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

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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 $\Theta=0.85$ 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.

40 **Introduction**

41 Agriculture, as the main source of food security, is the main economic foundation of many
42 developed and developing countries. Modern agricultural practices have a destructive effect on
43 the environment such as water and nutrients cycle, soil erosion, forest destruction, carbon
44 sequestration and other ecological patterns (Gamage *et al.*, 2023). Organic farming is an
45 effective way to reduce the harmful environmental and ecological effects of development
46 programs and projects in the agricultural sector. Using more organic inputs in agricultural
47 activities can reduce adverse effects on the environment by protecting natural cycles and
48 guarantee the health of humans and the environment (Zhou and Ding, 2022). Reducing poverty
49 and hunger in the world, improving food security and extending sustainable agriculture are the
50 main goals of the Sustainable Development Goals (SDGs) (Lu and Wu, 2022). Improving food
51 security is not achieved by increasing the quantity of food. Paying attention to the quality of
52 food and producing healthy food is of great importance. Organic farming plays an important
53 role in this regard. Organic farming helps humans in producing healthy food and reducing
54 environmental pollution (Rani *et al.*, 2023). Organic farming plays an effective role in
55 increasing farmers' resilience against adverse climate changes (Lu and Cheng, 2023). Organic
56 farming emphasizes soil and water conservation and increases flexibility (Couthouis *et al.*,
57 2023). Organic farming strategies that are compatible with environmental conditions are used
58 and protection of natural cycles are emphasized (Figure 1) (Gamage *et al.*, 2023). With the
59 expansion of conventional agriculture, the emphasis on the indiscriminate use of chemical
60 fertilizers, herbicides and insecticides has greatly expanded. One of the consequences of this
61 overuse is the environmental crisis, which has become very dangerous at the present time.
62 (Raven and Wagner, 2021). Organic agriculture is one of the important ways to protect people
63 and the environment against risks (Lu and Cheng, 2023). This strategy is used to improve
64 ecological performance, biodiversity, increase water quality, improve soil quality, increase
65 productivity, human health and environment, human welfare, respect ethics with animals and
66 plants, and other things related to the ecosystem (Couthouis *et al.*, 2023).

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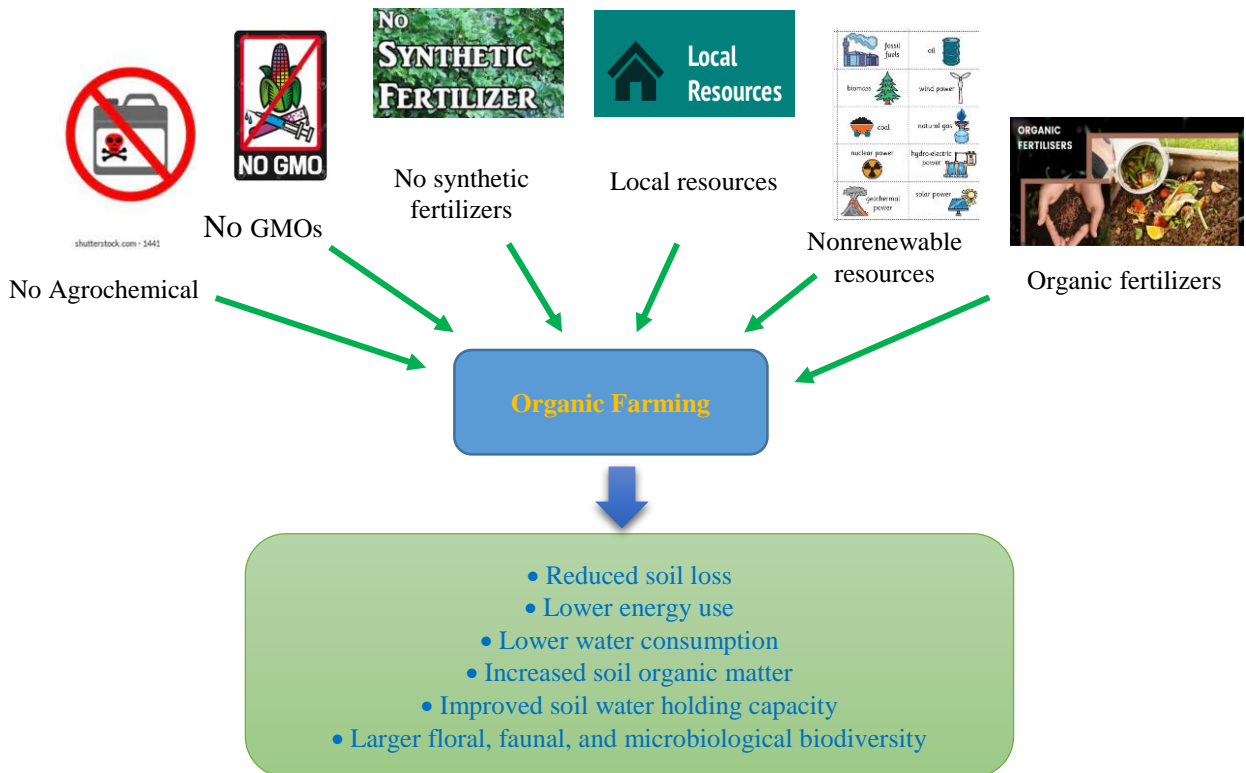


Figure 1. The main practices and effects of organic farming (Gamage *et al.*, 2023).

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 Environmental cycles: Nitrogen cycle, Phosphorus cycle, Water cycle Conservation of production | Clean water, ecotourism, nutrition, food security and sustained livelihoods, N surplus, P surplus | Lu and Cheng (2023); Rotchés-Ribalta <i>et al.</i> (2023) |
| Health | Use of manure, Use of green manure, Use of biological fertilizers, Use of crop rotation 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 <i>et al.</i> (2023); Chausali and Saxena, (2021) |
| Fairness | Considering fairness and ethics and not harming animals 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 <i>et al.</i> (2020); Krieger <i>et al.</i> (2020) |

Role of extension and educational programs in development of organic farming

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

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96 Nowadays, it is not a secret to everyone, agricultural extension and education is necessary to
97 empower farmers and transfer useful information to them. It plays an important role in
98 convincing farmers to apply technology and agricultural innovations (Alotaibi *et al.*, 2021).
99 Qiao *et al.* (2022) concluded agricultural extension programs play a significant role in organic
100 farming development. This programs by improving farmers' awareness can stimulate farmers'
101 willingness to green production. Kassem *et al.* (2021) explained that agricultural extension
102 programs play an important role in developing farmers' knowledge and skills to move from
103 conventional to organic farming. Mancini *et al.* (2008) stated that farmer field school (FFS)
104 was an effective educational approach among farmers to accept organic farming.
105 Unfortunately, one of the problems that exists in the researched area is the uncoordinated
106 implementation of educational and extension programs in the field of organic farming
107 development. For this reason, the necessity of carrying out this research with the purpose of
108 evaluating the role of extension and educational programs in development of organic farming
109 dimensions in vegetable and summer crops cultivation in Lorestan Province, Iran is very
110 important.

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112 **Methodology**

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

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146 **Results and Discussion**

147 **Demographic characteristics of vegetable and summer crop farmers**

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

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156 **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 |
| 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 |

157 ^a 0= Illiterate, 1= Preliminary, 2= Guidance school, 3= High school, 4= Diploma and above.

158 ^b The Domain of Each Item: 0= None; 1= Very low; 2= Low; 3= Average; 4= High; 5= Very High.

159 ^c The Domain of Each Item: 1= Strongly disagree, 2= Disagree, 3= Unsure, 4= Agree, 5= Strongly agree.

160 Source: Research findings (2022).

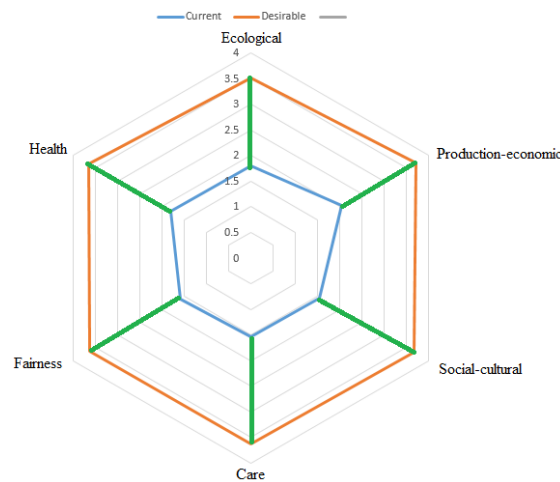
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162 **Evaluation of the current and desirable status of organic farming development indicators**

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

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

173 **Table 3.** Comparative analysis of the current and desirable status of organic agriculture
174 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 |

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176 **Status of vegetable and summer crop farmers' participation in extension and educational**
177 **programs**

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

184 **Table 4.** Frequency of vegetable and summer crop farmers according to participation in
185 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 |

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

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

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

193

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

195 Based on the results, farmers who participated in extension and educational classes were
196 significantly different in ecological (U= 3.42), health (U= 3.25), fairness (U= 5.61), care (U=
197 4.24), social-cultural (U= 3.56) and production-economic (U= 3.94) indicators at 1% level with
198 farmers who did not participate in these classes (Table 4). This result is in line with the research
199 results of Fatemi *et al.* (2022); Maulu *et al.* (2021), and Alotaibi *et al.* (2021a).

200

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

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

207

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

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

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

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

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

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

231

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

233 Farmers who visited demonstration farms were significantly different in ecological (U= 3.05),
234 health (U= 2.98), fairness (U= 3.68), care (U= 4.08), social-cultural (U= 5.13) and production-
235 economic (U= 4.03) indicators at 1% level with farmers who did not participate in these event
236 (Table 5). This result is in line with the research results of Huang *et al.* (2023), and Colbert
237 (2020).

238

239 **Correlation between variables**

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

Role of extension and educational programs in development of organic farming

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

| Programs → Indicators ↘ | Extension class | | | Field day | | | Extension exhibitions | | | Farmer field school | | | Scientific seminars | | | Demonstration farms | | | | | | | | |
|----------------------------|-----------------|------|------|-----------|------|------|-----------------------|------|------|---------------------|------|------|---------------------|------|------|---------------------|------|------|------|------|------|------|------|------|
| | Yes | No | Sig | Yes | No | U | Sig | Yes | No | U | Sig | Yes | No | U | Sig | Yes | No | U | Sig | | | | | |
| | 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 |
| 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 |

245
246 **Table 6.** Correlation analysis between the variables.

| Variables 1 | Variable 2 | Spearman Correlation coefficient | Sig | Result |
|-------------------------------|---|----------------------------------|-------|------------------------------|
| Access to information sources | | 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 | Level of using organic farming indicators | 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 |

247

248 **Ordinal regression**

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

272 **Table 7.** Examining the Appropriateness of the Selected Complementary Log-Log Regression
 273 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 | | | |

274

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

276 $\ln(-\ln(1-\gamma)) = \alpha_0 + \alpha_1 X_1 + \alpha_2 X_2 + \alpha_3 X_3 + \alpha_4 X_4 + \alpha_5 X_5 + \dots + \alpha_k X_k$

277 $\ln(-\ln(1-\gamma)) = 4.671 + 3.548X_1 + 2.654X_2 + 4.891X_3 + 3.281X_4 + 3.608X_5 + 5.091X_6 + 3.094X_7 + 4.009X_8$

278 $\ln(-\ln(1-\gamma)) = 3.098 + 3.548X_1 + 2.654X_2 + 4.891X_3 + 3.281X_4 + 3.608X_5 + 5.091X_6 + 3.094X_7 + 4.009X_8$

279 $\ln(-\ln(1-\gamma)) = 5.009 + 3.548X_1 + 2.654X_2 + 4.891X_3 + 3.281X_4 + 3.608X_5 + 5.091X_6 + 3.094X_7 + 4.009X_8$

280 $\ln(-\ln(1-\gamma)) = 3.621 + 3.548X_1 + 2.654X_2 + 4.891X_3 + 3.281X_4 + 3.608X_5 + 5.091X_6 + 3.094X_7 + 4.009X_8$

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

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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 |

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Factor analysis

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

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

303 **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 |

304
 305 **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 |
| Government support for the use of organic farming methods and development of its dimensions | Creating favorable changes in the attitude towards organic farming | 0.66 |
| | 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 |
| Application of legal instruments for the development of organic agriculture | Spiritual support for cultivation organic crops | 0.54 |
| | Legal support for the cultivation of organic crops | 0.61 |
| | Development of standards for the production of agricultural products | 0.66 |
| Changing consumers' views towards the use of organic foods | Legal supervision of the quality of production of agricultural products | 0.69 |
| | 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 |

306
 307 **Conclusions**

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

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

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

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

362 Identifying the sociable context of organic farming.

363 Designing suitable content for organic farming extension and education.

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

492
493 جهانبخش بیرانوند، احمدرضا عمانی، آزاده نوراله نوری وندی، و محمدرضا اردکانی

494
495 چکیده

496 یکی از مهم‌ترین مخاطرات زیست‌محیطی که در سال‌های اخیر چالش‌های زیادی را ایجاد کرده است، توسعه کشاورزی
497 غیر ارگانیک و استفاده بیش از حد از نهاده‌های شیمیایی در بخش کشاورزی است. هدف از این تحقیق بررسی نقش برنامه
498 های ترویجی و آموزشی بر توسعه کشاورزی ارگانیک در کشت سبزی و صیفی در استان لرستان بود. این پژوهش از
499 نظر ماهیت کمی و از نظر هدف کاربردی است. جامعه آماری را کشاورزان سبزی و صیفی در لرستان تشکیل می‌دادند
500 (3500 نفر). حجم نمونه بر اساس جدول مورگان (384 نفر) تعیین شد. به منظور تعیین روایی و پایایی پرسشنامه از پانل
501 خبرگان و ضریب $\Theta = 0/85$ استفاده شد. بر اساس نتایج، ابعاد کشاورزی ارگانیک بهینه نبود. از بعد اکولوژیکی،
502 بهداشتی، انصافی، مراقبتی، اجتماعی-فرهنگی و تولیدی-اقتصادی بین شرایط فعلی و مطلوب در سطح 1 درصد تفاوت
503 معناداری وجود داشت. کشاورزانی که در برنامه های کلاس ترویجی و آموزشی، روز مزرعه، نمایشگاه های ترویجی،
504 مدرسه مزرعه کشاورز، سمینارهای علمی و مزارع نمایشی شرکت کردند، از نظر همه جنبه های کشاورزی ارگانیک
505 با کسانی که شرکت نکردند، تفاوت معنی داری در سطح 1 درصد داشتند. با تحلیل عاملی، مهمترین عوامل موثر بر
506 توسعه ابعاد کشاورزی ارگانیک عبارتند از: (1) توسعه دانش فنی و توانمندسازی کشاورزان در زمینه کشاورزی
507 ارگانیک، (2) حمایت دولت از استفاده از روش های کشاورزی ارگانیک و توسعه کشاورزی. ابعاد آن، (3) استفاده از
508 ابزارهای قانونی برای توسعه کشاورزی ارگانیک و (4) تغییر دیدگاه مصرف کنندگان نسبت به استفاده از غذاهای
509 ارگانیک.
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