Assessment of innovative potential of farmers and homestead land owners

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Abstract. In the conditions of globalization, ensuring the food security of the population in the world community, based on the sustainable development of agriculture, requires the sector to be flexible to the external changing environment, to be effective in various innovations and scientific and technical development. Therefore, in the world's prestigious scientific research institutions, scientific research is being carried out in such directions as the introduction of innovative methods of agricultural production, the organization of non-traditional production and the production of environmentally friendly agricultural products to ensure the food security of the population. In particular, special attention is paid to scientific research aimed at solving problems such as the organization of vertical agricultural production on small land areas, the creation of disease-resistant and competitive varieties and hybrids in farming, and the introduction of resource-saving high-efficiency innovative technologies. In this article, the innovative activities of farms and homesteads operating in Kashkadarya region were studied and the innovative potential index of farms and homestead landowners in the regions was determined based on 5 indicators.

1 Introduction

Innovations are the basis for the modernization of agricultural production, increase the competitiveness of products and the export potential of the farm. Therefore, the correctly chosen direction of innovation will not only increase the economic indicators of farmers and households, but also increase its share in the agrarian sector. In addition, as a result of this, the experience of farms in the production of agricultural products and the qualification of workers will increase, personal funds will increase, their cooperation relations with scientific research institutes, land service and other scientific centers and international agrarian organizations will be strengthened.

The agricultural sector of Kashkadarya region, unlike the agriculture of other regions, has its own complex and changing natural and climatic conditions. One of the important strategic directions of the economic-structural policy is to comprehensively increase the efficiency of regional agricultural production in the agrarian reforms implemented in Uzbekistan. As a component of this direction, in addition to being one of the main sources of income for the rural population, meeting the needs and requirements of the country's

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population and processing enterprises for agricultural products, as an important factor of social stability and economic growth the policy of increasing the efficiency, diversification and modernization of agricultural production activities of great importance is being implemented rapidly. The effectiveness of the activities of agricultural holdings depends on the direct support of the state in terms of agro-innovation, organizational, legal, economic and social aspects. In the conditions of increasing the efficiency of agricultural activity, it consists of regularly repeating the level of socio-economic protection and security, the production of highly competitive products as a result of the use of attached land, material and labor resources, entrepreneurial activity and agro-innovation, ultimately, the regular increase of income. The efficiency of agricultural activity depends on internal and external factors. The internal factors are mainly the existing land-water, material-financial, human, entrepreneurial activity and agro-innovation resources, and the external factors are the country-wide political, economic and social processes, as well as the created business environment and market conditions.

2 Materials and methods

Many foreign scientists have studied the socio-economic development of small-scale agricultural entities. In particular, Uta Priegnits [4], K.Y. Voloshenko, A.A. Mikhailova [1], O.N. Pronskaya [11], A.Bobok [5], G.I. Shmelev [15], Z.I. Kalugina [6], M.S. Lata [9], O.Y. Starkova [12] and others were studied in scientific research subjects of small farms in agriculture, including the scientific-theoretical foundations of the development of private homesteads, issues of their innovative development.


However, at the same time, the innovative activities of farmers' households and the owners of homesteads of the population have not been analyzed, and researches on determining the innovative potential have not been carried out. Graphical and monographic methods, as well as abstract-logical and questionnaire-survey methods were used in the analysis of the laws considered within the framework of the research.

3 Results and Discussion

Kashkadarya is the region that supplies the most grain and cotton in the republic. As the main branches of agriculture, grain growing, cotton growing, potato growing, policing, vegetable growing, cattle breeding are widely developed. Horticulture, viticulture, and sericulture are also important. In our country, Kashkadarya region ranks highest in the supply of grain and cotton. According to statistics, it was observed that a 101.9 percent increase in total agricultural products in the region in 2022 compared to 2021[17]. Grain growing, cotton growing, potato growing, police growing, vegetable growing, horticulture, grape growing, and silk growing are widely developed in Kashkadarya region.

According to the analysis, in 2010-2022, the gross agricultural product of Kashkadarya region had a tendency to grow. Initially, in 2010, 1369.3 bln. agricultural products worth 1384.4 billion soums. Soums worth of livestock products were produced, by 2022 these indicators will reach 13266.4 billion soums in agriculture. to soums and 18647.7 billion in animal husbandry (amounting to soums. From 2010 to 2022, the change compared to 2020 was analyzed due to the sharp changes). in the number of farm categories producing agricultural and livestock products. So, in 2022, compared to 2020, agriculture increased by 143.6 percent and livestock by 128.2 percent, respectively. In 2022, the share of agriculture...
in the gross agricultural product was 40 percent, and the share of livestock was 60 percent [17].

In the course of the research, we conducted a survey of 60 farmers' farms and residential land owners who used innovative technologies in their production activities in order to assess their innovative potential. In the course of the research, the innovative potential of the farmers' farms and residential plots of land owners was evaluated based on the indicators:

- Education and qualification level of the owners and family members of peasant farms and residential estates.
- State of use of new agricultural machinery and equipment in production activities.
- Introduction of various innovative technologies in production.
- State of use of computer equipment and information technologies in the farm.
- The product was evaluated separately according to the level of marketability, processing and profitability.

In order to determine the overall innovation potential, corrections were made through the "weighting coefficient", where each indicator consists of a number of indicators, and total innovation indicators were calculated for five indicators. In this case, the sum of innovative indicators for each indicator ($\Sigma I_i$) is determined based on the following formula:

$$\Sigma I_i = I_{i1} \cdot k_1 + I_{i2} \cdot k_2 + I_{i3} \cdot k_3 + \cdots I_{in} \cdot k_n$$ (1)

Here $I_{i1}, I_{i2}, I_{in}$ – indicators of the innovation indicator; $k_1, k_2, k_n$ – indicator weight determination coefficient.

According to the method described above, innovative indicators of farms were determined for the respondents under study (Table 1).

### Table 1. Innovative indicators of dekhkan farms and households (Average for 2017-2022).

<table>
<thead>
<tr>
<th>Areas</th>
<th>Number of respondents (60 people)</th>
<th>Innovative indicator by information</th>
<th>Indicator of material and technical support</th>
<th>Indicator of use of innovative technologies</th>
<th>ICT usage indicator</th>
<th>Performance indicator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shakhrisabz</td>
<td>12</td>
<td>7.47</td>
<td>2.18</td>
<td>8.14</td>
<td>1.94</td>
<td>8.75</td>
</tr>
<tr>
<td>Yakkabag</td>
<td>11</td>
<td>3.46</td>
<td>0.88</td>
<td>4.81</td>
<td>0.71</td>
<td>4.81</td>
</tr>
<tr>
<td>Kitab</td>
<td>6</td>
<td>3.46</td>
<td>1.3</td>
<td>4.55</td>
<td>0.52</td>
<td>3.23</td>
</tr>
<tr>
<td>Kasbi</td>
<td>4</td>
<td>5.78</td>
<td>0.98</td>
<td>4.19</td>
<td>0.9</td>
<td>2.27</td>
</tr>
<tr>
<td>Koson</td>
<td>7</td>
<td>3.04</td>
<td>0.4</td>
<td>2.19</td>
<td>0.9</td>
<td>2.27</td>
</tr>
<tr>
<td>Nishon</td>
<td>4</td>
<td>2.79</td>
<td>0.5</td>
<td>3.06</td>
<td>0.78</td>
<td>1.66</td>
</tr>
<tr>
<td>Dekhkanabad</td>
<td>6</td>
<td>5.09</td>
<td>0.88</td>
<td>4.11</td>
<td>0.71</td>
<td>1.75</td>
</tr>
<tr>
<td>Mirishkor</td>
<td>3</td>
<td>2.3</td>
<td>0.55</td>
<td>1.23</td>
<td>0.6</td>
<td>2.19</td>
</tr>
<tr>
<td>Kamashi</td>
<td>7</td>
<td>3.28</td>
<td>0.48</td>
<td>2.01</td>
<td>0.3</td>
<td>2.88</td>
</tr>
</tbody>
</table>

The number of correction coefficients was developed to distinguish the effect of each of the indicated indicators on the index of innovative potential, as well as to optimize the numerical data obtained as a result of the survey and to determine the average index of innovative potential of the studied farms. It was proposed to determine the innovation potential index (ISI) for each investigated farm based on the following formula:

$$ISI = \sum_{i=1}^{5} I_{i} \cdot \alpha_i$$ (2)
Here ISI – index of innovative potential of the studied respondents; \( a_i = i \) - the amount of the coefficient determining the i-weight of the type of innovative indicator.

In the application of this formula, mainly using the expert method, we suggested determining the weight of indicators that serve to increase the innovative potential of enterprises with a high coefficient. In the study, the ISI assessment aims to minimize the weight of indicators such as the level of knowledge, skills or the state of agricultural machinery of farmers and householders and family members, innovations introduced in farms and the marketability of manufactured products. Taking into account that the indicators describing the level of profitability have a great impact on the innovative potential of economic entities, based on the need to maximize their weight, we proposed to optimize the correction coefficients of innovative indicators based on the following values:

\[
\begin{align*}
\alpha_1 &= 0.1; \\
\alpha_2 &= 0.1; \\
\alpha_3 &= 0.35; \\
\alpha_4 &= 0.15; \\
\alpha_5 &= 0.35 \\
\end{align*}
\]

According to the analysis, it was found that the index of innovative potential of farmers and households located in Shahrisabz district is high and was 28.47 points (Figure 1). The highest level of production diversification of the selected respondents in Shahrisabz district was recorded, and the highest indicators were recorded in terms of the use of innovative technologies and material and technical support.

4 Conclusion

According to the proposed method of extrapolation of the obtained results to regional levels, the identified ISI reflected the relationship between innovative development. According to it, farms with low innovation potential (Mirishkor district) with an index value of innovation potential not exceeding 7.2, subjects with average innovation potential from 7.2 to 14.4 (Nishon, Koson, Kamashi, Kitab, Dekhkanabad) and those with an index greater than 14.4 are farms with high innovation potential (Shakhrisabz, Kasbi, Yakkabag, Table 2).

According to the analyzes obtained as a result of the grouping of the ISI of the farms by region, the farms with high innovation potential mainly specialize in the production of grapes and fruit products, and pay attention not only to cultivation, but also to the processing of the produced products. The level of diversification of oil product production is high.
Table 2. Grouping of farms based on the index of innovative potential.

<table>
<thead>
<tr>
<th>Indicators</th>
<th>Innovation potential index</th>
<th>Areas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farms with high innovation potential</td>
<td>ISI≥14.4</td>
<td>Shakhrisaz, Kasbi, Yakkabag</td>
</tr>
<tr>
<td>Farms with average innovation potential</td>
<td>7.2 &lt; ISI&lt;14.4</td>
<td>Nishon, Koson, Kamashi, Kitab, Dekhkanabad</td>
</tr>
<tr>
<td>Farms with low innovation potential</td>
<td>ISI≤7.2</td>
<td>Mirishkor</td>
</tr>
</tbody>
</table>

Farms with medium innovative potential used resource-saving technologies and effective agrotechnical measures in the production process. For example, the respondents in Dekhkanabad district paid attention to renewing the soil composition in order to achieve high productivity from dryland farming products.

Only Mirishkor district was included in the region with low innovation potential. Despite the fact that this region is located close to the center, has good technical and technical support and personnel support, the indicator of innovative potential showed low indicators. The following reasons can be cited for this:

- Since most of the farmers and farms operating in the region are engaged in animal husbandry, little attention is paid to the introduction of innovative technologies in the field of agriculture.
- Farm production is not diversified.
- Due to the fact that only Mirishkor district is included in this group, the statistical and analytical evaluations of the indices cannot meet the requirements of representativeness and therefore cannot be considered sufficiently objective in terms of describing specific development trends.

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