INITIATIVE ON

Fragility to Resilience in Central and West Asia and North Africa

WP2: Genetic innovation, seed systems and agrobiodiversity conservation for climate resilient food and nutrition security
Task 3: Protecting CWANA Agrobiodiversity: Uzbekistan

REPORT

On farming systems survey for study of on-farm conservation of apple landraces in Karvak village in Khazarasp District of Khorezm Province of Uzbekistan

Tashkent - 2024

Authors: Muhabbat Turdieva, Ahmed Amri, Muhammad Imtiaz and Zewdie Bishaw

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1. Background

Karvak community (village) is in Khazarasp district in the south of the Khorezm province of Uzbekistan. It is one of the largest villages in the district and according to local farmers, it is named after the Karvak apple landrace, which is grown everywhere in the village. The village is in the very south of the Khazarasp district, near the Kyzylkum desert. The local climate is characterized by sharp continentality with hot summers and snowless cold winters. The soil types are characterized by moderate salinity. Numerous salinized marshes can be found in the areas around the village.

The village consists of six *mahallas* (traditional communities): Buyuk ajdodlar, Karvak, Gafur Gulam, Shavat, Yukori Shavat and Yangiobod, where 29,271 people live. The total area of area of the village is 2,485 hectares, of which 1,680 hectares are suitable for agriculture. Local farmers grow cotton, wheat, rice, fruit tree crops and grape in their farms, and also engage in livestock farming. The total area of household plots is 1,390 hectares. Information on the demography of the *mahallas* and the economic activities of their residents is presented in Table 1 below.

Table 1. Demographics and economic activities of the Karvak village by its *mahallas* (communities)

#	Mahalla name	Population, persons	Main occupation in agriculture
1.	Buyuk ajdodlar	4, 085	Horticulture (apple, grape), rice, cereals (wheat)
2.	Karvak	7, 457	Horticulture (apple, apricot, grape, sweet cherry, plum)
3.	Gafur Gulam	4, 115	Horticulture (apple, apricot), rice, cereals (wheat)
4.	Shavat	4, 170	Livestock, bee keeping
5.	Yukori Shavat	3, 552	Horticulture (apple), rice, cereals (wheat), livestock
6.	Yangiobod	5, 892	Horticulture (apple, apricot), rice
Total:		**29, 271**	

2. Methodology

To assess the current state of on-farm conservation of apple landraces, a survey of 15 farming households was conducted in Karvak village, Khorezm province where apple landraces are maintained (Appendix 1). The survey was conducted on 1-4 March 2024, using a semi-structured questionnaire (Appendix 2). The data collected was entered into an Excel template and analyzed. The results of the analysis are presented below.

3. Results and discussions

3.1 Households characteristics and demography

The survey covered a total of 15 households, including 5 large farms, 2 smallholder farms (*dehkan*) farms and 8 backyard orchards (Fig. 1).

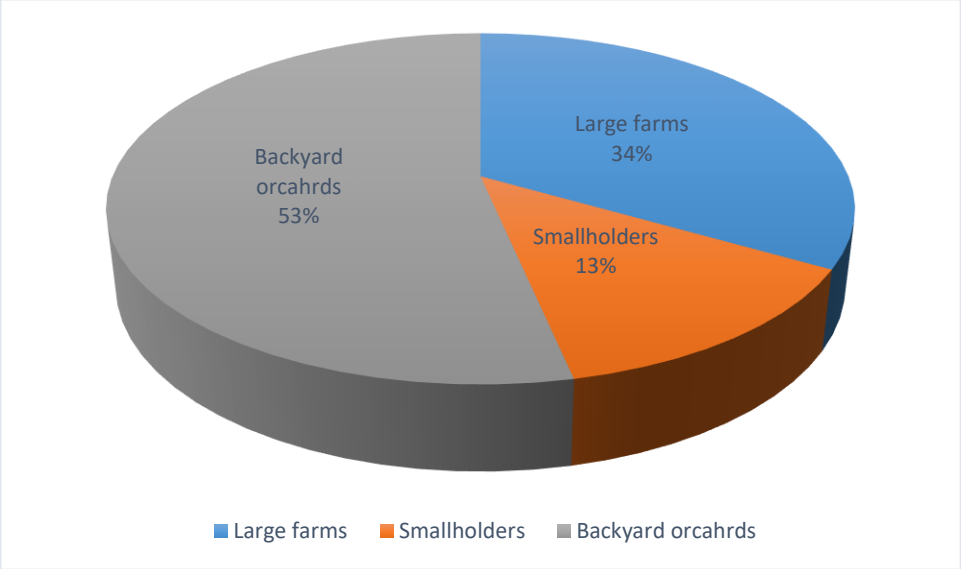

Fig. 1. Types of the surveyed households

53% of the surveyed households were headed by men and 47% by women (Fig. 2).

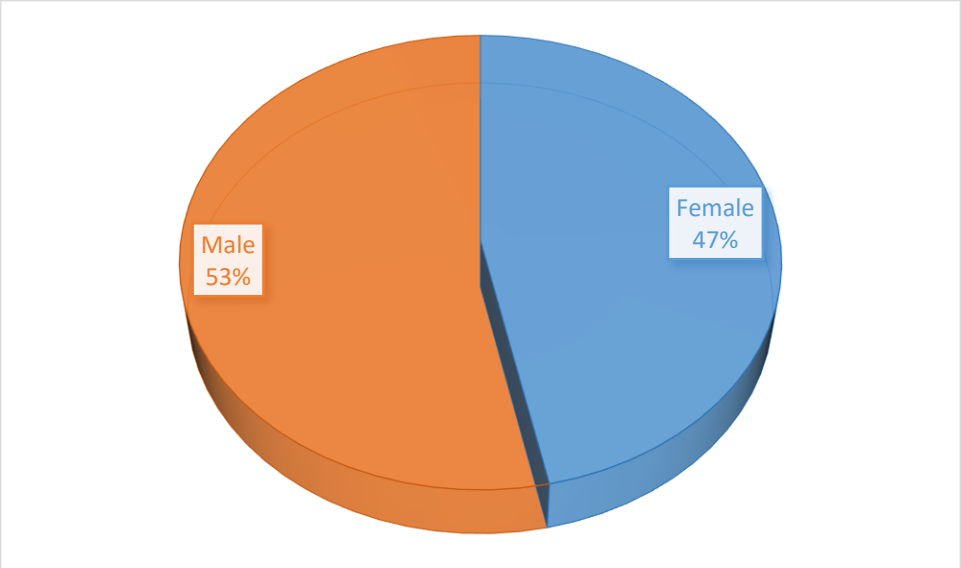

Fig. 2. Head in the surveyed households

The average age of the heads of the households surveyed was 52.9 years. The youngest head of the household was 32 years, and the oldest was 76 years old (Fig. 3). In terms of education, most heads of the households (87%) finished middle school, and only two (13%) had university diploma.

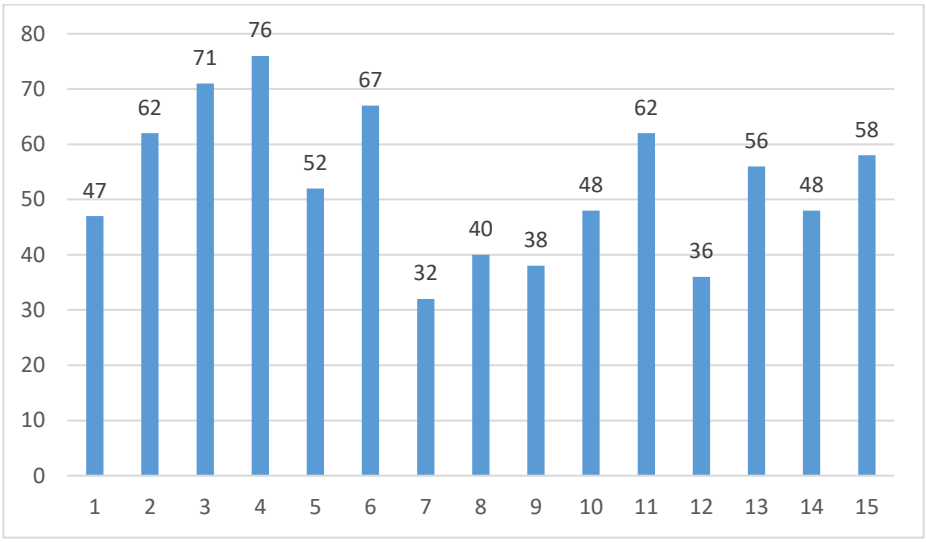

Fig. 3. Age of the heads of the surveyed HHs

The average size of the households surveyed was 5.6 people. According to the age distribution of HH members, there were no children under 7 in the households surveyed. The number of household members aged from 7 to 15 years old was on average 1.9 people, and over 15 years old – 3.7 people per household.

At the same time, according to the gender distribution, the number of female members aged from 7 to 15 years old was on average 0.9 people, and male – 1 person per household. The number of female household members over 15 years old was on average 1.9 people, and male – 1.7 people per household. The age and gender distribution of members of the surveyed households can be seen in Figure 4.

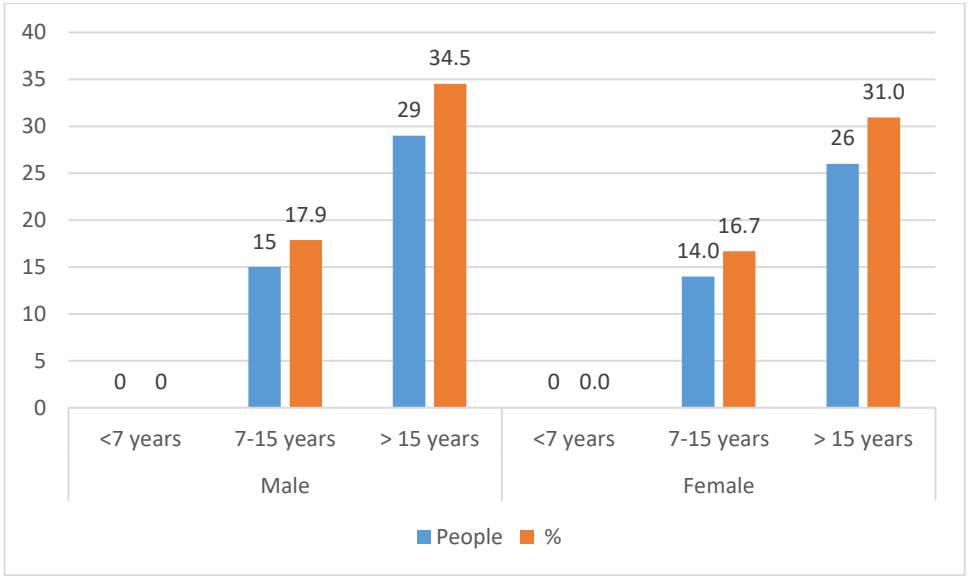

Fig. 4. Age and gender distribution of HHs members

It should be noted that household members start their engagement in farming at the age of 15.

In terms of education, only 4 people (4.7%) in all surveyed households have university degrees, the rest finished only middle school.
The average number of non-resident members of the household is 4 people (26.6%), and all of them are men. These are mainly household members aged from 26 to 38 years old.

3.2 Income sources

In 12 (80%) of the households surveyed, crop production was the main source of income. Income from agriculture accounted for 100% of the total income in two households (13%). In the rest of the households (67%), where agriculture was the main source of income, it accounted for from 60% to 80% (Fig. 5). In three households (20%), the main source of income was the service supply in agriculture and employment outside the country.

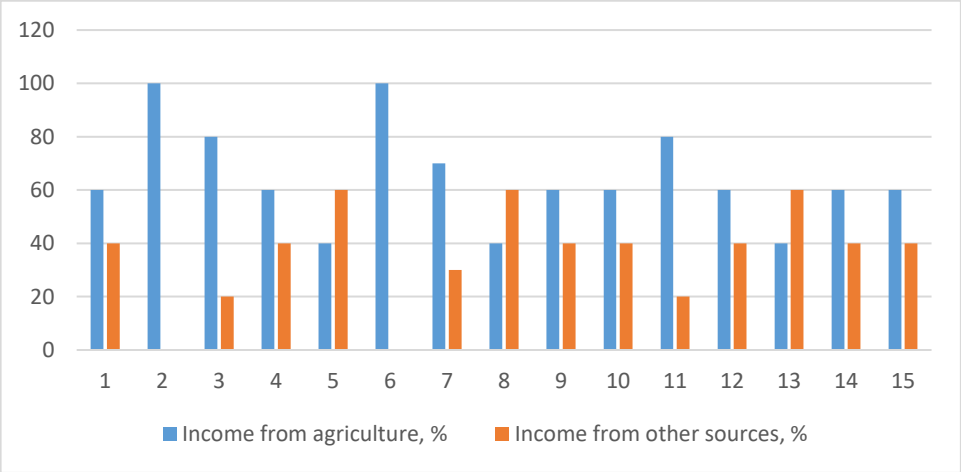

Fig. 5. Income sources of the households surveyed.

During the analysis of the data gathered, it was revealed that in 4 households (27%) one HH member over the age of 15 is working outside the country. The total amount of money transferred by the household members working outside the country averaged 15.4 million UZS per year. At the same time, the smallest transferred amount of money was 4 million UZS and the largest was 30 million UZS per year.

3.3 Farming systems

During the study of the on-farm conservation status of apple landraces (2024), it was found out that 13 apple varieties were grown in the surveyed households. Households have been growing these varieties for a long time, propagating them and planting new orchards with these apple varieties**. Of the 13 apple varieties identified, 10 varieties (77%) are landraces**. Along the landraces, the farmers also grow the improved apple varieties such as Renet Simirenko, Golden Delicious, Golden Grime, which have been acclimatized to local soil and climatic conditions since the 1970s. The apple landrace Yozgi Olma was the most popular in the surveyed households and was represented by 196 trees or 17.3% of the total number of trees of all apple varieties. The smallest number of trees was found in the apple landrace Rukhi Zhoni and Avgustovskoye - 0.5% and 0.2%, respectively (Table 2).

Table 2. Number of apple varieties grown in Karvak village

##	Apple variety	Origin	Number of trees	Share, %
1	Yozgi Olma	Landrace	196	17.3
2	Renet Simirenko	Improved	184	16.2
3	Golden Delicious	Improved	177	15.6
4	Kand Olma	Landrace	130	12
5	Kizil Olma	Landrace	116	10
6	Khazaraspskiy Letniy	Landrace	93	8
7	Besh Barmak	Landrace	83	7
8	Karvak	Landrace	73	6
9	Karvak Kutir Olma	Landrace	30	3
10	Khazaraspskiy Zimniy	Landrace	32	3
11	Golden Grime	Improved	11	1
12	Rukhi Zhoni	Landrace	6	1
13	Avgustovskoye	Landrace	2	0.2
Total:			**1,133**	**100**

Moreover, the apple landrace Yozgi Olma and improved variety Renet Simirenko are the most popular and are grown in 60% and 53% of the surveyed households, respectively, while the Avgustovskoye and Rukhi Zhoni apple landraces are the least common and are grown in only 7% of households (Fig. 6).

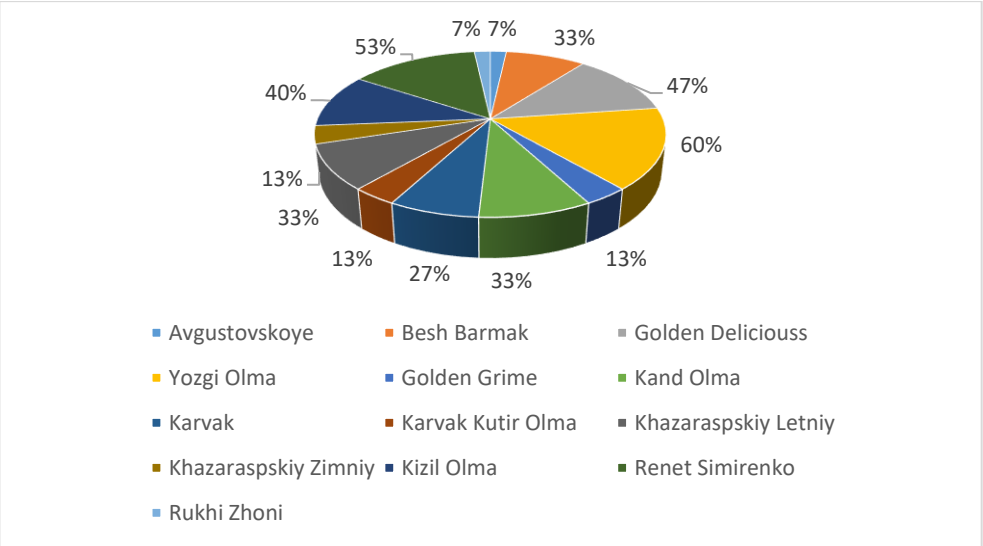

Fig. 6. Distribution of apple varieties in Karvak village

In general, all apple varieties produced a stable harvest in 2022-2023 in all surveyed households. The apple landraces Avgustovskoye (45 kg/tree), Kand Olma and Yozgi Olma (42 kg/tree) stood out in terms of average yielding (Fig. 7)

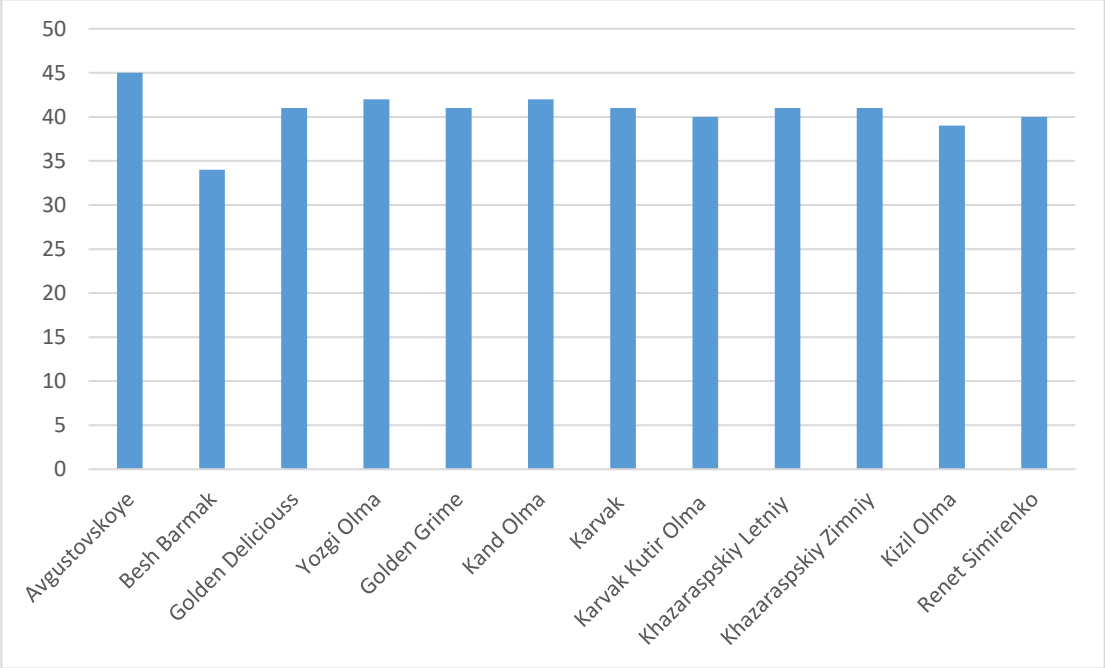

Fig. 7. Average yielding of apple varieties in Karvak village (kg/tree)

The main part of the harvested apples (70-80%) is sold during the harvest season on the local market, 10% are consumed in the household itself, and the remaining 10-20% is stored for personal consumption during off-season.

The entire farming system in Karvak village is based on crop irrigation. Water is supplied to the farmers' fields through a system of ditches. There are no rainfed lands in the village. While assessing changes in the farming systems in the village, all surveyed households indicated that the area under apple trees has increased in recent years due to the support provided by the national government and local authorities to increasing the area of apple orchards with apple landraces.

Many surveyed households (20%) noted that they are going to increase the area of apple orchards and the number of apple varieties grown on their farms in the future.

All surveyed households highly appreciated the role of apple landraces in ensuring the well-being of their households since they generate income from the sale of apple products.

3.4 Agronomic practices

During study of the agricultural practices applied by the surveyed households in management of apple trees, it was found that all households (100%) applied mechanized primary soil cultivation (plowing) - mainly with the use of walk-behind tractors and, in rare cases, of tractors. Manual primary soil cultivation (digging) is carried out very rarely, and, mainly, in small areas. This work is mainly performed by men (100% HHs).
Fertilizers are applied 2-3 times a year manually (100% HHs). This work is also mainly performed by men (85% HHs).

Planting of apple tree seedlings is also done manually (100% HHs) and, mainly, it is performed by women (75% HHs). In rare cases, they are assisted by men.

Pruning apple trees is done once a year - in spring. Pruning is done manually (100% HHs) and this work is done by men (100% HHs). Weed control is mainly done manually (100% HHs) and is performed by women (100% HHs).

Both men and women monitor the condition of trees. This activity is done 3-4 times per season. Pest and disease management measures are performed by men (100% HHs), and both men and women monitor the spread of diseases and pests. Pest and disease control is done up to 5-6 times per season. On average, about 1.5 million UZS are spent per hectare by the surveyed HHs. This includes the cost of purchasing chemicals, consultation service of a specialist, renting a sprayer, etc.

Tree watering is done manually. This work is done by men for large orchards (100% HHs), and for small orchards by women (100% HHs). On average, watering is carried out 10-11 times during the growing season. The costs of one household for tree watering was about 1 million UZS per 1 hectare. Cleaning of the irrigation system is also done manually (100% HHs). 20% of households use machinery to clean large canals. On average, one household spends about 1 million UZS per year for cleaning the irrigation infrastructure. Harvesting is done depending on the yield size 1-2 times per season. The harvest is done manually (100% HHs) and both men (75% HHs) and women (25% HHs) involved in it.

3.5 Managment of apple tree diseases and pests

While studying on pest and disease management of apple trees, it was found out that the main apple tree diseases in Karvak village are fireblight (*Erwinia amylovora*), fruit rot (monoliosis) (*Botryotinia fuckeliana* (de Bary) Whetzel), powdery mildew (*Podosphaera leucotricha*) and scab (*Venturia inaequalis* (Cooke) Winter) (Table 3).

Table 3. The main apple tree diseases in Karvak village

Apple disease	Number of respondents
Fireblight	7
Fruit rot	4
Powdery mildew	4
Scab	7

Among the listed diseases, fire blight (47%) and scab (47%) were the most common. Fruit rot and powdery mildew were mentioned by 27% of the households surveyed (Fig. 8). Households manage these diseases with the use of chemicals such as Entochlorok, Topaz, Kurzat and other.

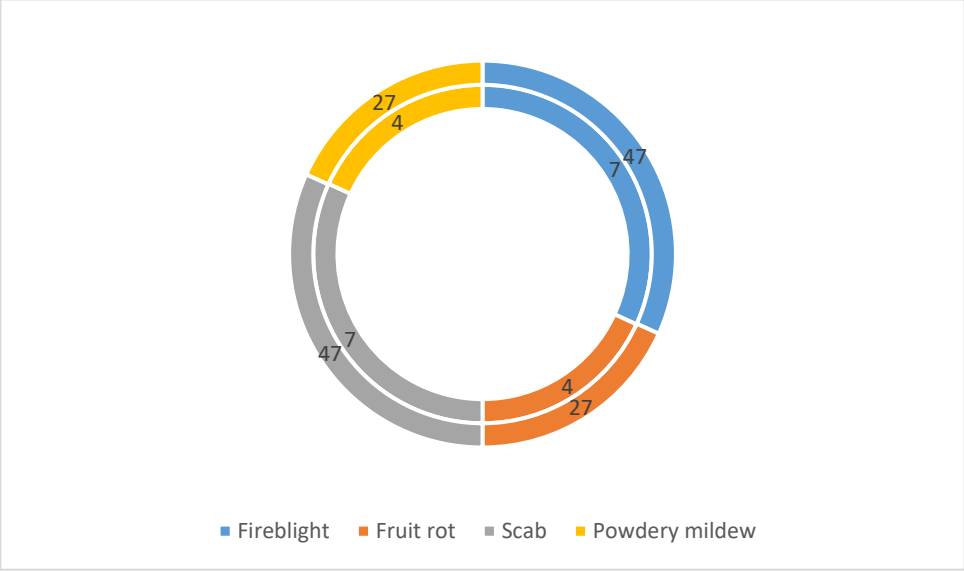

Fig. 8. The most common apple tree diseases in Karvak village

Among the apple tree pests in Karvak village, the codling moth (*Cydia pomonella* (Linnaeus)), spider mite (*Tetranychus urticae*) and aphid (*Aphis pomi* Deg.) were mentioned by the households (Table 4).

Table 4. The main apple tree pests in Karvak village

Pest	**Number of respondents**
Spider mite	7
Codling moth	14
Aphid	9

The most common pest of apple trees in Karvak village is the codling moth (93% HHs) (Fig. 9). To manage these pests, the households apply pesticides like Uzmayt and Entolucho.

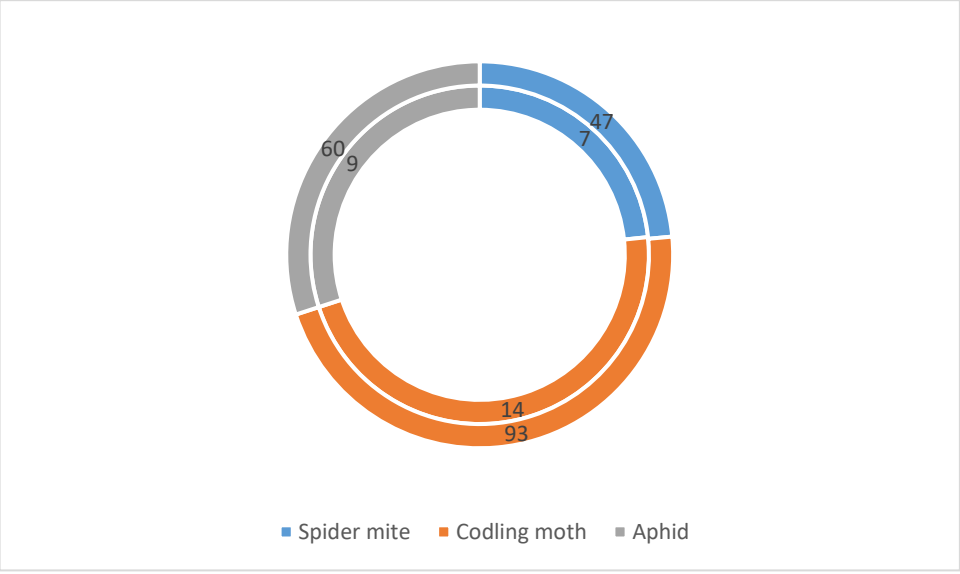

Fig. 9. Apple tree pests in Karvak village

Work on treating apple trees with chemicals is carried out in all households by men.

3.6 Comparison of apple landraces and improved varieties

3.6.1 Improved apple varieties

Such exotic improved apple varieties as Golden Delicious and Delicious, which perform well in local soil and climate conditions are cultivated in Karvak village. The surveyed households mentioned that they know about other improved apple varieties such as Granny Smith (13% HHs), Golden Rangers (13% HHs), Golden Delicious (13% HHs), Pink Lady (13% HHs), Delicious (7% HHs), Gala (6% HHs). They heard about these improved varieties from other farmers or came across them at local markets and in households in neighboring villages. The surveyed households noted that they would like to grow these apple varieties in their orchards in the future, as they heard from farmers in neighboring villages that these varieties have big fruit size and attractiveness, the dense pulp texture and long shelf life of fruits. However, it should be noted that attempts to grow the exotic improved apple varieties in Karvak village such as Pink Lady, Gala and Granny Smith were unsuccessful, and the seedlings of these varieties planted in 2017 died. This was the result of the fact that these exotic apple varieties are not adapted to local soil and climate conditions.

3.6.2 Apple landraces

During the study it was found out that the surveyed households currently grow 10 apple landraces, including Kizil olma, Karvak, Khazaraspskiy Letniy, Khazaraspskiy Zimniy, Kand Olma, Yozgi Olma, Karvak Kutir Olma, Besh Barmak, Rukhi Zhoni and Avgustovskoye.

Among them, the most common in terms of the number of trees grown are the apple landraces Yozgi Olma (26%), Kand Olma (17%) and Kizil Olma (15%) (Fig. 10). These landraces are characterized by early ripening of fruits, tolerance to stress factors of local environment as soil salinity, chilling temperatures, drought, heat, as well as the high demand at the local markets for their products. The fruits of these apple landraces can be stored under room conditions for up to 5-6 months.

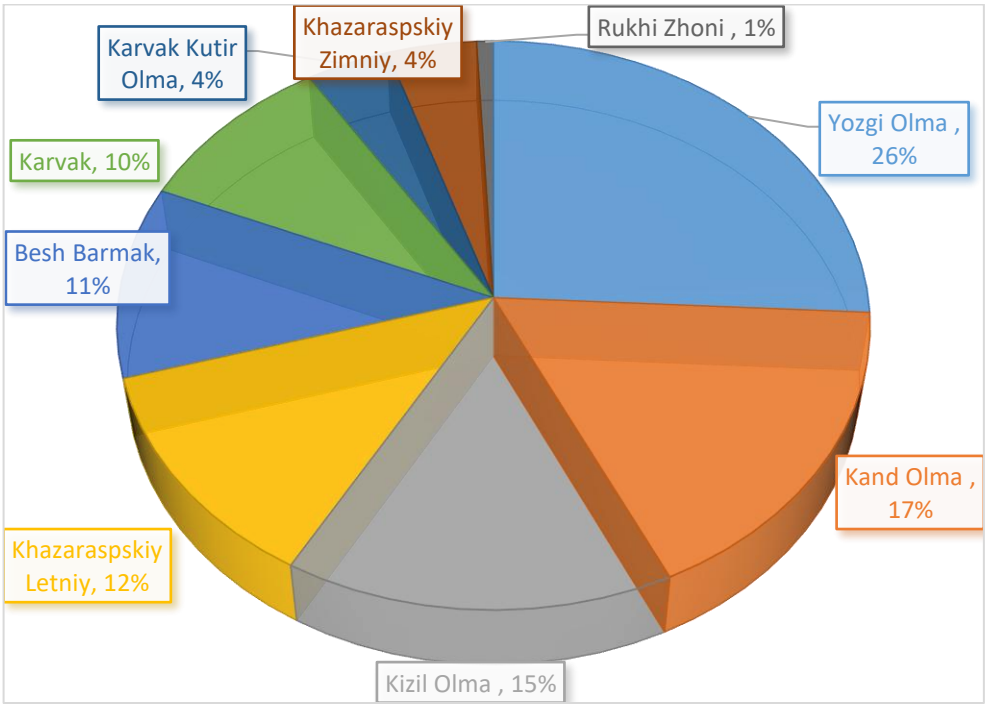

Fig. 10. Apple landraces currently grown

At the same time, the apple landraces Yozgi Olma and Kizil Olma are the most common and are grown in 60% and 40% of the surveyed households, respectively, while the landraces Avgustovskoye and Rukhi Zhoni are the least common and are grown in 7% of households (Table 5).

Table 5. Number of households growing apple landraces in Karvak village

Variety	Number of HHs	%
Karvak	4	27%
Kizil Olma	6	40%
Khazaraspskiy Letniy	5	33%
Karvak Kutir Olma	2	13%
Khazaraspskiy Zimniy	2	13%
Besh Barmak	5	33%
Yozgi Olma	9	60%
Kand Olma	5	33%
Avgustovskoye	1	7%
Rukhi Zhoni	1	7%
Total HHs:	**15**	

The survey results show that all apple landraces that were grown in the village in the past are still maintained there.

3.6.3 Yield of apple landraces and improved varieties

Comparison of the yielding of apple landraces and improved varieties maintained in the village showed that apple landraces such as Khazaraspskiy Letniy, Khazaraspskiy

Zimniy, Kand Olma and Yozgi Olma bear fruits on stable basis and produce good yield in both good and off years. At the same time, improved exotic apple varieties such as Pink Lady, Delicious, Granny Smith, Gala produce yield of 10-15 kg less per tree in off years and 3-8 kg less in good years than the apple landraces in local soil and climate conditions (Fig. 11). Therefore, the local farmers prefer to grow apple landraces in their farms.

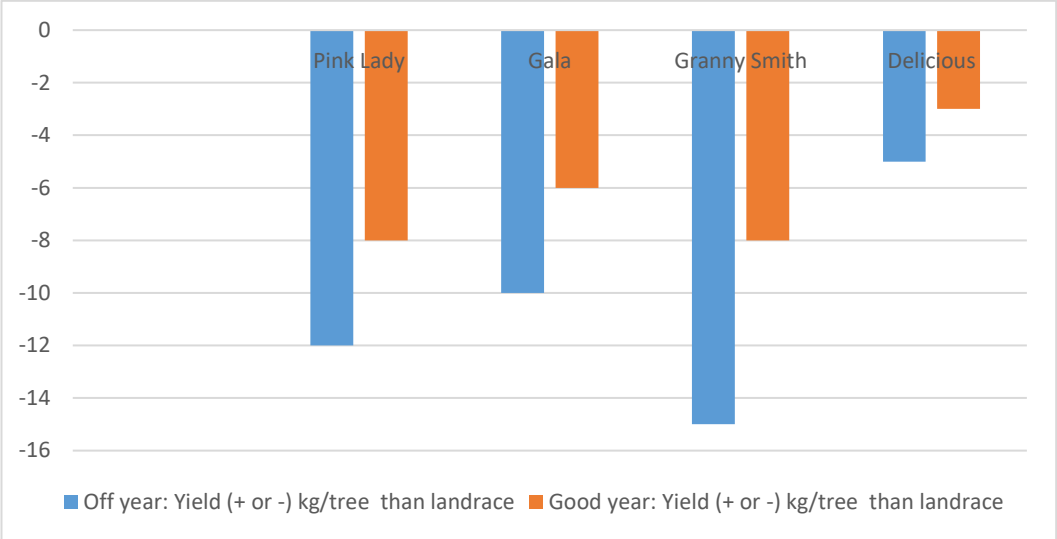

Fig. 11. Comparison of the yielding of apple landraces and improved varieties

Fig. 11 shows that regardless of whether the year was fruitful or off, the yielding of apple landraces was higher than that of improved varieties. If in fruitful years, improved apple varieties yielded 20-25 kg of apples per tree, while the yield of apple landraces was twice as much. In off years, improved apple varieties did not bear fruits at all, while the landraces yielded 10-12 kg of apples per tree.

3.7 Planting material (seedlings) sources

Study of the sources of planting material of apple landraces showed that 20% or 3 of the surveyed households grow apple landraces' seedlings themselves, 67% (10 HHs) get seedlings from outside sources, and 13% (2 HHs) both grow themselves and get from outside sources. At the same time, 53% (8) of households that get seedlings from outside sources buy them at the local market, 20% (3 HHs) buy from nurserymen in their village, and 40% (6 HHs) - both buy at the market and from neighbors in the village (Fig. 12). Of the five households that grow apple seedlings themselves, 3 households self-supply themselves with planting material for 100%, and 2 households - from 70 to 90%. None of the surveyed households exchange apple planting material with other households in the village or grow apple trees from self-seeded plants.

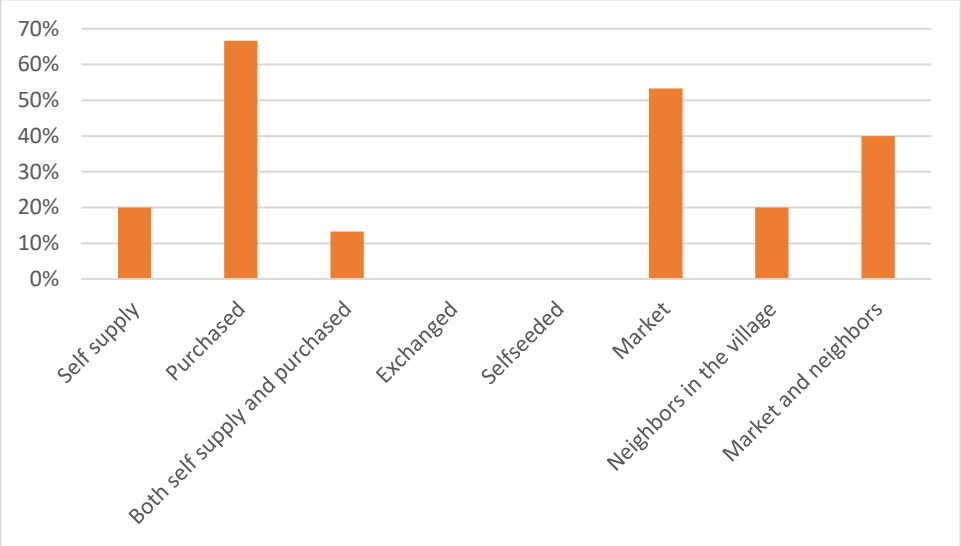

Fig. 12. Sources of apple tree seedlings in Karvak village

3.7.1 Practices for growing quality planting material of apple trees

The surveyed households that grow apple tree seedlings themselves practice propagation of fruit tree crops from 3 to 12 years. All of them mainly grow seedlings of apple landraces grafted on rootstocks from local apple seeds. 100% of these households noted that a land plot for growing apple seedlings should be carefully selected and 80% emphasized that it is important to know what crops were grown on this land plot before (Fig. 13). The soil type on the land plot where the seedlings will be grown is of great importance (33% HHs) and should be fertile and not subject to salinization (13% HHs). The land plot for growing apple seedlings should have access to the water for irrigation of seedlings (80% HHs).

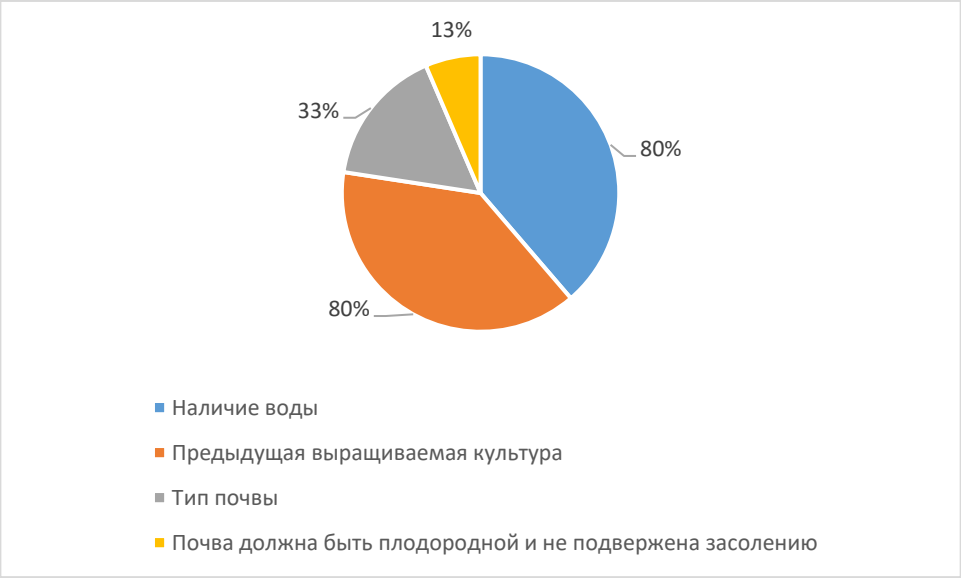

Fig. 13. Criteria for selecting a land plot for growing apple seedlings

100% of households also noted that the seeds for growing the apple rootstock also need to be selected properly (Fig. 14). It is necessary to collect the seeds and sow them in a timely manner to obtain good shoots. 20% of households indicated the need to stratify the seeds before planting in the soil. After the shoots appear, it is necessary to manage

properly the seedlings to ensure their good growth and development of the main stem for budding, i.e. the diameter of the rootstock's main stem should not be thinner than the diameter of ordinary pencil. 20% of the surveyed households indicated the need to correctly select varieties for grafting. It is important to perform grafting in a timely manner that ensures a high survival rate of the grafted plants (80% HHs). In early spring, it is necessary to cut the rootstock above the budding site to ensure good development of the budded scion. Particular attention should be paid to the growth and branching of the seedlings.

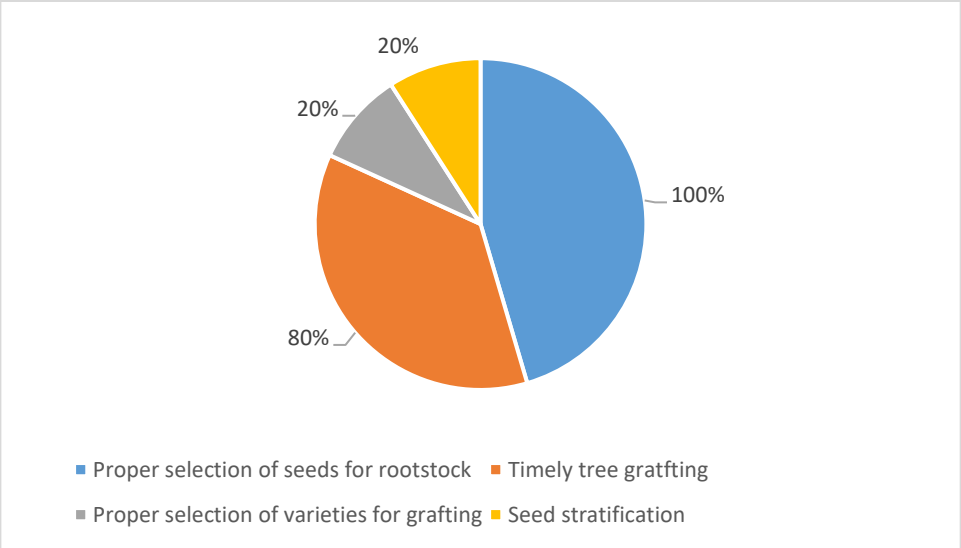

Fig. 14. Criteria for growing quality seedlings

Experienced nurserymen sell on average up to 1,500-2,000 seedlings of apple landraces per year at a price of 12,000 to 25,000 UZS per seedling.

3.7.2 Criteria for selection of quality seedlings

While planting the apple orchard, the surveyed households pay great attention to the quality of seedlings. They use the following quality criteria: availability of a budding site on the seedling stem (80% HHs), availability of lateral branches (40% HHs) and their cleanliness from damage (20% HHs); the seedling should have a well-developed root system; and the height of the seedling (20% HHs) (Fig. 15).

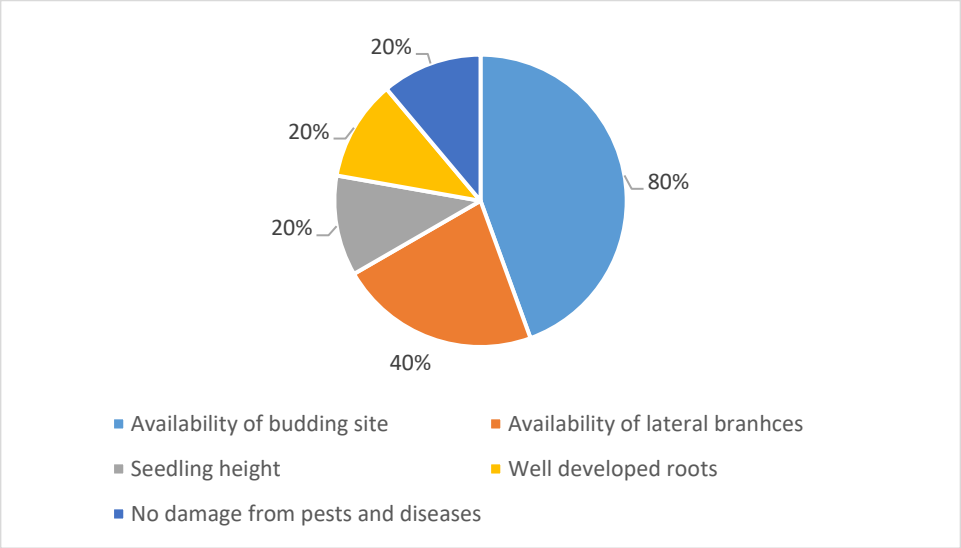

Fig. 15. Criteria for selecting quality seedlings

3.7 3 Planting material (seedlings) exchange network

The households surveyed in a very small amount exchange planting material (seedlings) of apple varieties. Usually, the households exchange seedlings of certain varieties (70% HHs). In this case, 2-5 seedlings of certain apple varieties are exchanged between the households within the village (67% HHs) and with the households in the neighboring villages (73% HHs). The farmers mainly exchange seedlings of apple landraces such as Kand Olma, Khazaraspskiy Letniy, Khazaraspskiy Zimniy, Yozgi Olma, as well as exotic improved apple varieties such as Golden Delicious, Renet Simirenko, Golden Grime.

3.8 Livestock

Almost all surveyed households (100%) keep local cattle breeds. The average number of cattle is 4 heads per household, of which 1.3 are calves, 0.8 are bulls and 2 are cows. Small ruminants are also local breeds. The average number of small ruminants is 6.8 heads per household, of which 0.7 are rams and 6 are sheep. Livestock grazing, watering and feeding in all households is done by women and in very rare cases by men (27% HHs).
Almost all households keep livestock in stalls. Some households (40% HHs) send their small ruminants for winter and summer grazing to distant rangelands for 5-6 months from September to December or until August of the following year.

4. Conclusions

1. In the village, most households (90-95%) are engaged in the growing of fruit tree crops (apple, apricot, plum, sweet cherry, and pear) and grapes.
2. About 53% of the surveyed households are headed by men and 47% by women.
3. The average size of the households surveyed is 5.6 people.
4. Agriculture is the only source of income for 74% of the households surveyed and the rest of 26% HHs generate their income both from agriculture and work in government agencies.
5. Thirteen apple varieties are maintained in the village, of which 10 varieties (77%) are landraces.
6. The most common apple landraces are Khazraspskiy Letniy (12% HHs), Khazraspskiy Zimniy (4% HHs), Karvak (10% HHs) and Kand Olma (17% HHs).
7. The main reasons for growing apple landraces are their early ripening (26% HHs), tolerance to drought, heat, soil salinity, as well as resistance to diseases (52% HHs), high demand at the market and long shelf life (22% HHs).
8. Improved apple varieties as Renet Simirenko, Golden Delicious, Golden Grime as also grown in the village.
9. Yielding of apple landraces exceeded the yielding of improved varieties in both good and off years.
10. 67% of surveyed households purchase apple tree planting material (seedlings) at the market or from neighbors, and 33% grow it themselves.
11. Surveyed households use the following quality criteria for selection of quality apple seedlings: availability of a budding site (80% HHs), availability of lateral

branches (40% HHs), availability of a well-developed root system (20% HHs), and the absence of damage from diseases and pests (20% HHs).

12. All agronomy practices for growing apple seedlings are performed manually, except the soil tillage.
13. Agronomy practices on fertilizer application are performed by men (100% HHs), planting and sowing by women (100% HHs), tree pruning by men (100% HHs), weeding by men (40% HHs) and women (60% HHs), pest and disease control both by men (93% HHs) and women (7% HHs), tree watering by men (40% HHs), women (47% HHs) and both by men and women (13% HHs), harvesting by men (93% HHs) and women (7% HHs).
14. The survey results showed that there no loss of apple landraces in the village, but there was a decrease or increase in the area under landraces depending on market demand.

Appendices

Appendix 1

CWANA Initiative: From Fragility to Resilience in Central and West Asia and North Africa (F2R-CWANA)
WP2: Genetic innovation, seed systems and agrobiodiversity conservation for climate resilient food and nutrition security
Task 3: Protecting CWANA biodiversity: Lebanon, Morocco and Uzbekistan

Farming systems survey for cultivated apple agrobiodiversity

1. Farm identification

- № Farm: _____ Date: _____
- Name of farmer: _____
- Village: _____ District: _____
- Province: _____ Interviewer: _____

2. Household

2 1- Head of the household

- Age: _____
- Education level:
- Main occupation: _____ Income: _____ %
- Other occupation: _____ Income: _____%

2.2- Household members (resident and non resident)

Age group	Resident members		Non-resident members	
	Male	Female	Male	Female
-7 years old				
7 - 15 years old				
+ 15 years old				

2.3- Active members of the household (All resident and non resident members aging more than 15 years that contribute to the household income)

Identification (son, daughter, etc.)	Age	Gender	Education	Main occupation*	Location**	Duration, months/years	Total amount of money transferred

* Agriculture: 1; Farm worker: 2; Trade: 3; Other: 4
** Urban area: 1, Province: 2, Village: 3, Outside the country: 4

3. FARMING SYSTEMS

3 1- <u>Farming system in 2022-2023.</u>

№ Field	Crop	Variety/ Landrace	Area/ Number of trees	Ownership type *	R/I**	Soil		Yielding, kg/tree	Use***
						Type	Slope		

* Owned: 1, Leased: 2, Public: 3
**R/I: Rainfed/ Irrigated
***Food: 1, Forage: 2, Seed: 3, Sale: 4, Storage: 5, Other: 6

3.2 Assessment of changes in planted area under each crop in the household

Crop	Apple	Walnut
1. Do you think that this crop is increasing or decreasing its importance in the household livelihoods?		
2. Are you going to increase or decrease the area under this crop in your household in the future?		
3. How do you assess the role of this crop in your household?		

For Q 1 and Q2:
\+ Low increase - Low decrease 0 no change
++ Medium increase -- Medium decrease
+++ Big increase --- High decrease

For Q3:
1 less important
2 medium important
3 highly important

3.3 Agronomy practices

Crop: Apple/Walnut
Type: Local or Improved
Origin: Landrace /Traditional/ Improved locally/ Exotic

(For the biggest plot under this crop)

Practice	Tillage *	Fertlizer / manure **	Sowing / Planting ***	Pruning ***	Control ****		Irrigation	Harvest *****
					Weeds	Pests and diseases		
Type								
Method (manual or mechanical)								
Equipement used								
Period or frequency								
Quantity (kg)								
Duration (hours)								
Frequency (times)								
Total cost (UZS)								
Who performs? (M or F)								
Observations								

For trees consider pruning

**	Animal: 1;	Tractor: 2	
***	Manual: 1;	Drill: 2;	Other: 3
****	Manual: 1	Chemical: 2;	Man+chem: 3
*****	Mechanical: 1;	Manual: 2;	Other: 3

3.4. Phytosanitary control (cite the crop) Apple/Walnut

Disease/Pest (scientific name)	Local name	Period of the attack/month	Symptoms	Treatment	
				Product used	Date of treatment

4 - LIVETOCK

4.1 Livestock

Species / Categories	Number	Breed*	Hurding		Watering		Feeding	
			M	**F**	**M**	**F**	**M**	**F**
Cattle Milk cows								
Veal								
Bulls								
Sheep								
Adult ewe								
Rams								
Lambs								
Goats								
Horses								
Number of bee hives								

* Pure improved bred: 1, Cross bred: 2, Local: 3

4.2. Feeding calendar

	Sept	**Oct.**	**Nov**	**Dec.**	**Jan.**	**Feb.**	**Mar.**	**April**	**May**	**June**	**July**	**Aug.**
Grazing:												

А) Rangeland												
Б) Forest												
Pasture:												
А) Pastureland												
Б) Forest												
В) Field												
Stall Housing												

5. LOCAL AND IMPROVED VARIETIES

5.1 Improved varieties

Response coding: 1= Yes; 2= No

Crop	**Apple**	**Walnut**
Do you know about the improved varieties?		
Did you grow them?		
If yes, which ones?	_____ _____ _____ _____ _____ _____	_____ _____ _____ _____ _____ _____
What characteristics of varieties are appreciated?	_____ _____ _____	_____ _____ _____
Do you still grow them?		
Justify your response?		

5.2. Local varieties/landraces

1. **Crop: _____**

What are the local varieties grown currently or in the past?

	Variety 1	**Variety 2**	**Variety 3**	**Variety 4**
Local name				
Other names				
Area planted, ha				
Number of trees				
Main specific traits	_____ _____ _____ _____ _____ _____	_____ _____ _____ _____ _____ _____	_____ _____ _____ _____ _____ _____	_____ _____ _____ _____ _____ _____
Since which year do you grow it?				

	Variety 1	Variety 2	Variety 3	Variety 4
Local name				
Why do you grow it?	_____ _____ _____	_____ _____ _____	_____ _____ _____	_____ _____ _____
When did you stop to grow it?				
Reasons for stopping to grow it?	_____ _____ _____	_____ _____ _____	_____ _____ _____	_____ _____ _____

2. **Crop: _____**
What are the local varieties grown currently or in the past?

	Variety 1	Variety 2	Variety 3	Variety 4
Local name				
Other names				
Area planted, ha				
Number of trees				
Main specific traits	_____ _____ _____ _____ _____ _____	_____ _____ _____ _____ _____ _____	_____ _____ _____ _____ _____ _____	_____ _____ _____ _____ _____ _____
Since which year do you grow it?				
Why do you grow it?	_____ _____ _____	_____ _____ _____	_____ _____ _____	_____ _____ _____
When did you stop to grow it?				
Reasons for stopping to grow it?	_____ _____ _____	_____ _____ _____	_____ _____ _____	_____ _____ _____

6. Productivity differences between landrace and improved varieties?

Percent of increase or decrease of productivity over the landrace

1. **Crop: _____**
Name of improved variety: _____ Landrace:_____
Good season: Yield: (+ or - ?) _____kg/tree in compare with landrace

Off year: Yield: (+ or - ?) _____ kg/tree in compare with landrace

2. **Crop: _____**

Name of improved variety: _____ Landrace:_____
Good season: Yield: (+ or - ?) _____kg/tree in compare with landrace

Off year: Yield: (+ or - ?) _____ kg/tree in compare with landrace

3. **Crop: _____**
Name of improved variety: _____ Landrace:_____
Good season: Yield: (+ or - ?) _____kg/tree in compare with landrace

Off year: Yield: (+ or - ?) _____ kg/tree in compare with landrace

4. **Crop: _____**
Name of improved variety: _____ Landrace:_____
Good season: Yield: (+ or - ?) _____kg/tree in compare with landrace

Off year: Yield: (+ or - ?) _____ kg/tree in compare with landrace

5. **Crop: _____**
Name of improved variety: _____ Landrace:_____
Good season: Yield: (+ or - ?) _____kg/tree in compare with landrace

Off year: Yield: (+ or - ?) _____ kg/tree in compare with landrace

7. Comparison of the characteristics of landrace and improved varieties:

Name of improved variety: _____ Landrace:_____
(Codes: 1 = improved variety is better; 2 = Landrace is better
3 = no difference; 4 = no idea)

Crop	**Walnut**	**Apple**
- Frost tolerance?		
- Drought tolerance?		
- Heat tolerance?		
- Soil salinity tolerance?		
- Diseases resistance?		
- Pests' resistance?		
- Lodging resistance?		
- Yield under marginal conditions?		
- Yield under no fertilizer application?		
- Early ripening?		
Easiness for manual harvest?		
Tolerance to fruits abscission?		
Ability for storage under local conditions?		
Yielding?		
Fruit size?		
- Fruit color?		
Regeneration after grazing?		

Crop	Walnut	Apple
Fruit quality for food?		
- Price for fruits		
- Post harvest characteristics (storage)		
- Taste		
- Market demand		

8. SEEDS/SEEDLINGS

Origin:	Self-produced	Bought	Exchanged
Walnut:			
Apple:			

9. Seed and seedling

Variety					
Who sold to you?					
Where?					
Since when?					
Are there any other well known seed/seedling suppliers and sellers in the region?					

9.2 If seed/seedling are produced in the farm:

Crop	Walnut	Apple		
- Do you reserve a special land plot for the seed /seedlings production?				
What criteria are used for plot selection? - Acreage - Previous cropping - Location, distance - Soil type - Topography - Exposure				

9.3 Seed/seedlings production practicies

Does the land plots where the seed/seedlings are grown get special care? (Yes or No)

If yes what are these special practices?

Crop	Special practices
Walnut	

9.4 Selection

Crop	Walnut	Apple
What is the origin of seeds/seedlings?		
Since how many years you have been producing the seeds/seedlings?		

How do you select your seed/ seedlings lot?

Method	**Walnut**	**Apple**
Bulk sample from harvest		
Special plot		
Plant selection		
Seed selection		

9.5. Special practices for the seed/seedlings quality:

Method	**Walnut**	**Apple**
Seed/seedling cleaning		
Seed/seedling treatment		
Germination test		
Other		

What do you do with the seeds/seedlings produced?

	Walnut	**Apple**
Quantity sold		
Sale location		

Average price		
Quantity stored		
Storage duration (month)		
Storage location		
Treatment (product)		
Quantity used for seeds/planting		
Quantity exchanged		

9.6. Seed exchang network

Do you know other seed/seedling suppliers within or outside your village?

Crop	**Within the village**	**Outside the village**

Are there farmers within the village or ouside the village with whom you exchange seeds/seedlings?

Crop	**Within the village**	**Outside the village**

Are there farmers with whom you exchange informations on seed/seedling production practicies within or ouside the village?

Crop	**Within the village**	**Outside the village**