 0.119 | 6.564 | 0.0001 |
| Health | 5 | 1.81 | 0.34 | 0.189 | 3.65 | 0.39 | 0.106 | 6.585 | 0.0001 |
| Fairness | 4 | 1.59 | 0.29 | 0.182 | 3.62 | 0.42 | 0.115 | 6.651 | 0.0001 |
| Care | 4 | 1.54 | 0.31 | 0.204 | 3.62 | 0.38 | 0.106 | 5.534 | 0.0001 |
| Social-cultural | 7 | 1.55 | 0.36 | 0.232 | 3.68 | 0.41 | 0.110 | 6.225 | 0.0001 |
| Production-economic | 7 | 2.04 | 0.33 | 0.164 | 3.72 | 0.52 | 0.140 | 5.658 | 0.0001 |

## Status of vegetable and summer crop farmers' participation in extension and educational programs

In Table 4, the status of farmers in educational and extension programs implemented at the Lorestan Province was evaluated. Among 384 farmers, 124 people participated in extension and educational class. According to the results, the status of participating in educational and extension programs in all programs was less than one third of the studied people. In some cases, such as scientific seminars, it was less than 10%.

**Table 4.** Frequency of vegetable and summer crop farmers according to participation in extension and educational programs

| Educational and extension programs | Participated | | Not participated | |
|---|---|---|---|---|
| Extension and educational class | 124 | 32.29 | 260 | 67.71 |
| Field day | 115 | 29.95 | 269 | 70.05 |
| Extension exhibitions | 56 | 14.58 | 328 | 85.42 |
| Farmer field school | 62 | 16.15 | 322 | 83.85 |
| Scientific seminars | 32 | 8.33 | 352 | 91.67 |
| Demonstration farms | 46 | 11.98 | 338 | 88.02 |

## The role of extension and educational programs on the development of organic farming

In order to measure the role of educational and extension programs on the status of organic farming indicators, the mentioned indicators were examined among farmers who participated

in the programs and those who did not participate through the Mann-Whitney test. Farmers who participated in extension and educational programs had a better condition in terms of organic agriculture indicators and the difference between the two groups was significant at 1% level.

**1) The role of extension and educational classes on the development of organic farming:**

Based on the results, farmers who participated in extension and educational classes were significantly different in ecological (U= 3.42), health (U= 3.25), fairness (U= 5.61), care (U= 4.24), social-cultural (U= 3.56) and production-economic (U= 3.94) indicators at 1% level with farmers who did not participate in these classes (Table 4). This result is in line with the research results of Fatemi *et al.* (2022); Maulu *et al.* (2021), and Alotaibi *et al.* (2021a).

**The role of field day on the development of organic farming:**

Farmers who participated in field day event were significantly different in ecological (U= 2.98), health (U= 3.54), fairness (U= 4.19), care (U= 3.06), social-cultural (U= 5.04) and production-economic (U= 4.35) indicators at 1% level with farmers who did not participate in these event (Table 4). This result is in line with the research results of Emerick and Dar (2021); Maertens *et al.* (2020), and Murphy *et al.* (2019).

**2) The role of extension exhibitions on the development of organic farming:**

According to the results, farmers who participated in extension exhibitions were significantly different in ecological (U= 3.01), health (U= 3.27), fairness (U= 4.31), care (U= 3.69), social-cultural (U= 4.02) and production-economic (U= 5.13) indicators at 1% level with farmers who did not participate in these event (Table 4). This result is in line with the research results of Mir Salimi *et al*. (2016), and Ranjbar and Omidi Najafabadi (2014). According to farmers' point of view, holding extension exhibitions for farmers has an effective role in optimal use of resources, social justice, attention to human health and environment.

**3) The role of farmer field school on the development of organic farming:**

Based on the results, farmers who participated in farmer field school were significantly different in ecological (U= 3.21), health (U= 3.59), fairness (U= 4.01), care (U= 4.65), social-cultural (U= 3.21) and production-economic (U= 3.52) indicators at 1% level with farmers who did not participate in these event (Table 4). This result is in line with the research results of Karimi and Niknami (2020) and Berg *et al.* (2020).

**4) The role of scientific seminars and workshop on the development of organic farming:**

The results of the Mann-Whitney test showed that, farmers who participated in scientific seminars and workshop were significantly different in ecological (U=3.05), health (U=3.54), fairness (U=4.16), care (U=3.65), social-cultural (U=3.54) and production-economic (U=2.96) indicators at 1% level with farmers who did not participate in these event (Table 4). This result is in line with the research results of Maertens *et al.* (2020), and Murphy *et al.* (2019).

**5) The role of demonstration farms on the development of organic farming:**

Farmers who visited demonstration farms were significantly different in ecological (U= 3.05), health (U= 2.98), fairness (U= 3.68), care (U= 4.08), social-cultural (U= 5.13) and production-economic (U= 4.03) indicators at 1% level with farmers who did not participate in these event (Table 5). This result is in line with the research results of Huang *et al.* (2023), and Colbert (2020).

**Correlation between variables**

According to the results obtained from the correlation analysis between the variables, it was found that there is a significant relationship between the level of access to information sources, extension services, social participation, technical knowledge, attitude, income, willingness to creativity and risk oriented with organic farming indicators at level of 1% (Table 6).

**Table 5**. Role of educational and extension programs on the status of organic farming indicators

| Programs → Indicators ↴ | Extension class | | U | Sig | Field day | | U | Sig | Extension exhibitions | | U | Sig | Farmer field school | | U | Sig | Scientific seminars | | U | Sig | Demonstration farms | | U | Sig |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Yes | No | | | Yes | No | | | Yes | No | | | Yes | No | | | Yes | No | | | Yes | No | | |
| Ecological | 3.12 | 1.96 | 3.42 | 0.01 | 3.27 | 2.05 | 2.98 | 0.01 | 3.40 | 2.08 | 3.01 | 0.01 | 3.30 | 1.99 | 3.21 | 0.01 | 3.81 | 2.03 | 3.05 | 0.01 | 3.25 | 2.13 | 2.98 | 0.01 |
| Health | 3.61 | 2.09 | 3.25 | 0.01 | 3.16 | 1.97 | 3.54 | 0.01 | 3.29 | 1.95 | 3.27 | 0.01 | 3.98 | 2.31 | 3.59 | 0.01 | 3.67 | 2.11 | 3.54 | 0.01 | 3.54 | 2.09 | 3.68 | 0.01 |
| Fairness | 2.99 | 2.01 | 5.61 | 0.01 | 4.12 | 2.18 | 4.19 | 0.01 | 3.81 | 2.01 | 4.31 | 0.01 | 4.14 | 2.18 | 4.01 | 0.01 | 4.09 | 2.13 | 4.16 | 0.01 | 3.95 | 2.17 | 4.08 | 0.01 |
| Care | 3.09 | 1.95 | 4.24 | 0.01 | 3.96 | 1.97 | 3.06 | 0.01 | 4.05 | 2.11 | 3.69 | 0.01 | 4.03 | 2.31 | 4.65 | 0.01 | 3.98 | 1.96 | 3.65 | 0.01 | 3.99 | 2.01 | 3.99 | 0.01 |
| Social-cultural | 3.58 | 1.89 | 3.56 | 0.01 | 4.02 | 2.34 | 5.04 | 0.01 | 4.11 | 2.14 | 4.02 | 0.01 | 4.31 | 2.01 | 3.21 | 0.01 | 3.97 | 2.09 | 3.54 | 0.01 | 4.11 | 2.54 | 5.13 | 0.01 |
| Production-economic | 4.11 | 2.12 | 3.94 | 0.01 | 3.97 | 2.11 | 4.35 | 0.01 | 3.67 | 2.15 | 5.13 | 0.01 | 4.11 | 1.98 | 3.52 | 0.01 | 3.68 | 1.35 | 2.96 | 0.01 | 3.68 | 2.01 | 4.03 | 0.01 |

**Table 6**. Correlation analysis between the variables.

| Variables 1 | Variable 2 | Spearman Correlation coefficient | Sig | Result |
|---|---|---|---|---|
| Access to information sources | Level of using organic farming indicators | 0.785 | 0.01 | Confirmation of correlation |
| Extension services | | 0.811 | 0.01 | Confirmation of correlation |
| Social participation | | 0.912 | 0.01 | Confirmation of correlation |
| Technical knowledge | | 0.789 | 0.01 | Confirmation of correlation |
| Attitude | | 0.711 | 0.01 | Confirmation of correlation |
| Income | | 0.632 | 0.01 | Confirmation of correlation |
| Willingness to creativity | | 0.689 | 0.01 | Confirmation of correlation |
| Risk oriented | | 0.712 | 0.01 | Confirmation of correlation |
| Age | | 0.098 | 0.251 | Non-confirmation of relation |

**Ordinal regression**

To perform ordinal regression variables were included in the ordinal regression analysis that had a significant relationship with the dependent variable based on the correlation coefficient. Dependent variable was level of using organic farming indicators and independent variables were access to information sources, extension services, social participation, technical knowledge, attitude, income, willingness to creativity and risk oriented. Table 7 shows information about the appropriateness of the log-log complementary model. In this table, the null hypothesis has been tested using the chi-square statistic. Due to the fact that the chi-square statistic, which compares the difference between two probabilities, is significant at the 5% level, the null hypothesis is rejected. Therefore, the test confirms the appropriateness of the model. In table 6 the -2Likelihood of the model with only intercept is 712.438 while the -2Likelihood of the model with intercept and independent variables is 234.813. That is the difference (Chi-square statistics) is 712.438 – 234.813= 477.625 which is significant at 0.01 ($p > .001$). Therefore, we can conclude that there is the association between the dependent and independent variables. By using the Chi-square statistic, the observed and expected frequencies in groups with different levels of organic farming use have been compared in terms of Pearson and Goodness of fit. Based on this test, the model is suitable when the significance level is high and the numerical value of the Pearson's statistic and the goodness-of-fit deviation are small. Therefore, according to the statistics in this table, it can be concluded that the model is suitable. The significance of the parallel lines test means rejecting the null hypothesis. Therefore, the null hypothesis is rejected. Nagelkerke's $R^2$ index is reported as a rank regression coefficient. Therefore, 75% of dependent variable changes can be explained through predictor variables. According to the results of the appropriateness test of the log-log complementary model, the relevant equations were adjusted.

**Table 7.** Examining the Appropriateness of the Selected Complementary Log-Log Regression Model.

| Appropriateness of the selected Complementary log-log regression model | | | |
|---|---|---|---|
| Model | -2 log Likelihood | $X^2$ | P |
| Intercept Only | 712.438 | 215.54 | 0.001 |
| Final | 234.813 | | |
| Goodness-of-fit | | | |
| Statistic | $X^2$ | Sig | |
| Pearson | 267.233 | 0.324 | |
| Deviance | 311.315 | 0.358 | |
| Parallel lines test | | | |
| Model | -2 log Likelihood | $X^2$ | Sig |
| Null Hypothesis | 436.312 | 276.232 | 0.004 |
| General | 342.431 | | |
| Cox and Snell $R^2$= 0.716, Nagelkerke $R^2$=0.754, McFadden $R^2$= 0.756 | | | |

According to Table 8, the extracted regression equations can be displayed as below:

$\ell n(-\ell n(1-\gamma))=\alpha_0+\alpha_1x_1+\alpha_2x_2+\alpha_3x_3+\alpha_4x_4+\alpha_5x_5+\ldots+\alpha_kx_k$

$\ell n(-\ell n(1-\gamma))=4.671+3.548x_1+2.654x_2+4.891x_3+3.281x_4+3.608x_5+5.091x_6+3.094x_7+4.009x_8$

$\ell n(-\ell n(1-\gamma))=3.098+3.548x_1+2.654x_2+4.891x_3+3.281x_4+3.608x_5+5.091x_6+3.094x_7+4.009x_8$

$\ell n(-\ell n(1-\gamma))=5.009+3.548x_1+2.654x_2+4.891x_3+3.281x_4+3.608x_5+5.091x_6+3.094x_7+4.009x_8$

$\ell n(-\ell n(1-\gamma))=3.621+3.548x_1+2.654x_2+4.891x_3+3.281x_4+3.608x_5+5.091x_6+3.094x_7+4.009x_8$

These equations show the probability of occurrence of the research dependent variable for its different levels. The variables included in the regression equation are access to information sources, extension services, social participation, technical knowledge about organic farming, attitude about organic farming, income, willingness to creativity and risk oriented.

**Table 8.** Ordinal regression coefficients and significance levels.

| | Variable | β | Sig |
|---|---|---|---|
| 1 | Access to information sources | 3.548 | 0.003 |
| 2 | Extension services | 2.654 | 0.009 |
| 3 | Social participation | 4.891 | 0.002 |
| 4 | Technical knowledge about organic farming | 3.281 | 0.003 |
| 5 | Attitude about organic farming | 3.608 | 0.003 |
| 6 | Income | 5.091 | 0.001 |
| 7 | Willingness to creativity | 3.094 | 0.003 |
| 8 | Risk oriented | 4.009 | 0.002 |
| Constant | Level 1 | 4.671 | 0.002 |
| | Level 2 | 3.098 | 0.003 |
| | Level 3 | 5.009 | 0.001 |
| | Level 4 | 3.621 | 0.003 |

**Factor analysis**

In order to summarize the variables, the factor analysis was used. To determine the number of factors used the eigenvalue criterion. For this regards, the Kaiser method was used and the factors whose eigenvalue was higher than 1 were selected. According to the results of the factor analysis, four factors that have the ability to explain a significant amount of the total variance of the variables were extracted. After factor rotation in the Varimax method, it was found that these 4 factors, explained 80.115% of the variance of the factors affecting the development of organic farming dimensions. These four factors and their share of variance are shown in Table 9. These 4 factors were: (1) Development of technical knowledge and empowerment of farmers in the field of organic farming, (2) Government support for the use of organic farming methods and development of its dimensions, (3) Application of legal instruments for the development of organic agriculture and (4) Changing consumers' views towards the use of organic foods. In order to identify the variables related to each factor and to make the factors more interpretable,

the factor load matrix of the variables was used (Table 10). Variables that have a factor load greater than 0.5 have a very favorable significance level with their factor.

**Table 9**. Factors extracted from factor analysis.

| Factors | Eigenvalue | % Explained variance | % Cumulative variance |
|---|---|---|---|
| First Factor | 8.951 | 32.581 | 32.581 |
| Second Factor | 6.897 | 21.512 | 54.093 |
| Third Factor | 5.881 | 15.524 | 69.617 |
| Fourth Factor | 5.614 | 10.498 | 80.115 |

**Table 10.** Extracted factors and variables of each factor.

| Factors | Variables | Factor load |
|---|---|---|
| Development of technical knowledge and empowerment of farmers in the field of organic farming | Participation in organic farming training courses | 0.69 |
| | Visiting demonstration farms of organic farming methods and results | 0.58 |
| | Distribution of organic farming educational bulletins | 0.71 |
| | Creating favorable changes in the attitude towards organic farming | 0.66 |
| Government support for the use of organic farming methods and development of its dimensions | Facilitative support of the government for the cultivation of organic products | 0.64 |
| | Financial support of the government for the cultivation of organic products | 0.79 |
| | Spiritual support for cultivation organic crops | 0.54 |
| Application of legal instruments for the development of organic agriculture | Legal support for the cultivation of organic crops | 0.61 |
| | Development of standards for the production of agricultural products | 0.66 |
| | Legal supervision of the quality of production of agricultural products | 0.69 |
| Changing consumers' views towards the use of organic foods | Using mass media to spread the culture of consuming organic products | 0.74 |
| | Informing people about the negative effects of non-organic foods | 0.59 |
| | Holding seminars and training workshops in the field of organic food consumption | 0.72 |

## Conclusions

According to the results about organic farming indicators it is clear that there is a gap between the current and favorable situations. Based on the results from the ecological, health, fairness, care, social-cultural and production-economic aspects, there was a significant difference between the current and desired conditions at the level of 1%. Therefore, one should try to reduce the gap between these two situations in terms of all aspects by implementing different programs. In order to measure the role of educational and extension programs on the status of organic farming indicators, the mentioned indicators were examined among farmers who participated in the programs and those who did not participate. Farmers who participated in extension and educational programs had a better condition in terms of organic agriculture indicators and the difference between the two groups was significant at 1% level. This result clarifies the path and solution to reduce the difference between these two situations. This result states what extension and educational methods can be used to improve the existing situation.

This is a fundamental and important achievement for policy makers and planners. According to the results obtained from the correlation analysis between the variables, it was found that there is a significant relationship between the level of access to information sources, extension services, social participation, technical knowledge, attitude, income, willingness to creativity and risk oriented with organic farming indicators at level of 1%.This result also explains the convergent variables with organic agriculture indicators, which can be expected to improve the status of organic farming indicators by improving their situation. Based on the results of the research, the factors affecting the development of organic farming dimensions were identified, and attention to them plays an important role in the development of these dimensions. One of the most important of them development of technical knowledge and empowerment of farmers in the field of organic farming, which can be achieved by using the strategies of participation in organic farming training courses, visiting demonstration farms of organic farming methods and results, distribution of organic farming educational bulletins and creating favorable changes in the attitude towards organic farming. According to the results, the second most effective factor was the government's support for the use of organic farming methods to develop its dimensions. For this purpose, government facilitation support for the cultivation of organic products, financial support for the cultivation of organic products and spiritual support for the cultivation of organic products should be provided. For spiritual support, one can use strategies such as appreciating organic farmers as exemplary and superior farmers and awarding them a certificate of appreciation, paying attention to their opinions in decision-making and planning, and using their indigenous knowledge in educational and extension programs. Therefore, this research will have positive implications for the development of organic farming, as it provides research-based information about the real actors in Iran's agricultural systems. The results of this research have implications for the design of future extension and education programs for the development of organic farming in the agricultural sector. It enables planners, policy makers and related ministries to design applied policies and programs that truly reflect the factors affecting the development of organic farming and the skills that need improvement. As theoretical implications, it can be concluded adoption of organic agriculture by farmers follows a systematic decision-making process. Use of organic agriculture requires educational programs in appropriate social, institutional and legal contexts. Since the contexts are different according to the region, extension and education programs should be chosen that suit the needs of the target audience, social and cultural structure, and create favorable conditions for the adoption of organic agriculture in a social system. Also, as practical implications, it can be said recognition of the role of extension and educational programs in development of organic

farming dimensions in vegetable and summer crops cultivation ensures that what kind of programs are suitable for the development of organic agriculture according to social systems. The results of this research enables planners, policy makers and related ministries to design applied policies and programs that truly reflect the factors affecting the development of organic farming and the skills that need improvement. Other research issues related to similar themes for the research of other scientists are:

Analysis of barriers to farmers' participation in organic farming extension and education programs.

Identifying the sociable context of organic farming.

Designing suitable content for organic farming extension and education.

References

1) Alotaibi, B. A., Yoder, E., and Kassem, H. S. (2021a). Extension Agents' Perceptions of the Role of Extension Services in Organic Agriculture: A Case Study from Saudi Arabia. Sustainability, 13(9), 4880. MDPI AG. Retrieved from http://dx.doi.org/10.3390/su13094880

2) Alotaibi, B.A., Yoder, E., Brennan, M. A., and Kassem, H.S. (2021b). Perception of organic farmers towards organic agriculture and role of extension, SJBS, 28(5) 2980-2986.

3) Berg, H., Ketelaar, J. V., Dicke, M and Fredrix, M. (2020). Is the farmer field school still relevant? Case studies from Malawi and Indonesia, NJAS - Wageningen Journal of Life Sciences, 92, 100329.

4) Chausali, N and Saxena, J. (2021). Conventional versus organic farming: Nutrient status, Editor(s): Vijay Singh Meena, Sunita Kumari Meena, Amitava Rakshit, Johnson Stanley, Cherukumalli Srinivasarao, Advances in Organic Farming, Woodhead Publishing, Pages 241-254.

5) Colbert, E. (2020). The role of demonstration farms in agroecological transitions - nexus for scaling up and scaling out agroecology. Thesis for MSc Agroecology Double Degree at Norwegian University of Life Sciences (NMBU) and Institut Superior d'Agriculture Rhône-Alpes (ISARA).

6) Couthouis, E., Aviron, S., P´etillon, J., and Alignier, A. (2023). Ecological performance underlying ecosystem multifunctionality is promoted by organic farming and hedgerows at the local scale but not at the landscape scale. J. Appl. Ecol. 60 (1), 17–28.

7) Damayanti, M., Nugroho, P., and Tyas, W. (2018). Norms in Community-Based Organic Farming. Agriculture, 8(12), 185.

8) Durham, T. C., and Mizik, T. (2021). Comparative Economics of Conventional, Organic, and Alternative Agricultural Production Systems. Economies, 9(2), 64.

9) Emerick, K and Dar, M. H. (2021). Farmer Field Days and Demonstrator Selection for Increasing Technology Adoption. The Review of Economics and Statistics. 103 (4): 680–693.

10) Fatemi, M., Monfared, N., Rezaei-Moghaddam, K., and Badzaban, F. (2022). Factors Affecting the Extension and Development of Organic Farming Activities. Karafan Quarterly Scientific Journal, 18(4), 13-32.

11) Gamage, A., Gangahagedara, R., Gamage, J., Jayasinghe, N., Kodikara, N., Suraweera, P., and Merah, O. (2023). Role of organic farming for achieving sustainability in agriculture, Farming System, 1(1). 101-105.

12) Huang, T., Hu, J., and Huang, Q. (2023). Sustainable Development between Demonstration Farm and Agricultural Labor Productivity: Evidence from Family Farms in the Mountainous Area of Western China. Sustainability, 15(12), 9560.

13) Javier, J. D., and Sison, M. P. M. (2023). Economic benefits of organic vegetable production among selected organic farms in Bukidnon. Agricultural Socio-Economics Journal, 23(3), 273–279.

14) Karimi, E., and Niknami M. (2020). Analyzing Impacts of Farmer Field School on the Economic, Social, Production, and Knowledge Status of Greenhouse Owners: Evidence from Tehran Province and its Surrounding Counties. JAST 2020; 22 (1) :27-41

15) Kassem, H.S., Alotaibi, B.A., Muddassir, M., and Herab, A. (2021). Factors influencing farmers' satisfaction with the quality of agricultural extension services. Eval. Program Plann, 85, 101912.

16) Kociszewski, K., Graczyk, A., Mazurek-Łopacinska, K., and Sobocińska, M. (2020). Social Values in Stimulating Organic Production Involvement in Farming—The Case of Poland. Sustainability, 12(15), 5945.

17) Kowalska, J., and Matysiak, K. (2023). Advances in Crop Protection in Organic Farming System. Agriculture, 13(10), 1947.

18) Krieger, M., Jones, P. J., Blanco-Penedo, I., Duval, J. E., Emanuelson, U., Hoischen-Taubner, S., Sjöström, K., et al. (2020). Improving Animal Health on Organic Dairy Farms: Stakeholder Views on Policy Options. Sustainability, 12(7), 3001.

19) Lu, C., and Cheng, C. (2023). Exploring the distribution of organic farming: Findings from certified rice in Taiwan, Ecological Economics, 212(4), 107915.

20) Lu, C and Wu, A. (2022). The impact of migration characteristics on rural migrant households' farmland use arrangements in China, PLoS One, 17 (8), 0273624.

21) Łuczka, W., Kalinowski, S., and Shmygol, N. (2021). Organic Farming Support Policy in a Sustainable Development Context: A Polish Case Study. Energies, 14(14), 4208.

22) Maertens, A., Michelson, H., and Nourani, V. (2020). How do farmers learn from extension services? Evidence from Malawi. Am. J. Agric. Econ. 103, 569–595.

23) Maulu, S., Hasimuna, O. J., Mutale, B., Mphande, J., Siankwilimba, E., and Yildiz, F. (2021). Enhancing the role of rural agricultural extension programs in pov-erty alleviation: A review. Cogent Food and Agriculture, 7(1), 1886663.

24) Mir Salimi, S. H., Farhadian, H., Kheiri, S., and Khosravani, F. (2016). Investigation of consumer attitudes toward organic agriculture Study: Alborz Province. FSCT, 13 (52), 147-160.

25) Murphy, D. M. A., Roobroeck, D and Lee, D. R. (2019). Show and Tell: Farmer Field Days and Learning about Inputs with Heterogeneous Yield Effects. Available at SSRN: https://ssrn.com/abstract=3493420 or http://dx.doi.org/10.2139/ssrn.3493420

26) Qiao, D., Li, N., Cao, L., Zhang, D., Zheng, Y., Xu, T. (2022). How Agricultural Extension Services Improve Farmers' Organic Fertilizer Use in China? The Perspective of Neighborhood Effect and Ecological Cognition. Sustainability, 14, 7166.

27) Raimondo, M., Caracciolo, F., Nazzaro, C., and Marotta, G. (2021). Organic Farming Increases the Technical Efficiency of Olive Farms in Italy. Agriculture, 11(3), 209.

28) Rani, M., Kaushik, P., Bhayana, S and Kapoor, S. (2023). Impact of organic farming on soil health and nutritional quality of crops, Journal of the Saudi Society of Agricultural Sciences, Available online 26 July 2023, In press, https://doi.org/10.1016/j.jssas.2023.07.002.

29) Ranjbar, H and Omidi Najafabadi, M. (2014). Affecting Factors on Consumption' Attitudes of Organic Agricultural Products in Tehran. Agricultural Extension and Education Research, 7(26), 51-62.

30) Reddy, A. A., Melts, I., Mohan, G., Rani, C. R., Pawar, V., Singh, V., Choubey, M. (2022). Economic Impact of Organic Agriculture: Evidence from a Pan-India Survey. Sustainability, 14(22), 15057.

31) Rizzo, G., Borrello, M., Dara Guccione, G., Schifani, G., and Cembalo, L. (2020). Organic Food Consumption: The Relevance of the Health Attribute. Sustainability, 12(2), 595.

32) Rossoni, L., Engelbert, R., Bellegard, N. L. (2016). Normal science and its tools: Reviewing the effects of exploratory factor analysis in management, Revista de Administração, 51(2), 198-211.

33) Rotchés-Ribalta, R., Marull, J., and Pino, J. (2023). Organic farming increases functional diversity and ecosystem service provision of spontaneous vegetation in Mediterranean vineyards, Ecological Indicators, Volume 147, 110023.

34) Scuderi, A., Timpanaro, G., Branca, F., and Cammarata, M. (2023). Economic and Environmental Sustainability Assessment of an Innovative Organic Broccoli Production Pattern. Agronomy, 13(3), 624.

35) Shrestha, N. (2021). Factor Analysis as a Tool for Survey Analysis. American Journal of Applied Mathematics and Statistics, 9(1), 4-11.

36) Thapa, G. T., and Rattanasuteerakul, K. (2011). Adoption and extent of organic vegetable farming in Mahasarakham Province, Thailand, Applied Geography, 31(1), 201-209. Yang, Q., Mamun, A., Naznen, F., Siyu, L., Makhbul, Z. K. M. (2023). Modelling the significance of health values, beliefs and norms on the intention to consume and the consumption of organic foods, Heliyon, 9(6), e17487.

37) Zhou, X., and Ding, D. (2022). Factors influencing farmers' willingness and behaviors in organic agriculture development: an empirical analysis based on survey data of farmers in Anhui Province, Sustainability, 14(1), 145-157.

# نقش برنامه های ترویجی و آموزشی در توسعه ابعاد کشاورزی ارگانیک در کشت سبزیجات و صیفی جات در استان لرستان

**جهانبخش بیرانوند، احمدرضا عمانی، آزاده نوراله نوری‌وندی، و محمدرضا اردکانی**

## چکیده

یکی از مهم‌ترین مخاطرات زیست‌محیطی که در سال‌های اخیر چالش‌های زیادی را ایجاد کرده است، توسعه کشاورزی غیر ارگانیک و استفاده بیش از حد از نهاده‌های شیمیایی در بخش کشاورزی است. هدف از این تحقیق بررسی نقش برنامه های ترویجی و آموزشی بر توسعه کشاورزی ارگانیک در کشت سبزی و صیفی در استان لرستان بود. این پژوهش از نظر ماهیت کمی و از نظر هدف کاربردی است. جامعه آماری را کشاورزان سبزی و صیفی در لرستان تشکیل می دادند (3500 نفر). حجم نمونه بر اساس جدول مورگان (384 نفر) تعیین شد. به منظور تعیین روایی و پایایی پرسشنامه از پانل خبرگان و ضریب 0/85 =Θ استفاده شد. بر اساس نتایج، ابعاد کشاورزی ارگانیک بهینه نبود. از بعد اکولوژیکی، بهداشتی، انصافی، مراقبتی، اجتماعی-فرهنگی و تولیدی-اقتصادی بین شرایط فعلی و مطلوب در سطح 1 درصد تفاوت معناداری وجود داشت. کشاورزانی که در برنامه های کلاس ترویجی و آموزشی، روز مزرعه، نمایشگاه های ترویجی، مدرسه مزرعه کشاورز، سمینارهای علمی و مزارع نمایشی شرکت کردند، از نظر همه جنبه های کشاورزی ارگانیک با کسانی که شرکت نکردند، تفاوت معنی داری در سطح 1 درصد داشتند. با تحلیل عاملی، مهمترین عوامل موثر بر توسعه ابعاد کشاورزی ارگانیک عبارتند از: (1) توسعه دانش فنی و توانمندسازی کشاورزان در زمینه کشاورزی ارگانیک، (2) حمایت دولت از استفاده از روش های کشاورزی ارگانیک و توسعه کشاورزی. ابعاد آن، (3) استفاده از ابزارهای قانونی برای توسعه کشاورزی ارگانیک و (4) تغییر دیدگاه مصرف کنندگان نسبت به استفاده از غذاهای ارگانیک.