Visiting Fellow Program

Horticulture versus Cotton: A Comparative Qualitative Analysis of Women's Well-being in Uzbek Villages

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Abstract

In Uzbekistan, where almost half the population lives in rural areas, agriculture plays an important economic role. Driven by political reasons, cotton and wheat have been dominating crops with control of the state in the last decades. Starting in the 2019–2020 period, some individual farms have been transitioning to horticulture crops in certain Uzbek districts. Given the high seasonality in labor demand in cotton and high involvement of female workers in other agricultural production, how did this change in cropping affect women's well-being? This study aims to contrast women from different social classes, including farmers and farm workers, in different agricultural environments, namely cotton-oriented and horticulture-oriented districts, by examining the economic impact of the transition to horticultural practices. Recognizing the potential benefits of crop diversification for the economic well-being of households and rural employment, especially for women, the study uses the last dimensions of the three-dimensional framework developed by Kabeer (1999), which are the dimensions of resources, agency, and achievements. Qualitative data collected in four villages—two cotton and two horticultural—in Samarkand and Tashkent provinces provides the basis for the analysis. Using thematic analysis, we systematically compare farmers to workers and districts. The qualitative study revealed positive economic outcomes for both farm workers and women farmers in horticulture-oriented districts. Moreover, the study reveals significant disparities between farmers and agricultural workers in rural Uzbekistan, particularly regarding living conditions, access to utilities, education, and healthcare. While farmers generally enjoy better financial stability and resource access, workers face economic constraints that limit their quality of life and opportunities for social and economic mobility.

Keywords: Well-being; Uzbek agriculture, Rural women

List of Figures

List of Tables

Introduction

The agricultural sector in Uzbekistan continues to dominate the political debate because of its strategic importance for the subsistence of its farming populations, alleviation of poverty, and domestic food security. It now contributes around 23% to the country's GDP and accounts for about a quarter of its labor force (World Bank, 2024). Since independence, the Uzbek government has pursued a policy of self-sufficiency, expanding wheat production alongside the traditionally dominant cotton sector. However, the problem of providing a balanced and safe diet for a growing population poses a major challenge to future food security (Payziyeva & Paiziev, 2012). Thus, the government's recent policies have led several districts to shift from cotton to horticulture. Specifically, the 2017–2021 strategic plan reduces cotton and cereals to develop vegetables, fodder crops, oilseeds, and orchards, while the 2020–2030 agricultural development strategy prioritizes food security, agribusiness support, and sustainable resource use (ADB, 2016; Larson et al., 2015).

Agriculture remains the main source of subsistence for rural communities and provides a significant source of formal and informal employment for the population. In 2022, women accounted for 41.2% of total employment in the economy, or 5.6 million people. Of these, about a quarter, or 1.5 million women, are officially employed in agriculture (gender.stat.uz). Despite this, according to the Food and Agriculture Organization (FAO), only 4% of farmers are women. This suggests that most women in agriculture are in roles such as farm laborers, processing workers, or agricultural support services rather than directly managing farms (FAO, 2019). Thus, each legislation has a direct impact on the livelihoods of rural communities.

With this policy context in mind, this paper examines the impact of the transition from cotton production to horticulture on the livelihoods of rural women. The study

compares the experiences of women farmers and workers in cotton-growing villages with those in horticulture-oriented communities. We employed four multifaceted dimensions of livelihood well-being: housing and living conditions, education and health, social-life participation, and financial and non-financial status (Ahmed et al., 2019; Alarcon et al., 2020; Bartl, 2019; Brennan et al., 2020; Isaac et al., 2024; Kaufman, 2015; Mourão et al., 2019; TerAvest et al., 2019). We used an open-ended questionnaire to collect data, which was analyzed via thematic analysis (Braun & Clarke, 2022; Bryman, 2012; Creswell, 2007; Creswell & Creswell, 2018).

The findings show that access to utilities such as electricity and water significantly impacts daily life. Although many farmers express increased satisfaction with electricity due to recent improvements, problems such as power outages persist, especially in cotton-producing regions. In addition, the study shows how the adoption of labor-saving devices correlates with economic stability, as well as various factors affecting housing upgrades, which often face constraints related to financial pressures and family commitments.

The study extends to aspects of education and health, identifying differences between farmers and workers in educational attainment and access to healthcare. Farmers tend to be more educated and invest heavily in their children's education despite financial sacrifices, while workers often face economic barriers that limit their investment in education. Participation in social life is necessary for everyone, regardless of district, although the frequency of attendance at social events often varies according to financial and family circumstances. In this context, we observed less variation in the uptake of horticulture practices.

However, cotton farmers often face serious financial problems, relying heavily on credit to manage production costs. Despite potentially high income from cotton cultivation,

they face high interest rates, erratic cluster support, and payment delays (Babadjanov & Petrick, 2023). This financial burden is compounded by dependence on traditional systems, leading to dissatisfaction with their financing mechanisms. In contrast, horticultural farmers tend to exhibit greater financial independence. They tend to diversify their crop production, which enables self-financing strategies and reduces dependence on external credit. Such diversification increases economic stability and allows horticultural farmers more flexibility to adapt to market conditions, providing a more stable income stream. Overall, the contrasting dynamics of cotton and horticulture emphasize the complex interplay between economic practices, infrastructure, and cultural values in shaping the livelihoods of rural communities in Uzbekistan.

The study makes a significant contribution to the existing literature on rural livelihoods and agricultural practices in Uzbekistan by offering a nuanced understanding of the relationship between infrastructure, economic conditions, education, health, and social dynamics. The socio-economic situation in Uzbekistan is characterized by a transition from cotton farming to horticulture agriculture, where traditional methods coexist with other agricultural approaches. This study clarifies the unique challenges and opportunities facing rural communities, focusing on how these factors shape the experiences of women, who often carry the greatest share of socio-economic inequalities.

The paper is structured as follows. Section 2 provides an overview of the agricultural context and gender dynamics in Uzbekistan. Next, Section 3 describes the conceptual framework. Section 4 presents the data and methodology of the qualitative analysis, respectively. Section 5 discusses the results of the analysis, and finally Section 6 summarizes the findings of the study and offers policy recommendations.

Uzbek Agricultural Background: Adoption of Horticulture and How it Functions

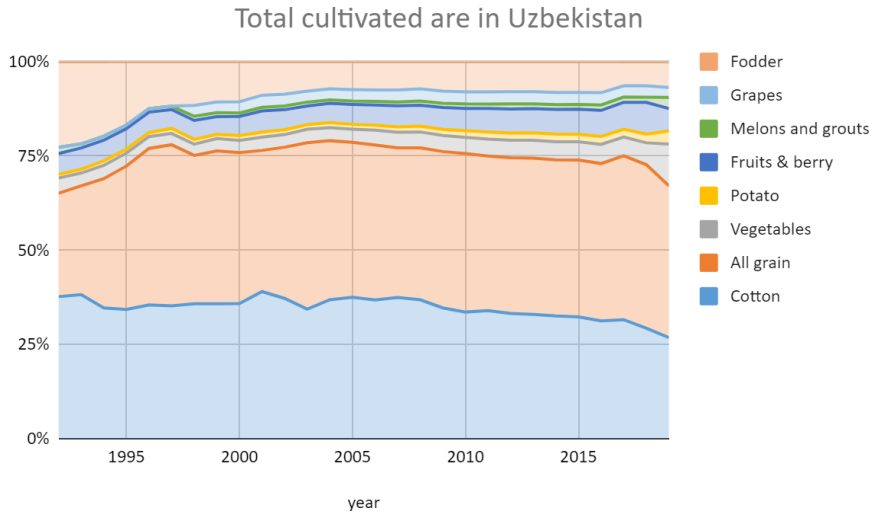
Uzbekistan, which neighbors countries in Central Asia, was one of the main cotton producers in the post-Soviet Union and worldwide. Historically, the main area of arable land has always catered to this technical crop. However, cotton monoculture has brought many challenges, starting with environmental issues and food security for the increasing population (Mukhamedova & Petrick, 2019). Hence, new government policies in 2010, 2011, and 2015 shifted several districts from cotton cultivation to horticulture production (ADB, 2016). The 2017–2021 national strategic plan further aimed to reduce cotton and grain areas, allocating freed-up land for vegetables, fodder crops, and oilseeds, and establishing intensive orchards and vineyards (Larson et al., 2015). Following this, the agricultural development strategy of the Republic of Uzbekistan for 2020–2030 (Presidential Decree No. 5853 of 2019) is a key program document for the agri-food sector. Its implementation focuses on nine priorities including ensuring food security, creating a favorable environment for agribusiness, reducing state involvement, and promoting the sustainable use of resources (lex.uz, 2024).

The Uzbek agricultural system comprises several types of producers. The main ones are *dekhan farms* (household farms), private individual farms, and other producers such as production cooperatives and some clusters (Babadjonov et al., 2023; Lerman, 2008; World Bank, 2019;). In crop decision-making, household farms are free to make decisions. Due to land size, they mainly cultivate vegetables and fruits for household consumption or small-scale trading. The second group of producers are individual private farms where the land belongs to the state, and farmers can lease the land while gaining the full right to use it (World Bank, 2019). All private individual farms have limited access to decision-making over farm management. However, the management frameworks of private cotton or wheat farms differ from those of private horticulture or gardening farms.

More than 500 private wheat and cotton farms were reorganized at the end of 2011 and transformed into farms focused on horticulture in 25 districts well-endowed for horticulture (Larson et al., 2015). Since then, Jomboy in Samarkand province, Asaka in Andijon, and Yangiyul in Tashkent province have started decreasing the number of cotton plantations and become more oriented to horticulture crops and gardening. Figure 1 shows the decrease in total cultivated area across Uzbekistan. In addition, one point in the national strategy for 2017–2021 is the importance of crop diversification. Hence, some districts in Uzbekistan slowly started eliminating cotton production[1].

Figure 1

Total Cultivated Area of Uzbekistan, %



Source: Data collected from the Agriculture in Uzbekistan Annual Statistical yearbook, Statistics Agency Under the President of The Republic of Uzbekistan

Since the beginning of 2018, the government has introduced a different cotton production strategy known as the "cluster system" (Babadjanov & Petrick, 2023). Formally,

[1] Asaka (Andijon), Yangiyul (Tashkent), Jomboy (Samarkand), Tomdi (Navoi), Bostonliq (Tashkent), Qibray (Tashkent), Boysun (Surhandaryo), Olti-orik (Fergana) for the 2021–2022 harvesting season.

the national government ceased to be responsible for quota cotton production and transferred this right to clusters. Clusters, as explained by the Uzbek government, are so-called private enterprises, but in reality, they retain a monopsony and indirectly follow the quota system. Hence, the government retains control over cotton production and other agricultural production under the land allocation program within clusters (falolex.fao)[2]. Table 1 describes the official land arrangements of horticulture producers.

Table 1

Land Arrangement of Horticulture and Wheat Farms

Crops	**Occupied area**	**Main decision-maker**	**Outcome**	**Quota**
Wheat	50–70% of land	Agro-prom/cluster	Cluster directly buys wheat; Overproduction for farmer	Yes
Horticulture 1	30–20% of land	Agro-prom/ cluster	Cluster buys; Overproduction for farmer	Yes
Horticulture 2	10–15% of land	Processing plant or market	Freedom to choose crops and use any marketing channel	No
2nd sowing	Crop cultivated after wheat harvest	Market or as a payment to permanent workers (share-cropping)	Complete freedom; Mainly for household consumption or market	No

Source: Authors' own observation (expert interviews with agro-prom and hokimiyat workers of Yangiyul and Jomboy districts, lecturers from Samarkand Agrarian Institute). Note: Some shares of the 2nd sowing can usually be sharecropped to permanent workers instead of a monetary payment or sub-lease to villagers.

As mentioned, Table 1 describes the land allocation of horticulture farmers. All horticultural and wheat farms are required to allocate at least 50% of their land to wheat

[2] https://faolex.fao.org/docs/pdf/uzb70912E.pdf

cultivation and the remaining area to horticultural crops. For example, in interviews with agro-industry complex (AIC) workers in the Yangiyul district of Tashkent province, it was explained that farmers in the region are required to allocate 70% of their land to wheat cultivation under agreements with the agro-industry and/or horticultural/wheat clusters. Such tripartite agreements have become widespread after the introduction of the cluster system in Uzbekistan. As a result, farmers have little discretion to terminate these agreements or decide how to use the mandatory 70% of their land, making wheat production subject to the same restrictive procedures as cotton.

On the remaining 15–20% of the land, farmers must grow horticultural crops, which are identified by processing enterprises or clusters that request certain value-added crops from the local AIC or hokimiyat. The hokimiyat, or AIC, then concludes agreements with farmers and allocates quotas to grow specific crops. Farmers are required to sell their produce directly to clusters or processing companies at predetermined prices, which are set based on the previous year's prices by the hokimiyat, clusters, or processing companies. On this part of their land, farmers have limited autonomy in their choice of crops. However, these contracts are less onerous than those in cotton-growing areas. On the remaining 15–10% of the land, farmers have complete freedom to decide what to grow and where to sell their produce without the involvement of AIC. However, this system is not applied in all horticultural districts. For example, in Jomboy district (Samarkand province), as in Yangiyul, farmers are obliged to allocate a fixed portion of their land to wheat cultivation, but they still have some choice regarding marketing channels, as Table 2 shows. If they voluntarily choose to cooperate with a cluster or a processing enterprise, they can easily contract for certain crop quotas.

Table 2

Horticulture Marketing Channels

Marketing channel	**Agreement**	**Input**	**Finance**	**Possibilities to sell all crops**
Clusters	Contracts are created at the beginning of the crop cultivation season	Cluster can provide (not subsidized) the input if farmer asks about it	If necessary, clusters might provide credits without collateral	Yes
Processing plants	Two options for contracts: 1. At the beginning of the cultivation period 2. In the middle/end of the harvesting season	Do not provide any input	No financial support in advance	Yes
Market	No agreement	Farmers should buy themselves	No financial support	No (market risks, e.g., prices)

Source: Author's observation (based on expert interviews with agro-prom and hokimiyat workers of Yangiyul and Jomboy districts, lecturers from the Samarkand Agrarian Institute).

Good climatic conditions positively affect the productivity of horticultural products, and farmers can easily meet the quota within cluster agreements. If necessary, farmers can ask for financial support from the cluster. Farmers must pay taxes for all non-strategic crops, including all horticulture crops. Furthermore, recently, farmers started paying taxes for their water use. Ultimately, horticulture and gardening are costly but provide higher earnings and yields than traditional crops (ADB, 2016; Larson et al., 2015). Table 3 outlines farmers' decision-making process in this regard.

Table 3

Decision-Making Process for Farmers

	Main decision-making level	**Under-production**	**Over-production**
Cotton & wheat producers	From agro-prom or cluster	Possibilities to lose the land use right	If any farmers over-produce cotton, the cluster takes it away

Vegetables & wheat producers	Wheat quota; Horticulture depending on marketing channel	No cases found	Market or payment to permanent workers or farmers' own consumption
Gardening	Farmers	No quota	No quota

Source: Author's observation (based on expert interviews with agro-prom and hokimiyat workers of Yangiyul and Jomboy districts, lecturers from the Samarkand Agrarian Institute).

One advantage of horticultural crops over cotton is that surplus produce remains under the control of the farmer, who has the right to determine its use. For example, wheat producers often use it to pay permanent laborers such as weeders and irrigators, sell it in the market, or keep it for home consumption. Similarly, horticultural producers have complete flexibility to use or market their produce, including any surplus fruit and vegetables. This flexibility is not possible in cotton production, where farmers cannot control surplus produce.

There are several reasons for shifting from monoculture production to crop diversification in countries in Central Asia. A primary reason is to tackle climate change, such as to resist drought and ensure proper water management. Note that drought directly contributes to gender inequality by increasing the unpaid work for rural women and girls and decreasing education opportunities, paid employment, and decision-making participation (UNCCD, 2024).

Uzbek Gender Differences: How Women Live in Rural Areas

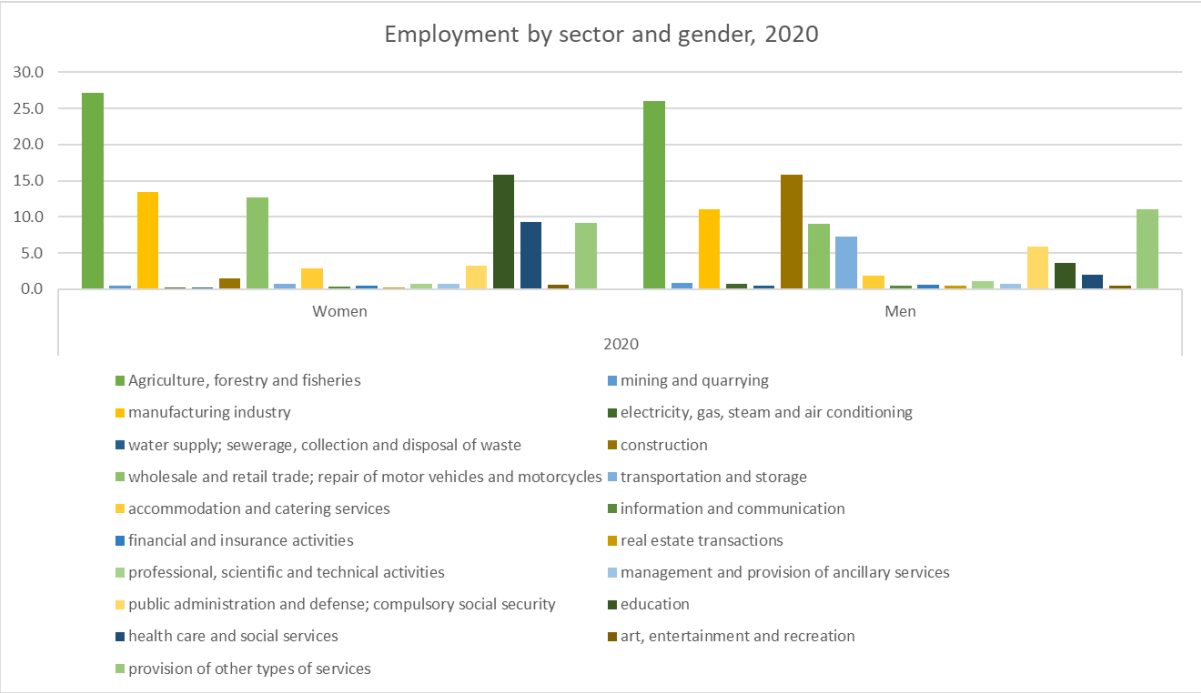
Uzbekistan is well-known for its patriarchal and traditional values. Hence, most heads of households are men. In 2020, only 18.1% of people lived in female-headed households, and these tend to be smaller and less poor than male-headed households (gender.stat.uz, 2021; Lerman, 2021). Regarding the right to make decisions within the household, we must consider the social norms and negative gender stereotypes prevalent in Uzbekistan. Gender roles are strictly clear for Uzbek households. While men earn money outside the home, women are expected to care for the house, children, and elder parents (Akiner, 1997; FAO, 2019; Kandiyoti, 2003). According to "gender.stat.uz," the average number of hours spent by women on unpaid work in 2023 was 5.36

hours per day, and this data does not include household chores and childcare. However, men spent 2.18 hours daily on unpaid work (gender.stat.uz, 2024). ~~Nevertheless, women constitute an important economic resource, providing a huge labor force for Uzbekistan's economic and social life. The labor market in Uzbekistan is also divided along gender lines, and there are certain professions where men or women predominate.~~ Finally, women do not have the same abilities and competencies as men in areas of public life including formal work and political positions. Hence, there are few women in managerial positions (FAO, 2019; Lerman, 2021).

In addition, women have less access to well-paying managerial roles due to gender prejudice in professional choices. There are certain sectors in which either men or women predominate, dividing the labor market among different genders (see Figure 2). However, women are an important resource, providing a vast workforce for economic and social life in Uzbekistan. For example, women play a significant part in the food system, which includes the conventional areas of food production, purchasing, processing, and cooking (Lerman, 2021; Najjar et al., 2022).

Figure 2

Employment Share by All Economic Sectors and Gender, 2020

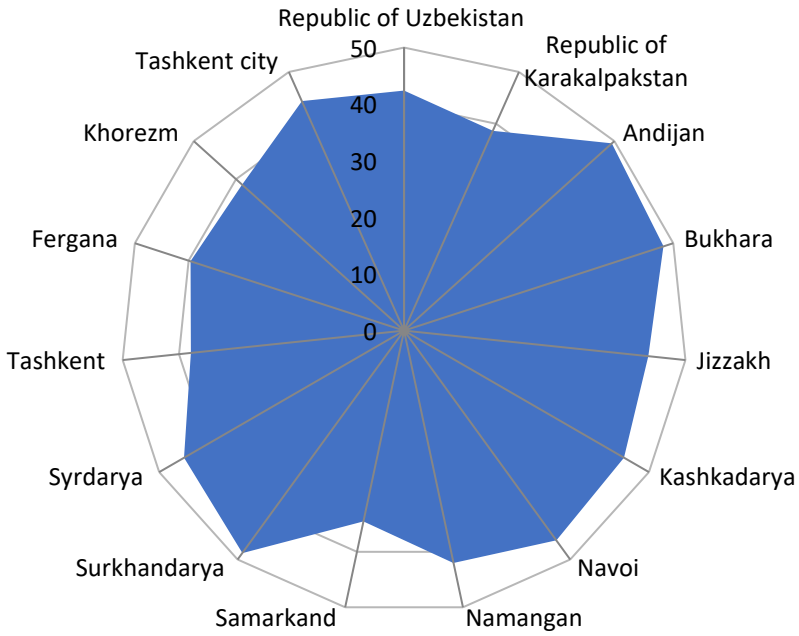


Source: gender.stat.uz, 31.1.2022

However, women's contribution is not acknowledged, especially in locations where they are the primary laborers and care givers. The gender pay gap—where women are paid less for everyday labor than men—remains the most obvious sign of bias in the labor market. In 2020, according to Figure 3, women made up 42.4% of the agricultural workforce and represented 27.1% of all female employment (gender.stat.uz, 2021). Regarding women's employment in agriculture, the greatest percentage works in Andijan Oblast (49.4%), followed by Surkhandarya Oblast (48.6%). The lowest percentage works in Tashkent Oblast (37.9%).

Figure 3

Female Share in Agriculture Labor by Province, 2020



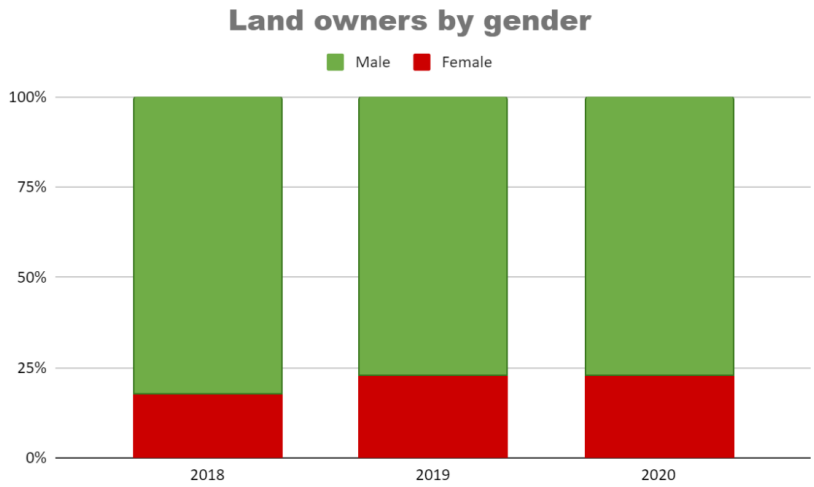
Source: gender.stat.com, 2022.

Regardless of women's equal rights at the legal level, prejudice against women farmers is prevalent in the day-to-day running of the farm. Most agricultural work is carried

out by women who own or manage farms, as they invest a large share of their labor and make most of the decisions affecting agricultural production. Lerman (2021) mentioned that women's place has changed dramatically since the collapse of the Soviet Union. This place has changed from women being part-time workers on collective and state farms on a small "subsidiary" garden plot to becoming full-time workers on family farms that include former garden plots after substantial expansion. In new Uzbekistan, only 4% of female farmers are officially registered and own land titles (FAO, 2019). In reality, the number of women who manage farms could be lower than 4%, because in some Uzbek families, it is common to register some businesses and farms in a woman's name, even though these "women farmers" do not have actual control over these farms. Figure 4 shows the landowners for the 2018–2020 period by gender.

Figure 4

Landowners by Gender, %



Source: gender.stat.uz. Note: The definition of "land" is not clearly defined by the statistical committee. The figure shows all kinds of "land," not specifically agricultural land.

Regardless of women's equal rights at the legal level, female farmers face discrimination in the day-to-day management of the farm. FAO (2019) emphasizes that female farm managers face trust problems with local administrations and AIC. Women primarily perform daily farm work such as picking cotton or harvesting fruits and vegetables. Although rural women classified as unpaid “housewives” are economically inactive, they participate in informal and part-time/seasonal work or unpaid work on family farms and homesteads (FAO, 2019). These daily farm workers are informally employed, and women are less likely to report that someone has formally employed them in the rural sector. Although women in such jobs earn wages that increase family income, their informal employment deprives them of all social benefits such as sick leave, maternity leave, holidays, and pension contributions (Lerman, 2021).

Thus, this study focuses on female farmers and workers. In this study, female farmers are legally registered as managers of private farms that cultivate horticulture or cotton. Workers are informal daily laborers who are part time or seasonal. Women working in these positions earn wages that supplement family income. However, because their employment is informal, they are not eligible for any social benefits including paid time off for illness or vacation and pension payments (Lerman, 2021).

Theoretical Framework: Conceptualizing the Well-being of Rural Women

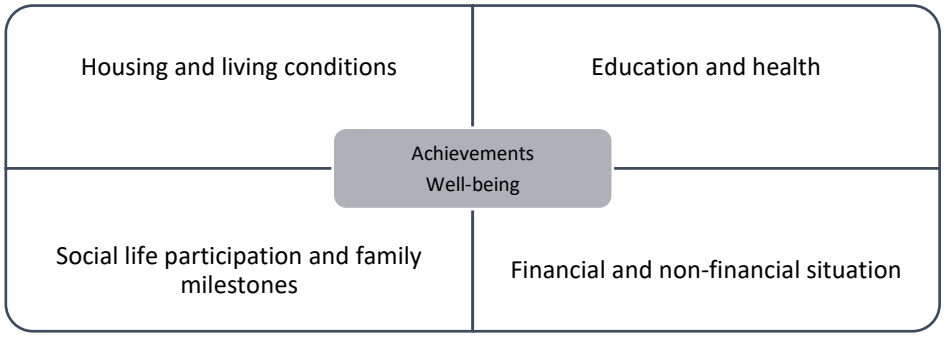
As women often play a key role in various stages of agricultural production and processing, the shift from monoculture to crop diversification has been shown to create significant rural employment opportunities, potentially increasing the workload of rural women (De et al., 2010; Dolan & Sorby, 2003; Emana et al., 2015; Feliciano, 2019; Fraser, 2006; Joshi et al., 2004; Kasem & Thapa, 2011; Teklewold et al., 2013; Van den Broeck et al., 2016). In defining well-being, the key problem is deciding what dimensions of life to include

and how to measure them. Hence, in our context, well-being refers to the changes in well-being experienced by rural women following the adoption of horticulture crops in specific districts.

One of the easiest ways to measure well-being is monetary measurement. Samuelson (1974) introduced this income-based metric or monetary measurement, which gained attention in the 1980s in applied welfare economics. Economists such as Deaton, Muellbauer, and King explored the concept in their work during this period (Decancq et al., 2015). The method was useful in measuring economically developing nations' well-being based on their economic growth. However, with further studies, economists broadened their perspective and started including more than monetary measures to approximate an individual's multi-dimensional well-being. Essentially, well-being also encompasses other important aspects of life that bring happiness, including *health, the quality of social relationships, environment, employment, and job satisfaction* (Frey & Stutzer, 2002; Hausman & McPherson, 2009; Kahneman et al., 1997, 2004; Kahneman & Krueger, 2006; Layard, 2005; Sen & Williams, 1986; Stiglitz et al., 2009), as Figure 5 shows.

Figure 5

Achievements (Well-being) in the Comparison of Farmers and Workers

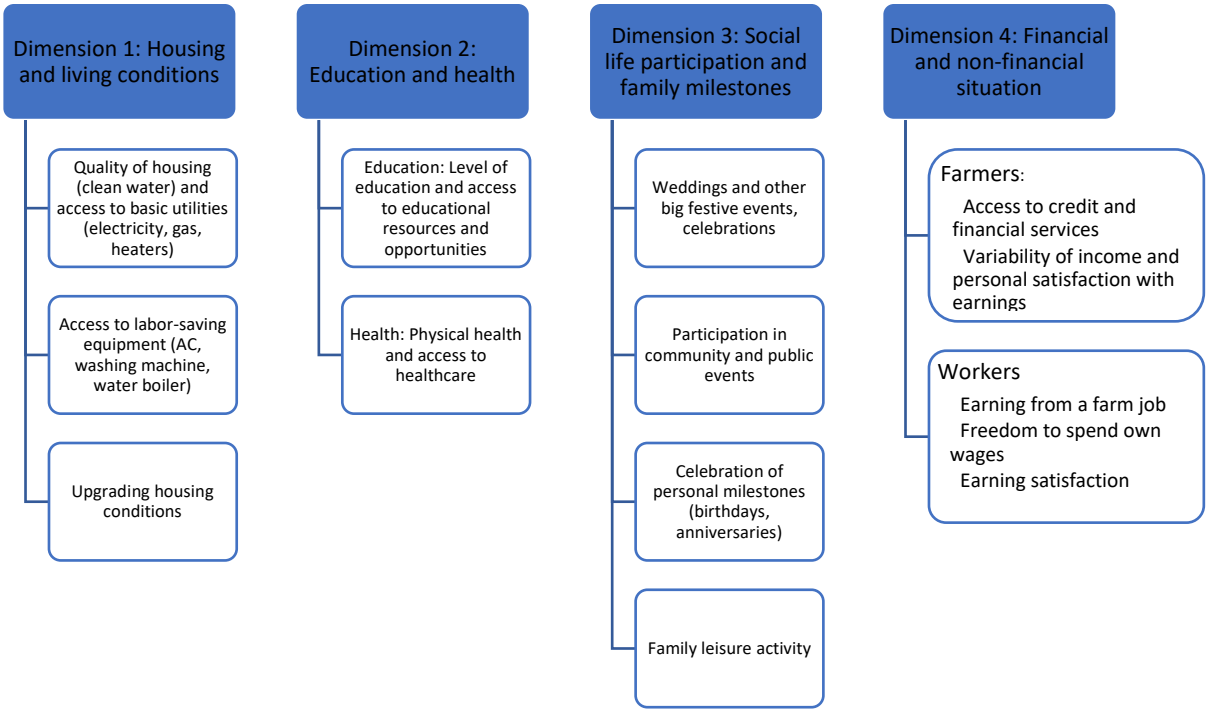


Recent economic literature in agriculture explores various well-being dimensions for farmers and farm workers, which include areas such as economic and environmental factors, agricultural management, general and physical health, mental health, governance, education, human-nature relationships, emotional well-being, culture, place, and factors contributing to ill-being (Alarcon et al., 2020; Bartl, 2019; Isaac et al., 2024; Mahama et al., 2021; Mourão et al., 2019; TerAvest et al., 2019). The financial situation directly affects farmers' well-being as it may be limited or improved by the quality and quantity of inputs, poor means of production, and lack of ability to pay workers (TerAvest et al., 2019). However, Brennan et al. (2020) highlight that the creation of farmer well-being indicators often neglects social and cultural dimensions despite their acknowledged importance in achieving sustainability in agriculture.

Hence, the integration of housing and living conditions, education and health, financial returns, social life, and access to resources offers a comprehensive framework for assessing the well-being of farmers and farm workers across different agricultural systems (see Figure 6) (Ahmed et al., 2019; Kaufman, 2015; TerAvest et al., 2019).

Figure 6

Dimensions of Well-Being



As mentioned, Figure 5 illustrates the primary dimensions of our study, while Figure 6 delves into the detailed sub-dimensions. To approximate and compare the well-being of women of different socio-economic statuses, it is necessary to develop an accurate measure of well-being that allows a fair comparison of their living conditions. Thus, we look beyond the financial situation in our comparison of well-being. We illustrate our dimensions of well-being using qualitative research methods that consider several factors.

For our purposes, household conditions including housing quality, access to clean water, sanitation, and basic utilities such as electricity and heating are also critical. Family and personal characteristics such as educational background, access to educational resources, and physical health play an important role in overall well-being. The social dimension focuses on participation in cultural events, festivals, weddings, and family gatherings, as well as celebrating personal milestones such as birthdays and enjoying social

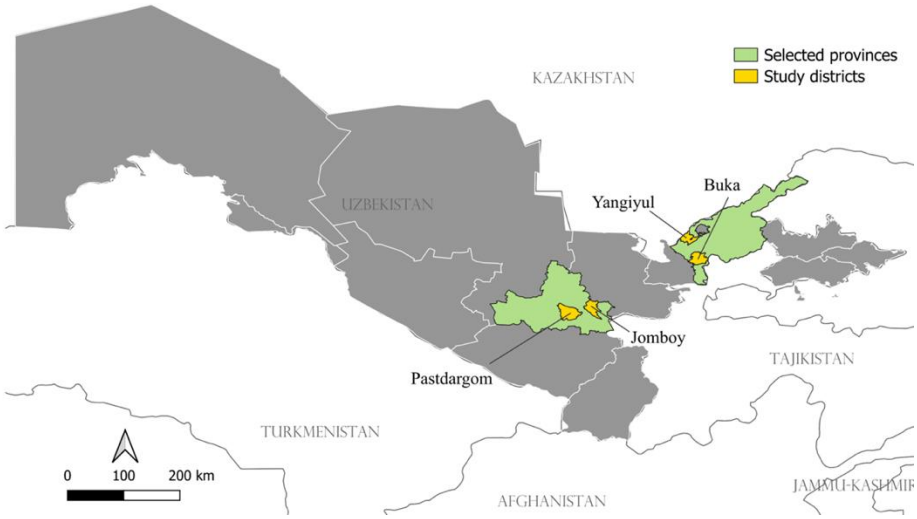
meals (Ahmed et al., 2019; Kaufman, 2015). The economic dimension considers factors such as financial stability, access to credit, and job satisfaction for both farmers and workers (Ahmed et al., 2019; Kaufman, 2015; TeraVest et al., 2019). Together, these dimensions provide a comprehensive and holistic understanding of the factors that influence the well-being of women farmers and farm workers.

Data and Method of Analysis

Data were collected in September 2021 in two cotton-oriented and two horticulture-oriented districts. The horticulture districts in our study were selected for several reasons. First, it was among the first districts to decrease cotton production in 2011 after the areas were considered too unstable for cotton production. A presidential decree issued that year mandated those three districts, including the two in our study (Jomboy and Yangiyul), to transition to the production of vegetables and fruits (Larson et al., 2015). The horticulture districts the state allowed are located nearby large cities. (Jomboy district is close to Samarkand city, and Yangiyul district is next to Tashkent city). The cotton districts (Buka and Pastargom) were selected for our study because they are geographically proximate to the horticultural districts, but as close to large cities as the horticulture ones. Thus, the geographical differences between the cotton and horticulture districts may influence the results of the study. Figure 7 shows the districts that are the focus of this study.

Figure 7

Map of the Study Field



Source: Based on the GADM database of Global Administrative Areas (2021).

The National Research University TIIAME supported the study, which was assisted with the participation of the hokimiyats of the oblasts of Tashkent and Samarkand. We began by visiting the hokimiyat or AIC's agriculture division in each district. Furthermore, we identified female farmers with the aid of the local government. In each district, speaking with two to eight female farmers was feasible. Thereafter, these farmers assisted us in finding daily female workers. Extensive in-person interviews were conducted from September to December 2021. Each semi-structured interview lasted between 20 and 70 minutes.

In total, 43 respondents—farmers and workers—from all 4 districts participated in our study. We ultimately interviewed 23 farmers: 8 from Buka, 2 from Pastargom, 5 from Jomboy, and 8 from Yangiyul. We also interviewed 20 workers: 6 from Buka, 3 from Pastargom, 7 from Jomboy, and 4 from Yangiyul. However, one interview from Jomboy was not considered due to short responses to the questions.

During the visit, the interviews with respondents focused on various aspects including personal factors, economic activities, household dynamics, family situation, educational background of respondents and family members, household living conditions, women's time allocation, and horticultural outcomes. To ensure the validity of the responses, we also interviewed local AIC and local hokimiyats, as well as university faculty members from Samarkand Agroinnovations and Research University, Westminster International University in Tashkent, and the "Tashkent Institute of Irrigation and Agricultural Mechanization Engineers" National Research University. In addition, the interview questions were tested prior to the fieldwork with colleagues. Within the field, we tested the questions with villagers from the Buka district. Each question was carefully evaluated for appropriateness and sensitivity before being asked. Some questions were added directly in the field, as responses to earlier questions generated further questions. Finally, the responses were analyzed via thematic analysis (Brown & Clarke, 2022; Bryman, 2012; Flick, 2009, 2014; Guest et al., 2012), wherein the questions were divided into themes and subthemes and compared within different groups.

Results

The interviewed farmers ranged in age from 44 to 67 years. The interviewed workers were noticeably younger, ranging in age from 28 to 65 years. Among those interviewed, 9 of the 23 farmers had a university degree, in stark contrast to the 1 of 19 workers with a similar level of education. In addition, each household had a *tomorka*, a vegetable garden plot adjacent to or near the house, which was used mainly for growing produce for household consumption. Table 4 provides more details on the interviewed farmers and workers.

All respondent farmers became farm managers after the collapse of the Soviet Union, some in the early 1990s and others in more recent years. During various land and farm optimization periods, farm tenders sometimes occurred, which saw changes in the farm managers and the size of

farms. Some farmers obtained their land in this way, although others inherited it from their parents or parents-in-law. Women who already had an agricultural-related background, either from education or intensive work experience around collective farms, found it easier to manage the farm. Regardless, all respondents highlighted the difficulties experienced when they began managing a farm.

Farmers from Buka, Pastargom, and Jomboy lived in their respective districts. However, half the farmers from Yangiyul mainly lived in the city of Tashkent and travelled to their fields periodically. The other half lived in the immediate vicinity of the farm. In addition, a small number lived in district centers, from where they reached the fields in their own cars, often driven by their sons. In general, most farmers expressed satisfaction with the short distances they had to travel to the farm. In contrast, some horticultural workers in Yangiyul do not live in the district but in cotton-orientated areas such as Chirchik. In Jomboy, however, all workers live in their villages or even within the same mahalla. Similarly, cotton farmers also live in their own or neighboring villages.

Table 4

Characteristics of Female Farmers and Female Workers

	Cotton farmers (10 respondents)	**Horticulture farmers (13 respondents)**	**Workers from cotton districts (9 respondents)**	**Workers from horticulture districts (10 respondents)**
District	Buka (Tashkent) Pastorgom (Samarkand)	Yangiyul (Tashkent) Jomboy (Samarkand)	Buka (Tashkent) Pastorgom (Samarkand)	Yangiyul (Tashkent) Jomboy (Samarkand)
Age (years)	44–62	45–67	28–62	32–65
Educational degree (number)	University degree (5) Vocational school degree (3) High school (2)	University degree (4) Vocational school degree (6) High school degree (1)	Vocational school degree (4) High school degree (5)	University degree (1) Vocational school degree (2) High school degree (7)
Number of children	2–3	2–3	2–3	1–4
Availability of *tomorka*	Yes	Yes	Yes	Yes

Availability of household (hh) animal	Yes	Yes	No or poultry	Yes
Availability of car	Yes (themselves or husband/son uses)	Yes (themselves or husband/son uses)	No	No/Yes (husband/son uses)
Can drive a car	Yes/No	Yes/No	No	No
Household chores	Daughter-in-law/herself	Daughter-in-law/herself	Herself/unmarried daughters	Herself/unmarried daughters/ daughter-in-law
Head of household	Themselves or husband	Themselves or husband	Husband or parents-in-law	Husband or parents-in-law
Lives with	Husband, son, daughter-in-law, and grandchildren or son(s), daughter-in-law, and grandchildren	Husband, son, daughter-in-law, and grandchildren or son(s), daughter-in-law, and grandchildren	Husband and children or parents-in-law, husband, and children	Husband and children (grandchildren)
Household decision-making	Farmer herself/ farmer herself together with husband	Farmer herself/ farmer herself together with husband	Husband/parents-in-law	Husband/parents-in-law

All farmers raised livestock. Sheep, cows, and poultry were typical choices. Only some workers had household livestock. Notably, only a minority of farmers, 4 of the 21 interviewed, know how to drive automobiles. However, almost every farm household had a personal automobile driven by a male family member. In contrast, most workers' families did not have personal vehicles.

Workers' age ranged from 28 to 65 years, and they had between 1 and 4 children. On average workers had a high school diploma and lived with their parents-in-law. Even if they did not live with their parents-in-law, the husband was the head of family. They or their daughters performed all household chores. Typically, the household did not have a vehicle, and most had a *tomorka* in tomorka they grew vegetables for daily household consumption.

Only two of the workers interviewed also engaged in other economic activities. For them, daily farm work provided an opportunity to earn extra money.

Below, the results regarding each dimension are discussed.

Dimension 1: Livelihood and Household Conditions

Table 5 summarizes the key findings for Dimension 1.

Table 5

Results for Dimension 1

	Farmers	**Workers**
Quality of housing and access to basic utilities		
Cotton districts	• Unreliable electricity, although recent infrastructure improvements have led to some satisfaction with the availability of electricity. • Access to clean water is generally adequate, with many farmers using piped water systems or wells. • Heating systems are often based on traditional methods such as firewood and coal due to lack of access to gas.	• Frequent interruptions to electricity. • Clean water availability depends on wells and other sources. • Traditional heating methods are popular. • Gas cylinders rather than gas lines are used.
Horticulture districts	• Fewer power outages and slightly better stability of electricity supply compared to cotton districts. • Various heating sources are used, including traditional stoves, electric heaters, and air conditioners. Some are planning to install more modern systems. • Access to water is generally good, but hot water is not always available from taps.	• Fewer electricity outages compared to cotton districts. • Depends on water wells or other sources. • Traditional heating methods are used. • Gas cylinders rather than gas lines are used.
Access to labor-saving equipment		
Cotton districts	• Some have water boilers (Ariston). • Some own washing machines but might prefer to do the laundry manually (handwashing).	• Do not own water boilers. • Do not own washing machines.
Horticulture districts	• Fewer farmer reported about water boilers • Fewer reported owning washing machine • Some farmer own AC and vacuum cleaners	• Do not own water boilers • Few own semi-automated washing machines
Upgrading housing conditions		
Cotton districts	• There are reasons for large-scale renovations, such as preparations for wedding celebrations. • Renovations are a trade-off between other expenses.	• Slow improvements due to a lack of finances. • Financial constraints are common.

	• Harvest season influences the timing of the renovations. • Income from horticulture crops contributes toward financing renovations.	
Horticulture districts	• Large-scale renovations are undertaken when there are sufficient resources available. • Renovations are a trade-off between other expenses.	• Partial improvements • Financial constraints

Quality of Housing (Clean Water) and Access to Basic Utilities (Electricity, Heating, Cooling)

Numerous aspects characterize rural infrastructure in Uzbekistan. Roads in rural areas are often in poor condition, making it difficult to transport agricultural produce and access markets. Furthermore, an unstable electricity supply is another problem, especially in some areas. In addition, access to clean water and quality sanitation remains limited, and many households rely on wells. Finally, access to gas is obtained mainly through the utilization of gas cylinders.

In our analysis, the responses from farmers and workers confirm and highlight various issues related to household infrastructure in rural communities. In general, all farmers expressed satisfaction with the quality of electricity in their area, citing recent rural infrastructure developments as a contributing factor (Buka 2, Buka 4, Buka 5, Buka 8, Jomboy 4, Jomboy 5, Yangiyul 2, Yangiyul 7, Yangiyul 8). The introduction of advanced electricity meters has enabled alerting users of a low balance, thus preventing potential disconnection (Buka 1[3], Buka 2). However, it is notable that some farmers continue to experience intermittent electricity supply (Buka 7). The horticultural farmers did not mention electricity meters. This suggests that in areas historically oriented toward cotton production, infrastructure has generally begun to undergo changes driven by local

[3] "An electricity registration device has recently been installed in our house. If the prepaid money ends, it (electricity) lets us know two days in advance. But if you pay on time, it doesn't turn off" (Buka 1).

authorities' desire to control electricity use. However, horticulture farmers also mentioned that no power outages had occurred in the last two years (Jomboy 1, Jomboy 5, Yangiyul 8).

Water used for household consumption is described as being freely available, allowing households to meet their daily water needs without major problems. Its availability facilitates various activities including cooking, cleaning, bathing, and washing. However, the availability of clean, fresh water is under question. While many farmers have access to water through piped systems or mechanically driven pumps, workers often face challenges in securing similar access.

Water from taps or mechanically driven systems is generally considered safe for drinking and other household uses. Some farmers have taken the initiative to make their own arrangements for hot and cold water (Buka 1, Buka 2, Buka 4, Buka 5, Buka 6, Buka 8, Jomboy 2, Jomboy 3, Jomboy 5, Yangiyul 2). To this end, they have installed their own water boiling systems (*Ariston*). There are also references to a water billing system and the need for timely payment of bills to avoid interruptions in water supply. In these cases, non-payment of bills can lead to an interruption of water supply (Buka 2).

However, obtaining hot water directly from the tap is a luxury for the majority of workers. Several workers such as Buka 1, Buka 2, and Buka 5 mention having access only to cold water. Meanwhile, Buka 4 does not even have access to cold water in her house. As Pastargom 2 and Buka 6 note, significant challenges are involved in collecting water, as some have to collect it from outside sources such as wells (Jomboy 3). Hot water is often prepared by boiling cold water on gas stoves (Buka 1, Buka 5, Jomboy 3, Jomboy 6, Jomboy 7). Finally, some workers obtain cold water from pipelines (Jomboy 4), boiling it to meet their hot water needs.

The **heating systems** in cotton-oriented villages range from traditional methods such as wood or coal stoves to modern solutions such as gas or electric heating. The majority of cotton farming households rely on traditional heating methods, using firewood and coal to heat stoves during the colder months (Buka 1, Buka 2, Buka 4, Buka 6, Buka 7, Buka 8). One farmer uses air conditioners for guests and stoves for other parts of her house during the cold months, while another relies on a stove due to frequent gas outages affecting her gas line heating (Buka 1, Buka 6). Furthermore, two respondents mentioned steam heating as a potential heat generation method, although the energy source was not specified (Buka 3, Buka 5). Finally, only one farmer mentioned using gas as a source of heating (Pastargom 1), while another used an electric heater (Pastargom 2).

Horticultural farmers use several heating methods and do not rely on any one type of heater. In general, traditional stoves are used in addition to electric heaters (Jomboy 1, Jomboy 4). Similar to cotton-oriented districts, some farmers use only furnaces (Jomboy 2, Jomboy 3), and if access to the gas is poor, they use either wood or coal for the stove. One farmer also mentioned using an air conditioner as a heater together with the electric heater. Finally, a farmer mentioned plans to install a central heating system in a newly constructed building[4].

As farmers, many workers use stoves for heating with wood or gas (Buka 1; Buka 4, Buka 6, Pastargom 2, Jomboy 3, Jomboy 6, Jomboy 7, Yangiyul 4), although some mentioned using electricity (Pastargom 3). Buka 5 and Buka 6 are working on improving heating systems in their homes, with Buka 6 detailing the household financial challenges that have

[4] "We use a gas cylinder for that. We have water pipes. In winter, we heat the house with an air conditioner and electric heater. My mother has a simple heater, and we burn wood for it. I am building a new building (onto my house), and I plan to have a central heating system after the construction is finished. But for now, I will adjust to the wood" (Jomboy 4).

affected the heating system in previous years[5]. Pastargom 2 collects wood in the summer for heating, indicating a reliance on traditional fuel sources due to a lack of gas or consistent electricity supply.

Access to proper gas is problematic for many respondents, regardless of their position. The rural infrastructure of gas pipes is also only available to those living in district centers or nearby areas. Due to the development of rural infrastructure, very few respondents including farmers (Buka 6, Pastargom 1, Jomboy 1) and a worker (Buka 4) have access to a gas line. However, another respondent (worker: Buka 6) noted that although gas lines have been installed in their village, they are yet to be connected to their house. All other respondents are using gas cylinders as a source of gas.

Moreover, both farmer groups express frustrations with distribution delays and bureaucratic hurdles, which hinder equitable access to **gas services**. Distribution problems, delays, or difficulties in obtaining gas cylinders are also reported. One farmer mentions that affluent families, teachers, and government employees have better access to gas infrastructure than farmers or economically disadvantaged households. Note though that the workers did not specifically complain about their situation and in general, were not very vocal in their responses.

Access to Labor-Saving Equipment (Air Conditioner, Washing Machine, Water Boiler)

Access to labor-saving equipment generally necessitates a certain level of economic stability. Water boilers, particularly the Ariston brand, are a common example of such

[5] "Currently, there is construction, and we are making heaters for our house. There was only one room available; however, with the construction, it is in every room now. Last year, my son was stubborn and only made a stove because he wanted to put heating in every room during a big renovation. Last year, there was a coal stove in two rooms. He saved some money for renovation, and we were planning to start one last summer (2021). However, there were other expenditures. We organized a festive event for our grandchildren with that money. That's why we couldn't do a renovation in our home last summer" (Buka 6).

equipment that is widely used in urban areas. Another significant labor-saving device is the washing machine, which helps reduce unpaid labor time, especially for women. These machines do not have to be fully automated; semi-automated models are also popular.

A discussion on water boilers indicated that many workers rely on gas stoves to heat water when hot water is needed, while many farmers have at least one Ariston water boiler. This difference indicates higher economic stability and convenience among farming households. Nevertheless, in discussions on water boilers, opinions among cotton farmers varied. One farmer mentioned the widespread adoption of water boilers[6]; in contrast, another farmer highlighted limited availability[7]. Six cotton farmers mentioned Ariston water boilers, with one farmer even having two—one for the kitchen and another for the bathroom (Buka 1, Buka 2, Buka 3, Buka 4, Buka 5, Buka 6). In the horticulture district, only one farmer reported using an Ariston boiler (Jomboy 2). Five of the 12 horticulture farmers did not provide responses about water boiler machines, and 3 mentioned having hot water without specifying the heating method. No workers mentioned owning water boilers, and they generally described boiling water as needed.

Regarding washing machines, opinions were split among cotton farmers. One resident who had a washing machine stated an interesting opinion[8], explaining that they enjoyed doing laundry by hand and did not want to rely on machines all the time, which is associated with city life. Furthermore, another farmer also expressed a preference for doing laundry by hand[9] (Yangiyul 8).

[6] “Every household now has an Ariston heater. People love themselves. No one carries water; water flows from the tap nowadays" (Buka 1).
[7] "We have a separate Ariston in the kitchen and a separate bathroom. We built it ourselves. Not everyone has it. It is available to well-to-do families, teachers, and government employees" (Buka 3).
[8] "We have a washing machine. However, I like to do laundry by hand. I don’t want to do laundry all the time with machinery. Using machinery is more suited to city-style life conditions, which we don't have" (Pastargom 1).
[9] "I have never felt the need for a washing machine. I do laundry by hand” (Yangiyul 8).

Among the horticulture respondents, at least three mentioned having a washing machine, while others did not discuss it. However, some respondents mentioned owning other household appliances such as vacuum cleaners, air conditioners, and refrigerators.

Four workers mentioned not having a washing machine and doing the laundry by hand (Workers: Buka 4, Buka 6, Pastargom 2, Pastargom 3). Buka 5 managed to purchase a washing machine through hard work, showing that improving living conditions is possible but challenging. Ultimately, owning a washing machine is the goal for some workers, as it reduces the time it takes to do the laundry[10]. In contrast to horticulture workers, few workers have washing machines, and those are mainly semi-automatic (Jomboy 2, Jomboy 3, Jomboy 6). However, even those with machines often do laundry by hand. Others, like Jomboy 4, do not have a washing machine, indicating financial reasons for sticking to manual laundry.

Upgrading Housing Conditions

Reconstruction of or slight renovation to the house is considered an update to living conditions. All farmers consider home renovation alongside various factors including economic resources, time and motivation, the scale of renovation, and planning and execution challenges.

Based on the farmers' responses, we observed that one of the main factors driving large-scale home reconstruction is an upcoming wedding of one of the children (Buka 4, Buka 8, Yangiyul 7). However, as it is a big financial commitment, some farmers do small renovations or slight changes to the wall color or roof. Some cotton farmers undertake

[10] "We don’t have a washing machine. I want to buy one soon. After the renovation of the heating and gas pipelines, the next goal will be the washing machine" (Worker: Buka 6).

gradual improvements over several years because of financial or logistical constraints (Buka 1).

Agricultural seasons heavily influence the timing and progress of home renovations for farmers, as seen with the experience of Pastargom 2. During the harvesting season it is difficult for farmers to stay at home and control the renovation process. Managing construction projects can be demanding, requiring homeowners to juggle multiple responsibilities including taking care of workers, as noted by Pastargom 2. Farmers' income from farming activities significantly impacts their ability to finance home repairs. For example, Jomboy 1 used profits from growing carrots to finance extensive repairs.

Trade-offs with other spending or investment activities demonstrate the limitations imposed by budget constraints. Yangiyul 8 postponed renovating the interior of the house to pay for tutoring and education-related expenses. The high cost of education often reduces the disposable income available to spend on home renovations.

The responses of all workers regarding home renovation demonstrate the diversity of living conditions and efforts to improve them. While some workers are actively engaged in repairs or have recently completed them (Buka 3, Buka 5, Jomboy 4, Jomboy 5, Jomboy 6, Yangiyul 3, Yangiyul 5), others are planning future repairs, currently constrained by financial or family factors (Buka 4, Buka 6, Pastargom 2).

Some, like Buka 2, need immediate renovations after moving, while others, such as Buka 3, are enhancing their living conditions. Workers like Buka 4 are saving for major future renovations. External factors including government requests can prompt quick action, as seen with Buka 5 during COVID-19 pandemic quarantine. Furthermore, some horticultural workers are constantly engaged in repairs through partial annual improvements (Jomboy 6) or as part of large ongoing projects (Yangiyul 3).

Income from agricultural activities plays a role in financing renovations, as demonstrated by Pastargom 2. However, not every worker's daily earnings from agricultural work contribute directly to these renovation efforts. However, some horticulture workers disagree with this statement. For example, one mentioned that daily farm work income goes directly to daily household expenses such as groceries. For renovations, large lump sums of money are needed.

Summary

Living conditions in the rural areas of Uzbekistan differ significantly depending on the individual's economic position and stability. There are virtually no differences between respondents from the horticulture and cotton-growing areas regarding access to basic utilities. However, there is a marked difference between farmers and workers. Farmers generally have better access to basic utilities including gas, electricity, hot and cold water, and heating systems. In contrast, workers often do not have consistent access to these amenities.

The differences in rural infrastructure between the cotton-growing and horticultural areas are primarily due to government rural infrastructure development projects such as the *Obod Qishloq* initiative, which has improved the stability of the electricity supply in these villages (lex.uz, 2024)[11][12]. Nevertheless, workers' responses indicate significant challenges with household infrastructure, particularly regarding gas supply and access to hot water. Many households lack direct gas pipelines, relying instead on gas cylinders, coal, and wood. Reliance on traditional methods (wood, coal) for heating is common for farmers and workers in all groups.

[11] https://www.zarnews.uz/uz/post/jomboy-tumanida-obod-bolayotgan-qishloqlar
[12] https://lex.uz/ru/docs/5352592

We must mention our outlier, who has the poorest living conditions among farmers. She is also one of the reasons that the difference between cotton and horticulture farmers is larger. Economic constraints significantly limit the ability to improve the living conditions of this farmer and her family.

In terms of labor-saving machinery, farmers generally have similar access to equipment such as washing machines and water boilers. However, there is a slight difference among workers: horticulture workers tend to have better access to washing machines than cotton workers, although manual laundry remains common in both groups. Despite these challenges, there is an evident effort to adapt and improve living conditions, with plans for future enhancements like installing water boilers for workers.

In addition, a significant incentive for home renovation among all respondents is festive occasions such as weddings and other celebrations (childbirth or *sunnet toy*). However, financial constraints are a common issue that renders large-scale home renovation problematic. As a result, some respondents opt for partial or minor renovations or prioritize other expenses such as funding their children's education. Despite these problems, all respondents are keen to improve their living conditions by repairing and modernizing their household utilities.

Dimension 2: Family and Personal Characteristics

Table 6 summarizes the key findings for Dimension 2.

Table 6

Results for Dimension 2

	Farmers	**Workers**

Cotton districts **Horticulture districts**	**Education:** • Support education of children/grandchildren • Private universities and private tutors • Cotton farmers: local universities • Horticulture farmers: local/international schools	**Education:** • They hope children will be able to attend a university. • Might have children who migrate for work. • Tuition fees are concerning.
Cotton districts	**Healthcare:** • Frequent check-ups • Local district clinics • Alternative treatment choices • Family and preventive care	**Healthcare:** • Alternative treatment choices • Economic constraints
Horticulture districts	**Healthcare:** • Urban private hospitals • Delayed health prioritization • Sanatorium visits	**Healthcare:** • Pharmacies first • State-supported care for chronic illness • Family-driven health choices

Education: Level of Education and Access to Educational Resources and Opportunities

In Uzbekistan, education for children aged up to 11 years is free and compulsory (primary school, secondary and high school). In addition, numerous territorial, vocational, and higher educational institutions are available. Obtaining a bachelor's degree can enhance employment opportunities, particularly in government positions. Prospective students can finance their education in one of two ways, namely through government scholarships or through contract-based tuition fees.

Farmers generally have higher or vocational degree education. On the other hand, in many cases, workers have only the first 11 years of education. Nevertheless, all respondents consistently emphasized the importance of education throughout the interviews. Farmers prioritize the education of their children and grandchildren, often making significant financial sacrifices to ensure they receive higher education. Many farmers also emphasize investing heavily in education from their farm income (Buka 4, Buka 1, Buka 8, Jomboy 1, Jomboy 3, Jomboy 4, Yangiyul 2, Yangiyul 7, Yangiyul 8). This includes paying for tuition, transportation, and private lessons.

Private tutoring is one investment among cotton farmers, especially from grade 7 onward, which is when children/grandchildren prepare for university exams (Buka 2, Buka 5). Families focus on strengthening core academic subjects and language skills. Buka 4 and 5 emphasize tutoring in languages such as Russian, English, and Arabic. However, this is not practiced in every family. A major reason for not continuing education is finances. In addition, farmers also mentioned scholarships or contract-based education. When children/grandchildren receive a scholarship, farmers noted it without us asking about it (Buka 8). Furthermore, private kindergartens were mentioned frequently. Farmers whose grandchildren attend kindergarten choose them because of their easy accessibility and better education opportunities (Buka 1; Buka 2; Buka 6).

Compared to cotton farmers, almost all horticulture farmers' children pursue or are pursuing higher degrees in education or vocational degrees. Both sons and daughters are given educational opportunities[13]. The outcomes of these educational investments are diverse. Some children pursue higher education abroad (Yangiyul 5's child in Kazakhstan, Yangiyul 2's in Poland), while others attend prestigious institutions locally (Yangiyul 8's sons, who received scholarships). There is a strong emphasis in most families on education, with significant financial investments and reliance on private contracts. Farmers often use their farming earnings to fund these educational pursuits (Jomboy 1, Jomboy 2, Jomboy 3, Jomboy 4, Jomboy 5, Yangiyul 2, Yangiyul 5, Yangiyul 7).

Comparing cotton versus horticulture farmers, the latter demonstrate higher financial stability, which enables them to better support their children's higher education. However, both groups invest significant financial resources to support education, including

[13] For example, Jomboy 5's daughter is studying to become a nurse, and Yangyul 1's daughter is an accountant. Jomboy 1's son is training to be a police officer, Jomboy 5's son is a surgeon, Jomboy 4's son is an architect, and Yangiyul 7's son is an agricultural specialist. Overall, there is strong support for higher education.

private contracts and scholarships, which are often obtained with the help of private tutoring. Both groups frequently mention private kindergartens, reflecting a preference for early education in a private environment.

The situation differs for workers, firstly due to age. Workers tend to be younger than farmers; hence, most cotton workers' children are still pupils at school (Buka 1, Buka 2, Buka 4, Buka 5, Pastargom 2). Educational aspirations vary; although some workers have themselves not received tertiary education, they express the hope that their children and grandchildren will attend university, indicating a desire for upward social mobility through education (Buka 6). Family relationships play an important role: some children go into military service directly out of high school or help with household chores (Buka 1, Buka 6). Moreover, there are huge financial challenges for workers. This also prevented them from sending their children to private kindergartens or enrolling them in private classes (Buka 4, Buka 5).

Horticulture workers also reported that costs prevented them from enrolling their children in private kindergarten or private tutoring programs (Jomboy 1, Jomboy 6). Despite that, there is an interest in learning languages (Yangiyul 5, Jomboy 1). Only one horticulture worker mentioned sending their children abroad to work and support their family through remittances (Jomboy 5). However, parents try to provide higher education for their children. One worker mentioned that his child had enrolled in a medical university, but expressed concern about tuition fees as it was a private contract rather than a scholarship (Jomboy 1). In addition, other workers mentioned that their children had graduated from a vocational school (Jomboy 5, Jomboy 6).

Health: Physical Health and Access to Healthcare

Uzbekistan's healthcare system is state-funded, offering free medical care to all citizens[14]. The government-operated health system is structured in three hierarchical tiers: the national level, viloyat level, and local level, which includes rural districts or cities[15]. In rural areas, primary healthcare has shifted to a two-tier system, while urban specialized polyclinics are being restructured into general polyclinics that cater to all urban residents[16]. In rural areas, these polyclinics are usually located in district centers. However, the quality of state-owned hospitals is under question. There have been state and private hospitals in recent years, especially in urban settings, where the number of private clinics and private hospitals has significantly increased.

The health practices of respondents vary based on accessibility to healthcare facilities, personal habits, and influence of family members. In Uzbekistan, health insurance is not widespread and usually, people do not have one unless they work in a government job, which creates an automatic employment situation. Neither farmers nor workers have health insurance. Hence, the priority of health also varies according to needs. Frequent check-ups are common among some cotton farmers (Buka 1, Buka 2, Buka 3, Buka 4, Buka 5, Buka 8), while others seek medical care only when necessary (Pastargom 1, Pastargom 2). Some farmers mention preventive measures such as regular exercise, praying, and diet, which emphasizes the importance of a holistic approach to health.

When cotton farmers fall ill, their primary course of action is to seek help from local district polyclinics. Some call an ambulance (Buka 4), while others go directly to the polyclinic (Buka 2, Buka 3, Buka 5). If the local polyclinic is unable to provide adequate assistance, these farmers then turn to specialized hospitals in the nearest large city (Buka 2,

[14] https://www.intechopen.com/chapters/1163298#
[15] https://iris.who.int/bitstream/handle/10665/151960/HiT-16-5-2014-eng.pdf?sequence=5&isAllowed=y
[16] https://who-sandbox.squiz.cloud/__data/assets/pdf_file/0011/299369/Uzbekistan-HiT-web-ru.pdf

Buka 3). However, not all cotton farmers seek medical help directly from local polyclinics. Two farmers mentioned going directly to a pharmacy to request medicine according to their needs (Pastargom 1, Pastargom 2). Only one farmer mentioned visiting a private hospital, and this farmer's son is a doctor (Buka 8). In addition, one farmer mentioned making annual visits to a sanatorium for rehabilitation (Buka 1).

Furthermore, some farmers mentioned that due to advancing age, they had not taken medicine seriously before, but now do. Some also emphasized support from family, their children's medical experiences, and the value of siblings' help with health-related issues (Buka 1, Buka 8, Pastargom 1).

In horticulture villages, healthcare-seeking patterns differ. As those in cotton areas did, they first call an ambulance in urgent cases; however, the majority of respondents reported going directly to an urban private hospital based on the higher quality of care provided (Jomboy 2, Jomboy 3, Jomboy 5, Yangiyul 3). Another significant portion of respondents mentioned that they never paid much attention to their health and did not undergo regular medical check-ups (Yangiyul 2, Yangiyul 6, Yangiyul 7). Some farmers, like Jomboy 5, express regret over neglecting their health in the past. One reasons farmers do not always take their health seriously is a lack of time. In contrast, others, like Yangiyul 8, have recently started seeking medical treatment, acknowledging the importance of addressing health issues. Compared to those in cotton districts, a greater number of farmers in the horticulture districts visit or plan to visit sanatoriums.

Workers’ standing differs from that of farmers due to significant barriers such as financing. Many cotton workers express distrust or dissatisfaction with local polyclinics and prefer to seek medical care in city hospitals. This sentiment is driven by perceived inadequacies in local healthcare facilities, such as improper medical procedures (e.g.,

incorrect x-rays), which erode trust in local healthcare providers (Buka 4). Cotton workers often opt to self-treat or use alternative healthcare points when unable to afford a hospital visit. This highlights a reliance on home remedies or delayed medical attention due to economic limitations (Buka 1, Buka 4, Buka 6, Pastargom 2). Nevertheless, a minority of cotton workers mentioned regular check-ups (Buka 1, Buka 3). As in the case of farmers, family members are important in healthcare management. They support each other by taking sick family members to clinics or hospitals when necessary and ensuring that prescribed medications are obtained and taken as directed (Pastargom 2).

A notable concern is the cost of healthcare. Workers mention the need to spend their money carefully, especially when healthcare costs compete with financial obligations to the family. This economic factor influences decisions to seek medical care and treatment (Jomboy 1). Furthermore, other workers such as those with asthma receive annual medications provided by the state (Jomboy 3, Jomboy 4)[17].

Similarly, for other respondents, family assistance or having someone in the medical field in the family is one notable feature of the health approach, but with a different dynamic (Jomboy 6). One pattern demonstrated among some respondents was going directly to a pharmacy rather than a hospital for medical assistance during sickness. Pharmacies can directly provide medication, and this practice is economically cheaper and faster timewise (Pastargom 2, Jomboy 5).

Summary

[17] During COVID-19, the Uzbek government also provided free vaccination and medical staff travelling home-to-home to vaccinate people. However, some workers were hesitant to be vaccinated. The reasons include a fear of side effects based on observations of other people's reactions, such as high fever, which has led to unwillingness to vaccinate despite its mandatory status (Jomboy 1).

There is a clear difference between all groups in terms of providing education to their children or grandchildren. While all respondents are strongly committed to education, the ability to access and afford higher education poses significant challenges. Most farmers have a university or vocational level of education and attach great importance to learning, often making financial sacrifices to ensure their children and grandchildren receive a higher education. They invest in private tutors to prepare for university exams. Scholarships are highly valued and private kindergartens are favored for their affordability and quality. Horticultural farmers usually show greater financial stability, which enables them to better support their children's education, including providing opportunities for higher education abroad and at prestigious local institutions.

Workers' children are often still in school and mostly attend public kindergartens and public schools without tutoring. Financial constraints prevent many workers from enrolling their children in private kindergartens or private tutoring programs.

Regarding access to healthcare, farmers have better access than workers. Some farmers have regular medical check-ups, while others seek help only when necessary. Cotton farmers mainly seek medical care at local district clinics, some call an ambulance, and others go directly to clinics. If necessary, they go to specialized hospitals in nearby towns. Some cotton farmers self-medicate by visiting pharmacies, while others emphasize preventive measures such as exercise and diet and generally prefer government hospitals because of their lower costs. Horticultural farmers prefer private urban hospitals because of the higher quality of care they provide, and are more likely to visit sanatorium for rehabilitation. Finally, some regret having neglected their health in the past due to financial constraints, although they have recently started to seek healthcare.

In comparison, many workers self-medicate or use alternative therapies due to financial constraints, delaying professional medical care. In general, directly obtaining medicines from a pharmacy is a common and cost-effective practice among workers. Economic factors significantly influence the decision to seek medical care as costs compete with other financial obligations. Essentially, family involvement and financial considerations are critical factors in healthcare decisions for both farmers and workers.

Dimension 3: Social Gatherings

Table 7 summarizes the key findings for Dimension 3.

Table 7

Results for Dimension 3

	Farmers	**Workers**
Cotton districts	• Host large weddings and celebrations at home, accommodating hundreds to more than a thousand guests. • They save money over several years, renovating their homes and preparing livestock for these events. • Family-oriented celebrations • Village-wide celebrations (e.g., Nowruz) • Often dine out while running errands or meeting other farmers for work purposes.	• Small modest gatherings • Family-oriented celebrations • Village-wide celebrations (e.g., Nowruz) celebrations • Often participate in traditional gap meetings, where dining out is a central activity. • Cannot dine out too often due to financial constraints.
Horticulture districts	• Some wedding events are hosted in restaurants rather than at home. • Holidays celebrated in various locations. • Family-oriented celebrations • Village-wide celebrations (e.g., Nowruz) • Enjoy eating out, especially during the winter.	• Some host small wedding celebrations while others organize bigger ones. • Family-oriented celebrations • Village-wide celebrations (e.g., Nowruz) celebrations • Dining out is for special reasons, and not frequently engaged in.

Weddings and Other Big Festive Events

Celebratory events such as weddings and childbirth are integral in Uzbek culture. This cultural significance is evident in the previously discussed dimensions at the household level, where major renovations are often carried out in preparation for a child's wedding. Much money is saved over several years to renovate their houses. Furthermore, livestock is slaughtered during these ceremonies. Respondents highly value family and community involvement in wedding celebrations, often including extended family members, other relatives, and neighbors. Respondents note a mix of celebrations including weddings, *sunnet* (circumcision ceremony for boys), and birthday celebrations (*ogul toy*, celebrating the birth of a grandson). These events serve as important social gatherings within their communities. As the survey was conducted during the COVID-19 pandemic, temporary restrictions were placed on the extent of these festivities. Enforcement was with local administration.

Many farmers such as Buka 1 and Buka 4 prefer to hold weddings and other celebrations at home rather than in outside venues like restaurants. Some cotton farmers often organize large gatherings, sometimes accommodating hundreds or even up to 1,700 guests, demonstrating the importance of extended family and community ties (Buka 3, Buka 5, Buka 8, Pastargom 2). Important singers and dancers are also invited to these events to showcase the family's status.

In contrast to cotton farmers, horticulture farmers sometimes opt for city restaurants or other rented venues for their weddings (Jomboy 2). Similar to cotton farmers, the number of guests at events typically ranges from 400 to 700 people (Yangiyul 2, Yangiyul 3, Yangiyul 7). During the pandemic, however, the number of guests was significantly reduced, with some events hosting only 20 guests and others up to 100 (Jomboy 3, Jomboy 4). Unlike cotton farmers, a greater number of horticulture farmers reported having some

sort of celebration during the previous year (Jomboy 3, Jomboy 4), while the majority of cotton farmers had their celebrations before the pandemic (Buka 3).

Cotton workers' responses, compared to those of farmers, were noticeably shorter and more concise. There are references to the scale of the celebration, which may vary depending on the resource situation. Some celebrations are smaller in scale (Buka 5, Buka 6), while others involve large gatherings and more elaborate preparations depending on the financial situation of the family at the time of the event (Buka 4).

Celebrations among horticulture workers also vary in scale. Some weddings or celebrations were held with fewer people due to pandemic constraints (Jomboy 7, Jomboy 2). In contrast, larger celebrations such as Jomboy 2's wedding before the pandemic included 500 people. The financial burden of hosting weddings is evident, with families sometimes resorting to loans or selling assets to meet cultural expectations (Jomboy 1). Financial matters related to weddings are culturally sensitive. Jomboy 1 mentions a reluctance to ask the groom's family for financial assistance for fear of social humiliation, highlighting the complex interplay of tradition, pride, and financial realities in organizing these events.

Community Events and Public Holidays

Respondents' holiday celebrations are deeply rooted in family unity, traditional customs, joint cooking, and participation by the entire community. Similarly, the concept of family unity and gathering is central to the festive celebrations of cotton farmers. In many citations, such as those from Buka 1, Buka 2, Buka 5, and Buka 8, a recurring theme of bringing extended family members together during significant holidays such as New Year's Day, Nowruz (Persian New Year), and International Women's Day (March 8) is evident.

Farmers express a deep commitment to maintaining family unity during these gatherings, which often take place in their own backyards or homes rather than in external venues like restaurants (Buka 1, Buka 2, Buka 3).

There is a strong adherence to cultural norms in the village, such as organizing Nowruz celebrations and inviting singers to entertain guests, which are considered an integral part of community life (Buka 1, Buka 7, Pastargom 2). Although most celebrations are held at home or in the village, there are instances where some small celebrations like birthdays and occasional holidays are celebrated outside the home or at a restaurant (Buka 6).

Holidays among horticultural farmers vary in style and setting. Farmer Yangiyul 2 describes celebrating the New Year with festive decorations and traditions at home, while holidays such as birthdays are sometimes celebrated in restaurants. As with cotton farmers, several horticulture farmers emphasize the importance of family-oriented holidays (Jomboy 1, Yangiyul 2)[18]. There are also notable mentions of village-wide celebrations among horticultural farmers. One farmer speaks of participating in village celebrations during the holidays, highlighting the communal aspect where celebrations go beyond individual households to encompass the entire community (Jomboy 2)[19].

A common theme among all farmers is the meticulous preparation and anticipation of a celebration (Buka 1, Buka 2, Buka 3, Jomboy 1, Jomboy 5, Yangiyul 3). They mentioned preparing for holiday celebrations several days in advance together with their families and doing bulk groceries, cooking, and organizing of the house and yard.

[18] For example, Jomboy 1 mentions New Year's Day and International Women's Day (March 8) as favourite holidays that center on family gatherings and outdoor celebrations.

[19] In some cases, holidays such as Independence Day are not only personal celebrations, but also occasions for recognition and awards. Jomboy 1 mentions receiving medals and gifts from the local authorities for achievements in agriculture, such as high yields of wheat per hectare.

As with farmers, workers celebrate some holidays at home and others in the village center. However, socio-economic factors do influence the scale and style of cotton workers' celebrations. Those with more resources may opt for larger and more elaborate celebrations, while others may be simpler (Buka 5, Buka 6, Pastargom 2). During some holidays, especially those involving children, families may visit parks and concerts or participate in community events to create an enjoyable experience (Buka 1, Buka 6).

Many horticulture workers emphasize the importance of traditional holidays such as Nowruz and local customs associated with the celebrations (Jomboy 3, Jomboy 4, Jomboy 6, Jomboy 7, Yangiyul 4, Yangiyul 5). The contributions to village community funds to these events mentioned by some respondents underline the financial aspect of these celebrations (Jomboy 3, Jomboy 4, Jomboy 6). These traditions often dictate how and when holidays are celebrated, influencing everything from the activities to the locations chosen. Mentioning specific age groups or generations celebrating together (e.g., those born in certain years) shows how traditions are passed down and maintained over time (Jomboy 6).

All groups emphasize cultural traditions and family unity during the holidays, strengthening social ties and cultural identity. However, because of the diversity of the crops grown, farmers, especially horticulturalists, can be more flexible in their economic activities and costs associated with celebrations.

Celebrating Personal Milestones (Birthdays, Anniversaries)

Farmers answered this question very briefly. Only two farmers from the horticultural districts answered with a detailed description. Birthday celebrations are important in Uzbek culture. Farmers try to celebrate it with their relatives and neighbors. However, all farmers celebrate every birthday in the family, especially those of elders, in large-scale festive events. As with holidays, farmers prepare for these in advance and invite numerous guests.

Birthdays are important to workers as well, especially celebrating those of their children. Birthday celebrations are given a lot of meaning: they are a way to make children happy and create memorable experiences for the family (Buka 4, Buka 5, Buka 6, Jomboy 1, Jomboy 7).

Some workers acknowledge financial constraints when it comes to celebrating birthdays (Buka 4, Buka 6, Jomboy 1, Jomboy 6, Yangiyul 4). Sometimes, workers forgo celebrating their own birthday so that they can celebrate that of their children, or they combine several birthdays into one event. One worker reported that the family had stopped celebrating birthdays due to financial difficulties because celebrating one person's birthday could cause offence to the other children (Yangiyul 4). Despite this, some workers can afford to celebrate birthdays (Buka 5, Jomboy 7). One respondent reported having recently celebrated her birthday in a restaurant (Yangiyul 5).

Social Dining and Leisure Activities

There are several reasons for visiting restaurants, including leisure time and any kind of celebration. However, some cotton farmers mentioned that they dine out when running errands or meeting fellow farmers for work, suggesting that dining out is not necessarily a luxury activity for everyone (Buka 2, Buka 4, Buka 8, Pastargom 1). Moreover, these farmers noted that they frequently dine out with family for leisure, with some reporting eating out weekly (Buka 1, Buka 3, Buka 4). However, other farmers prefer to eat only at home or only eat out for festive events (Buka 2, Buka 5).

The responses of horticultural farmers are similar. Several farmers mentioned going to restaurants for holiday and birthday celebrations, and some specifically mentioned that winter is the best season for this due to the reduced workload (Jomboy 1, Jomboy 2,

Jomboy 5). However, some prefer to eat at home due to heavy workloads that do not allow them to eat outside the home. In addition, having family members such as a daughter-in-law do the cooking contributes to this preference (Yangiyul 2, Yangiyul 8). As with cotton farmers, some horticultural farmers often eat out for other reasons in the district center (Yangiyul 6).

In addition, for workers, dining out varies between people and depends on social, cultural, and economic factors. In contrast to farmers, workers in both groups noted engaging in traditional *Gap* as a means of dining out (Buka 4, Buka 6, Jomboy 6). *Gaps* typically form within the same generation, often among individuals with shared backgrounds such as school alumni or neighborhood residents. The classification of *gaps* is complex and ambiguous. Despite this, most share common activities such as acting as mutual aid units during emergencies and supporting members during significant family rituals like weddings. *Gaps* also assist when a member falls ill or faces an accident. Today, *gaps* are evolving, with some exploring new functions including financial activities like *ROSCAs*[20] *(rotating savings and credit association)*.

More recently, some *gaps* are organized to cooperate in purchasing durable goods like TVs or carpets, or to jointly cover ceremonial expenses. In other cases, there may be no specific plan for spending, but the *gaps* still indirectly function as ROSCAs. During gatherings, leaders collect membership fees to cover hosting expenses, with any leftover funds available for the host to use as needed. In Uzbekistan, where the financial system is underdeveloped, people tend to quickly convert large sums of money into physical assets

[20] https://src-h.slav.hokudai.ac.jp/publictn/acta/25/hiwatari.pdf

like accessories or automobiles. Therefore, the effectiveness of *gaps* as ROSCAs is less about participants' intentions and more about their practical financial outcomes[21].

For these workers, dining only happens during *gap* meetings and eating outside is considered a luxury activity. Moreover, some cotton workers do not dine out either due to financial constraints or because their husbands prohibit it (Buka 1, Buka 3). Another cotton worker states that food is usually cooked at home and outside the home, and is often eaten when travelling or visiting urban areas (Buka 5).

The majority of horticulture workers prefer to eat at home, except for special occasions such as treating themselves upon receiving their pension (Jomboy 3) or during the harvesting season when they dine out with colleagues (Yangiyul 5). However, some workers also frequently meet their co-workers for lunch (Jomboy 7).

In general, the frequency of restaurant visits ranges from once a month to more infrequent occasions depending on individual circumstances and cultural traditions. These patterns reflect a combination of traditional home eating and occasional dining out, shaped by social and cultural norms among co-workers and friends. For workers, economic factors primarily influence the habit of dining out, while for farmers, busy seasons and the availability of someone to cook at home are significant factors.

Summary

In Uzbek culture, festive events such as weddings, *toy,* and birthdays are significant for all population groups, but their scale depends on financial means. Farmers often organize large gatherings for these events, sometimes with hundreds of guests, while workers tend to have more modest celebrations due to financial constraints. Some workers

[21] https://src-h.slav.hokudai.ac.jp/publictn/acta/25/hiwatari.pdf

organize small gatherings due to limited resources or pandemic constraints, while those with financial means arrange larger events. Furthermore, some workers take out loans or sell assets to meet cultural expectations, although they may be more reluctant to ask for financial assistance because of social pressure.

National, religious, and cultural holidays are another way of showcasing traditions. Similarly, with weddings, farmers organize bigger events and gather the whole family, while workers opt for simpler celebrations. Dining out among cotton and horticultural farmers is often associated with errands, meetings with fellow farmers, or family holidays, and some prefer home meals except on festive occasions. Horticultural farmers sometimes dine out, especially in winter, while others rely on home-cooked meals due to workload or family support. Workers, on the other hand, tend to dine out during meetings with their colleagues or on special occasions such as *gap*, with financial constraints and cultural norms strongly influencing their eating habits. The frequency of restaurant visits varies, reflecting a combination of traditional home meals and occasional restaurant visits influenced by economic and social factors.

In this dimension, not many differences are evident between the cotton and horticulture districts, but mainly between the farmers and workers in these areas.

Dimension 4: Financial and Non-Financial Situation

Table 8 summarizes the key findings for Dimension 4.

Table 8

Results for Dimension 4

	Farmers	**Workers**
Cotton districts	• State/cluster credit reliance • Self-financing instead of private credits	• Wages based on harvested cotton per kilogram • Seasonal wage fluctuations

	• Expressed frustration with cluster finance • Revenue and profitability challenges • Resource management of state credits • Meeting quotas challenges	• Cross-village employment (horticulture villages) • Many cotton workers express satisfaction with their daily wages, but despite overall satisfaction, some report that their income does not always cover unexpected or higher household expenses
Horticulture districts	• State/cluster credits only for wheat • Positive attitude toward private credits • Limited need for credits • Profitability from crop diversification • Market fluctuations • Significant profit possibilities	• Wages based on hours worked • Steady but lower earnings compared to those for cotton • Wage negotiations and flexibility • Mixed satisfaction with earnings, but satisfied with availability of work

Farmers: ***Access to Credit and Financial Services***

Continuous access to financial support is necessary to meet production quotas and ensure effective farming operations. Cotton farmers in different regions face different financial conditions, which are affected by access to credit, interest rates, and the role of clusters and banks. One reason for this is that not all farmers know how finance works and remember interest rates from previous years. Another is that every cluster could have its own interest rate for credit.

The credit system for cotton and wheat production was usually collateral-free, and during the state cotton system, the interest rate was low (e.g., 3%). Farmers use credits to buy diesel fuel, fertilizers, and insect repellents, and pay for labor during cotton harvesting. Under the cluster system, interest rates have increased from 3–5% to 10–16%, and in extreme cases, up to 60% (Buka 1, Buka 4, Buka 8, Pastargom 1). Consequently, some farmers opt to self-finance to avoid high cluster credit costs, which is more feasible for those with smaller land holdings (Buka 3, Buka 4, Buka 8).

Clusters provide the necessary financial and material support, reducing farmers' burden to manage bank loans directly (Buka 3, Buka 5, Buka 6, Buka 8). However, the

efficiency and fairness of the system may vary, resulting in different experiences for various farmers. Some benefit from convenience and support, while others face problems related to costs and dependency. Credits provided by clusters are insufficient for some farmers, and they have had to take private credits (with collateral and higher interest rates) (Buka 3). Others allocated wheat profits to manage cotton costs (Buka 4). Not every farmer is satisfied with the work of the cluster. First, higher costs arise from interest rates each year and potential markups on inputs, and some farmers are unaware of the interest rates on their credits due to incomplete contract terms (Buka 4, Buka 7, Buka 8, Pastargom 2).

There have also been delays in payments for harvested crops and input deliveries, along with variability in the quality and timeliness of support. Nearly all cotton farmers express a strong desire to avoid taking out credits for crop cultivation if possible, but 10 of the 10 farmers interviewed (Buka 1–8, Pastargom 1–2) indicate that they rely on credit, especially from clusters, for their farming activities. All ten farmers have some form of direct or indirect interaction with cluster credit through the cluster management of finances and inputs.

Horticulture farmers also receive collateral-free credits from clusters or AIC for wheat production; however, for horticulture crops, the availability of collateral-free credit depends on the contract signed with the cluster or AIC. Farmers can have private credits for crop production, but it can be costly due to higher interest rates and collateral. All farmers mentioned that they do not get state-subsidized credits for horticulture production and have to finance themselves. Some also mentioned allocating wheat credit to horticulture production.

The interest rates for collateral-free credits from AIC or clusters varied significantly. One farmer (Jomboy 2) reported an interest rate of 5–8% for crop production, primarily for

wheat. Others (Yangiyul 6, Yangiyul 8) mentioned an interest rate of 12%, which had increased from 10%. An (Yangiyul 3) noted a current interest rate of 20%, down from 30% the previous year. In comparison to cotton farmers, horticulture farmers, in addition to using credits for crop inputs, may also invest in infrastructure development such as greenhouse construction, irrigation systems, and storage facilities (Jomboy 5). Besides that, some farmers are open to private credits for purchasing vehicles (Jomboy 3).

However, in general, the horticulture farmers highlighted that they do not need credits for horticulture crop production (because of their good financial situation), at least for the season at the time of the interviews, and do not have the desire to get one for the following harvesting years (Jomboy 2, Jomboy 3, Jomboy 5, Yangiyul 2, Yangiyul 3, Yangiyul 4, Yangiyul 5, Yangiyul 6). One farmer mentioned obtaining personal loans from private people for crop production rather than banks (Yangiyul 5), and other reported selling livestock if they needed money to cover crop production (Yangiyul 5, Jomboy 1).

In conclusion, while all farmers prefer not to take out credit, cotton farmers often rely on it to finance their activities, in particular to purchase inputs and cover production costs. In contrast, horticultural farmers receive government credit solely for wheat production and can usually sustain their horticultural production without additional credit. However, they are more open to private loans for infrastructure development. Finally, cotton producers are not satisfied with the rules of cluster financing.

Regular and Sufficient Income (Profit from Farm Management)

Cotton farmers face a dynamic financial situation and fluctuating returns from wheat sales (Buka 1, Buka 3, Buka 6). Despite the revenues generated from cotton, challenges such as managing costs and ensuring profitability remain (Buka 3, Buka 5, Buka 6). Farmers

emphasize the importance of effective resource management, including the use of inputs and modern equipment, to optimize productivity and reduce costs (Buka 3). Here, financial management skills are critical in maintaining stability and avoiding bankruptcy, as evidenced by the need to make informed decisions on resource allocation and credit utilization (Buka 7).

Farmers are dissatisfied with the cotton clusters and their payment systems because of non-transparent contract terms. Issues such as delayed payments from clusters, difficulties in meeting quotas, and concerns about some clusters' reliability are other potential difficulties some cotton farmers face (Buka 3). Moreover, the mention of farmers struggling to meet quotas and facing financial hardships due to high costs such as for machinery parts and diesel fuel highlights the precarious financial situation many face (Buka 7, Buka 5).

On the other hand, Buka 1 reported a significant income of 700 million UZS from cotton, with a profit of about 350 million UZS after expenses. However, wheat revenues were comparatively lower this year despite high cotton revenues. This suggests that cotton cultivation can be a highly profitable source of income for farmers. Buka 5 highlights the importance of hard work and efficient management in generating income from farming. This suggests that diligent farmers who fulfil their quotas and manage their resources effectively can expect excess revenue. In addition, by investing in modern equipment such as pneumatic seeding units, farmers can optimize seed use and improve crop quality, leading to higher profitability (Buka 6).

Most horticulture farmers report profitability in their farming activities. Crop diversification helps to ensure a steady income stream by reducing dependence on a single source of income. It also prevents complete dependency on cluster/state systems by

assuring access to the market. Farmers manage their finances through careful planning, avoiding credit, and using their assets (e.g., livestock) when additional funds are needed (Jomboy 1). Taxes are a major problem for some farmers, affecting their net income (Jomboy 5). Despite fluctuations in market prices, such as the decline in wheat prices (by cluster) mentioned by Yangiyul 2, they have maintained profitability, indicating the resilience and effective adaptation to market conditions of other crops.

Jomboy 1 highlights the importance of diversifying income sources by cultivating different crops and raising livestock. The farmer mentions making a significant profit (600–700 million UZS) from selling carrots, which had a cost of 69 million UZS, indicating a high return on investment. In general, these farmers express satisfaction with their incomes even though they might have higher costs than cotton farmers (Jomboy 5, Yangiyul 2).

Finally, the majority of cotton farmers rely heavily on subsidized credit, particularly from clusters/local agricultural administrations, to finance their operations. However, they face challenges such as high interest rates, non-transparent contracts, and delayed payments. Some prefer to self-finance or avoid credit altogether due to the high costs associated with clusters. In contrast, horticulture farmers tend to be more financially independent, relying on diversified crop income, resource allocation from other crops, and private loans for infrastructure investments. They are generally more satisfied with their profitability despite issues like taxes and fluctuating market prices.

Workers: *Earning from Farm Work*

For this group, financial constraints are common (Jomboy 1, Jomboy 4), and many workers rely on remittances from family members working abroad (Jomboy 4). One horticulture worker mentioned sending her children to work abroad, which allows them to

support the family through remittances (Jomboy 5). Some cotton farmers receive their 10-day or monthly wages once and can contribute it directly to bigger projects. Other horticulture workers may receive a daily wage.

Due to the nature of agricultural labor, workers are usually paid daily, which provides immediate access to funds for everyday expenses. Daily earnings can vary significantly based on the type of work and location. In particular, during the cotton-picking season, wages are a piecewise wage rate depending on the amount of cotton picked; workers are paid in proportion to the kilograms of cotton they pick. Thus, the more cotton a worker picks, the higher his or her earnings. The wage structure is relatively similar throughout Uzbekistan. However, it may vary depending on the timing of the harvest season (workers harvesting early in the season tend to earn less than those working late in the season when pay tends to be higher). Wage negotiation during this period is usually limited. In other types of agricultural work, pay is often based on an hourly or daily rate, and there is usually more room for negotiation.

In Buka and Pastargom, workers picking cotton by weight earn 1,500 to 2,000 UZS per kilogram (in the 2021 harvesting year). Thus, earnings per day can total between 50,000 and 200,000 UZS (Buka 2, Buka 4, Buka 5, Buka 6, Pastargom 1, Pastargom 2, Pastargom 3). In addition, there are signs of gender-equal pay for cotton workers: during the harvest season, men and women earn the same wages (Buka 2). Furthermore, seasonal climatic changes affect wages: in summer, the workday is longer and pay is lower, while in late fall, the day is shorter and the weather colder (Buka 4, Pastargom 1). Cotton-picking workers have the opportunity to earn a significant income. Some workers report earning up to 3 million UZS in one month (Buka 4, Buka 6).

Horticulture workers have significantly lower earnings than cotton workers, with daily work earnings varying between 40,000–100,000 UZS. However, compared to cotton workers, these ones have bargaining power over their earnings and are usually paid for working hours (Jomboy 1, Jomboy 3, Jomboy 6). In addition, workers often receive daily payments but can negotiate bulk payments based on financial need. While most prefer cash payments, some receive additional goods, especially when there is a surplus of production (Yangiyul 5).

As in cotton villages, wages are usually lower in summer, ranging from 40,000 to 50,000 UZS due to longer working hours and cheaper labor. In contrast, wages rise to 70,000–100,000 UZS in the fall and winter due to shorter days and colder and harsher working conditions (Jomboy 4, Yangiyul 3). Due to its wage attractiveness, some horticulture workers also harvest cotton if there are nearby cotton villages (Yangiyul 1).

Earning Satisfaction

Satisfaction with daily wages varies. Some workers are happy with pay flexibility, while others struggle to meet their financial needs. The majority of cotton workers generally express satisfaction with their income, indicating that the daily wage meets their needs, although individual circumstances vary (Buka 2, Buka 3, Buka 4, Buka 5, Buka 6, Pastargom 3). Some workers emphasize the importance of honesty and fairness in earnings, explaining that the wages are sufficient for their needs including those related to medication and the household (Buka 6). Others show sympathy for farmers, indicating an awareness of the economic dynamics of wage distribution (Buka 4). Nevertheless, a few workers note that satisfaction can fluctuate based on personal or household needs, suggesting that while

earnings are generally acceptable, they may not always meet higher or unexpected expenses (Buka 1, Pastargom 2).

The responses from horticulture workers regarding their satisfaction with their farm wages demonstrate various perspectives ranging from complete dissatisfaction to an unwilling agreement to direct satisfaction. Some are happy with flexible payment terms, but many consider their wages insufficient to meet basic needs, leading to ongoing financial hardship. For example, workers often feel that their daily earnings are barely enough to make ends meet, highlighting their economic challenges (Jomboy 1, Jomboy 4). In addition, Jomboy 4 expresses dissatisfaction with her pension, which is the lowest in her village at 400,000 UZS per month. Other pensioners receive more than 500,000 UZS. This situation has forced her to take up farming work. This financial strain adds to her overall dissatisfaction with her income.

In contrast, other workers consider their daily earnings of 80,000 UZS satisfactory (Jomboy 5, Jomboy 6, Jomboy 7, Yangiyul 3, Yangiyul 4). However, for Jomboy 6, this is a small amount. She explains that 50,000 UZS a day is quickly spent shopping at the market on the way home from work, leaving little money. Despite this, she is grateful to her husband for the extra income that helps support their family.

In general, earnings during the cotton-picking season are higher than those from horticulture work because they depend on the amount of cotton picked. However, cotton picking only occurs in the fall, while horticulture workers receive a stable hourly wage throughout the year adjusted for seasonal fluctuations. In addition, cotton workers generally lack bargaining power over their earnings, whereas horticulture workers can negotiate their wages. However, expenditure patterns and financial independence are consistent across villages, with household dynamics being the primary influencing factor,

not the crop harvested. Moreover, many cotton workers consider their daily wages sufficient to meet their needs. Finally, this indicator varies among horticulture workers.

Freedom to Spend Own Wages

The basic expenditures of different workers remain the same despite the different degrees of financial freedom. All workers prioritize their income for household and children's necessities, including food, clothing, utility bills, and personal needs, which are often secondary. The degree of financial autonomy varies across all villages and household dynamics. Those who live apart from their parents-in-law have more independence (Buka 1). In addition, some workers manage their earnings to cover household needs without significant external supervision because they are elders in the house (Jomboy 3, Jomboy 6). Others, especially those living in traditional families, make joint financial decisions with their husbands or parents-in-law, which may limit their personal spending freedom (Buka 2, Buka 3). One worker spends her income on household needs and pleasing her grandchildren by buying food and socks at the bazaar. Although she keeps some control over her income, her expenditure is mainly on family needs (Buka 2). One horticulture worker also mentioned assisting women without husbands in the village who need economic support (Yangiyul 3)[22].

Summary

[22] According to my interviews and objective observations, farmers who live in the districts shifted to horticulture crops seem more confident and open in their responses. One reason for this is the income from diversified agricultural products and low pressure from clusters/local hokimyats regarding production quota. The lack of pressure affords more land security, and with higher earnings, these farmers tended to invest in their land by buying new machinery and technologies such as water-saving devices. Meanwhile, cotton farmers were not too open about investing in new machinery or various new technologies. They were generally more concerned about fulfilling the cluster request and finishing it on time, and also concerned about the financial situation for the next harvesting season. The financial stability of horticulture districts, especially in Jomboy, enabled big purchases such as buying new homes, buying cars, or hosting larger wedding celebrations for their children/grandchildren. In general, they had a fpositive vision about farming and forward-looking approaches.

Agricultural workers in Uzbekistan are paid daily, with significant variations in earnings depending on the type of work and season. Cotton harvesters earn based on the amount of cotton harvested, with rates ranging from 1,500 to 2,000 UZS per kilogram, leading to potential daily earnings during harvesting season of between 50,000 and 200,000 UZS. Horticulture workers, in contrast, earn between 40,000 and 100,000 UZS daily. Their pay varies more due to their ability to negotiate and because they work over more months during the growing season, which leads to seasonal fluctuations. Wage satisfaction also varies; cotton workers generally express more satisfaction due to the higher potential earnings, but work is only available during the cotton harvesting season. Some horticulture workers often find their wages insufficient, leading to financial strain; others are happy with what they earn, mentioning the availability of work. Despite differences in pay, all workers prioritize spending their earnings on essential household and family needs, with varying levels of financial independence depending on their living arrangements and household and family dynamics.

Conclusion

The study focuses on comparing two groups of people in two different districts. It tries to understand the changes in the livelihoods of women in villages that transitioned to horticulture crops. In general, the findings suggest a significant difference between farmers and workers, regardless of district and village. Compared to workers, farmers already possess a certain degree of economic stability. Furthermore, whatever the neighborhood, all women farmers are either the head of the household or claim the same authority as the husband in the family. Therefore, all decisions related to the home affect them as well. This

includes those related to the distribution of earnings among family members; buying a new car, flat, or furniture for the house, and the education of family members.

In contrast, workers are not always the head of the household. Rather, in many instances, they are housed with in-laws who have a voice in intra-family relations. None are the head of the household. Thus, these workers do not participate (or this is very limited) in household decision-making. In the household, workers are responsible for all unpaid domestic labor, which leaves them with very few free hours in the day.

Regarding the well-being dimension, first, significant socio-economic differences are highlighted between farmers and workers in rural Uzbekistan, which are evident in various aspects of their lives. While both groups are engaged in agriculture, farmers' economic stability provides them with better living conditions, greater access to basic utilities, and improved infrastructure. In contrast, workers often lack consistent access to facilities such as gas and hot water, and rely on traditional methods for heating. In this dimension, we observe that districts that transitioned to horticulture have better access to basic facilities.

Second, similar differences are evident for education and healthcare. Farmers, especially those involved in horticulture, tend to have higher education levels and more financial capacity to invest in their children's education. They also have better access to health services, preferring private clinics, while workers often rely on self-medication or alternative treatments due to financial constraints. This dimension also highlights differences between horticulture-oriented workers and better access to education and healthcare.

Financially, farmers—especially those engaged in horticulture—show greater independence and satisfaction with their sources of income than workers who face seasonal

and unstable wages. Dependence on subsidized credit and problems with opaque contracts further highlight the financial instability cotton farmers face.

In conclusion, the transition to horticulture in Uzbekistan offers prospects for the economic empowerment and overall well-being of rural women. The transition offers increased income, improved livelihoods, and employment opportunities, especially for women. However, challenges remain, particularly in cotton-growing areas, highlighting the need for targeted interventions to ensure inclusive rural development.

Policy Recommendations

Over the last years (2020-2023), Uzbekistan focused on liberalizing the agricultural sector by lifting cotton quotas and creating agricultural clusters, even though they have monopsony over agricultural production and the land allocation program indirectly controls the quota system. In addition, cotton and wheat continue to dominate Uzbek agricultural policy. The socio-political implications of continued rural development can also be potentially damaging and require proactive policy interventions in the agricultural and non-agricultural industries to boost rural growth and farmers' incomes and improve rural livelihoods. Uzbekistan has the labor, climate, and environmental potential to diversify into more profitable crops. In fact, the growing internationalization of agri-food marketplaces also provides possibilities for the export of high-value food supplies.

The Uzbek government could do many things to support rural women, regardless of their social status and type of district in which they are located. In this regard, the following recommendations are made:

- As a general recommendation, the Uzbek government should expand rural infrastructure development, such as the Obod Qishlok program, to include more remote and

underdeveloped districts to provide a stable electricity supply, water, and access to gas lines. In the long run, the Uzbek government can use sustainable energy sources for sustainable development. The developed rural infrastructure would support women whose movements are restricted (e.g., poor roads, buses, and private taxis do not enter the villages, leaving women and children to walk long distances every day). It would also support farmers in delivering agricultural output.

    - In addition, established low-interest rural housing loans and grant programs could support workers in helping them upgrade their homes.

- An increase in low-cost healthcare in villages could benefit workers. Furthermore, broaden access to better quality education could be broadened for rural children, with a focus on workers' families. Targeted programs could facilitate developments that may ease the financial burden for the families of workers and farmers.
    - For example, partnership programs between NGOs and the private sector could provide agricultural scholarships and training programs to empower girls and women from rural areas.
- All workers in the study are informal workers, which is not an officially recognized category. Furthermore, due to the nature of farm work, these workers have the highest financial instability and are the first to face shocks that can trap them in poverty. Thus, the government should establish an official registration system for agricultural workers (especially one that is easy to implement and in an accessible language) so that they are recognized as part of the formal workforce. With modern technology, this could even be done online on government-supported platforms.
- In addition to official recognition, the government should ensure that fair labor standards in agriculture are enforced. This includes establishing minimum wage laws, ensuring safe

working conditions, and establishing mechanisms for workers to report and resolve labor disputes.

- Since agricultural work is seasonal, economic diversification in rural areas would open broader economic opportunities for workers and increase financial stability. Micro-credits could encourage rural women to engage in various economic activities. Besides some sort of training, education would support these women.
- Regarding farmers, the cotton farmers in this study expressed their dissatisfaction with cluster-based credits and input-providing systems. First, the government could create an independent committee to monitor the work of clusters, their behavior toward farmers, and transparency within the farmers' agreement. The government should also explore making clusters more transparent and fairer by ensuring timely payments and adequate credit rates for agricultural production. In this regard, clusters should be obliged to use clear and transparent contracts that outline all terms, conditions, the prices of inputs, and payment schedules. This will afford farmers more confidence in their cluster engagement.
- It is also important to strengthen women's role in agriculture and decision-making. The Uzbek government can increase the land right usages for women farmers by providing priority access to agricultural croplands through land reform policies. This may include:
    - Subsidized resources for first-time female farmers and low interest loans and grants are channels of empowerment.
    - Mentorship programs should be provided for young female farmers.
    - There is also a need to develop training programs for women in modern farming techniques and management.
- Financial literacy is also important. With the local banks and local universities, local governments could organize training for female farmers about the credit system and

interest rates. This would help farmers manage their finances more efficiently, understand credit conditions, and make informed decisions regarding them.

- Due to cultural norms and the family structure, women workers have limited control over their wages. Introducing programs that promote women's economic empowerment and financial independence, such as training on household budgeting and financial planning, would increase their ability to manage their income. This could be done with the contribution of local bank workers and faculty members of economic departments. The implementation of these measures can improve the living standards in rural areas, women's empowerment, sustainable rural development and agriculture sector in Uzbekistan.

References

ADB. (2016). *Horticulture value chain development project: Report and recommendation of the President*. https://www.adb.org/projects/documents/uzb-horiticulture-value-chain-development-rrp

Ahmed, A., Dompreh, E., & Gasparatos, A. (2019). Human wellbeing outcomes of involvement in industrial crop production: Evidence from sugarcane, oil palm and jatropha sites in Ghana. *PLoS ONE, 14*(4), e0215433. https://doi.org/10.1371/journal.pone.0215433

Alarcon, M., Marty, P., & Prévot, A.C. (2020). Caring For vineyards: Transforming farmer-vine relations and practices in viticulture French farms. *Journal of Rural Studies*, *80*,160–170. https://doi.org/10.1016/j.jrurstud.2020.08.029

Akiner, S. (1997). Between tradition and modernity: The dilemma facing contemporary Central Asian women. In M. Buckley (Ed.), *Post-Soviet women: From the Baltic to Central Asia* (pp. 261–304). Cambridge University Press.

Babadjanov, J., & Petrick, M. (2023). Uzbekistan's cotton clusters in the context of the industrial policy debate. *Eurasian Geography and Economics*. https://doi.org/10.1080/15387216.2023.2267093

Bartl, A. L. (2020). The wellbeing of smallholder coffee farmers in the Mount Elgon region: A quantitative analysis of a rural community in Eastern Uganda. *Bio-Based and Applied Economics*, *8*(2), 133–159. https://doi.org/10.13128/bae-8928

Bobojonov, I., Lamers, J. P. A., Bekchanov, M., Djanibekov, N., Franz-Vasdeki, J., Ruzimov, J., & Martius, C. (2013). Options and constraints for crop diversification: A case study in sustainable agriculture in Uzbekistan. *Agroecology and Sustainable Food Systems*, *37*(7), 788–811. https://doi.org/10.1080/21683565.2013.775539

Braun, V., & Clarke, V. (2022). *Thematic analysis: A practical guide*. SAGE Publications Inc. https://us.sagepub.com/en-us/nam/thematic-analysis/book248481

Brennan, M., Hennessy, T., & Emma D. (2020). Towards a better measurement of the social sustainability of Irish agriculture. *International Journal of Sustainable Development*, *23*(3–4), 263–287. https://doi.org/10.1504/IJSD.2020.10037663

Bryman, A. (2012). *Social research methods* (4th ed.). Oxford University Press.

Creswell, J. W. (2007). *Qualitative inquiry & research design: Choosing among five approaches* (2nd ed.). SAGE Publications Inc.

Creswell, J. W., & Creswell, J. D. (2018). *Research design: Qualitative, quantitative, and mixed methods approaches* (5th ed.). SAGE Publications Inc.

De, U. K., & Chattopadhyay, M. (2010). Crop diversification by poor peasants and role of infrastructure: Evidence from West Bengal. *Journal of Development and Agricultural Economics*, *2*(10), 340–350.

Decancq, K., Fleurbaey, M., & Schokkaert, E. (2015). Inequality, income, and well-being. In *Handbook of Income Distribution* (Vol. 2, pp. 67–140). Elsevier B.V. https://doi.org/10.1016/B978-0-444-59428-0.00003-5

Dolan, C. S., & Sorby, K. (2003). Gender and employment in high-value agriculture industries. In *Agricultural and Rural Development Working Paper* (No. 26393; Vol. 7). http://rmportal.net/library/II/C/2/multi0page-2.pdf

Emana, B., Afari-Sefa, V., Dinssa, F. F., Ayana, A., Balemi, T., & Temesgen, M. (2015). Characterization and assessment of vegetable production and marketing systems in the humid tropics of Ethiopia. *Quarterly Journal of International Agriculture*, *54*(2), 163–187.

FAO. (2019). *Gender, agriculture and rural development in Uzbekistan. Country gender*

assessment series. http://www.fao.org/3/ca4628en/ca4628en.pdf

Feliciano, D. (2019). A review of the contribution of crop diversification to Sustainable Development Goal 1 “No poverty” in different world regions. *Sustainable Development*, *27*(4), 795–808. https://doi.org/10.1002/sd.1923

Flick, U. (2009). *An introduction to qualitative research* (4th ed.). SAGE Publications Inc.

Flick, U. (2014). *The SAGE handbook of qualitative data analysis*. SAGE Publications Inc. http://dx.doi.org/10.4135/9781446282243

Fraser, E. D. G. (2006). Crop diversification and trade liberalization: Linking global trade and local management through a regional case study. *Agriculture and Human Values*, *23*(3), 271–281. https://doi.org/10.1007/s10460-006-9005-5

Frey, B. S., & Stutzer, A. (2002). What can economists learn from happiness research? *Journal of Economic Literature*, *XL*(2), 402–435. https://doi.org/10.1257/jel.40.2.402

Guest, G., MacQueen, K. M., & Namey, E. E. (2012). *Applied thematic analysis*. SAGE Publications Inc. https://books.google.se/books?id=Hr11DwAAQBAJ&hl=sv

Hausman, D. M., & McPherson, M. S. (2009). Preference satisfaction and welfare economics. *Economics and Philosophy*, *25*(1), 1–25. https://doi.org/10.1017/S0266267108002253

Isaac, M. E., Lin, T., Caillon, S., et al. (2024). Multidimensional measures of farmer well-being: A scoping review. *Agronomy for Sustainable Development*, *44*, 39. https://doi.org/10.1007/s13593-024-00971-7

Joshi, P. K., Gulati, A., Birthal, P. S., & Tewari, L. (2004). Agriculture diversification in South Asia: Patterns, determinants, and policy implications. *Economic and Political Weekly*, *39*(24), 2457–2467. http://www.jstor.org/stable/4415148

Kabeer, N. (1999). Resources, agency, achievements: Reflections on the measurement of

women's empowerment. *Development and Change*, *30*(May), 435–464.

Kahneman, D., & Krueger, A. B. (2006). Developments in the measurement of subjective well-being. *Journal of Economic Perspectives*, *20*(1), 3–24.

Kahneman, D., Krueger, A. B., Schkade, D., Schwarz, N., & Stone, A. (2004). Toward national well-being accounts. *The American Economic Review*, *94*(2), 429–434. https://doi.org/10.1257/0002828041301713

Kahneman, D., Wakker, P. P., & Sarin, R. (1997). Back to Bentham? Explorations of experienced utility. *Quarterly Journal of Economics*, *112*(2), 375–405. https://www.jstor.org/stable/2951240

Kandiyoti, D. (2003). The cry for land: Agrarian reform, gender and land rights in Uzbekistan. *Journal of Agrarian Change*, *3*(1–2), 225–256. https://doi.org/10.1111/1471-0366.00055

Kasem, S., & Thapa, G. B. (2011). Crop diversification in Thailand: Status, determinants, and effects on income and use of inputs. *Land Use Policy*, *28*(3), 618–628. https://doi.org/10.1016/j.landusepol.2010.12.001

Kaufman, A. H. (2015). Unraveling the differences between organic and non-organic Thai rice farmers' environmental views and perceptions of well-being. *Journal of Agriculture, Food Systems, and Community Development*, *5*(4), 29–47. https://doi.org/10.5304/jafscd.2015.054.002

Larson, D. F., Khidirov, D., & Ramniceanu, I. (2015). *Uzbekistan strengthening the horticulture value chain* (94281). https://openknowledge.worldbank.org/handle/10986/21495

Layard, R. (2005). Happiness: Lessons from a new science. *Foreign Affairs, 84*(6). https://doi.org/10.2307/20031793

Lerman, Z (2008). Agricultural Development in Uzbekistan: The Effect of ongoing Reforms. Discussion Papers 37945, Hebrew University of Jerusalem. DOI:10.22004/ag.econ.37945

Lerman, Z. (2021). Gender gaps in Central Asia: A reassessment. *Central Asian Journal of Water Research*, *7*(2), 47–73. https://doi.org/10.29258/cajwr/2021-r1.v7-2/47-73.eng

Mahama, T. A. K., & Nkegbe, P. K. (2021). Impact of household livelihood diversification on welfare in Ghana. *Scientific African*, *13*. https://doi.org/10.1016/j.sciaf.2021.e00858

Mourão, I., Moreira, M. C., Almeida, T. C., & Brito, L. M. (2018). Perceived changes in well-being and happiness with gardening in urban organic allotments in Portugal. *International Journal of Sustainable Development & World Ecology*, *26*(1), 79–89. https://doi.org/10.1080/13504509.2018.1469550

Mukhamedova, N., & Petrick, M. (2018). *Coping with constraints: Crop diversification and soil salinization in two Central Asian cotton regions is based on the AGRICHANGE survey and qualitative findings from selected project regions.* Soil degradation and shifting agrarian orders in Central Asia, Tübingen, Germany.

Najjar, D., Devkota, R., & Feldman, S. (2022). Feminization, rural transformation, and wheat systems in post-Soviet Uzbekistan. Journal of Rural Studies, 92, 143–153. https://doi.org/10.1016/j.jrurstud.2022.02.017

Payziyeva, S., Paiziev, A. (2012). Food security in Uzbekistan. In H. Alpas, M. Smith, & A. Kulmyrzaev (Eds.), *Strategies for achieving food security in Central Asia. NATO Science for Peace and Security Series C: Environmental Security*. Springer, Dordrecht. https://doi.org/10.1007/978-94-007-2502-7_5

Samuelson, P. A. (1974). Complementarity: An essay on the 40th anniversary of the Hicks-

Allen revolution in demand theory. *Journal of Economic Literature*, *12*(4), 1255–1289. https://www.scopus.com/record/display.uri?eid=2-s2.0-84995008637&origin=inward&txGid=4ab8df391458c2a3df56ff7b5657b84b

Sen, A., & Williams, B. (1986). Utilitarianism and beyond. Cambridge University Press. https://doi.org/10.5840/intstudphil198618331

Stiglitz, J. E., Sen, A., & Fitoussi, J.-P. (2009). *Report by the Commission on the Measurement of Economic Performance and Social Progress*. https://ec.europa.eu/eurostat/documents/8131721/8131772/Stiglitz-Sen-Fitoussi-Commission-report.pdf

Teklewold, H., Kassie, M., Shiferaw, B., & Köhlin, G. (2013). Cropping system diversification, conservation tillage and modern seed adoption in Ethiopia: Impacts on household income, agrochemical use and demand for labor. *Ecological Economics*, *93*, 85–93. https://doi.org/10.1016/j.ecolecon.2013.05.002

TerAvest, D., Wandschneider, P., Thierfelder, C., Reganold, J. P. (2019). Diversifying conservation agriculture and conventional tillage cropping systems to improve the wellbeing of smallholder farmers in Malawi. *Agricultural Systems*, *171*, 23–35. https://doi.org/10.1016/j.agsy.2019.01.004

United Nations Convention to Combat Desertification (UNCCD). (2024). *Women-led solutions for drought resilience.* https://www.unccd.int/sites/default/files/2024-10/20241005_women-led-DRAFT_V6.pdf

Van den Broeck, G., & Maertens, M. (2016). Horticultural exports and food security in developing countries. *Global Food Security*, *10*(October 2017), 11–20. https://doi.org/10.1016/j.gfs.2016.07.007

World Bank. (2019). *Farm restructuring in Uzbekistan: How did it go and what is next?*

https://doi.org/10.1596/31248

World Bank. (2024). Agriculture, forestry, and fishing, value added (% of GDP) – Uzbekistan. https://data.worldbank.org/indicator/NV.AGR.TOTL.ZS?locations=UZ

Annex 1: Description of Respondents

Table 9

Characteristics of Farmer Respondents

Farmer Code Name	Interview date (dd/mm/yyyy)	Region	Age	Education	Number of children	Lives with	Decision-making in the household	Household (hh) chores	Tomorka	Animals	Car	Can drive a car
Cotton Farmers												
Buka 1	02.11.2021	Buka	65	⅔ places: Technical Agricultural College, Law and Accounting College	4 sons	husband, youngest son + DIL, grandchildren	husband & wife	DIL	yes	1 Dutch cow	every son has a car, 2 cars in the hh: Spark, Cobalt	no
Buka 2	02.11.2021	Buka		Tashkent Vocational School: Accounting	5: 3 sons, 2 daughters	husband	wife	herself	yes, vegetables for own consumption	3 cows+ calves		
Buka 3	02.11.2021	Buka, Kora Koylik village	60	Tashkent National Institute	4: 3 sons, 1 daughter	2 sons, 2 DILs, grandchildren, herself	herself	DILs	no, there was, but it was reconstructed as a kindergarten		currently, 3, but there will be 4 soon (2 cars with credits)	no
Buka 4	03.11.2021	Buka, Guliston	61	High School	1 son	husband, DIL, son, grandchildren	husband & wife	DIL	yes	yes	yes	no
Buka 5	03.11.2021	Buka	58	NA	3 sons	husband, son, DIL, grandchildren	husband & wife	DIL	yes	yes	yes	NA
Buka 6	03.11.2021	Buka	50	Vocational School	3: 2 sons, 1	son, DIL, grandchildren	wife	DIL	yes	yes	no	NA

					daughter							
Buka 7	03.11.2021	Buka	44	High School	3	Husband, unmarried children	herself	herself, children	no	no; chickens only	no	no
Buka 8	04.11.2021	Buka; Independent Uzbekistan Farmers Association	52	Tashkent National Economy Institute	2 sons	husband	wife & husband	herself	yes	yes	yes	no, son
Pastargom 1	26.10.2021	Pastargom	62	Samarkand Agriculture Institute	no childrden, not married		herself	herself	yes	yes	no	no
Pastargom 2	26.10.2021	Pastargom	45	Samarkand Institute	3: 2 married daughters, 1 son	husband, son, and her	husband & wife	herself	yes	none	yes	yes
Horticulture Farmers												
Jomboy 1	19.10.2021	Jomboy: Ohun Boboyev village		Samarkand State University	3: 2 sons, 1 daughter	husband, son, DIL, two grandchildren	herself	DIL	yes, own consumption (animal fodder)	sheep, chickens	3 cars	yes
Jomboy 2	20.10.2021	Jomboy	50	Vocational School: Accounting	3 children	married son, DIL, grandchild	herself (widow)	DIL	yes, fodder for animals	cat (at home)	2 cars	no
Jomboy 3	20.10.2021	Jomboy		NA	4: 2 sons, 2 daughters		herself (widow)	herself, DIL, (son is in Russia as a migrant worker)	vegetables, own consumption, gardening tree, sometimes sells cherries	2 cows, 3 calves, 45 chickens, 5 sheep	1 car	yes

Jomboy 4	21.10.2021	Jomboy		High School	2: 1 son, 1 daughter	mother	herself & mother	Herself: she does not have anyone to help	yes, own consumption, garlic, onion, greeneries	2 cows: with calves, 5–6 animals	no	yes
Jomboy 5	21.10.2021	Jomboy, Aygirbulaq village	47	Vocational School: Nurse	3: 2 sons, 1 daughter	husband, daughters	wife & husband	daughters & herself	yes, fresh crops, garlic, cucumber, tomatoes, for own consumption	10 livestock: 4 cows, 6 oxen, 10 chickens	2 vehicles	yes
Yangiyul 1	10.11.2021	lives: Tashkent city; farm: Yangiyul district, Yozbash village	63	Tashkent Institute	1 daughter	daughter and son-in-law	herself	daughter & herself	no, she lives in a panel house	yes, cows	yes	yes
Yangiyul 2	10.11.2021	Yangiyul city, Yangiyul district	53	Polytechnical Institute	2 sons	husband and 2 sons	wife & husband	herself	yes, vegetables for own consumption, such as tomatoes, paprika, and eggplant	poultry, 7 sheep	no	yes
Yangiyul 3	10.11.2021	lives: Tashkent city, farm: Yangiyul	62	Tashkent State University, Faculty of Journalism	4: 2 sons, 2 daughters	herself, son, DIL, 4 grandchildren	herself	DIL	yes, flowers and fruits	poultry	yes	no
Yangiyul 4	13.11.2021	Yangiyul Sector 2	66	Republican Institute	none	sister's family	herself & brother	kind of DIL	yes, trees	Poultry, cows, sheep	yes	yes
Yangiyul 5	13.11.2021	Yangiyul, Pchelovot	45	High School	4 childr en	husband, 4 children		DIL & herself	yes		yes	no
Yangiyul 6	13.11.2021	Yangiyul, Halkobot	58	Technical College	NA	8 people: herself, husband, 2 sons, 2 DILs, 2 grandchildren	husband	herself & DIL	no	yes	yes	yes
Yangiyul 7	13.11.2021	Yangiyul, Halkobot	66	Agricultural institute:	1 son	5: husband, son, DIL, grandchild	husband	DIL	yes, fruit trees	yes, livestock	yes	no

				Department of Accounting								
Yangiyul 8	13.11. 2021	Yangiyul, Halkobot	55	Technical College of Accounting	2 sons	sons, brothers' family	herself	herself	yes, 16 acres of land	yes, small livestock	yes, son	no

Note: hh–household; *tomorka*–small garden plot attached to the house; DIL–daughter-in-law.

Table 10

Characteristics of Worker Respondents

Farmer code name	interview date (dd/mm/yyyy)	Region	Age	Education	Number of children	Lives with	Head of household (hh)	Decision-making in the household (hh)	Household chores	Tomorka	Animals	Car	Can drive a car	Crop	Working months
Cotton workers															
Buka 1	04.11. 2021	Buka	42	Secondary School	3: 1 son, 2 daughters	Husband, 3 children	husband	husband	daughter, herself	yes, potatoes, tomatoes, paprika, carrots, for household consumption	no	no	no	cotton	only September to early November
Buka 2	04.11. 2021	Buka,	32	High School	several	Husband, children	husband	Husband & wife	herself	yes	no	no	no	cotton	cotton season
Buka 3	05.11. 2021	Buka	35	NA		PIL, husband, 3 children		MIL & herself	herself, daughter, MIL	yes	a cow	no	no	summer crops	cotton season
Buka 4	05.11. 2021	Buka	36	High School	2 sons	Husband, 2 sons	husband	wife and husband	herself	yes	poultry	no	no	cotton	cotton season

Buka 5	05.11.2021	Buka	32	Vocational School: Accountant	2: 1 son, 1 daughter	PIL, husband, 2 children	Father-in-law	husband	herself, daughter	yes, 0.08 ha	3–4 cows, a donkey, 7 hens	no	no	cotton	cotton season, beans
Buka 6	05.11.2021	Buka	62	High School	2: 1 son, 1 daughter	husband, son, DIL, grandchildren		husband & wife	herself, DIL	yes	no	yes (son drives)	no	cotton	cotton season
Pastargom 1	25.10.2021	Pastargom, Hirmonsoy village	NA	Vocational School: Tailoring Uzbek College	2 children	husband, 2 children	husband	husband	Herself, husband (sometimes), children	yes	no			cotton	cotton season
Pastargom 2	25.10.2021	Pastargom	34	High School	2 children	Husband, 2 children	husband	husband	herself	yes	yes: 4 chickens, 5 cows	no	no	cotton and any work vegetable	cotton season, summer
Pastargom 3	25.10.2021	Pastargom	35	Vocational School: Pharmaceutics College	2: 1 son, 1 daughter	husband, children	husband	husband & wife	herself	yes	yes: 2–3 cows	no	no		
Horticulture workers															
Jomboy 1	20.10.2021	Old Jomboy	46	Vocational School		Husband, 2 children	husband	husband & wife	children	yes	yes	no	no	any work	any time any work
Jomboy 2	24.10.2021	Jomboy	NA	Vocational School: Medicine related: Suzan Karan Vocational School	1 child	PIL, husband, BIL/SIL, child	father-in-law	PIL		yes	yes	no	no	only own farm	only own farm work, 1 month

Jomboy 3	24.10.2021	Jomboy	65	Vocational School	grandchildren	Husband, youngest son, DIL, grandchildren	husband	husband & wife	DIL	yes	yes	yes: Nexia	can drive a tractor	horticulture	March–November
Jomboy 4	24.10.2021	Jomboy	61	High School		husband, sons, 2 DILs, grandchildren	husband			yes	yes: cow, calf	no	no	horticulture	March–November
Jomboy 5 (SOB head)	24.10.2021	Jomboy	35	High School			husband	husband	DIL	yes	yes	yes: Nexia	no	horticulture	March–November
Jomboy 6	24.10.2021	Jomboy	47	High School	3 children	Husband, DIL, grandchild	husband	together	DIL	yes	yes: 2 cows			horticulture	
Jomboy 7 (SOB head)	24.10.2021	Jomboy, Cukur village	34	High School		PIL, Husband, children	father-in-law	father-in-law	herself, daughter, MIL	yes	yes	no, but a tractor	no	horticulture	
Yangiyul 1	09.11.2021	Yangiyul, Qorasuv	36	NA	2 children	6 people				yes	yes	no	no	horticulture & cotton	March–November
Yangiyul 3 (SOB head)	11.11.2021	Qoyichirchik	41	Samarkand School		NA	husband	herself & husband	children	yes	no	yes	no	any work	11 months
Yangiyul 4	11.11.2021	Qoyichirchik	36	NA	2 children	3			herself	yes	no	no	no	any work	all year
Yangiyul 5 (SOB Head)	11.11.2021	Qoyichirchik,	52	High School	3: 2 sons, 1 daughter	NA	husband	herself & children	DIL	no	yes: 7 oxen	yes	no	any work	all year

Note: hh–household; PIL–parents-in-law; Yangiyul 3, 4, 5: these workers are from different districts

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