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# THE ROLE OF HUMAN CAPITAL IN SHAPING ATTITUDES AND ADOPTING ORGANIC AGRICULTURE IN KOSOVO AND METOHIJA

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## ARTICLE INFO

Original Article

Received: 06 April 2026

Accepted: 25 June 2026

doi:10.59267/ekoPolj2603783P

UDC

330.142.211:631.147(497.115)

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### Keywords:

*human capital, workforce, organic agriculture, adoption of practices, agricultural holdings, Kosovo and Metohija.*

**JEL:** Q12, Q13, J24, O13

## ABSTRACT

This paper examines the role of human capital and workforce characteristics in shaping attitudes and adopting organic agricultural practices in Kosovo and Metohija. The research is based on a quantitative approach, using survey data collected from agricultural producers and analyzed through multiple linear regression. The results indicate that the level of knowledge, perception of the importance of human capital, and workforce characteristics have a statistically significant impact on attitudes toward organic production, with the model explaining a substantial portion of the variability. The findings confirm that human capital represents a key determinant in the adoption of sustainable agricultural practices. The results further suggest that enhancing education, skills, and access to information can positively influence the development of organic agriculture. Therefore, strengthening training programs and institutional support for producers is recommended.

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## Introduction

*“He who knows not, and knows not that he knows not, is a fool; shun him.  
He who knows not, and knows that he knows not, is a child; teach him.  
He who knows, and knows not that he knows, is asleep; wake him.  
He who knows, and knows that he knows, is wise; follow him.”*

Confucius

In the twentieth century, a century of technological and scientific advancement, fundamental changes occurred in various areas of human life and work, which were also reflected in the agricultural sector (Tripković, 2024). Based on the principles of sustainable agriculture, and with the aim of understanding and determining its impact on the environment, innovative concepts and efficient agricultural methods have been developed, with organic agricultural production occupying a particularly important place (Bojičić & Tripković, 2023; Luković et al., 2026). As a new paradigm in the agrarian sector, organic production is increasingly recognized as a significant production concept attracting the attention of farmers, researchers, scientists, and the wider public (Radović et al., 2023). Organic agriculture is defined as production that relies on minimal use of chemical inputs, preservation of biodiversity, and sustainable management of natural resources, all with the aim of meeting the needs of present and future generations (Möhring et al., 2024). The fundamental principles of organic production are based on the rational use of natural resources, soil fertility preservation, biodiversity protection, and the reduction of negative environmental impacts. The growing global demand for organic products further stimulates farmers' interest in adopting this type of production. In contemporary literature, this form of agricultural production has been extensively studied by numerous authors worldwide from various theoretical and methodological perspectives, and it is increasingly applied in practice, as evidenced by the rising number of organic producers, the percentage of land under organic cultivation, and the number of livestock raised within organic farming systems in many countries (Ristić et al., 2023). According to data from the International Federation of Organic Agriculture Movements (IFOAM) and the Research Institute of Organic Agriculture (FiBL), global areas under organic agriculture have increased significantly in recent years. In 2017, approximately 69.8 million hectares of agricultural land were under organic production, and by 2020 this area had grown to around 75 million hectares, with more than 3.4 million producers worldwide. With continuous growth, by 2023, the organic agricultural area reached nearly 99 million hectares, while the number of organic producers exceeded 4.3 million (Willer & Trávníček, 2024).

Although organic agriculture offers numerous advantages, the process of its adoption is often complex and influenced by various economic, institutional, and social determinants. Among these, human capital stands out as a key determinant in the adoption of organic practices, encompassing farmers' knowledge, skills, experience, and capabilities. As noted by Tripković et al. (2023, p. 66), organic agriculture, as a form of sustainable agricultural system, requires land, resources, and, ultimately, people who

must be motivated, committed, and intellectually agile to produce in accordance with ethical and ecological standards. Creating the necessary conditions and providing human resources for the development and competitiveness of organic agriculture—including infrastructure, incentive measures, and various facilitative policies—requires a series of actions and development programs (Stanojević et al., 2015). By investing in education, training, and skill development programs tailored to organic agriculture, stakeholders can enhance human capital and stimulate the continuous growth and sustainability of organic agriculture (Tomaš-Simin et al., 2024). Ignjatijević et al. (2022) argue that human capital in organic agriculture affects both production and financial outcomes, while the socio-economic characteristics of producers can influence the development of this production system. A higher level of human capital enables farmers to better understand and implement new production techniques, manage risks, and adapt their operations to contemporary market demands (Nguyen To-The et al., 2025). Furthermore, the importance of human capital is also reflected in the structure of the labor force on farms, which in many rural areas largely relies on family labor. In such conditions, knowledge and experience are transferred among household members, ensuring continuity in production and strengthening farm capacities (Hatzenbuehler & Peña-Lévano, 2022).

In the specific socio-economic context of Kosovo and Metohija, the agricultural sector is not only a source of livelihood but also provides social security for a large number of poor and elderly people (Bojičić & Tripković, 2022). Despite significant natural and economic potential, and a strong desire to eliminate the widely accepted extensive farming practices, the modernization of the agricultural sector in Kosovo and Metohija has, in some ways, remained incomplete. A limited level of formal education, insufficient practical experience in modern production techniques, and inadequate institutional support represent key barriers to the wider adoption of organic practices. Nevertheless, a recorded annual growth of 24.1% and a ten-year growth of 1,692.8% in areas under organic land place Kosovo and Metohija among the territories with the most dynamic development of organic agriculture in Europe (Bojičić & Tripković, 2023; FiBL–IFOAM, 2023). In order to cope with changes occurring on the global stage, farmers in Kosovo and Metohija need to improve their knowledge and skills to perform highly productive tasks. Considering the high unemployment rate in the region, enhancing farmers' knowledge should be a primary strategy for growth and development in all districts, enabling multiple benefits through self-employment or family-based businesses (Tripković, 2024).

Starting from the identified theoretical and empirical gaps in understanding the role of human capital in organic production, this paper aims to examine the influence of knowledge levels, labor force characteristics, and socio-demographic attributes of farmers on the implementation of agricultural practices on farms in Kosovo and Metohija. Special attention is given to identifying the key determinants of human capital and understanding their relationship with farmers' attitudes and perceptions, in order to provide a basis for designing effective support measures and improving the sustainable development in the agricultural sector.

## Methodology

The research was conducted with the aim of examining the importance of human capital in organic agricultural production, as well as determining the relationships between knowledge levels, labor force characteristics, and perceptions of organic production on farms in Kosovo and Metohija. The main objective of the research was to identify the human capital factors that influence the adoption of organic practices. Secondary objectives include analyzing the correlation between farmers' knowledge of organic production and their attitudes and perceptions, examining the role of labor force characteristics in the application of organic methods, and assessing the impact of socio-demographic characteristics on attitudes and practices in organic agriculture.

The empirical research was carried out using a quantitative approach in the period from December 2023 to March 2024, with a survey questionnaire as the primary data collection instrument. The sample included 431 farmers from 18 municipalities in Kosovo and Metohija. The sample was formed using a convenience sampling method, taking into account the availability of respondents and the specifics of field research in the observed region. Respondents were characterized by various socio-demographic features, including gender, age, municipality of residence, level of education, income level, and marital status. Additionally, data were collected on farm characteristics, such as the type of agricultural activity, the number of household members involved in agricultural activities, and the duration of engagement in agriculture.

The research instrument consisted of three thematic sections. The first section covered socio-demographic data, the second assessed the level of knowledge about organic production and the prevalence of organic practices, and the third section examined attitudes toward the importance of human capital, labor force characteristics, and perceptions of organic production. Respondents used a five-point Likert scale, where 1 indicated strong disagreement and 5 indicated strong agreement with the statements. The internal consistency of the scales was verified using Cronbach's alpha coefficient, confirming the reliability of the instrument for measuring the observed constructs.

Data analysis included descriptive statistics, correlation analysis using Pearson's coefficient, multiple linear regression, and principal component analysis (PCA) method. Factor analysis was applied to identify latent dimensions of human capital, labor force characteristics, and perceptions of organic production, enabling the reduction of a larger number of variables into a smaller number of significant factors. The adequacy of factor analysis was tested using the KMO measure and Bartlett's test of sphericity, and all statistical analyses were performed using IBM SPSS Statistics Version 26. Respondents were informed about the purpose of the research, and their participation was voluntary, ensuring compliance with ethical research standards.

## Results

Of the total number of respondents, 55% were male and 45% were female, with an average age of 39 years. The youngest respondent was 18 years old, while the oldest was 80 years old. The average income of respondents ranged between 51,000 and 100,000 dinars, while slightly more than a quarter of respondents (28.31%) reported income below 50,000 dinars (Tripković, 2024). The research covered four municipalities in northern Kosovo and Metohija (Kosovska Mitrovica – 13.2%, Zvečan – 10.2%, Leposavić – 6%, and Zubin Potok – 9.3%) and fourteen municipalities south of the Ibar River (Dragaš – 3.2%, Gračanica – 8.6%, Kosovo Polje – 2.1%, Kosovska Kamenica – 2.1%, Lipjan – 7.7%, Novo Brdo – 3.2%, Obilić – 8.6%, Pasjane – 5.1%, Priština – 2.6%, Prizren – 2.1%, Ranilug – 3.0%, Štrpce – 3.7%, Vitina – 2.6%, and Vučitrn – 6.7%) (Tripković, 2024). Other socio-demographic characteristics of respondents are presented in *Table 1*.

**Table 1.** Socio-demographic characteristics of respondents

|                   |                     | Number of Respondents (N) | Percentage (%) |
|-------------------|---------------------|---------------------------|----------------|
| Gender            | male                | 237                       | 55             |
|                   | female              | 194                       | 45             |
|                   |                     | Number of Respondents (N) | Percentage (%) |
| Educational Level | primary education   | 11                        | 2.6            |
|                   | secondary education | 69                        | 16.0           |
|                   | higher education    | 197                       | 45.7           |
|                   | master's degree     | 153                       | 35.5           |
|                   | doctorate (PhD)     | 1                         | 0.2            |
|                   |                     | Number of Respondents (N) | Percentage (%) |
| Marital Status    | single              | 142                       | 32.9           |
|                   | cohabiting          | 19                        | 4.4            |
|                   | married             | 255                       | 59.2           |
|                   | divorced            | 13                        | 3.0            |
|                   | widowed             | 2                         | 0.5            |

Source: Author's research

The analysis of the agricultural production structure shows that respondents are most often engaged in crop production (50.8%), while fruit growing is represented among 36.0% of respondents. On the other hand, viticulture is the least represented activity, practiced by 9.7% of respondents. Regarding the engagement of household members in agricultural activities, the results indicate that on some farms up to nine members are involved in agricultural activities, while the average number of engaged members, in almost all municipalities is three. Observed over time, the longest period of engagement in agriculture is thirty years, while the average duration is approximately ten years. In response to the question, *“Is organic production, as a new production concept, sufficiently represented on farms in Kosovo and Metohija?”*, slightly more than one-

third of respondents (35%) stated that this concept is partially represented. The most common reasons for this perception include a lack of understanding of the concept of organic production (39.7%) and the presence of misinformation (29.7%). Self-assessment results regarding knowledge of organic production show that the largest percentage of respondents rated their knowledge as good (42%). A significant proportion reported very good knowledge (31%), while 11% stated they have excellent knowledge in this area. A smaller number of respondents rated their knowledge as sufficient (10%) or insufficient (6%). Furthermore, 29.2% of respondents believe that human capital, combined with other elements of production (means and objects of labor), plays an important role in organic production, while 17.6% of respondents emphasize that human capital represents the backbone of organic production development.

**Table 2.** Respondents' attitudes regarding the importance of human capital in organic agricultural production

| STATEMENT                                                                                                                | MIN      | MAX      | AS          | SD           |
|--------------------------------------------------------------------------------------------------------------------------|----------|----------|-------------|--------------|
| Human capital is important for the development of organic production.                                                    | 1        | 5        | 3.63        | 1.001        |
| Human capital in organic production requires continuous learning and acquisition of new skills.                          | 1        | 5        | 3.83        | .961         |
| Human capital in organic production involves monitoring and applying innovative approaches on farms.                     | 1        | 5        | 3.84        | .913         |
| The workforce in organic production must be fully familiar with the principles of cultivating ecologically healthy food. | 1        | 5        | 3.87        | .947         |
| A certain level of knowledge and skills in organic production directly leads to higher yields.                           | 1        | 5        | 3.86        | 1.017        |
| A certain level of knowledge and skills in organic production directly leads to lower costs.                             | 1        | 5        | 3.66        | 1.055        |
| Knowledge and skills in organic production are acquired through education, training, and work experience.                | 1        | 5        | 3.94        | 1.005        |
| $\Sigma$                                                                                                                 | <b>1</b> | <b>5</b> | <b>3.80</b> | <b>0.848</b> |

Source: Author's research

The importance of human capital at the overall scale level shows a high mean value ( $AS = 3.80$ ;  $SD = 0.848$ ), with scores ranging from 1 to 5. This average indicates a positive perception among respondents regarding the importance of human capital in organic agricultural production. The highest-rated statement was that "*knowledge and skills in organic production are acquired through education, training, and work experience*" ( $AS = 3.94$ ;  $SD = 1.005$ ).

**Table 3.** Respondents' attitudes regarding workforce characteristics in organic agricultural production

|                        | MIN      | MAX      | AS          | SD          |
|------------------------|----------|----------|-------------|-------------|
| Innovativeness         | 1        | 5        | 3.89        | .844        |
| Entrepreneurial spirit | 1        | 5        | 3.97        | .981        |
| Commitment             | 1        | 5        | 4.09        | .881        |
| Diligence              | 2        | 5        | 4.03        | .900        |
| Responsibility         | 2        | 5        | 4.12        | .902        |
| Willingness to learn   | 2        | 5        | 4.07        | .859        |
| Patience               | 1        | 5        | 4.11        | .968        |
| $\Sigma$               | <b>1</b> | <b>5</b> | <b>4.04</b> | <b>.905</b> |

Source: Author's research

Regarding respondents' attitudes toward the characteristics of the workforce in organic agricultural production, the overall mean score was  $AS = 4.04$ ;  $SD = 0.905$ , with values ranging from 1 to 5. The obtained average indicates an above-average presence of these traits. When evaluating individual workforce characteristics, respondents rated *responsibility* highest ( $AS = 4.12$ ;  $SD = 0.902$ ) and *patience* closely behind ( $AS = 4.11$ ;  $SD = 0.968$ ), while *innovativeness* ( $AS = 3.89$ ;  $SD = 0.844$ ) and *entrepreneurial spirit* ( $AS = 3.97$ ;  $SD = 0.981$ ) received the lowest scores.

**Table 4.** Respondents' attitudes toward organic agricultural production

|                                                                                          | MIN      | MAX      | AS          | SD          |
|------------------------------------------------------------------------------------------|----------|----------|-------------|-------------|
| Organic production is a promising agricultural activity.                                 | 1        | 5        | 3.84        | .937        |
| Organic production achieves a higher level of productivity.                              | 1        | 5        | 3.72        | .900        |
| Teamwork is very important in organic production.                                        | 1        | 5        | 3.93        | .871        |
| I possess a certain level of knowledge about the basic principles of organic production. | 1        | 5        | 3.76        | 1.060       |
| I have successfully mastered the skills necessary for engaging in organic production.    | 1        | 5        | 3.81        | .983        |
| I make high-quality and cost-effective business decisions on my farm.                    | 1        | 5        | 3.87        | 1.010       |
| I continuously follow innovations in organic production and apply them on my farm.       | 1        | 5        | 3.82        | 1.113       |
| $\Sigma$                                                                                 | <b>1</b> | <b>5</b> | <b>3.82</b> | <b>.982</b> |

Source: Author's research

The third and final scale of the questionnaire refers to respondents' perceptions of organic agricultural production. On this scale, the average score was  $AS = 3.82$ ;  $SD = 0.982$ . The results indicate that respondents consider *teamwork* in organic agricultural production to be the most important factor ( $AS = 3.93$ ;  $SD = 0.871$ ). In contrast, the statement that organic production achieves a *higher level of productivity* received the lowest rating ( $AS = 3.72$ ;  $SD = .900$ ).

In the following section of the paper, a correlation matrix of the analyzed variables is presented, enabling a systematic examination of the relationships among the key indicators in the study.

**Table 5.** Correlation matrix of the analyzed variables

|                                        | 1     | 2     | 3     | 4     | 5    | 6    | 7                                               | 8    | 9    | 10   | 11   | 12   | 13 |
|----------------------------------------|-------|-------|-------|-------|------|------|-------------------------------------------------|------|------|------|------|------|----|
| 1                                      | 1     |       |       |       |      |      |                                                 |      |      |      |      |      |    |
| 2                                      | -.119 | 1     |       |       |      |      |                                                 |      |      |      |      |      |    |
| 3                                      | -.093 | .097  | 1     |       |      |      |                                                 |      |      |      |      |      |    |
| 4                                      | -.077 | -.252 | .431  | 1     |      |      |                                                 |      |      |      |      |      |    |
| 5                                      | -.030 | .334  | .236  | -.111 | 1    |      |                                                 |      |      |      |      |      |    |
| 6                                      | -.171 | -.005 | -.022 | -.026 | .036 | 1    |                                                 |      |      |      |      |      |    |
| 7                                      | -.090 | .616  | -.102 | -.191 | .283 | .259 | 1                                               |      |      |      |      |      |    |
| 8                                      | .031  | -.031 | .106  | .069  | .155 | .064 | -.036                                           | 1    |      |      |      |      |    |
| 9                                      | -.125 | .126  | .021  | .036  | .269 | .101 | .154                                            | .329 | 1    |      |      |      |    |
| 10                                     | -.145 | .236  | .040  | -.076 | .042 | .114 | .284                                            | .129 | .109 | 1    |      |      |    |
| 11                                     | .067  | .024  | .058  | .044  | .091 | .025 | .131                                            | .067 | .197 | .310 | 1    |      |    |
| 12                                     | .074  | .013  | .052  | -.084 | .090 | .044 | .106                                            | .081 | .062 | .117 | .647 | 1    |    |
| 13                                     | -.040 | .151  | .040  | .044  | .174 | .143 | .239                                            | .276 | .385 | .300 | .624 | .535 | 1  |
| * $p < 0.005$                          |       |       |       |       |      |      |                                                 |      |      |      |      |      |    |
| ** $p < 0.001$                         |       |       |       |       |      |      |                                                 |      |      |      |      |      |    |
| LEGEND                                 |       |       |       |       |      |      |                                                 |      |      |      |      |      |    |
| 1 – gender                             |       |       |       |       |      |      | 8 – representation of organic production        |      |      |      |      |      |    |
| 2 – age                                |       |       |       |       |      |      | 9 – level of knowledge about organic production |      |      |      |      |      |    |
| 3 – income level                       |       |       |       |       |      |      | 10 – importance of human capital                |      |      |      |      |      |    |
| 4 – education level                    |       |       |       |       |      |      | 11 – human capital in organic production        |      |      |      |      |      |    |
| 5 – marital status                     |       |       |       |       |      |      | 12 – characteristics of workforce in OP         |      |      |      |      |      |    |
| 6 – household workforce participation  |       |       |       |       |      |      | 13 – attitudes toward OP                        |      |      |      |      |      |    |
| 7 – years of engagement in agriculture |       |       |       |       |      |      |                                                 |      |      |      |      |      |    |

Source: Author's research

Based on the obtained correlations, a multiple linear regression model was applied in further analysis to examine the predictive strength of selected independent variables in explaining respondents' attitudes toward organic agricultural production.

**Table 6.** Regression model: Level of knowledge about organic production, importance of human capital, workforce characteristics in organic production, length of engagement in agriculture, and educational attainment as predictors of respondents' attitudes toward organic agricultural production

| Model | R     | R Square | Adjusted R Square | Std. Error of the Estimate |
|-------|-------|----------|-------------------|----------------------------|
| 1     | .719a | .518     | .512              | 3.71243                    |

| Model      | Sum of Squares | Df  | Mean Square | F      | Sig.  |
|------------|----------------|-----|-------------|--------|-------|
| Regression | 6282.526       | 5   | 1256.505    | 91.169 | .000b |
| Residual   | 5857.404       | 425 | 13.782      |        |       |
| Total      | 12139.930      | 430 |             |        |       |

|                                                 | <b>B</b> | <b>Std. Error</b> | <b>Beta</b> | <b>t</b> | <b>Sig.</b> |
|-------------------------------------------------|----------|-------------------|-------------|----------|-------------|
| Constant (Attitudes toward OP)                  | 2.064    | 1.423             |             | 1.450    | .148        |
| Level of knowledge about organic production     | 1.448    | .186              | .272        | 7.799    | .000        |
| Importance of human capital                     | .359     | .043              | .380        | 8.319    | .000        |
| Workforce characteristics in organic production | .283     | .048              | .255        | 5.909    | .000        |
| Length of engagement in agriculture             | .089     | .024              | .131        | 3.738    | .000        |
| Educational attainment                          | .442     | .238              | .065        | 1.858    | .064        |

Source: Author's research

After examining the interrelationships and predictive influence of individual variables through correlation and regression analysis, factor analysis was applied in the next phase of the research.

**Table 7.** Factor Analysis

KMO and Bartlett's Test

|                               |                                     |             |
|-------------------------------|-------------------------------------|-------------|
| <b>Kaiser-Meyer-Olkin</b>     | <b>Measure of Sampling Adequacy</b> | <b>.906</b> |
| Bartlett's test of Sphericity | Approx. Chi-Square                  | 6445.762    |
|                               | Df                                  | 210         |
|                               | Sig.                                | .000        |

Total Variance Explained

| <b>Component</b> | <b>Total</b> | <b>Initial Eigenvalues</b> |                     |
|------------------|--------------|----------------------------|---------------------|
|                  |              | <b>% of Variance</b>       | <b>Cumulative %</b> |
| 1                | 9.716        | 46.267                     | 46.267              |
| 2                | 2.276        | 10.837                     | 57.104              |
| 3                | 1.576        | 7.504                      | 64.608              |
| 4                | 1.097        | 5.222                      | 69.830              |

Rotated Component Matrix

|                                          | <b>Component</b> |      |      |      |
|------------------------------------------|------------------|------|------|------|
|                                          | 1                | 2    | 3    | 4    |
| Human Capital in OP 1                    | .770             |      |      |      |
| Human Capital in OP 2                    | .738             |      |      |      |
| Human Capital in OP 3                    | .754             |      |      |      |
| Human Capital in OP 4                    | .711             | .412 |      |      |
| Human Capital in OP 5                    | .754             |      |      |      |
| Human Capital in OP 6                    | .576             |      | .432 |      |
| Human Capital in OP 7                    | .706             |      |      |      |
| Characteristics of the Workforce in OP 1 |                  |      |      | .748 |
| Characteristics of the Workforce in OP 2 | .419             | .452 |      | .574 |
| Characteristics of the Workforce in OP 3 |                  | .687 |      |      |
| Characteristics of the Workforce in OP 4 |                  | .737 |      |      |
| Characteristics of the Workforce in OP 5 |                  | .772 |      |      |
| Characteristics of the Workforce in OP 6 |                  | .790 |      |      |
| Characteristics of the Workforce in OP 7 |                  | .752 |      |      |

|                       | Component |   |      |      |
|-----------------------|-----------|---|------|------|
|                       | 1         | 2 | 3    | 4    |
| Attitudes toward OP 1 |           |   |      | .594 |
| Attitudes toward OP 2 |           |   | .522 | .601 |
| Attitudes toward OP 3 |           |   | .463 | .499 |
| Attitudes toward OP 4 |           |   | .774 |      |
| Attitudes toward OP 5 |           |   | .832 |      |
| Attitudes toward OP 6 |           |   | .781 |      |
| Attitudes toward OP 7 |           |   | .822 |      |

Source: Author's research

## Discussion

The analysis of the obtained data highlights the crucial role of human capital, workforce characteristics, and producers' attitudes, providing insight into the factors that may influence the development and implementation of organic practices in Kosovo and Metohija. Furthermore, the results can be placed within the context of existing research, revealing both similarities and differences in the perception and practical implementation of organic production.

The variable "gender" shows a statistically significant relationship with the following variables:

1. "age in years" ( $p = 0.013$ ;  $\rho = -0.119$ );
2. "household workforce participation" ( $p = 0.000$ ;  $\rho = -0.171$ );
3. "level of knowledge about organic production" ( $p = 0.010$ ;  $\rho = -0.125$ );
4. "importance of human capital" ( $p = 0.002$ ;  $\rho = 0.145$ ).

The observed differences can be interpreted within the context of the broader socio-economic and institutional characteristics of the agricultural sector, where the roles of men and women are defined differently. In many rural areas, the organization of work on family farms, the distribution of responsibilities, and access to resources remain partially conditioned by traditional gender roles. Mladenović and Bojičić (2021) note that women in Kosovo and Metohija more often engage in activities such as retail trade and small-scale production, including food production and service activities that do not require significant physical effort, while men are more represented in sectors such as transport, large-scale production, and wholesale trade. The FAO (2023) emphasizes that gender can influence access to education, agricultural training, and information about innovations in agriculture, which indirectly affects the knowledge level of agricultural producers. Furthermore, research indicates that greater involvement of women in agricultural production may contribute to a wider adoption of environmentally responsible practices, as women tend to demonstrate a stronger inclination toward

preserving natural resources and sustainable farm management (Valencia et al., 2021). In this context, a gender perspective represents an important analytical framework for understanding how knowledge, experience, and competencies are developed and applied in organic agricultural production.

The variable “*age in years*” shows a statistically significant relationship with the following variables:

1. “*income level*” ( $p = 0.043$ ;  $\rho = 0.097$ );
2. “*education level*” ( $p = 0.000$ ;  $\rho = -0.252$ );
3. “*marital status*” ( $p = 0.000$ ;  $\rho = 0.334$ );
4. “*years of engagement in agriculture*” ( $p = 0.000$ ;  $\rho = 0.616$ );
5. “*level of knowledge about organic production*” ( $p = 0.000$ ;  $\rho = 0.126$ );
6. “*human capital in organic production*” ( $p = 0.000$ ;  $\rho = 0.236$ );
7. “*attitudes toward OP*” ( $p = 0.002$ ;  $\rho = 0.151$ ).

A strong correlation between age and the length of engagement in agriculture is expected, as accumulated production experience increases over time. Long-term experience in agriculture contributes to the development of practical knowledge and a better understanding of production processes, which may also influence the perception of the importance of human capital in organic production. Klerkx and Rose (2020) confirm that farmers’ experience is an important factor in the adoption of sustainable and organic production practices. The negative correlation between age and formal education can be explained by generational differences in access to education, as younger generations are more likely to have higher levels of formal education. However, the results indicate that formal education is not the only source of knowledge, since older farmers acquire a significant level of practical competencies through work experience. The scientific literature emphasizes that the combination of education, experience, and continuous learning represents an important element in the development of human capital in agriculture (Doss et al., 2017).

The variable “*income level*” shows a statistically significant relationship with the following variables:

1. “*marital status*” ( $p = 0.000$ ;  $\rho = 0.236$ );
2. “*years of engagement in agriculture*” ( $p = 0.035$ ;  $\rho = -0.102$ );
3. “*representation of organic production*” ( $p = 0.028$ ;  $\rho = 0.106$ ).

The correlation between income level and marital status may indicate the importance of family structure and joint labor within agricultural households, as farms with a larger number of active members tend to have greater production capacities and potentially

higher economic stability. Bojičić and Tripković (2022) confirm that farms in urban areas and municipal centers usually have fewer members, most often up to three, whereas farms in rural areas more frequently include four to five members, typically representing two-generation or extended families. Eti (2025) emphasizes that the socio-economic characteristics of farms, including family structure and labor availability, can influence the economic performance of agricultural production. The relationship between income and length of engagement in agriculture suggests that economic results in agriculture depend not only on experience but also on technology, financial resources, and market conditions. Ogunya and Tijani (2022) point out that the adoption of modern and sustainable production practices can improve the economic efficiency of agricultural households.

The variable “*education level*” shows a statistically significant relationship with the following variables:

1. “*marital status*” ( $p = 0.022$ ;  $\rho = -0.111$ );
2. “*years of engagement in agriculture*” ( $p = 0.000$ ;  $\rho = -0.191$ ).

The correlation between education level and marital status confirms the influence of social and family structures on an individual’s educational attainment in agricultural communities. Additionally, the relationship between education and the length of engagement in agriculture shows that the intensity and duration of agricultural involvement are not always directly associated with the level of formal education. These findings are consistent with the research of Eti (2025) and Ogunya and Tijani (2022), which emphasize that human capital, including education and continuous training, plays an important role in the adoption of new technologies, resource management, and market access, while social and family factors may influence opportunities for educational development in agricultural communities.

The variable “*marital status*” shows a statistically significant relationship with the following variables:

1. “*years of engagement in agriculture*” ( $p = 0.000$ ;  $\rho = 0.283$ );
2. “*representation of organic production*” ( $p = 0.000$ ;  $\rho = 0.155$ );
3. “*level of knowledge about organic production*” ( $p = 0.000$ ;  $\rho = 0.269$ );
4. “*attitudes toward OP*” ( $p = 0.000$ ;  $\rho = 0.174$ ).

The correlation between marital status and the analyzed variables confirms that socio-demographic factors influence the adoption of new practices and education within agricultural communities. There is evidence that social and family aspects, including marital status, may affect access to information, labor, and resources necessary for engagement in organic agriculture and the development of relevant knowledge (Sapbamrer & Thammachai, 2021). Moreover, the same authors (Sapbamrer &

Thammachai, 2021) emphasize that technology, information, and access to advisory support form the foundation for shaping farmers' attitudes and knowledge toward sustainable systems. Without adequate knowledge and a positive attitude, the adoption of organic agriculture may be hindered, regardless of long-term experience in traditional farming.

The variable "*household workforce participation*" shows a statistically significant relationship with the following variables:

1. "*years of engagement in agriculture*" ( $p = 0.000$ ;  $\rho = 0.259$ );
2. "*level of knowledge about organic production*" ( $p = 0.036$ ;  $\rho = 0.101$ );
3. "*human capital in organic production*" ( $p = 0.018$ ;  $\rho = 0.114$ );
4. "*attitudes toward OP*" ( $p = 0.003$ ;  $\rho = 0.143$ ).

The correlation between household member involvement and variables such as length of engagement in agriculture, level of knowledge about organic production, human capital, and attitudes toward organic farming highlights the importance of collective work and mutual support within households. The involvement of more household members enables better allocation of labor resources, sharing of knowledge and experience, as well as greater capacity to adopt innovations and sustainable practices in agriculture. Sapbamrer and Thammachai (2021) note that active participation of family members in agricultural activities positively influences the adoption of new technologies and organic production systems. Raveloaritiana and Wanger (2024) emphasize that both attitudes and knowledge levels regarding organic production depend on household involvement, as members actively engaged in production often exchange information, learn from each other, and support the implementation of sustainable practices, leading to increased productivity and economic efficiency.

The variable "*years of engagement in agriculture*" shows a statistically significant relationship with the following variables:

1. "*level of knowledge about organic production*" ( $p = 0.000$ ;  $\rho = 0.154$ );
2. "*importance of human capital*" ( $p = 0.000$ ;  $\rho = 0.284$ );
3. "*human capital in organic production*" ( $p = 0.000$ ;  $\rho = 0.131$ );
4. "*characteristics of workforce in OP*" ( $p = 0.000$ ;  $\rho = 0.106$ );
5. "*attitudes toward OP*" ( $p = 0.001$ ;  $\rho = 0.239$ ).

The conditional relationship between the length of engagement in agriculture and variables such as knowledge of organic production, the importance and role of human capital, and workforce characteristics confirms that long-term experience in agriculture can contribute to the development of specific skills and a better understanding of organic production systems. Nguyen To The et al. (2025) argue that, although experience alone is

not sufficient for the full adoption of modern or sustainable practices, when combined with the development of human capital, it enables better resource management, knowledge transfer, and the application of innovations on agricultural farms. Additionally, long-term engagement in agriculture influences workforce characteristics, as practical competencies, teamwork, and organizational skills, which are crucial for the successful implementation of organic practice, develop over time. This aligns with findings that human capital in agriculture is not only individual knowledge but also a collective resource accumulated through experience and interaction among household members, thereby enhancing farm productivity and economic sustainability (Raveloaritiana & Wanger, 2024).

The variable “*representation of organic production*” shows a statistically significant relationship with the following variables:

1. “*level of knowledge about organic production*” ( $p = 0.000$ ;  $\rho = 0.329$ );
2. “*attitudes toward OP*” ( $p = 0.000$ ;  $\rho = 0.276$ ).

The correlation between the prevalence of organic production and farmers’ knowledge and attitudes toward organic farming indicates that the adoption of organic practices on a farm depends on both cognitive and affective factors. Specifically, farmers with higher levels of knowledge about organic agriculture and more positive attitudes are more likely to implement organic production methods, which is expected, as they are better informed and more motivated to change production practices (Zhou & Ding, 2022). Farmers’ attitudes toward the social and ecological aspects of organic production play a significant role in their willingness and ability to apply sustainable practices. The position and perception of farmers, as well as their understanding of the benefits of organic production, influence the prevalence of organic systems on the farm, which is consistent with findings indicating a significant correlation between attitudes and the adoption of organic production (Canavari et al., 2022).

The variable “*level of knowledge about organic production*” shows a statistically significant relationship with the following variables:

1. “*importance of human capital*” ( $p = 0.000$ ;  $\rho = 0.109$ );
2. “*human capital in organic production*” ( $p = 0.002$ ;  $\rho = 0.197$ );
3. “*attitudes toward OP*” ( $p = 0.000$ ;  $\rho = 0.385$ ).

The interdependence of knowledge levels about organic production with the importance of human capital and attitudes toward organic farming indicates that farmers’ education and competencies are fundamental prerequisites for the successful implementation of sustainable practices. Zhou and Ding (2022), as well as Canavari et al. (2022), emphasize that higher levels of knowledge enable farmers to better understand the benefits and challenges of organic production, shaping their attitudes and facilitating the adoption of innovations. Furthermore, human capital, encompassing practical

experience, specific skills, and teamwork, plays a crucial role in knowledge transfer and the formation of positive attitudes toward sustainable methods. Therefore, policies and programs that support continuous learning and skill development in organic agriculture can significantly improve the productivity and quality of production on local farms.

The variable “*importance of human capital*” shows a statistically significant relationship with the following variables:

1. “*human capital in organic production*” ( $p = 0.000$ ;  $\rho = 0.310$ );
2. “*characteristics of workforce in OP*” ( $p = 0.036$ ;  $\rho = 0.117$ );
3. “*attitudes toward OP*” ( $p = 0.000$ ;  $\rho = 0.300$ ).

The variable “*human capital in organic production*” shows a statistically significant relationship with the following variables:

1. “*characteristics of workforce in OP*” ( $p = 0.000$ ;  $\rho = 0.647$ );
2. “*attitudes toward OP*” ( $p = 0.000$ ;  $\rho = 0.624$ ).

The variable “*characteristics of workforce in OP*” shows a statistically significant relationship with the following variable:

1. “*attitudes toward OP*” ( $p = 0.000$ ;  $\rho = 0.535$ ).

Milardo (2025) and Rizzo et al. (2024) emphasize that organic production functions as a complex system in which education, the adoption of innovative principles, and understanding of sustainable techniques directly influence farmers’ readiness to implement new methods, while the development of human capital, including formal education and continuous learning, represents a primary factor enabling this process. Furthermore, international reviews show that socio-demographic and psychological factors, such as access to information, education level, and positive attitudes toward sustainable practices, significantly increase the likelihood of adopting innovative methods, including organic production, as these components shape the perception of benefits and practical readiness to apply new techniques (Rizzo et al., 2024). These findings confirm that knowledge and attitudes are not passive consequences of experience but active mechanisms that enable agricultural households to integrate organic farming concepts into production models. At the same time, the research results have significant implications for designing educational programs, advisory services, and support policies that promote continuous learning, knowledge exchange, and human capital development in rural areas. Such a synergy of knowledge, competencies, and attitudes forms the foundation for the long-term improvement of sustainable organic production and the economic stability of agricultural households.

The results of the conducted multiple linear regression analysis indicate that the model has a high level of statistical significance. The correlation coefficient between the predictor and dependent variables is  $R = 0.719$ , indicating a strong relationship

between the independent variables and respondents' attitudes toward organic agricultural production. The coefficient of determination,  $R^2 = 0.518$ , shows that the model explains 51.8% of the variability in the dependent variable, meaning that more than half of the variation in attitude formation can be explained by the analyzed predictors: level of knowledge about organic production, the importance of human capital, workforce characteristics, length of engagement in agriculture, and formal education. The adjusted coefficient of determination, Adjusted  $R^2 = 0.512$ , indicates that the model maintains a high explanatory power even after correcting for the number of included independent variables, confirming the stability of the regression model. The standard error of the estimate is 3.712, reflecting a relatively low deviation of the actual values from those predicted by the model. The statistical significance of the model is further supported by the ANOVA test results ( $F = 91.169$ ;  $p = 0.000$ ), indicating that the regression model as a whole is statistically significant and that at least one of the independent variables significantly contributes to explaining the variability of the dependent variable. Among the analyzed predictors, based on the significance levels of the standardized  $\beta$  coefficients, it can be observed that:

- *the level of knowledge about organic production* ( $\beta = .272$ ) is a statistically significant predictor of respondents' positive attitudes toward organic agricultural production;
- *the importance of human capital* ( $\beta = .380$ ) is a statistically significant predictor of respondents' positive attitudes toward organic agricultural production;
- *workforce characteristics in organic production* ( $\beta = .255$ ) are statistically significant predictors of respondents' positive attitudes toward organic agricultural production;
- *years of engagement in agriculture* ( $\beta = .131$ ) is a statistically significant predictor of respondents' positive attitudes toward organic agricultural production;
- *education level* ( $\beta = .065$ ) is not a statistically significant predictor of respondents' positive attitudes toward organic agricultural production.

Overall, the results of the regression analysis confirm that respondents' attitudes toward organic agricultural production are primarily shaped by knowledge, the perceived importance of human capital, and workforce characteristics, confirming the key role of human capital. Similar findings have been reported in studies indicating that education, knowledge, and experience of agricultural producers are significant factors in shaping attitudes and readiness to adopt organic production practices (Läpple & Kelley, 2013; Wollni & Andersson, 2014; Erokhin, 2022). Furthermore, Knowler and Bradshaw (2007) emphasize that human capital, encompassing farmers' knowledge, skills, and experience, has a substantial impact on the adoption of innovations and the implementation of sustainable agricultural systems.

To examine the structure of the questionnaire and identify latent dimensions explaining the variability of the analyzed statements, factor analysis was applied using the Principal Component Analysis (PCA) method. Before performing the factor analysis, the adequacy of the data was assessed. The Kaiser-Meyer-Olkin (KMO) measure yielded a value of 0.906, indicating a very high degree of sample adequacy for factor analysis, while Bartlett's test of sphericity showed a statistically significant result ( $\chi^2 = 6445.762$ ;  $p = 0.000$ ), confirming sufficient intercorrelations among variables to justify factor extraction. The results of the initial eigenvalues analysis revealed four components with values greater than 1, in line with Kaiser's criterion for retaining factors. The first component has an eigenvalue of 9.716 and explains 46.267% of the total variance, indicating its dominant influence within the data structure. The second component accounts for 10.837% of the variance, the third 7.504% and the fourth 5.222% of the total variance. After factor extraction, Varimax rotation with Kaiser normalization was applied to achieve a clearer factor structure. The rotation converged after six iterations, indicating the stability of the obtained solution. Analysis of the rotated factor matrix shows that the statements group into several clearly defined factors:

- The first factor encompasses statements related to the importance of human capital in organic production, with factor loadings ranging from (0.576 – 0.770). This indicates that respondents consistently recognize knowledge, skills, and competencies as crucial elements for successful organic production.
- The second factor includes variables associated with workforce characteristics, such as entrepreneurial spirit, responsibility, diligence, and willingness to learn, with factor loadings ranging from (0.419 – 0.790). The high loadings indicate a clear dimension describing the personal and professional traits of agricultural producers.
- The third factor pertains to respondents' attitudes toward organic agricultural production, including their perception of the prospects of organic production, level of knowledge, and ability to make business decisions on the farm, with loadings ranging from 0.463 – 0.832.
- The fourth factor represents a smaller but relevant dimension, encompassing specific aspects of the perception of organic production and the application of certain principles in practice, with moderate loadings ranging from 0.412 – 0.601.

## Conclusion

Based on the results of the conducted empirical analysis, as well as theoretical considerations regarding the importance of human capital in modern agriculture, it can be observed that the process of adopting organic agricultural practices is not determined solely by economic factors, but largely depends on the knowledge, skills, experience, and attitudes of agricultural producers. In this context, human capital and labor force characteristics emerge as key determinants shaping producers' readiness to adopt innovations and sustainable production models. The obtained results indicate that the level of knowledge, perception of the importance of human capital, and agricultural experience are statistically significant factors influencing the formation of attitudes toward organic production. At the same time, the results of the regression analysis confirm that the analyzed factors explain a substantial portion of the variability in respondents' attitudes, further emphasizing their relevance in the context of organic agriculture development. From a broader socio-economic perspective, these findings suggest that improving human capital is a prerequisite not only for the development of organic production but also for the sustainable development of rural areas. Based on the results, the following recommendations can be formulated:

- *Strengthening education and professional development:* Training programs for farmers should be developed by combining theoretical knowledge and practical exercises. Special attention should be given to young farmers in order to ensure the long-term development of human capital and knowledge transfer to future generations.
- *Encouraging family labor participation:* Household members should be actively involved in all stages of production, with mechanisms created to enable systematic knowledge transfer and skill development.
- *Developing collaboration and communication networks:* Establishing local and regional farmers' associations and experience-sharing platforms can significantly accelerate the adoption of organic practices and motivate farmers to implement innovations.
- *Support through economic and technical measures:* It is important to provide subsidies, access to certification, advisory services, and planting material in order to encourage farmers to apply organic methods.
- *Promoting ecological awareness and sustainability values:* Educational programs should encourage and motivate farmers to understand the long-term benefits of organic production, both in terms of environmental conservation and economic sustainability of farms.
- *Focusing on the local specificities of Kosovo and Metohija:* When creating policies and support programs, it is essential to consider rural conditions, limited resources, and labor force structure at the local level in order to ensure effective and sustainable interventions.

Overall, the research results highlight that human capital and organized labor force represent the fundamental prerequisites for a successful transition to organic agriculture

in Kosovo and Metohija. The implementation of the recommended measures can lead to increased productivity, economic sustainability of farms, and long-term development of rural communities. In conclusion, the enhancement of human capital and labor force is not only a matter of individual farmer development, but also a key strategy for achieving sustainable and competitive agriculture in the region.

### Conflict of interests

The authors declare no conflict of interest.

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