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Unlocking Innovation in Homestead Farms

Exploring drivers and barriers to innovation adoption among farming households in Uzbekistan

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Introduction

Homestead, or tomorqa, farms play a key role in agriculture and food security in Uzbekistan. These small-scale farms are integral to the livelihoods of more than 5.5 million rural households, collectively utilizing over 500,000 hectares of agricultural land, which accounts for nearly 15 percent of the country's total arable agricultural land area.[1] The significance of homestead farms is also underscored by their substantial contribution to the overall agricultural output of the country, producing the majority of horticulture and livestock products. In 2023, homestead farms produced approximately 62 percent of agricultural products, 37 percent of crop output, and an impressive 88 percent of livestock production.[2]

Recognizing their critical importance, the Uzbek government has positioned homestead farms at the heart of its poverty reduction strategy. This strategy includes the allocation of additional land to rural households, thereby expanding their capacity for agricultural production and improving the economic stability of rural communities. Furthermore, the government actively promotes the adoption of innovative agricultural technologies and practices by homestead farms.

In addition to agricultural production and rural livelihoods, homestead farms are also central to Uzbekistan's efforts to foster climate-smart agriculture to enhance climate resilience and reduce greenhouse gas emissions from the agriculture sector. The government has also promoted the implementation of water-saving technologies and practices that reduce land degradation among homestead farms, which not only help mitigate the impacts of climate change but also ensure the long-term viability of agricultural resources amid land- and water-scarcity challenges.

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[1] Ministry of Agriculture of the Republic of Uzbekistan. Agriculture Annual Report 2023. https://www.agro.uz/wp-content/uploads/2024/03/agriculture-annual-report-2023.pdf.

[2] UzStat. Share of dehkan and subsidiary farms in the total volume of agricultural production (annual). August 28, 2024. https://api.siat.stat.uz/media/uploads/sdmx/sdmx_data_1482.pdf. UzStat. Share of crop production grown on dehkan and subsidiary farms in the total volume of crop production (annual). August 28, 2024. https://api.siat.stat.uz/media/uploads/sdmx/sdmx_data_1486.pdf; UzStat. Share of livestock products produced on dehkan and subsidiary farms in the total volume of livestock products (annual). August 28, 2024. https://api.siat.stat.uz/media/uploads/sdmx/sdmx_data_1492.pdf.

Understanding the drivers and barriers to the adoption of these innovative practices is crucial for tailoring policies to better support farmers, enhancing the effectiveness of government initiatives, and ensuring the sustainable development of homestead farms. This project note examines the key drivers of and barriers to the adoption of innovative technologies and practices by homestead (tomorqa) farms in Uzbekistan. To answer this question, this note analyzes data from an intra-household survey conducted among 1600 households with homestead plots in 4 provinces of Uzbekistan in 2024.

Methods

This project note is based on the intra-household survey data collected in May-August 2024. The data spans 1600 households across 80 mahallas (or communities that form the lowest level administrative unit) from 20 districts, distributed among Fergana, Kashkadarya, Khorezm, and Samarkand provinces.

The survey questionnaire covered a wide range of topics, including household demographics, socioeconomic status, crop economics, agricultural production, practices, and technologies, gender dynamics, food consumption, and more. Additionally, we included a detailed module focused on the drivers of and barriers to the adoption of innovative farming technologies and practices.

This module aimed to conduct a comprehensive assessment of the challenges and incentives faced by homestead farmers in Uzbekistan by examining three key categories of factors influencing innovation adoption. First, the module investigated farmers' perceptions of informal institutional conditions and social norms, with a particular focus on the sources of information available to them. Second, it explored individual motivational factors, including those affecting decision-making processes and styles. Third, the module captured farmers' perceptions of the benefits, triggers, and barriers to adopting new technologies. This included questions on the perceived impact on profits, production, the environment, and labor; market conditions and opportunities; formal institutions and regulations; and the availability of essential inputs like land and water.

What follows is a summary of key findings from a descriptive analysis of responses to this module.

Results

Sources of information on innovative technologies and practices

Evidence suggests that communication and access to information play a critical role in farmers' adoption of innovative technologies, as it allows them to understand the benefits, proper usage, and potential risks of new practices, ultimately influencing their decision to implement them on their farms; without adequate information, farmers may be hesitant to adopt new technologies due to uncertainty or lack of trust in their effectiveness.[3] Homestead farmers in Uzbekistan whom we surveyed have limited access to information about innovative farming technologies and practices. Table 1 summarizes the frequency with which respondents consult various information sources. It highlights that most respondents never receive information about innovative agricultural technologies and farming practices. While the traditional media (press, TV, and radio) and the internet are relatively more frequently used – around 30% of respondents consult them at least several times per year – a substantial portion of homestead farmers do not regularly utilize them. Similarly, only one fifth of them receive such information from family, relatives, and community members. Other potential sources such as agricultural advisors, supplier and

[3] Jack, B. Kelsey. 2013. "Market Inefficiencies and the Adoption of Agricultural Technologies in Developing Countries." Technical report, Abdul Latif Jameel Poverty Action Lab, Massachusetts Institute of Technology, Cambridge, MA.

buyer representatives, open days and presentations, farmers' organizations, and the district- or village-level administrations play marginal roles in providing information to households about innovative agricultural technologies and farming practices.

Table 1: How often homestead farmers reported consulting various information sources

	At least monthly	Several times per year	Once a year	Less than once a year	Never
Family and relatives	14.8%	6.7%	9.0%	6.4%	63.1%
Community members	8.6%	8.0%	8.9%	6.7%	67.8%
Agricultural advisors	3.9%	5.0%	8.9%	6.4%	75.8%
Supplier representatives	1.8%	2.5%	6.9%	5.6%	83.1%
Buyer representatives	0.9%	3.0%	7.2%	6.3%	82.6%
Open days and presentations	1.0%	1.5%	6.1%	5.0%	86.3%
Press/TV/Radio	20.3%	11.3%	8.5%	6.3%	53.7%
Internet	21.1%	9.7%	8.1%	5.8%	55.4%
Farmers organization	1.4%	2.6%	5.8%	6.0%	84.3%
District or village admin	1.4%	3.1%	5.1%	5.3%	85.2%

Source: Author's calculations.

The survey also included questions to gauge homestead farmers' perceptions of the information sources they consult. This was presented through a series of statements that respondents were asked to consider and respond to by indicating whether they strongly disagree, disagree, neither agree nor disagree, agree, or strongly disagree. Two of these statements focused on whether the information sources and people they consult promote or support innovative and/or environmentally friendly farming technologies and practices. Table 2 provides a breakdown of responses to these two statements, focusing on a sub-sample of respondents who reported consulting at least one information source. Only three percent of respondents strongly agreed, and a majority agreed that their information sources and people whose opinions they value are supportive of these practices. However, a considerable proportion did not agree. Almost 23 percent of respondents disagreed or strongly disagreed that the sources of information they consult regularly promote innovative technologies and practices. Similarly, nearly 19 percent of respondents disagreed or strongly disagreed that the people whose opinions they value are supportive of using innovative practices or environmentally friendly practices. Interestingly 20 percent of respondents were indifferent to both statements.

Table 2: Homestead farmers' perception of promotion of innovative practices by information sources and people they consult

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
Sources of information I consult regularly promote innovative technologies and farming practices	2.6%	19.9%	20.3%	54.2%	3.0%
People whose opinions I value are supportive of using innovative practices / environmentally friendly practices	1.9%	17.0%	20.0%	58.0%	3.0%

Source: Author's calculations based on a subsample of respondents who reported consulting at least one information source at least less than once a year.

Additionally, respondents were presented with statements about the adoption of innovative farming practices by their peers. Table 3 provides a breakdown of responses to the statements among a subset of respondents who reported consulting at least one information source. Overall, the results are mixed. While a little over half the respondents agreed that their peers have adopted innovative practices, nearly half either disagreed or were indifferent to both statements.

Table 3: Homestead farmers' perception of peer adoption of innovative practices.

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
Few farmers I know are using innovative practices	1.7%	23.5%	23.0%	48.5%	3.2%
Most farmers I know have adopted at least one innovative farming practice	1.7%	22.8	23.9%	47.5%	4.1%

Source: Author's calculations based on a subsample of respondents who reported consulting at least one information source at least less than once a year.

Factors influencing decisions on farming practices

The survey included two sets of questions focused on individual motivational factors to better understand how homestead farmers make decisions regarding their farming practices and technologies.

The first set asked farmers to rate ten factors based on their importance while making decisions on farming practices. Table 4 summarizes responses to these questions. The table shows that most farmers consider various factors important or very important when making decisions about farming practices. The most highly valued factors include practices that reduce production risk (78.9 percent consider it to be important or very important), improve soil quality (82.4 percent), conserve water (84.3 percent), and are environmentally sound (79.6 percent). Profitability is also a key consideration, with 78.8 percent of farmers rating it as important or very important.

In contrast, factors such as whether a practice is implemented on other farms or promoted by the government are less influential, though still significant, with 60.3 percent and 65.0 percent of farmers respectively rating these as important or very important.

These results suggest that while external influences like government promotion and peer practices are considered, intrinsic benefits such as risk reduction, environmental impact, and profitability are more critical in decision-making by homestead farmers.

Table 4: Importance of various factors while making decisions on farming practices

	Not at all important	Unimportant	Indifferent	Important	Very Important
Practice is implemented on other farms	2.9%	24.0%	12.8%	57.2	3.1%
Practice is promoted by the government	1.9%	17.3%	15.7%	60.2%	4.8%
Practice is widespread on similar farms	2.5%	17.4%	15.5%	60.6%	4.0%
Practice is innovative	1.9%	13.1%	15.3%	63.8%	5.9%
Practice is profitable	1.2%	8.0%	11.9%	66.9%	11.9%
Practice is environmentally sound	1.2%	7.2%	11.9%	68.9%	10.7%
Practice conserves water	0.9%	5.4%	9.5%	63.7%	20.6%
Practice improves soil quality	0.9%	5.7%	11.0%	65.1%	17.3%
Practice reduces production risk	0.9%	7.7%	12.5%	69.2%	9.7%
Practice reduces financial risk	1.0%	7.7%	12.3%	66.7%	12.2%

Source: Author's calculations.

Furthermore, respondents' evaluations of these three types of intrinsic benefits—risk reduction, environmental impact, and profitability—show consistency. Table 5 shows the relationship between the importance respondents place on profitability and their consideration of environmental benefits (such as being environmentally sound, conserving water, and improving soil quality) through cross-tabulation. Most respondents (78.6 percent) who consider profitability important also find environmental considerations important. Conversely, very few farmers who are indifferent or find profitability unimportant place high importance on environmental considerations.

Table 5: Cross-tabulating the importance of profitability and environmental considerations

		Knowing the practice is environmentally friendly or conserves resources		
		Indifferent	**Not important**	**Important**
Knowing the practice is profitable	**Indifferent**	8.0%	0.1%	3.9%
	Not important	0.4%	5.3%	3.6%
	Important	0.1%	0.1%	78.6%

Source: Author's calculations.

Note: The variable "knowing the practice is environmentally friendly or conserves resources" combines farmers' evaluation of the importance of the practice being environmentally sound, conserving water, and improving soil quality

Similarly, Table 6 examines the relationship between the importance of profitability and the importance of reducing production or financial risk. The cross-tabulation indicates that a significant majority of respondents (75.7 percent) who consider profitability important also value practices that reduce risks. As

in Table 5, those who are indifferent or find profitability unimportant are less likely to consider risk reduction important.

Table 6: Cross-tabulating the importance of profitability and risk reduction

		Knowing the practice reduces production risk or financial risk		
		Indifferent	**Not important**	**Important**
Knowing the practice is profitable	**Indifferent**	8.5%	0.2%	3.3%
	Not important	0.5%	6.1%	2.7%
	Important	1.7%	1.3%	75.7%

Source: Author's calculations.

Note: The variable "knowing the practice reduces production risk or financial risk" combines farmers' evaluation of the importance of the practice reducing either type of risk.

Decision-making styles

The survey also presented respondents with a set of statements describing various decision-making styles, asking them to rate the extent to which they agreed with the statement to understand how they evaluate their own decision-making style. Table 7 summarizes these responses. The data show that the surveyed homestead farmers have a strong preference for thorough and deliberative decision-making processes—almost all farmers prefer to mull over decisions before acting (96.3 percent agree or strongly agree) and keep records and calculate outcomes before making decisions (93.8 percent). Further, respondents display a tendency toward risk aversion and prefer being proactive—a substantial proportion dislike making risky decisions (76.9 percent), while an overwhelming majority prefer a preventive approach to a remedial one (95.8 percent). Finally, while surveyed homestead farmers are open to innovation, they are also cautious about change. Many farmers find trying new practices exciting (84.6 percent), showing openness to innovation. While many also find changing well-established practices painful (72.9 percent), most are willing to tolerate mistakes while making changes (83.2 percent), suggesting a willingness to learn and adapt, if necessary, despite resistance to change.

Table 7: Farmers' decision-making style

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
Mull over decisions before acting	0.2%	1.8%	1.7%	77.9%	18.4%
Keep records and calculate outcomes before making decisions	0.1%	3.5%	2.6%	75.1%	18.7%
Dislike making risky decisions	1.2%	16.8%	5.1%	62.7%	14.2%
Tolerate mistakes while making changes	1.3%	10.3%	5.1%	71.0%	12.2%
Trying new practices is exciting	1.3%	7.4%	6.7%	72.3%	12.3%
Changing well-established practices is a real pain	1.6%	14.6%	10.8%	63.8%	9.1%
Prefer preventive rather than remedial approach	0.1%	2.1%	1.9%	75.2%	20.6%

Source: Author's calculations.

Table 8 explores the relationship between respondents' preferences for risk-averse decision-making on the one hand and deliberative decision-making on the other hand. It cross-tabulates the responses to the statement about disliking risky decisions with those about preferring to mull over decisions or keep records and calculate outcomes before making a decision. Most homestead farmers dislike making risky decisions and prefer deliberative decision-making. This suggests that respondents who are risk-averse are also more likely to engage in thorough and careful decision-making processes. Conversely, those who are less risk-averse show a slightly more varied position on deliberative decision-making, albeit most respondents show a strong preference for making deliberative decisions.

Table 8: Cross-tabulating risk averse decision-making with deliberative decision-making

		Prefer mulling over decisions / keeping records and calculating outcomes before making a decision		
		Neither agree nor disagree	**Disagree**	**Agree**
Dislike making risky decision	**Neither agree nor disagree**	0.9%	0.1%	4.1%
	Disagree	0.2%	1.0%	16.7%
	Agree	0.2%	0.2%	76.5%

Source: Author's calculations.

Factors and events triggering changes to farming practices

The survey included a set of questions that asked respondents to rate the importance of 11 distinct factors and trigger events considering the last time they changed their farming practice or imagining what would happen if they changed their farming practice had they never adopted changes previously. Table 9 summarizes respondents' evaluations of these factors. Among them, the availability of water for irrigation stands out as the most essential factor, with 31.2 percent respondents considering it very important, more than any other factor, and 63.8% considering it important. It is highly plausible given that Uzbekistan is a severely water-scarce country. Nevertheless, most surveyed homestead farmers also deem several other factors as important or very important while changing farming practices. 94.5 percent of farmers consider the ability to cope with pests and diseases as important or very important, making it a critical factor. Similarly, the ability to meet quality and/or safety standards is important or very important for 89.6 percent of respondents. The ability to cope with changing weather, observe and measure benefits, the fit with current farming practices, and the cost of adoption are also significant triggers, with over 85 percent of farmers rating these factors as important or very important. Market rewards, supply chain contract restrictions, skilled labor requirements, and availability of support are slightly less influential but still important for most farmers.

Table 9: Importance of various factors as potential triggers to changing farming practices

	Not at all important	Unimportant	Indifferent	Important	Very Important
Ability to cope with pests & diseases	0.3%	1.7%	3.6%	81.0%	13.5%
Ability to cope with changing weather	0.6%	3.7%	8.9%	74.7%	12.1%
Ability to observe / measure benefits	0.4%	3.5%	9.7%	77.5%	8.9%

Fit with the way you currently farm	0.4%	3.1%	7.2%	78.2%	11.2%
Cost of adoption	0.2%	3.1%	9.6%	76.5%	10.6%
Market reward	0.5%	6.1%	11.8%	70.5%	11.2%
Supply chain contract restrictions	0.4%	9.0%	16.1%	66.1%	8.5%
Ability to meet quality / safety standards	0.3%	2.9%	7.2%	75.2%	14.4%
Amount of skilled labor required	4.4%	12.4%	9.0%	66.1%	8.1%
Availability of advice and support	2.9%	10.5%	9.3%	67.6%	9.6%
Availability of water for irrigation	0.1%	1.0%	3.8%	63.8%	31.2%

Source: Author's calculations.

In addition to the aforementioned factors, farmers were also asked to consider a set of ten events and reflect on how important they were the last time they changed their farming practices (or how important they would be if they changed their farming practice, had they never done so previously). Table 10 summarizes their responses.

As earlier, availability of key natural resources emerges as the most essential event that may trigger changes to farming practices. 34.9 percent of surveyed homestead farmers rated water availability as very important and 60.6 percent as important. Similarly, 31.3 percent rated land availability as very important and 62.7 percent as important. Additionally, most respondents also deemed other trigger events as important or very important, highlighting that they consider various aspects while changing their farming practices. 86.4 percent of respondents deemed changes in input prices as very important or important, and 85.7 percent did so for changes in product prices. Financial difficulties are significant triggers as well, with 84.1 percent of farmers considering them important or very important. Changes in weather patterns (84 percent) and the availability of new technologies (83 percent) are similarly influential. Other factors such as changes to regulations, new market opportunities, and the availability of skilled labor also play significant roles, though to a slightly lesser extent.

Table 10: Importance of various events as potential triggers to changing farming practices

	Not at all important	Unimportant	Indifferent	Important	Very Important
Changes in input prices	0.6%	5.1%	7.9%	78.1%	8.3%
Changes in product prices	0.4%	4.4%	9.4%	77.3%	8.4%
Financial difficulties	0.7%	5.8%	9.3%	73.3%	10.8%
Availability of skilled labor	4.5%	11.7%	10.7%	65.9%	7.2%
Changes in weather patterns	0.5%	3.9%	11.6%	72.1%	11.9%
Land availability	0.1%	1.2%	4.8%	62.7%	31.3%
Water availability	0.1%	0.7%	3.7%	60.6%	34.9%
Changes to regulations	0.5%	4.9%	15.3%	69.6%	9.7%
Availability of new technologies	1.0%	5.1%	10.8%	72.1%	10.9%

New market opportunities (domestic or export)	1.4%	5.3%	10.6%	69.9%	12.8%

Source: Author's calculations.

Perceived effects of adopting innovative farming technologies and practices

To better understand homestead farmers' expectations and perceptions of the effects of adopting innovative farming technologies and practices, the survey asked them to evaluate the impact such adoption has had, or would have, on various key outcomes. The responses provide useful insights into both the perceived benefits and potential barriers associated with these technologies and farming practices. Table 11 summarizes their responses.

The data reveal that homestead farmers generally have moderate expectations regarding the benefits of innovative technologies and practices. For most outcomes, most respondents perceive either no change or a slight increase. Specifically, when considering benefits such as farm profitability and farm production, around half of the respondents expect only slight increases, while one-fifth expect no change. A similar pattern emerges for all other outcomes. Interestingly, this includes factors like labor requirements, time spent working on the farm, physical nature of work, mental workload, and the intensity of seasonal peaks, for all of which hardly any respondents expect a decrease. This pattern suggests that while farmers recognize some potential benefits of adopting innovative technologies or practices, they also expect these changes to farming practices to come with increased demands on their time and effort.

Table 11: Perceived effect of adopting innovative farming technologies and practices on various outcomes

	Large decrease	Slight decrease	No change	Slight Increase	Large increase
Farm profitability	0.8%	3.2%	20.5%	50.5%	25.1%
Farm production	0.6%	3.2%	22.4%	48.2%	25.6%
Labor requirements for farm	0.6%	2.3%	23.0%	49.9%	24.2%
Ability to meet farm support payment req.	2.0%	2.6%	26.1%	48.2%	21.1%
Ability to meet farming objectives	0.7%	2.3%	24.0%	50.2%	22.8%
Your time spent working on the farm	4.4%	5.4%	20.9%	49.2%	20.2%
Soil quality on your farm	1.2%	3.1%	22.7%	48.2%	24.9%
Biodiversity of your farm	0.8%	2.0%	23.6%	48.9%	24.7%
Intensity of seasonal peaks of work	2.0%	2.8%	23.9%	49.0%	22.4%
Physical nature of work	5.2%	9.1%	23.2%	44.4%	18.1%
Mental workload	1.2%	3.8%	19.7%	48.0%	27.3%

Source: Author's calculations.

To further explore homestead farmers' expectations regarding labor requirements, the survey included a specific question about the impact of adopting innovative farming technologies and practices on labor needs. Respondents were asked to describe how their farm labor requirements changed the last time

they adopted such innovations or how the requirements would change if they adopted such innovations. Table 12 summarizes their responses.

The data indicate that while some farmers anticipate decreases in various kinds of labor needs, most farmers expect either no change or an increase. Specifically, a sizable portion of respondents foresee slight increases in managerial labor time (43.8 percent), full-time family labor (37.9 percent), part-time family labor (41.6 percent), and hired labor time (36.7 percent). Additionally, 45.6 percent of farmers anticipate a slight increase in skill requirements for farm work and management. Likewise, one-fifth to one-fourth of all respondents expect no changes in these various labor requirements, whereas between one-tenth and one-fifth of farmers expect a large increase.

Table 12: Perceived effect of adopting innovative farming technologies and practices on labor-related outcomes

	Large decrease	Slight decrease	No change	Slight increase	Large increase
Managerial labor time	6.2%	15.4%	20.6%	43.8%	14.0%
Family full time labor	6.6%	18.4%	23.7%	37.9%	13.5%
Family part time labor	6.7%	17.3%	22.9%	41.6%	11.6%
Hired labor time	8.1%	15.7%	27.9%	36.7%	11.5%
Skill requirements for farm work and management	3.4%	7.9%	24.3%	45.6%	18.8%

Source: Author's calculations.

Conclusion

The intra-household survey conducted in Uzbekistan in the summer of 2024 has generated important insights on the factors influencing the adoption of innovative farming technologies and practices among homestead farmers in Uzbekistan and highlights areas needing improvement to unlock innovation in this sector.

First, the survey findings suggest that homestead farmers in Uzbekistan have limited access to information about the existence, use, and profitability of innovative agricultural technologies and farming practices. The limited availability of such information could be one of the main reasons why these technologies and practices are not more widely adopted among smallholders in the country. Therefore, designing and implementing effective agricultural information dissemination systems thus has the potential to increase both farm productivity and household welfare. Traditional media and the internet are relatively important sources of information for homestead farmers, while farmers' organizations and local governments are less frequently consulted. This indicates a need to improve rural internet access and utilize traditional media and online platforms to share information about agricultural innovations. Notably, only about 60 percent of the information sources consulted by households promote innovative and environmentally friendly practices, indicating a gap that needs addressing.

Second, while most households value technologies that are both profitable and environmentally sound, they have modest expectations regarding their benefits and anticipate increased demands on time, effort, and labor. This suggests a need for further research to understand these expectations and assess the effectiveness of currently available technologies. This will help determine the steps that should be

taken to ensure that the available technologies meet farmers' pressing needs and their expectations are improved.

Third, most households are risk-averse and make well-informed decisions. Studies in other regions show that this may affect the adoption of agricultural innovations, including through farmers avoiding or delaying adopting new practices if they perceive them as risky, regardless of potential benefits. For instance, a 2006 Bt Cotton Survey conducted in China found that less risk-averse farmers adopted Bt cotton earlier and accumulated more wealth despite no actual difference in risk. The study suggested insurance and demonstration plots to reduce the perceived risks.[4] Similarly, an experimental study in South Africa found that risk-averse farmers are less likely to adopt new farming technologies even with insurance. The study highlights that effective insurance schemes must consider residual production risks and mismatched payouts to encourage adoption among risk-averse farmers.[5]

The survey and these descriptive statistics that emerge from it offer valuable insights, but further research is essential to delve deeper into the factors influencing farmers' decision-making processes. Understanding the nuances of farmers' risk aversion, their specific needs, and how they engage with information sources to educate themselves can help tailor policies and support mechanisms that encourage the adoption of innovative practices. This, in turn, can enhance the sustainability and productivity of homestead farms, contributing to broader agricultural and economic development goals in Uzbekistan.

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