ADB

Technical Assistance Consultant's Report

Project Number: 53109-002
April 2021

Republic of Tajikistan: Preparing the Irrigation and Drainage Modernization in the Vaksh River Basin Project

Prepared by

Z-Analytics

Dushanbe, Tajikistan

For the Asian Development Bank

Asian Development Bank

Preparation of the Irrigation and Drainage Modernisation in the Vakhsh river Basin Project
TA-9867 TAJ




AGRICULTURE SOCIO-ECONOMIC BASELINE SURVEY

Report on the Results of the Baseline Survey

July 2020-February

Dushanbe – 2021

The Report on the Results of the Socio-Economic (Baseline) Survey is prepared for the Asian Development Bank (ADB) in the framework of the Preparation of the Irrigation and Drainage (I&D) Modernization in the Vakhsh River Basin Project, Project Number TA-9867 TAJ.

Executor:

Tahlil va Mashavarat, Limited Liability Company is operating under the brand name Z-Analytics. Agriculture Socio-Economic Baseline Survey, Report on the Results of the Baseline Survey, Dushanbe, 2021

Contacts:

Parviz Yusupov, Director
28 Pulodi Street, (2nd floor, 8 office), Dushanbe, Tajikistan, 734013
Telephone: (+992) 935721001
Email: yusupov.parviz@z-analytics.tj

Abduaziz Kasymov, Survey Analyst
28 Pulodi Street, (2nd floor, 8 office), Dushanbe, Tajikistan, 734013
Telephone: (+992) 935721008
Email: abduaziz.kasymov@z-analytics.tj

On Cover:

Photo “The Irrigation Canals and Household Kitchen Garden”- Yavan and Abdurahmon Jomi districts, Khatlon region, Republic of Tajikistan, November, 2020

ACKNOWLEDGEMENTS

This report is prepared by the Z-Analytics specialists based on the results of Agriculture Socio-Economic Baseline Survey in the framework of the Preparation of the I&D Modernization in the Vakhsh River Basin Project and also is a result of cooperation between Z-Analytics, ADB, Agency for Land Reclamation and Irrigation under the Government of the Republic of Tajikistan (ALRI) and Technical Assistance Team (TA Team).

Z-Analytics expresses its gratitude to the ALRI, Water User Associations (WUAs) and local authorities of Yavan, Abdurahmon Jomi, Khuroson, Jayhun, Vakhsh, and Jaloliddin Balkhi districts of Khatlon region for the active cooperation and support in the preparation and conduct of this survey.

The Z-Analytics also would like to thank Alan Clark, Team Leader and Nozilakhon Mukhamedova, Independent Consultant (IC) on the Preparation of the I&D Modernization in the Vakhsh River Basin Project for management and valuable contribution to the development and adaptation of survey's methodology (questionnaire and sampling).

Survey Implementers

Gulnora Beknazarova	Team Leader, Social Development Specialist
Abduaziz Kasymov	Irrigated Agriculture and Water Management Specialist
Mehrdod Yorov	Data Processing Manager
Nargis Hamidova	Field Manager
Muhayyo Rahimzoda	Junior Analytical Specialist
Zarema Akhmadiyeva	Junior Analytical Specialist
Lubov Sayfetdinova	Regional Manager/Supervisor in Khatlon Region

Authors of the Report[1]

Abduaziz Kasymov

Muhayyo Rahimzoda

Zarema Akhmadiyeva

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ANNEXES

LIST OF ACRONYMS

ADB	Asian Development Bank
ALRI	Agency for Land Reclamation and Irrigation under the Government of the Republic of Tajikistan
I&D	Irrigation and Drainage
IC	Independent Consultant
LLC	Limited Liability Company
N	Sample size = Number of respondents surveyed
NDS-2030	National Development Strategy of Tajikistan until 2030
RT	Republic of Tajikistan
TA	Technical Assistance
TJS	Local Currency Unit (Somoni)[2]
USD	US Dollar
Z-Analytics	Tahlil va Mashvarat, Limited Liability Company

[2] Exchange rate by 01-02-21: 1.00 USD = 11.30 TJS: https://nbt.tj/tj/kurs/kurs.php?date=01.02.2021

LIST OF TERMS AND DEFINITIONS

CSPro	Census and Survey Processing System – a software product for data collection, editing and analysis
Dehkan Farm	Midsized peasant farms that are legally and physically distinct from household plots or a business entity, production, storage, processing and sale of agricultural products which are based on the personal activities of one person or joint activities of a group of individuals on the land and their property[3]
Household	A group of people who support one another in maintaining a shared household
Jamoat	Local authorities
SPSS	Statistical Package for the Social Sciences – a software package used for interactive, or batched, statistical analysis.
Survey	The set of events on systematic collection of data, approbation and analyses of data on specific information
Respondent	A person who presents information during the course of a survey
Pesticides	Agricultural pesticides are used for pest control and plant disease as well as parasite, weed, grain and grain products pest, wood, cotton, wool and leather products control. Also, agricultural pesticides are used against ectoparasites of domestic animals and the transmitters of human and animal diseases.
Herbicides	Agricultural pesticides used for weed killing
WUA	Water Users Association – a non-profit organization that is initiated, and managed by the group of water users along one or more hydrological sub-systems regardless of the type of farms involved[4].

LIST OF MEASUREMENTS UNITS

Ha	Hectare (1 HA = 1 AR)
T	Ton (1 T = 1000 Kg)
Kg	Kilogram
L	Liter
M	Meter

[3] Law of Republic of Tajikistan # 1289 "on Dehkan Farms" dated March 15, 2016
[4] How to establish a Water Users Association? http://www.iwmi.cgiar.org/regional-content/central_asia/pdf/wua_eng.pdf

INTRODUCTION

The modernization of irrigation and sustainable management project is carried out within the framework of the National Development Strategy of Tajikistan until 2030[5] by ADB and in agreement with the Government of Tajikistan. Under this project, one of the priorities is to integrate food security with production and marketing development, water management and climate change adaptation, targeting poorer regions of the country. In particular, the project is aimed at modernizing the I&D systems of Yavan and Kumsangir zones of the Lower Vakhsh river basin, which will help to increase the capacity of the ALRI, increase water productivity in agriculture and, in general, improve living conditions in rural areas and food security.

An advance study was carried out with ADB support in 2019 to assess the involvement of women in irrigated agriculture in two selected schemes where feasibility studies for modernization are being carried out[6]. The purpose of this agro-socio-economic baseline survey (survey) is to collect additional information to support the project baseline and design, with a greater focus on financial and economic assessment of agriculture, institutions and irrigation practices.

The key objective of the survey was to obtain data for the identification of baseline indicators for the project, including current production characteristics and financial status of farming households. The survey is aimed at providing the basis for management operation and maintenance (mom), farmer support aspects of the project design and to facilitate development and establishment of a monitoring and evaluation strategy and framework for project impact evaluation.

Z-Analytics has been selected to implement activities under the contract S53734, Project No. 9867-TAJ.

The scope of work under this contract includes: (i) finalization of the survey questionnaire in both English and Tajik languages, (ii) preliminary meetings with selected WUAs and selection of respondents to be representative of the project/scheme areas, (iii) carrying out the field interviews with respondents, (iv) compiling data, (v) analyzing data, and (vi) reporting.

[5] National Development Strategy of Tajikistan until 2030: https://nafaka.tj/images/zakoni/new/strategiya_2030_en.pdf
[6] A Study of Women's Role in Irrigated Agriculture in the Lower Vaksh River Basin, Tajikistan: https://www.adb.org/publications/womens-role-irrigated-agriculture-tajikistan

EXECUTIVE SUMMARY

The baseline survey has included 420 dehkan farmers in two irrigation and drainage systems (I&D system) of the Vakhsh River Basin situated in the Khatlon region – Yavan and Kumsangir. In addition to dehkan farmers, there are also other types agricultural actors in the I&D system area, such as households (with a kitchen gardens and presidential lands) and large agricultural enterprises. However, they are not well integrated into the WUA system.

Most of the respondents (87.6%) were male, individuals at the age of 35-64 (74.5%), from Yavan I&D system (78.6%), members of WUAs (89.1%), primary decision makers (76.0%), own family dehkan farms (97.3%) where family members work, have more than 5 years of experience in agriculture, the producers of cotton and with less of 5 farm members.

The average size of farm in Kumsangir I&D system is 3.58 ha and in Yavan I&D system is 5.22 ha the average size of respondents' households is around 10 persons in Yavan I&D system and 9 persons in Kumsangit I&D system. Around 5% of respondents' are involved in agricultural sector. Primary crops in both I&D systems are cotton (66.7%), wheat (16.7%), and horticultural crops (10,7%). Farmers in Yavan I&D system preferred to grow cotton (76.4%), winter wheat (66.4%) and perennial forage (alfalfa) (41.8%), whereas, the most popular crops cultivated in Kumsangir I&D system were cotton (65.6%), winter wheat (52.2%), and vegetables (38.9%). Farmers plant cotton mostly for sale and winter wheat for self-consumption. In both I&D systems, agricultural revenue constitutes a big share of respondents' income (52.8% in Yavan and 98.4% in Kumsangir). Both in Yavan and Kumsangir I&D systems, winter wheat is often used for self-consumption. A relatively small share of households has off-farm income (15.2%), though many more receive remittances and pensions. Most respondents have cell phones (77.4%) and reliable electricity (76.7%). The half of households have an automobile (50.0%).

The farmers both in Yavan (55.8%) and Kumsangir (54.4%) I&D systems reported a decrease in crop production in the last two years (2019-2020). The deteriorated drainage system and climate change were mentioned as the most important reasons for this decrease. Half of respondents in both I&D systems assesses the quality of irrigation pipes, hydrants, and canals as poor or very poor. Yet the conditions of drainage infrastructure (64.0% - poor or very poor) are assessed as worse than the conditions of irrigation infrastructure (54.8% - poor or very poor). Farmers most often suggested to improve irrigation infrastructure, particularly drainage system, pumping stations and irrigation distribution system.

The main water provider in both schemes is WUAs (77.1%). WUAs do better with water distribution than with maintenance. About 72 percent of respondents assess the management of water distribution by WUA as good or fair and 53 percent of respondents assess the management of maintenance as good or fair. A membership in a WUA with an annual average membership fee (TJS 57 per ha in Yavan I&D system and TJS 78 per ha for Kumsangir I&D system) has not improved the quality of irrigation services for more than half of respondents. The main problem in irrigation services reported by the respondents in both I&D systems is insufficiency and untimeliness of water supply.One of the important issues in the region notices around 87 percent of respondents is that irrigation water has never been measured. However, overall the irrigation service quality is good or fair, as was reported

around 70 percent of respondents. Main source of irrigation water is surface water outlet from canal (86%). Only a tiny fraction of farmers report getting irrigation water from a buried pipeline hydrant (5%). Agricultural disputes are rare, around 94 percent of respondents reported no disputes. A big share of land is affected by high or medium salinity (62.6% of respondents) and potential waterlogging problems; around 43 percent of respondents reported water within 1.5 meter of surface. More than half of respondents do not use nitrogen to increase soil fertility.

COVID-19 pandemic led to disruptions in the labour market and a sharp decrease in remittances flow. This, in turn, led to increase in local food prices. During the pandemic in 2020 around 25 percent of respondents reported difficulties. In response to the uncertainties, approximately quarter of farmers increased the prices on their products.

.

1. SURVEY METHODOLOGY

1.1. Survey Implementation Stages

To conduct this survey the following set of activities have been implemented:

1. **Inception:**
   1) Preparation of the fieldwork plan;
   2) Adaptation and pre-testing of the questionnaire in cooperation with the TA Team and IC;
   3) Development, adaptation and finalization of the sample in cooperation with the TA Team and IC;
   4) Development of the training materials, including guide for enumerators;
   5) Translation of the questionnaire into Tajik language;
   6) Finalization of the questionnaire and training materials;
   7) Approval of the final version of questionnaire and sampling by the TA Team and IC; and
   8) Design of data collection program in Census and Survey Processing (CSPro)[7] format for tablets.
2. **Data Collection:**
   1) Recruitment of supervisors and enumerators, and conduction of the training;
   2) Organization of a fieldwork, sample management; and
   3) Coordination and monitoring the quality of a work.
3. **Data Processing:**
   1) Conversion of the database into Statistical Package for the Social Sciences (SPSS)[8] software and database cleaning.
4. **Data analysis and reporting:**
   1) Preparation of a short report on preliminary testing results;
   2) Preparation of a technical report on the survey results;
   3) Results analysis, concluding results, cross-tables;
   4) Preparation of summary tables and figures;
   5) Writing a survey report in Microsoft Word format.

1.2. Inception stage

Survey method

The survey was conducted with the use of a quantitative method[9].

Preparation of the fieldwork plan

A fieldwork plan was prepared by Z-Analytics specialists based on the technical proposal and depended on the epidemiological situation in the country related to COVID-19. During the preparation of a fieldwork plan all activities and tasks to be performed by Z-Analytics in the TOR, were taken into account. Duration of the survey based on the fieldwork plan totalled 41 working days starting from November 5, 2020 to January 3, 2021.

[7] Census and Survey Processing: http://www.census.gov/population/international/software/cspro/
[8] Statistical Package for the Social Sciences: https://ru.wikipedia.org/wiki/SPSS
[9] Quantitative method – is survey of household and smallholder farmers by having an individual interview “face to face”.

Adaptation and Finalization of the questionnaire

The survey questionnaire including its structure and target questions was prepared by the TA Team. The questionnaire is designed in accordance with the goals and objectives of the project and in-line with existing questionnaires such as: "Living Standards Measurement Survey in Tajikistan (LSMS)"[10][11], "Baseline report "Feed the Future" [12], "Interim survey initiative "Feed the Future", "Impact of water user associations on water and land productivity, equity and food security in Tajikistan and Baseline survey in the framework of Family Farming Program USAID (FFP)".

The survey questionnaire is structured according to topic-specific modules that include: socio-demographic characteristics of farmers, of their farm and production activities. The questionnaire also covers irrigation related and institutional aspects, information on COVID-19 and other questions related to goals and objectives of the project (see Table 1.1).

Table 0.1. Survey module questionnaire

Number of Module	Name of Module
COVER	Introduction
A1	General Information
A2	Land Tenure, Soil Fertility, Depth to Water Table and Salinity
A3	Membership in Farm Based on Certificate
B	Household Structure, Demographic Characteristics and Main Occupation
C	Labour Resources
D1-D3	Agricultural Data
E1-E2	Irrigation Related Data
F	Institutional Aspects
G	Access to Information and Farming Skills
H	Household Income, Assets and Expenditure
I	Rights
J	COVID-19
K	Respondents Views/ Suggestions for Scheme Improvement

Source: Report on the Results of the Baseline Survey July 2020-February 2021

The final version of the survey questionnaire is provided in Annex 1.

The questionnaire was prepared originally in English and after its final approval was translated into Tajik language. After receiving the Tajik version of the questionnaire, the Z-Analytics specialists double checked the questionnaire taking into consideration any changes, comments and proposals from ADB consultants. The questionnaire was sent to ALRI for approval and obtaining support letters for the field work.

Z-Analytics piloted the questionnaire through 10 interviews. The results of the pilot were analysed and proposals on changes provided for further consideration and approval by the TA Team. It should be noted that, taking into account testing results, slight changes and permutations of the sequence of some questions were introduced into the questionnaire.

[10] Tajikistan - Living Standards Measurement Survey 2007 (Wave 1): http://microdata.worldbank.org/index.php/catalog/72
[11] Tajikistan - Living Standards Measurement Survey 2009 (Wave 2): http://microdata.worldbank.org/index.php/catalog/73
[12] Tajikistan Feed the Future Baseline Report 2014: https://www.feedthefuture.gov/resource/tajikistan-feed-future-baseline-report

Development and Finalization of the sample

The survey was carried out in two I&D systems of Yavan and Kumsangir zones of the Lower Vaksh river basin, with a total area of 90,011 ha[13], which serve the territory of Yavan, Khuroson, Abdurahmon Jomi, Vakhsh, Jaloliddin Balkhi, and Jayhun districts of Khatlon region.

The sampling methodology was based on a disproportionate approach, in which the sampling for farm was divided by project pre-selected WUAs located in Yavan and Kumsangir I&D systems and smaller group of non-WUA member farms. Each I&D system covered three districts. In total 390 surveys were conducted among farmers – members of the WUA and 30 surveys among farmers who are not members of the WUA. Thus, in total 420 surveys were conducted among farmers.

The survey sampling was based on the lists of dehkan farms obtained from pre-selected target nine WUAs and additional list was composed from farms reported by WUAs as non WUA members. The total number of dehkan farms in the lists obtained from pre-selected target WUAs was 3981, of which 306 (or 7 percent) dehkan farms were headed by women. In general, our sample covered around 10 percent of dekhan farms. This sampling size is optimal in terms of financial costs and the data analysis, and reflects estimation of the sample with a 95% confidence level and 4.71% error margin[14].

The final sampling was presented to and approved by the TA Team (see Table 1.2).

Table 0.2. Sampling distribution

I&D Systems	Districts	WUA names	Total number of dehkan farmers	*including the number of farms headed by women*	Total number of visits	Sample size
Yavan	Yavan	Obshoron	222	*14*	35	30
		24-solagii Istiklol	116	*8*	47	30
		Dastgiri	555	*121*	63	30
		Chorgul-2012	283	*39*	51	30
		Elok-Norin	396	*7*	47	30
	Khuroson	Mehnat-2013 (Mehman)	142	*4*	33	30
		Gulobod-2013	201	*11*	35	30
		Navobod-2016	360	*25*	53	30
	Abdurahmon Jomi	Shabnam	70	*3*	36	30
		Mehnati Sof	224	*5*	34	30
Kumsangir	Vakhsh	Chashmasoroni Vakhsh	455	*42*	34	30
	Jaloliddin Balkhi	Chashmai Zulol	411	*20*	32	30
	Jayhun	Obi Ravon	546	*7*	38	30
SUB-TOTAL OF FARMERS – MEMBERS OF THE WUA			**3981**	***306***	**538**	**390**
SUB-TOTAL OF FARMERS – NOT MEMBERS OF THE WUA			*	**-**	**33**	**30**
TOTAL			**3981**	***306***	**571**	**420**

*no information

Source: Report on the Results of the Baseline Survey July 2020-February 2021

A detailed description of the survey sampling is provided in Annex 2.

[13] Terms of Reference

[14] The error margin was calculated using the online calculator based on the sample size: http://www.raosoft.com/samplesize.html

1.3. Data Collection

Preparation for the data collection began in November 2020 after the approval of survey methodology (questionnaire and sampling). Z-Analytics had a team of ten enumerators who worked under a field manager, data processing manager and regional manager/supervisor in Khatlon region. The team of enumerators implementing the survey were selected and hired two weeks before the training.

The training for enumerators was conducted in two phases:

1. First training was for enumerators who have interviewed respondents in Yavan district (according to the coverage of the respondents – these are five points, which is more in comparison with other districts) was held on November 26, and data collection began on November 28.
2. Second training was held on December 3-4, 2020. The number of enumerators was determined depending on the survey points and the number of respondents at the points.

Trained enumerators of Z-Analytics carried out individual interviews with farmers by digital data collection tools-tablets and software CSPro.

Ensuring the quality of field work and monitoring enumerators' work

To make sure that a quality of the field work is maintained, enumerators filled 1-2 questionnaires which were picked by chance and later were checked by regional manager/supervisor. A regional manager/supervisor while looking at all questionnaires made necessary changes, corrections and provided feedback and recommendations to enumerators.

Each completed interviews/filled questionnaire by enumerators and audio records were automatically uploaded into a general Dropbox file on a daily basis [15].

Enumerators and supervisors were monitored by five quality control specialists. Regional manager/supervisor, quality control specialists, and data processing manager checked the work of enumerators daily. That gave an opportunity for enumerators to make timely corrections in their work while implementing the survey.

The verification procedure included the following steps:

1) Visual control of completed questionnaires on correctness. Visual control included subjects as: the correctness of filling the questionnaire; the presence of errors and missing items; the clarity of filling open-ended questions and compliance with skips. Visual control of the 100% completed questionnaires is fulfilled.

2) To ensure the actual visits of enumerators and quality implementation of interviews, random monitoring of enumerators was carried out by phone based on a specially developed monitoring list. For each enumerator 30 percent of the completed questionnaires were randomly selected and monitored by phone.

Totally, data collection was carried out from November 28, 2020, to January 5, 2021. Close to the end of the field work (January 5, 2021) the New Year celebration and holidays commenced in the

[15] https://ru.wikipedia.org/wiki/Dropbox

Republic of Tajikistan (RT). Therefore, the fieldwork in Vakhsh district was suspended from January 1 to January 4, 2021.

1.4. Data Processing

Tablets Lenovo TabA7 have been used for data collection. The questionnaire has been programmed into tablets by CSPro software in advance. CSPro software allowed to create a data base and to remove likelihood of errors during data collection by enumerators and also avoid likelihood of negative influence on survey results. Data cleaning is implemented by SPSS and Microsoft Excel program package.

1.5. Data Analysis and Reporting

The analysis of collected data in the survey is implemented by the use of the SPSS and Microsoft Excel program packages. By the end of the survey, Z-Analytics specialists prepared an Excel output table with survey results and a report of the survey methodology and descriptive analysis of the results in the form of graphs and tables with comments, conclusions.

An output tables are provided in Annex 3.

The main goal of the given report is to present the baseline results and to inform the TA Team about ongoing practices and situations in irrigation and agriculture in Yavan and Kumsangir I&D systems.

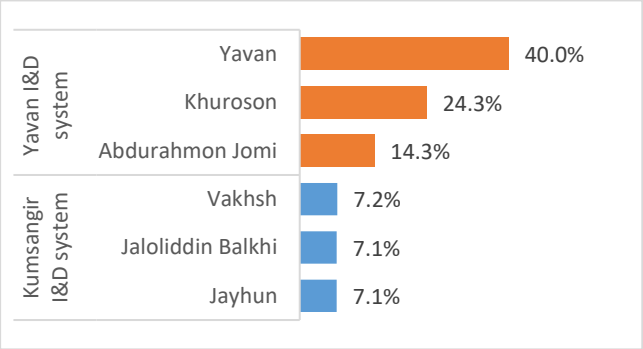
2. RESULTS OF THE SURVEY

2.1. Characteristics of Dehkan Farmers

The survey was focused in two I&D systems: (i) Yavan, and (ii) Kumsangir, which serve the territory of Yavan, Khuroson, Abdurahmon Jomi, Vakhsh, Jaloliddin Balkhi, and Jayhun districts of Khatlon region.

Overall, 420 respondents (dehkan farmers) interviewed within the framework of the survey [16]. The main share of respondents interviewed in the districts served by Yavan I&D system (78.6%): Yavan (40.0%), Khuroson (24.3%) and Abdurahmon Jomi (14.3%) (see Figure 2.1).

Figure 0.1. Characteristics of Dehkan farmers – distribution by I&D systems and districts, n=420



Since the survey targeted only dehkan farmers, the data is representative of the farmer population in which women are in minority, men are the majority. Thus, the majority of respondents were male (87.6%). This data is almost comparable with the data of the national statistics.[17]

The majority of respondents were dehkan farmers aged 35-64 years old (74.6%).Analysis of the survey data in the distribution by I&D systems, gender and age shows that the:

- female-dehkan farmers were relatively most frequently interviewed in the territory served by Yavan I&D system (13.9% vs 6.7%);
- dehkan farmers aged 45-54 years old were relatively most frequently interviewed in the territory served by Yavan I&D system (23.9% vs 13.3%), and dehkan farmers aged 65 years older in the territory served by Kumsangir I&D system (16.7% vs 9.4%) (see Figures 2.2-2.3).

[16] 571 farmers are visited and 420 farmers, which fit to the goals and objectives of the survey, are selected in the framework of the baseline survey.

[17] According to the data of national statistics, about 20% of dehkan farms are headed by women in the Khatlon province. Information is available in the statistical book 'Gender indicators in the production activities of dehkan farms for 2014 – 2019, Dushanbe, 2020'.

Figure 0.2. Characteristics of Dehkan farmers – distribution by I&D systems and gender

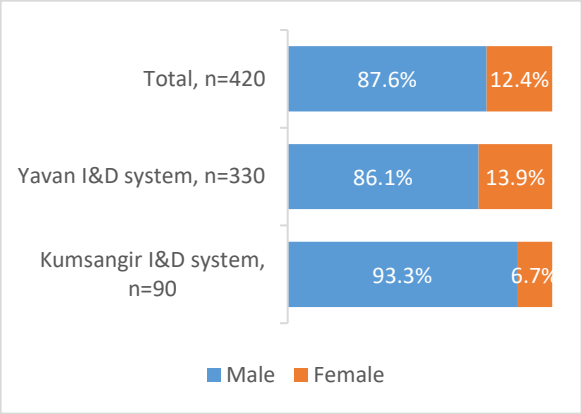


Figure 0.3. Characteristics of Dehkan farmers – distribution by I&D systems and age

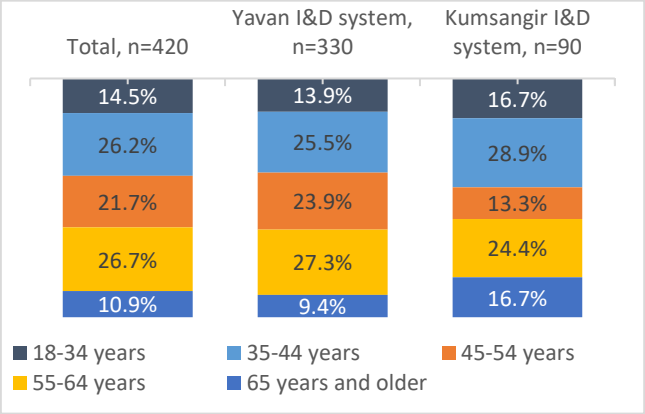
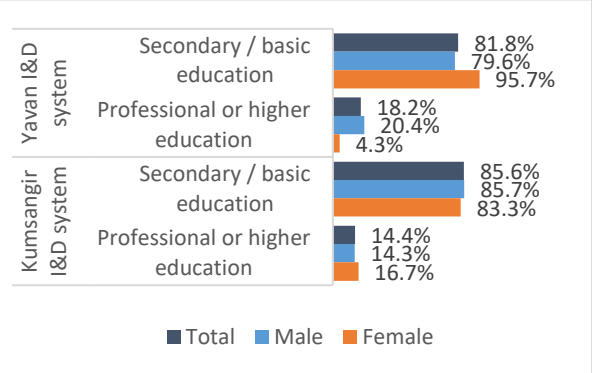


Figure 0.4. Characteristics of Dehkan farmers – distribution by I&D systems, education and gender



Absolute majority of respondents both in Yavan and Kumsangir I&D systems have secondary or basic education (more than 80%).

Female-dehkan farmers from Kumsangir I&D system mentioned that they have professional or higher education relatively more often than females from Yavan I&D system (16.7% vs 4.3%) (see Figure 2.4).

The survey has covered majority of the members of WUAs (more than 90%) (see Figure 2.5).

Figure 0.5. Characteristics of Dehkan farmers – distribution by membership and gender

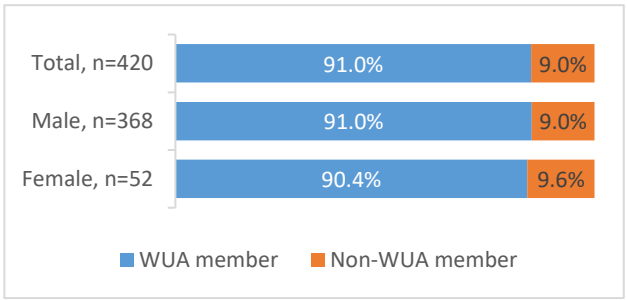
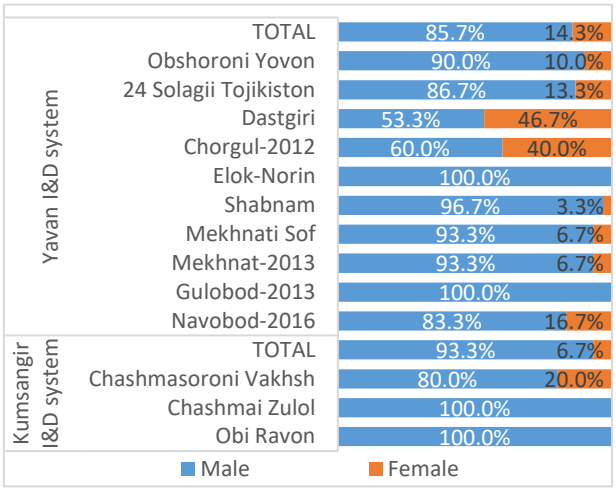
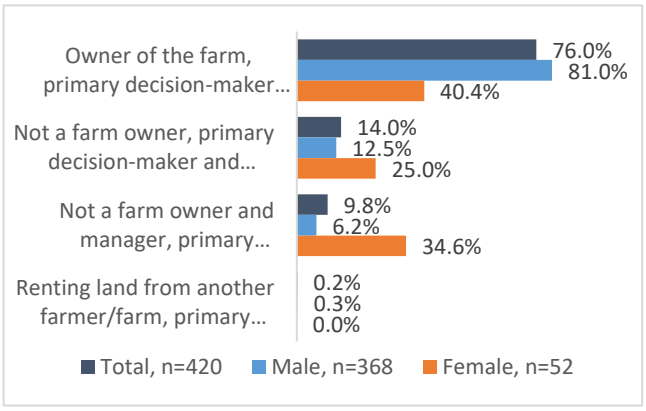


Figure 0.6. Characteristics of Dehkan farmers – distribution by I&D systems, WUA members and gender



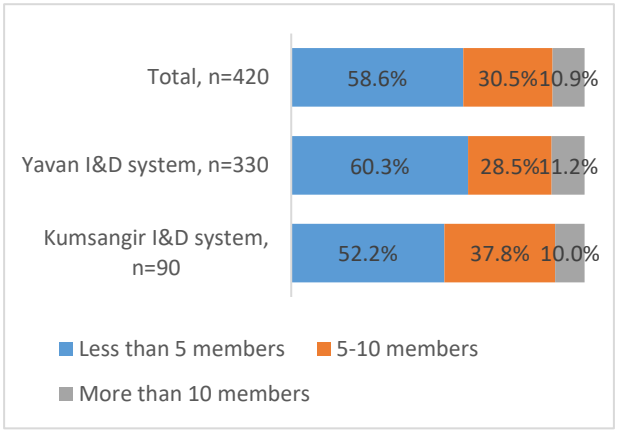
The majority of female-respondents were interviewed in Dastgiri (53.3%) and Chorgul-2012 (40.0%) WUAs (see Figure 2.6).

Figure 0.7. Characteristics of Dehkan Farmers – distribution by decision making and gender



The majority of respondents (76.0%) indicated that they are owners, primary decision makers, and managers of dehkan farms. Relatively most often male respondents mentioned it (81.0%). Among the respondents, although in minority (12.4%; n=52), there are female registered as farm owners, however about 60 percent and 31 people of such female respondents report that they are not the primary decisions makers and their management roles are nominal (see Figure 2.7).

Figure 0.8. Characteristics of Dehkan Farmers – distribution by I&D systems and farm size (number of farm members)

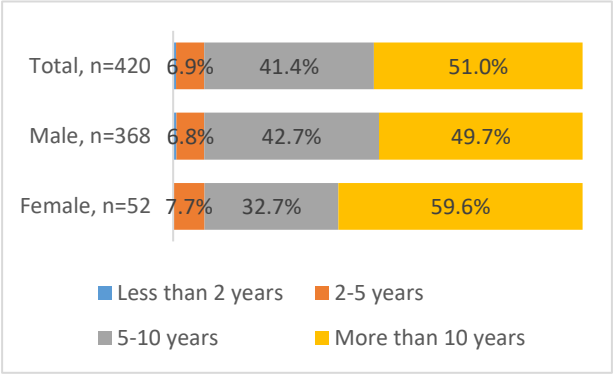


The results of the survey show that over half of the respondents report that they have less than 5 farm members (58.6%). Mostly (60.3%) this situation can be seen in the territory served by Yavan I&D system (see Figure 2.8).

The absolute majority of respondents have over 5 years of experience in agriculture (more than 90%).

The analysis of data in distribution by I&D systems shows that female-dehkan farmers compared to male dehkan farmers were more likely to report that they have more than 10 years of experience in agriculture (59.6% vs 49.7%) (see Figure 2.9).

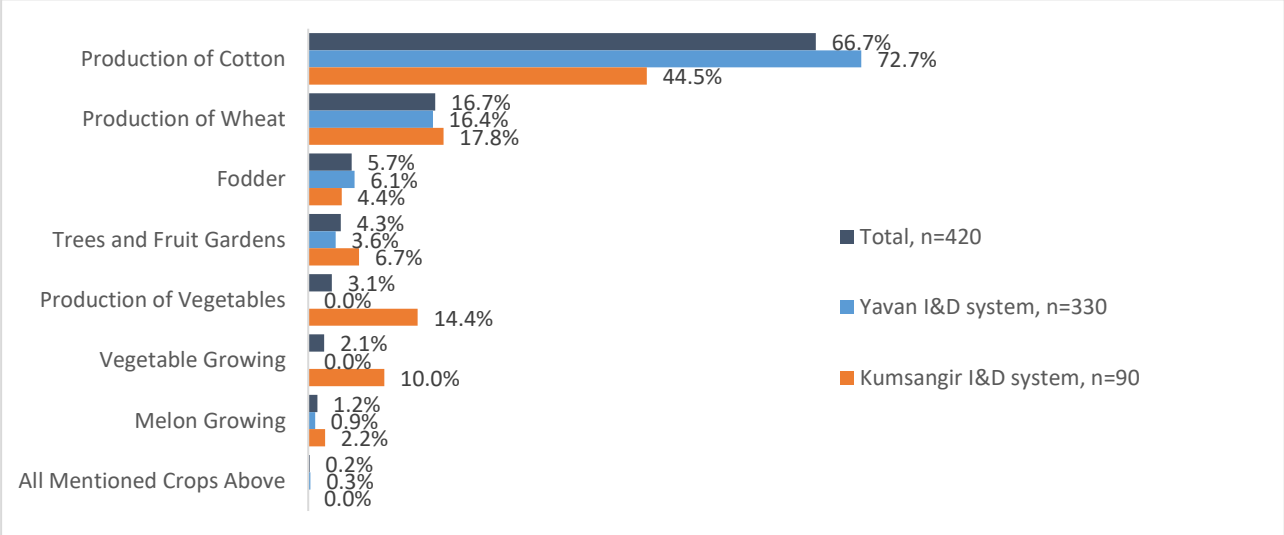
Figure 0.9. Characteristics of Dehkan Farmers – distribution by experience and gender



The major agricultural specialization / agricultural activity of the respondents is cotton production (66.7%).

The analysis of data in distribution by I&D system shows that farmers in Kumsangir I&D system are less involved in cotton production than farmers in Yavan I&D system (44.5% vs 72.7%). This indicates that the farmers of Kumsangir I&D system have more diversified production, agricultural specialization with prevalence in vegetable growing, melon growing and fruit gardening (see Figure 2.10).

Figure 0.10. Characteristics of Dehkan Farmers – distribution by I&D systems and agricultural specialization / agricultural activity



The absolute majority of respondents noted that they are family dehkan farms (97.4%), certificate-based working (98.3%) and have a legal status as an individual entrepreneur (98.1%). This situation is observed in the analysis of the data in distribution by I&D systems, gender and land size (see Table 2.1).

Table 2.1. Farm type, land rights ownership and legal status – distribution by I&D systems, gender and land size

		Total	I&D system		Gender		Total Area		
			Yavan	Kumsangir	Male	Female	Less than 5 ha	5-10 ha	More than 10 ha
Farm type	Family dehkan farm	**97.4%**	**97.3%**	**97.8%**	**97.3%**	**98.1%**	**98.6%**	**96.7%**	**91.1%**
	Collective dehkan farm	2.4%	2.7%	1.1%	2.4%	1.9%	1.4%	2.2%	8.9%
	Agricultural / production cooperative	0.2%	0.0%	1.1%	0.3%	0.0%	0.0%	1.1%	0.0%
Legal document or ownership right	Certificate	**98.3%**	**98.2%**	**98.9%**	**98.4%**	**98.1%**	**98.2%**	**97.8%**	**100.0%**
	Act (sealed document)	1.0%	0.9%	1.1%	1.1%	0.0%	1.1%	1.1%	0.0%
	Contract of rent	0.5%	0.6%	0.0%	0.3%	1.9%	0.7%	0.0%	0.0%
	Do not have any legal documents	0.2%	0.3%	0.0%	0.2%	0.0%	0.0%	1.1%	0.0%
Legal status	Individual entrepreneur (patent)	1.9%	1.8%	2.2%	2.2%	0.0%	2.1%	2.2%	0.0%
	Individual entrepreneur (certificate)	**98/1%**	**98.2%**	**97.8%**	**97.8%**	**100.0%**	**97.9%**	**97.8%**	**100.0%**
	TOTAL. n	**420**	**330**	**90**	**368**	**52**	**283**	**92**	**45**

2.2. Results of Yavan I&D system

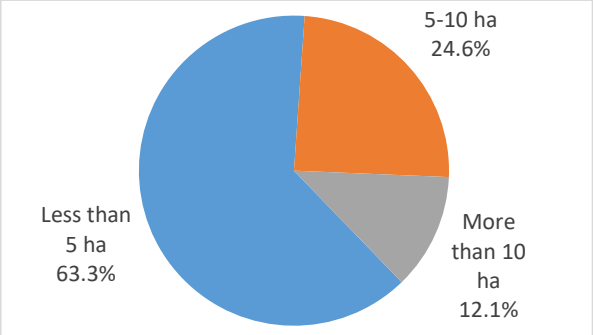
Land characteristics of farms

According to the results of the baseline survey average farm land area is 5.22 ha. The average area of irrigated lands is 5.10 ha. The difference between irrigated and cultivated area is 0.12 ha (see Table 2.2).

Table 2.2. Agricultural land area, ha (average)

Characteristics	Average land area, ha
Average cultivated land area	5.22
Average irrigated land area	5.10
Difference	(0.12)

Figure 0.11. Land characteristics - distribution by size (land area), n=330



Most of the respondents (63.3%) have less than 5 ha farm land (see Figure 2.11).

The absolute majority of respondents noted that they grow crops on annual cropland (89.7%).

Average soil quality and fertility, assessed in soil bonitet, is average for half of the respondents (60.0%), 21 percent evaluate their soil as of good quality and fertility, and around 18 percent - low quality and fertility (see Figures 2.12 and 2.13).

Figure 0.12. Land characteristics - distribution by type (land area), n=330

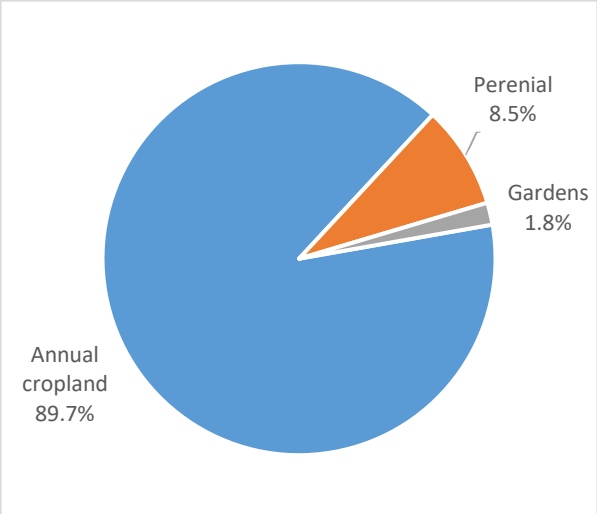
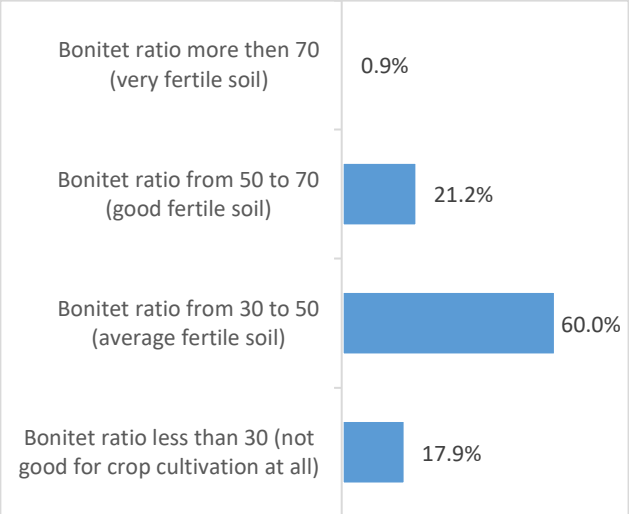


Figure 0.13. Land characteristics - distribution by average soil fertility rate, n=330



The respondents have been asked to evaluate the average ground water level during the cropping seasons. Slightly less than half of the respondents (46.7%) mentioned that the average ground water level is high (0.0-1.5 m depth) and one-third of the respondents (34.8%) consider the ground water levels in their farms to be low (lower than 2 m).

For majority of respondents the soil salinity level is high (32.7%) and medium (33.9%) (see Figures 2.14 and 2.15).

Figure 0.14. Evaluation of the average ground water level in the crop cultivation season, n=330

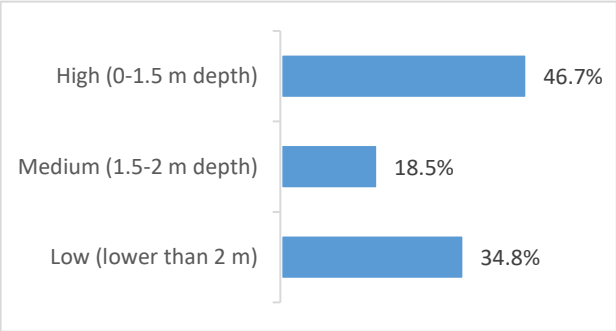
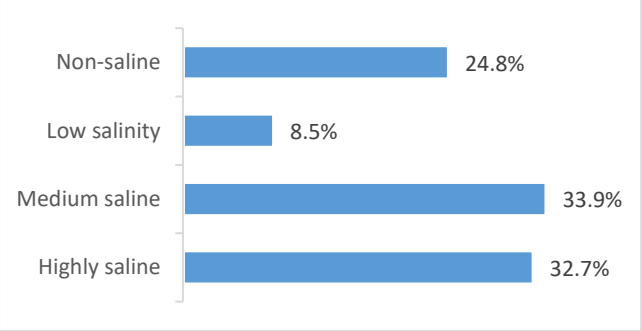


Figure 0.15. Evaluation of soil salinity level, n=330

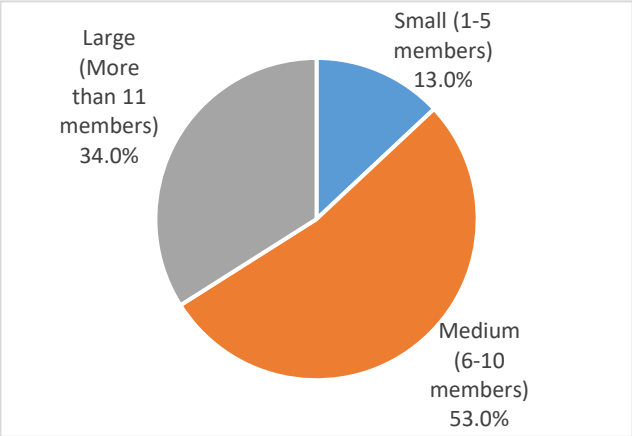


Households characteristics of respondents (dehkan farmers)

The results of the baseline survey in Yavan I&D system show that households of dehkan farmers consist of 9.5 persons on average.

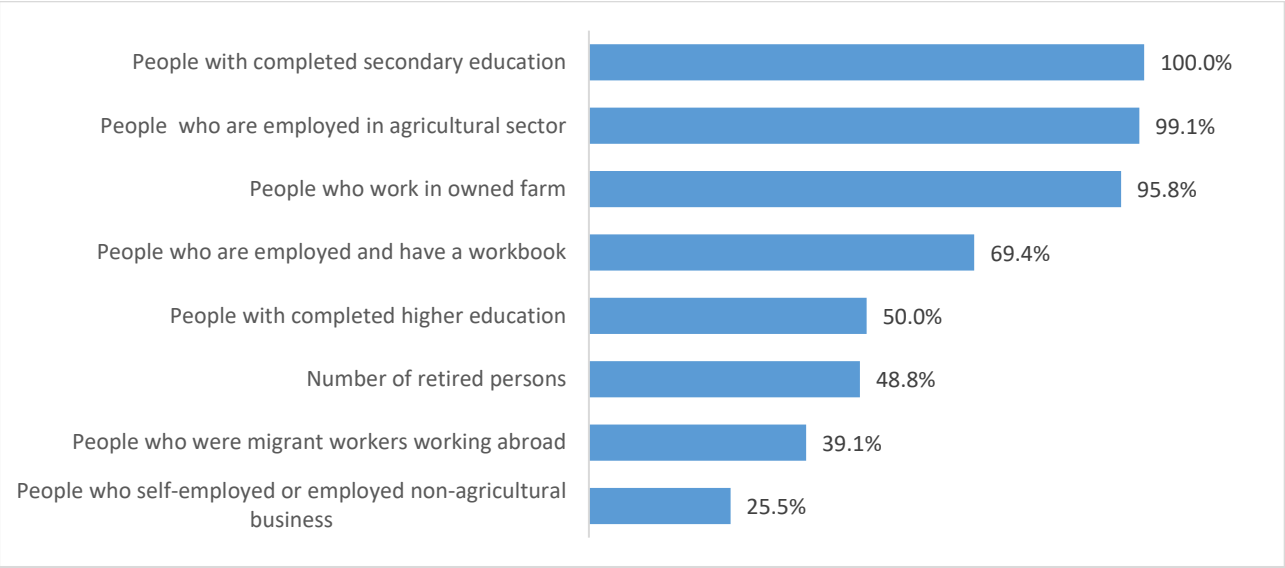
Slightly more than half of households (53.0%) have a medium sized household (with 6-10 members). 13 percent of respondents have small-sized household (1-5 members), and 34 percent of farmers have large household (with more than 11 members) (see Figure 2.16).

Figure 0.16. Household size of farmers, n=330



The survey results show that all farmers from Yavan I&D system have at least one member with secondary education. At the same time, half of the respondents-farmers noted that they have a member with higher education (50.0%). In addition, more than half of the respondents-farmers noted that they have a member, who is employed and own a workbook. Almost all the household members of interviewed farmers are engaged in agricultural sector activities and quarter of household members are self-employed or work in non-agricultural sector (see Figure 2.17).

Figure 0.17. Employment status and occupation of household members, n=330 (multiple choice)



Labour

The results of the baseline survey in Yavan I&D system show that the average number of people involved in agricultural works is 4.9; *on a permanent basis – 1.9 and* on *a seasonal/temporary basis* – 2.7 (see Table 2.3).

Table 2.3. Labour resources

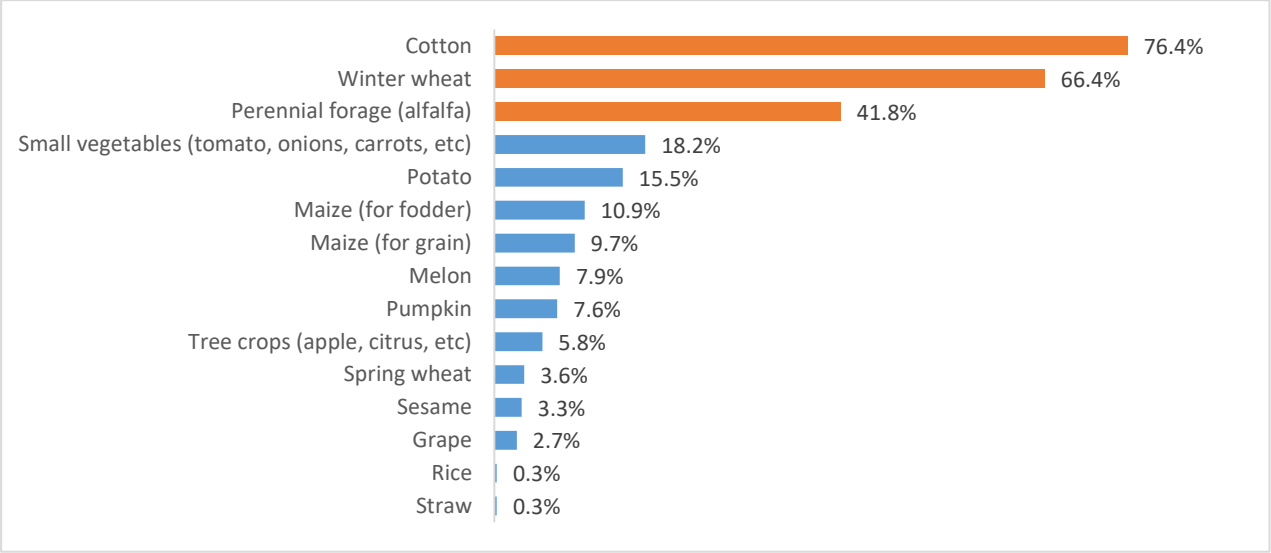
	Person (average)
Household members involved in agriculture[18]	4.9
- *Working on a permanent basis (with work book)*	1.9
- *Working on a seasonal/temporary basis*	2.7
Numbers of permanent workers (with labour books)	0.2
Number of permanent workers (without labour books)	0.2
Number of hired workers involved in agricultural (short-term wage workers)	4.7
Number of managers	1.1
Number of main specialists involved in agricultural work	0.1

Agricultural production

Despite the efforts of the Government of Tajikistan to diversify crops, cotton and wheat remain the main crops grown, as cotton is the main export crop, and wheat is the main crop ensuring the country's food security[19]. The most of the interviewed farmers (76.4%) have mentioned that they cultivated mainly cotton. The second famous agricultural crop is winter wheat (66.4%). More than third (41.8%) of farmers plant perennial forage (alfalfa). Perennial forage is less irrigated and planted once, which then yields a harvest from 4 to 8 times per season for 5 years (from March to November). 18 percent of dehkan farmers are engaged in production of small vegetables such as tomatos, onions etc. The share of other types of crops is less than 15 percent (see Figure 2.18).

[18] Considering the absence of family members
[19] Program for Reforming the Agriculture Sector of the Republic of Tajikistan for 2012-2020: https://extranet.who.int/nutrition/gina/sites/default/filesstore/TJK%202012%20Program%20on%20Agricultural%20Reform%202012-2020.pdf

Figure 0.18. Types of crops



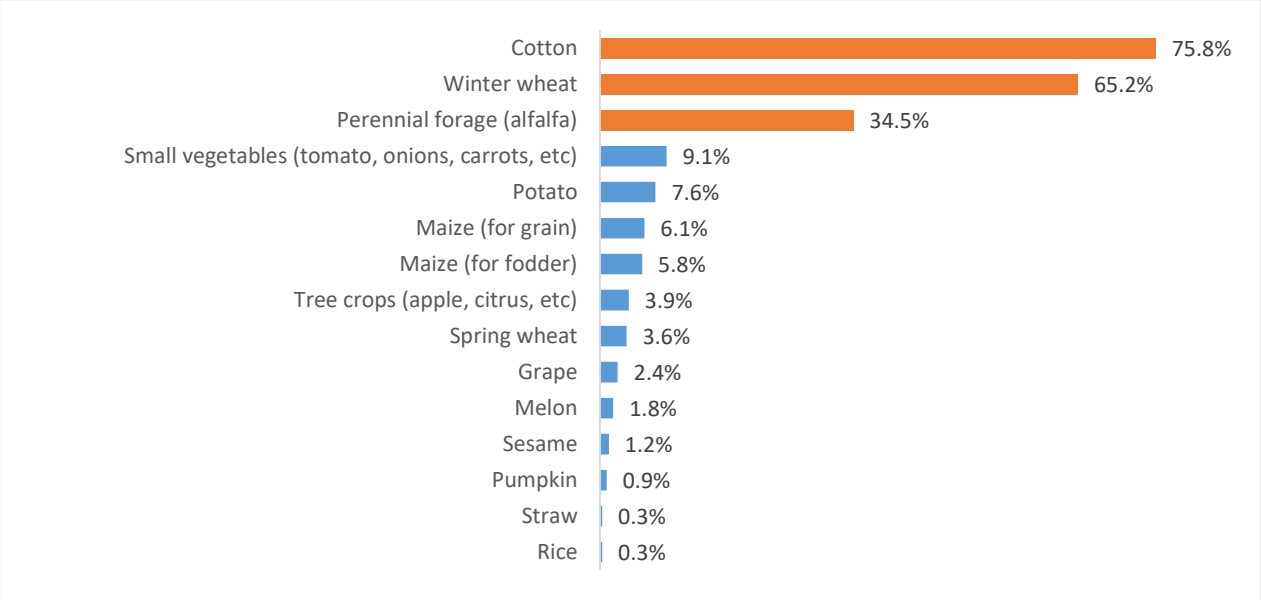
Notwithstanding the fact that cotton and rice are mostly cultivated crops, their yield is much lower than perennial forage (alfalfa) and small vegetables (see Table 2.4).

Table 2.4. Yield of crops in land

Crop	Yield in irrigated area, kg/ha
Perennial forage (alfalfa)	89980.1
Small vegetables (tomato, onions, carrots, etc)	15940.1
Melon	15901.7
Pumpkin	8097.8
Potato	6998.5
Maize (for fodder)	4189.5
Maize (for grain)	2549.3
Rice	2333.3
Cotton	1851.7
Grape	1775.1
Winter wheat	1770.0
Tree crops (apple, citrus, etc)	1637.7
Spring wheat	1371.6
Straw	1250.0
Sesame	668.3

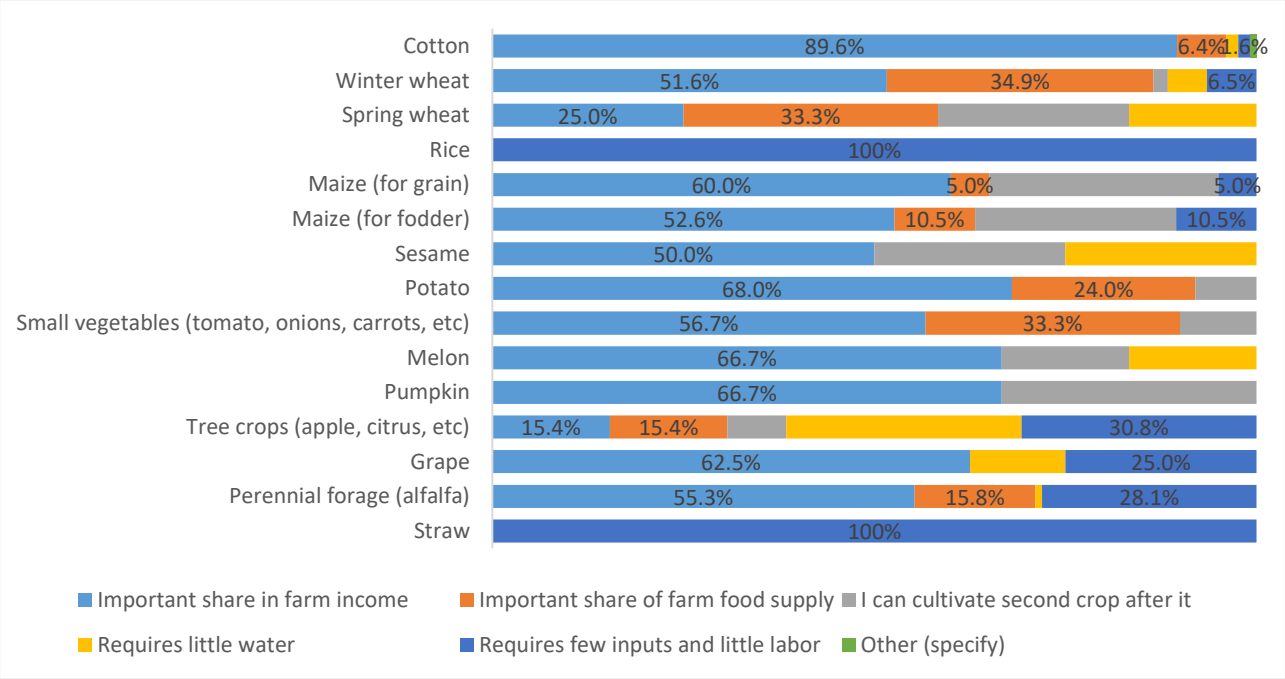
Among all cultivated crops cotton (75.8%), winter wheat (65.2%) and perennial forage (34.5%) are the most important for the farmers. The share of other crops is less than 20% (see Figure 2.19).

Figure 0.19. The most important cultivated crops (multiple choice)



Among the main reasons for considering selected crops (cotton, winter wheat, spring wheat and perennial forage) important, farmers mentioned their contribution to farm income (89.6%, 51.6% and 55.3% respectively) and as important source of food supply (winter wheat – 34.9% and small vegeratable – 33.3%). Crops characterised by opportunities for cultivating a second crop, necessity of less irrigation and few labours were considered less or not important (see Figure 2.20).

Figure 0.20. Reasons why mentioned crop is important



Cotton is considered a technical crop and almost all of the harvest (86.5%) is sold. Only 10 percent is used by households. In contrast, overall majority of the farmers use winter wheat for self-consumption and only 9 percent is left for sowing next. Only 6 percent of winter wheat is sold. 77 percent of perennial forage is used for self-consumption and is 19.2% sold (see Table 2.5).

Table 2.5. Usage of harvested crop

Usage	Cotton %	Winter wheat %	Perennial forage (alfalfa) %
Used for self-consumption	10.4	80.0	77.4
Sold	86.5	6.4	19.2
Provided as payment to workers	0.2	3.3	0.7
Left for next year planting	2.2	8.6	0.6
Used for self-destroyed	0.7	1.7	2.0

Inputs, expenditures and suppliers

Farmers spend a big share of their money on fertilizers and seeds. In comparison to cotton and winter wheat the farmers spend more money on perennial forage. The cost for fertilizers for cotton is among the highest. At the same time the costs for manure is also relatively high for cotton. We can conclude that the planting cotton is the most expensive (see Table 2.6).

Table 2.6. Costs of inputs (average)

	Cotton, TJS/kg	Winter wheat TJS/kg	Perennial forage (alfalfa) TJS/kg
Costs for seeds	7.0	3.9	32.3
Costs for fertilizer			
- **Superphosphate (Nitrogen)**	4.8	4.9	4.9
- **Urea (Nitrogen)**	4.4	4.6	4.7
- **Saltpetre (Nitrogen)**	4.3	4.5	4.8
- **Phosphorus**	3.6	2.6	3.2
- **Potassium**	4.5	4.5	-
Costs for manure	4.5	3.1	3.1
Costs for plant protection			
- **Pesticide**	113.7	121.5	111.3
- **Herbicide**	78.4	91.1	52.0

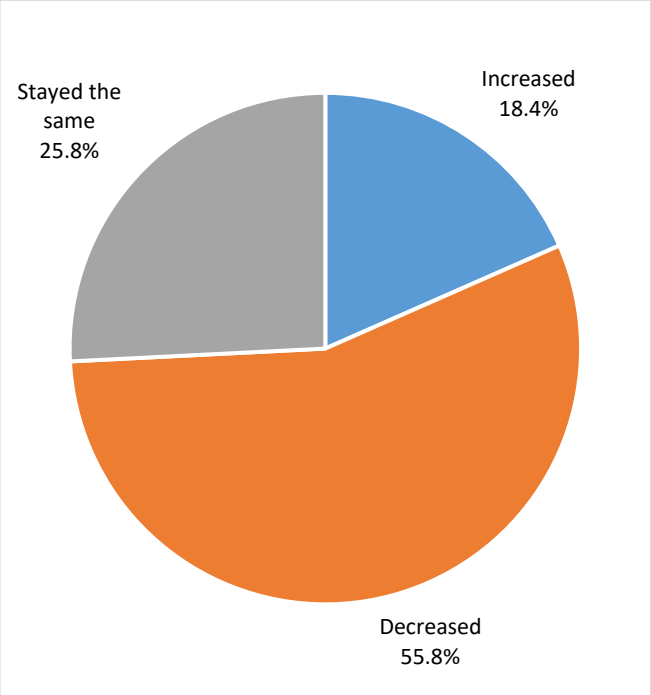
The results of the survey show that the costs for machinery used for cotton is 4 times higher than other two most important crops Majority of farmers do not have their own machinery and rent in machinery for cotton crop related works. The machinery rent cost usually include the costs of fuel and often, daily wage of the driver. Costs for the use of fuel and diesel are approximately the same for all three crops.

Farmers spend majority of their expenses on payments to workers involved in harvesting, land preparation and sowing activities. Cotton is among the most intensely irrigated crops, usually 4-6 times per season. As a result, the cost for irrigation of cotton is the highest among the three and its price equals to TJS 830.4 (see Table 2.7).

Table 2.7. Costs of machinery, labour and irrigation

	Cotton	Winter wheat	Perennial forage (alfalfa)
Machinery, TJS	4477.0	890.5	945.6
Oil/diesel and lubricants, TJS/l	7.0	6.9	7.1
Labour resources, person per TJS/day	8.6	2.1	4.1
Payments to workers (seasonal or permanent) for:			
- *land preparation and sowing, TJS/season*	652.9	438.0	400.6
- *field work during cultivation, TJS/season*	68.6	33.6	26.7
- *harvesting, TJS/season*	1128.5	477.9	906.0
Number of times for irrigation	4.4	1.8	4.3
Price for irrigation, TJS/season	830.4	306.5	346.8
Other expenses	357.7	195.3	228.4

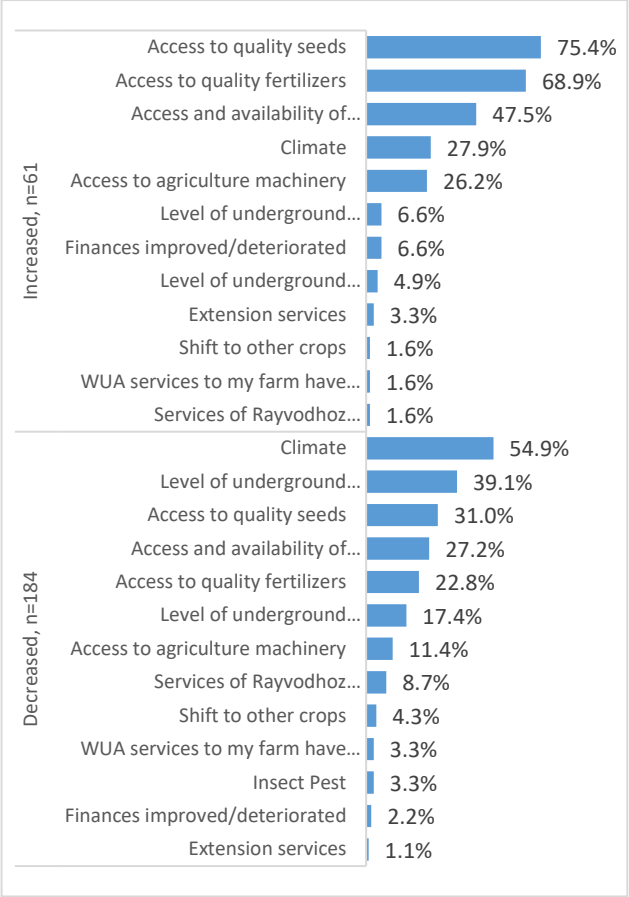
Figure 0.21. Changes in crops production



Over half the farmers (55.8%) have mentioned that in the past 2 years the crop production decreased. Among the reasons for decreasing crops production the farmers mentioned the climate impact (75.4%), deteriorated drainage services (39.1%) and lack of access to quality seeds.

Figure 0.22. Reasons for increase or decrease in crops production

Just 18 percent of the farmers say that their production of crops has increased. Among these farmers, 75 percent mention the access to quality seeds, 69 percent availability of good quality fertilizers and 47 percent access to irrigation water (see Figures 2.21 and 2.22).



The farmers have been questioned on the sources of inputs. Majority of the farmers purchase inputs from specialized private shops. Few farmers get inputs from state companies (see Table 2.8).

Table 2.8. Source of inputs

Source of your inputs	Don't use	Purchased from:					
		Specialized private shops	Specialized state companies	Other farms	Processing enterprise as part of contract	Taken from own production	Public supplier
Nitrogen / carbamide	22.4%	71.2%	2.1%	0.3%	0.9%	0.9%	2.1%
Phosphorus	65.8%	31.8%	0.9%	0.0%	0.6%	0.0%	0.9%
Potassium	96.4%	3.0%	0.3%	0.0%	0.3%	0.0%	0.0%
Pesticides	58.2%	39.4%	1.8%	0.0%	0.0%	0.0%	0.6%
Herbicide	69.4%	29.4%	0.9%	0.0%	0.0%	0.0%	0.3%
Diesel for machinery	34.5%	46.4%	1.2%	0.0%	0.0%	0.0%	17.9%
Cotton	21.8%	22.1%	3.9%	17.3%	20.0%	8.5%	6.4%
Wheat	27.0%	23.3%	3.6%	18.8%	0.6%	24.8%	1.8%
Vegetable	72.4%	22.4%	0.6%	1.5%	0.0%	2.7%	0.3%
Fodder	62.4%	23.9%	4.2%	2.1%	0.0%	7.0%	0.3%
Fruit seedlings	90.6%	5.2%	0.0%	2.4%	0.0%	1.2%	0.6%

Infrastructure

For absolute majority of the farmers the distance from home to the source of inputs from where the farmers purchase them is less than 5 km. Meanwhile for over 77 percent of farmers the distance from their farm to the nearest market is far, about 5 to 20 km. More than half of farmers assess the condition of the roads to the nearest market as ‘bad’ and ‘extremely bad’ (see Figures 2.23 and 2.24).

Figure 0.23. Distance from home to source of inputs and farm to the nearest market

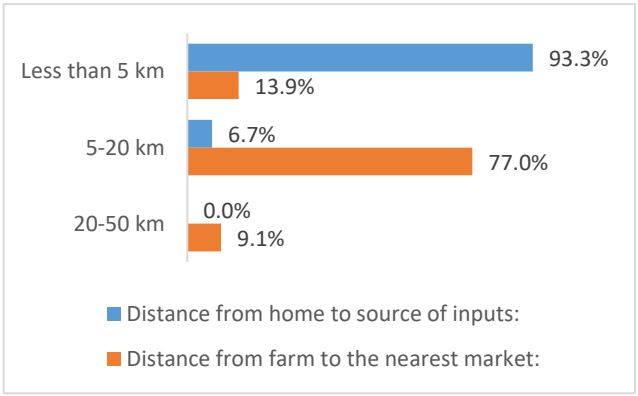
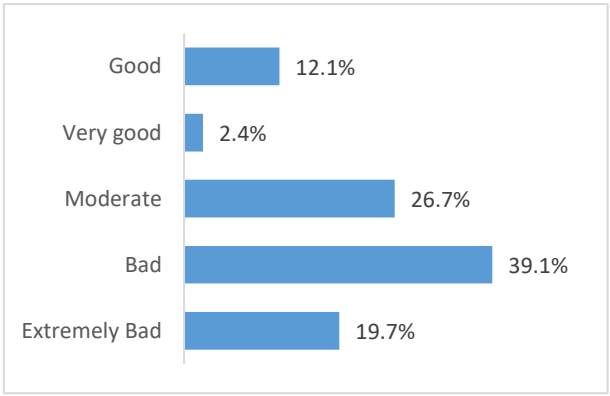


Figure 0.24. Assessment of the condition of the road to the nearest market

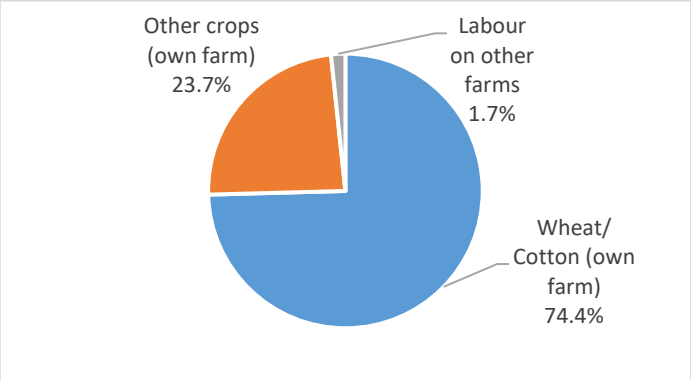


Agricultural income

The average annual income of farmers in Yavan I&D system is TJS 62,657.1.

The share of the entire income from agricultural production in total income earned by a farmer in 2019 was more than half (52.8%). For majority of farmers, main sources of income from agricultural production were wheat and cotton. Other crops constituted 24 percent and agricultural works performed for other farms consisted around 2 percent of farmers earned income (see Figure 2.25).

Figure 0.25. Distribution of earned income, n=330



Irrigation and water source

The results of the survey show that main source of irrigation for majority of farmers is surface water outlet from canal (87.0%). the respondents in Yavan I&D system have mentioned that their land is located in the head of the water source (23.9%), in the middle of the water source (43.6%) and in the tail of the water source (32.1%) (see Figures 2.26 and 2.27).

Figure 0.26. Main irrigation water source

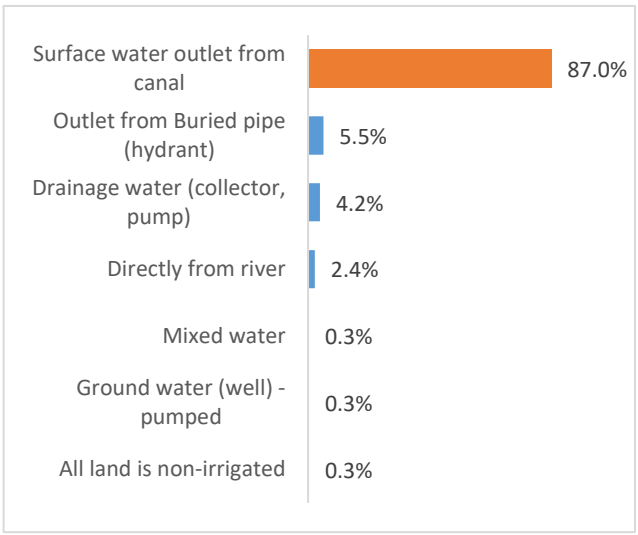
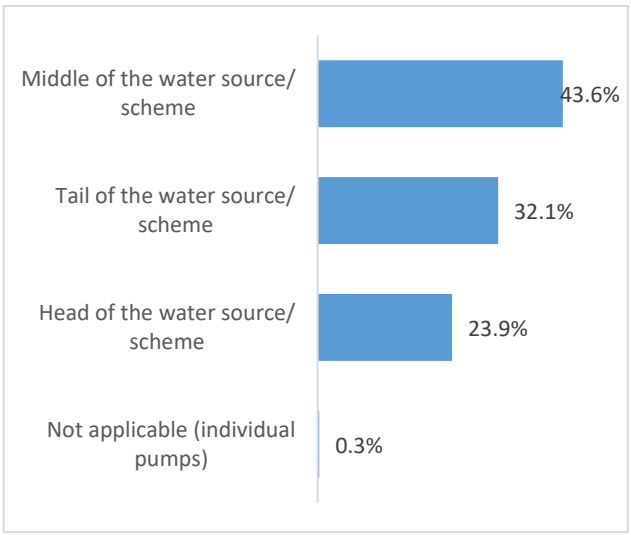


Figure 0.27. Land location relative to irrigation water source



Over 75 percent of farmers in selected WUAs of Yavan I&D system use gravity irrigation. About a half (44.8%) of the respondents consider that the water received for irrigation is insufficient for irrigation (see Figures 2.28 and 2.29).

Figure 0.28. Pumping required to bring water to land

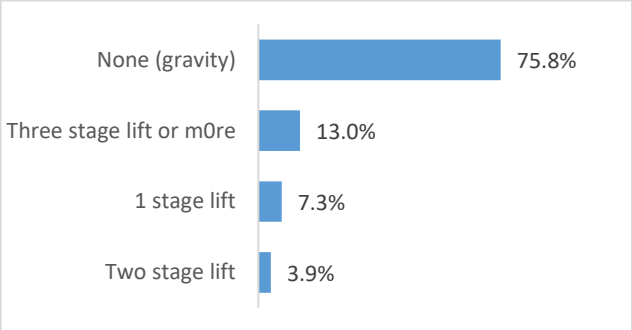


Figure 0.29. Sufficiency of water for irrigation

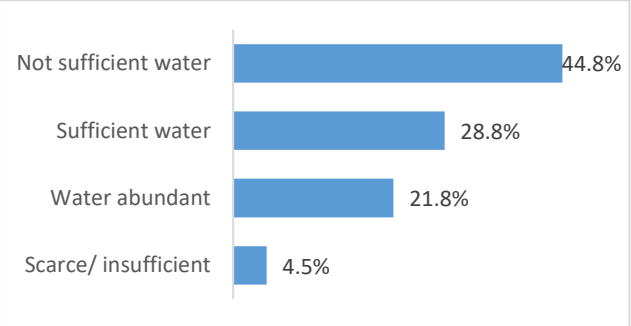
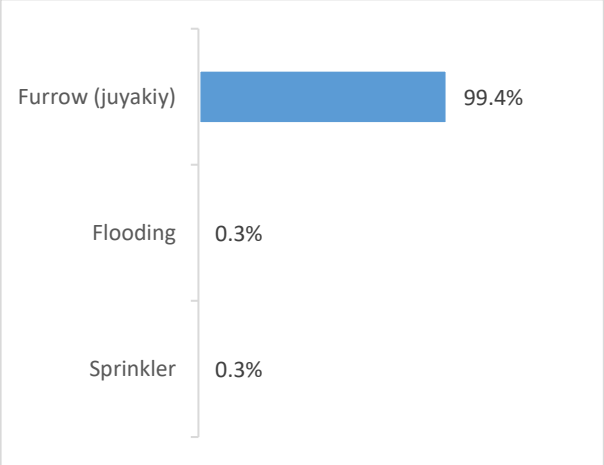


Figure 0.30. Applied irrigation system



The absolute majority of farmers use manual, furrow irrigation (juyakiy) irrigation methods to their lands (99.4%) (see Figure 2.3).

Around 78 percent of respondents in Yavan I&D system reported that WUAs manage and are responsible for the supply of water to their farm lands and only 12 percent mention ALRI district branches to directly supply them water. More than 65 percent of the farmers assesses the quality of irrigation services (water management and water distribution) provided as good and fair and about 34 percent of farmers are not satisfied with quality of irrigation services (see Figures 2.31 and 2.32).

Figure 0.31. Management of water supply

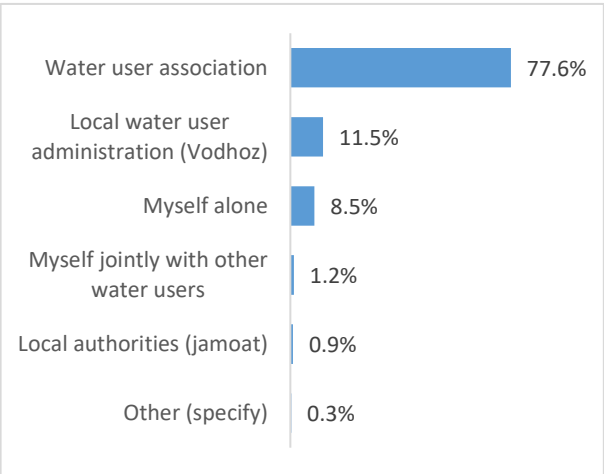
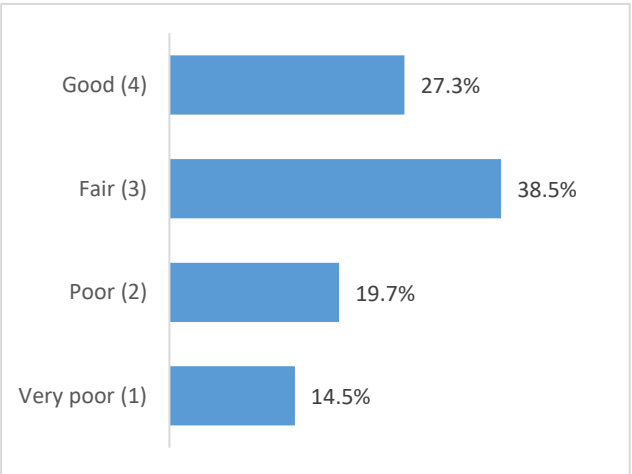


Figure 0.32. Assessment of quality of irrigation service provided



Among the dehkan farmers only 9 percent use drainage water. Among the reasons for using drainage water the farmers have mentioned unsatisfactory water provision through the main canal (43.3%) and absence of canal water and of delivery services when required (36.7%) (see Figures 2.33 and 2.34).

Figure 0.33. Usage of drainage water

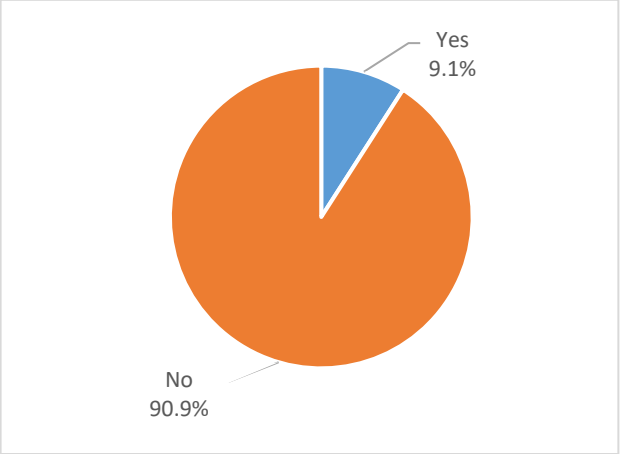
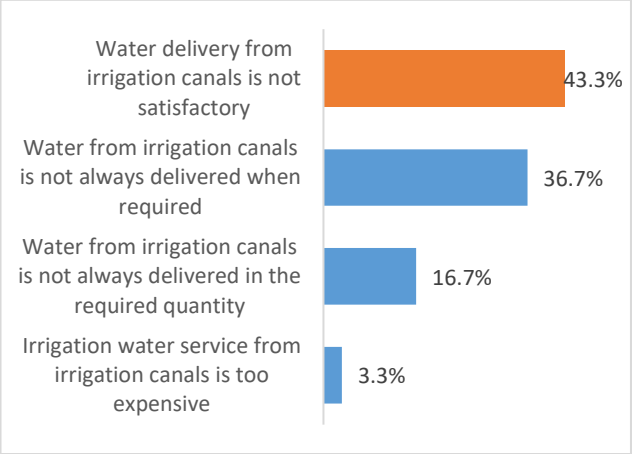
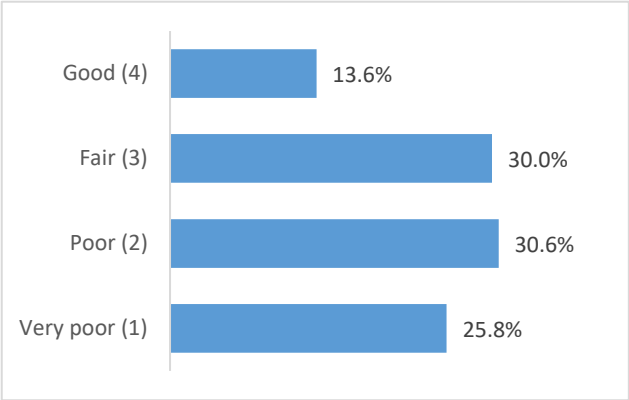


Figure 0.34. Reasons for using drainage water



Over 60 percent of farmers evaluate the irrigation infrastructure (irrigation pipes, hydrants and canals) condition in their area as poor and very poor (see Figure 2.35).

Figure 0.35. Assessment of quality of served irrigation pipes, hydrants, and canals



Around 64 percent of farmers consider that the drainage pipes, and ditches infrastructure condition in their farming area is poor or very poor condition. Only 2 percent of respondents use an electric or motor pumping for lifting water for irrigation (see Figures 2.36 and 2.37).

Figure 0.36. Assessment of quality of served drainage pipes, and ditches

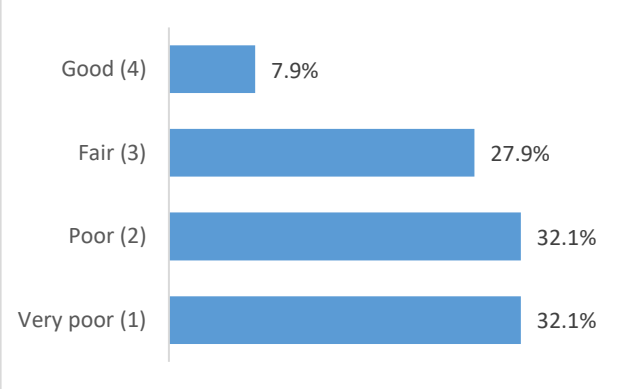
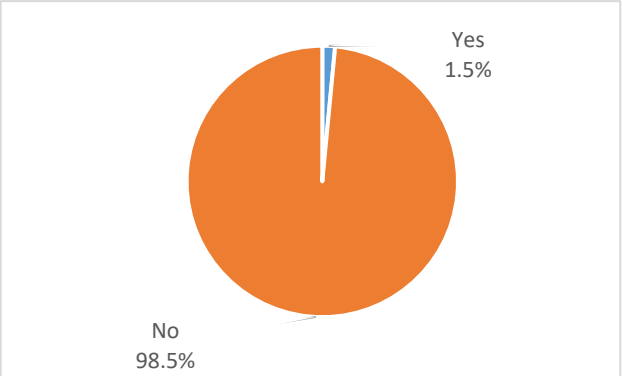


Figure 0.37. Usage of an electric/motor pump for irrigation



According to the results of survey, sharply half of the farmers mention that they faced water problems during the last growing season. Among the most urgent problems farmers mentioned water scarcity (87.3%) (see Figures 2.38 and 2.39).

Figure 0.38. Encountered water problems during the last growing season

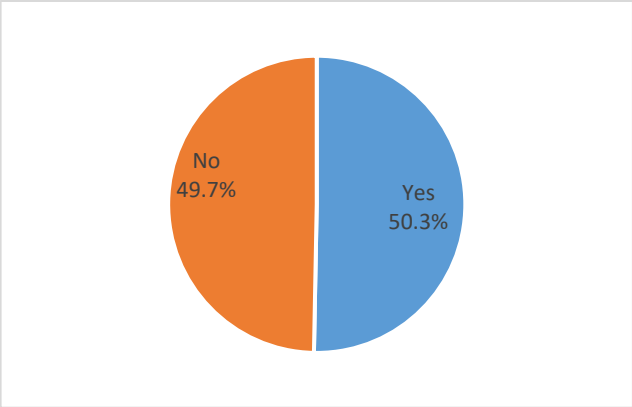


Figure 0.39. Kind of encountered water problems

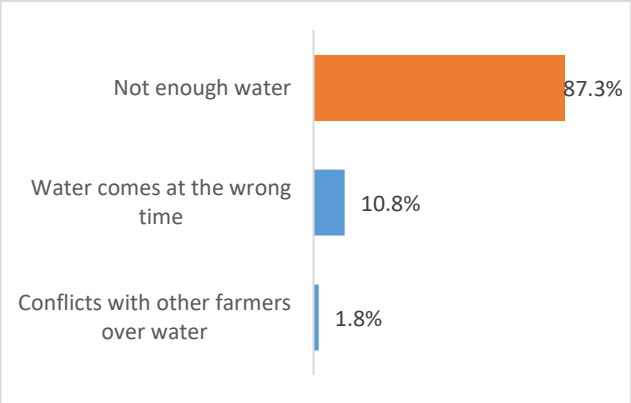
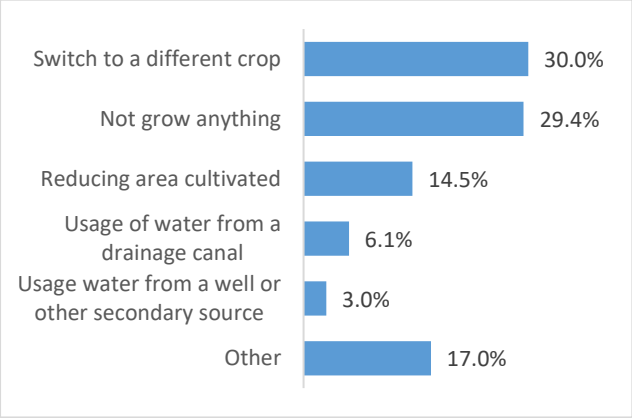


Figure 0.40. Actions taken in case of water is scarce



When facing water scarcity, one third of respondents switch to a different crop (less water demanding crops) (30.0%), stop growing any crops (29.4%) or reduce cultivated area (14.5%) (see Figure 2.40).

The results of the survey show that almost half of the farmers do not set any rules when distributing water on tertiary level. Only 35.2% of the respondents have reported that farmers together with other water users come together and create a schedule before each cropping season.

Over 70 percent of farmers personally monitor the irrigation process and compliance to water use rule and about one-quarter of farmers assign guards specially hired to monitor the irrigation turns and compliance to water use rule (see Figures 2.41 and 2.42).

Figure 0.41. Ways to deal with water distribution

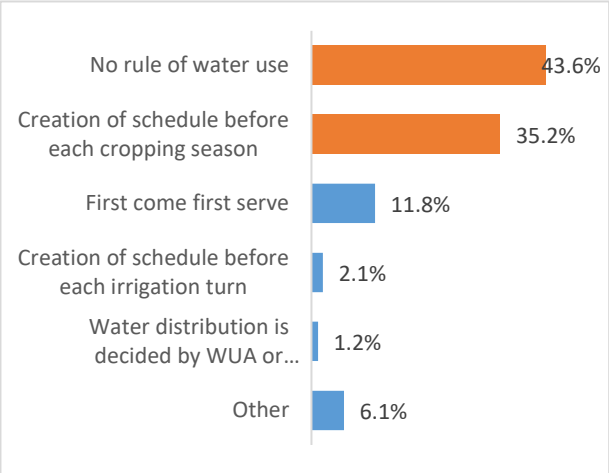
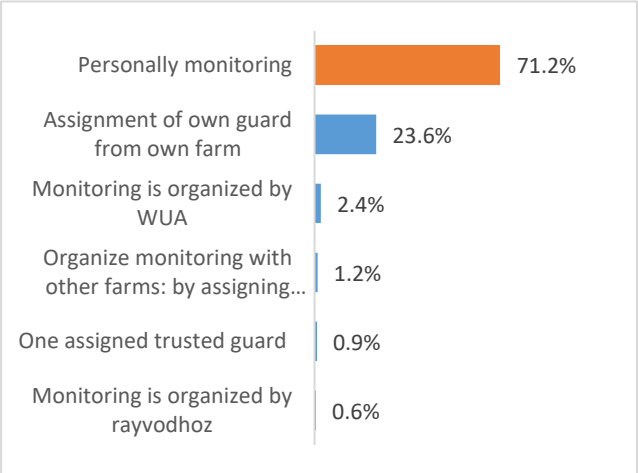


Figure 0.42. Organization of monitoring of compliance to water use rule



Membership to WUAs and other agricultural aspects

Over 89 percent of dehkan farmers identify themselves as members of WUAs, 8 percent of farmers declare that they have direct contracts with ALRI branch and 4 percent state that they do not have any contracts or membership for receiving water. For half of the farmers irrigation services did not change after acquiring membership with WUAs (see Figures 2.43 and 2.44).

Figure 0.43. Membership to WUAs

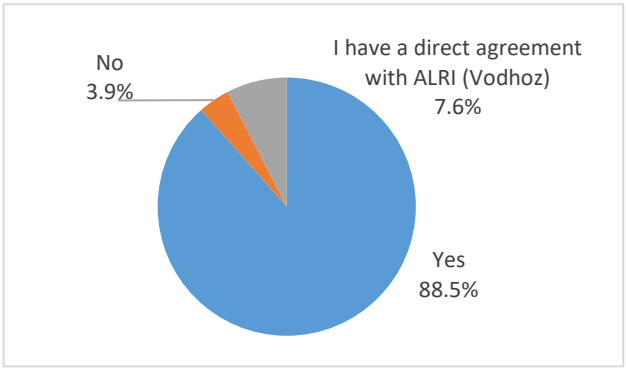


Figure 0.44. Operation of irrigation service after membership

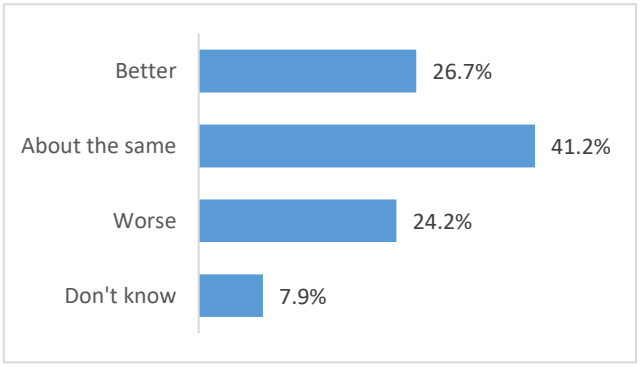
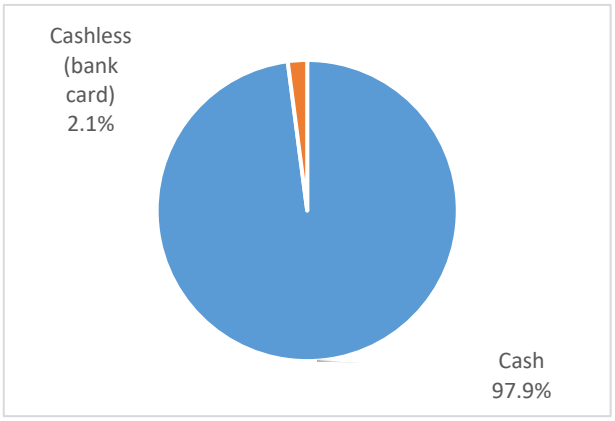


Figure 0.45. Ways to pay membership fee



The absolute majority of farmers reported that they pay membership fee to WUAs mainly cash (97.9%) (see Figure 2.45).

Majority of farmers pay water fees to WUAs (86.7%) and around 10 percent of the respondents pays water fees to branches of ALRI in the district. 9 percent of the farmers have reported that they paid

extra money in addition to official water charges and 73 percent of the extra money were paid to WUAs (see Figures 2.46 and 2.47).

Figure 0.46. Water fees paid to:

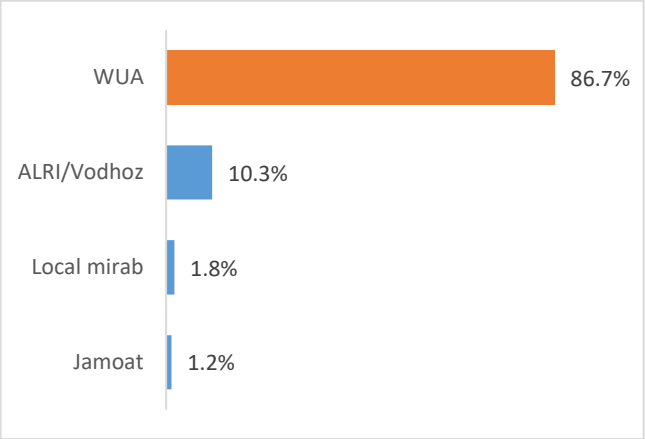
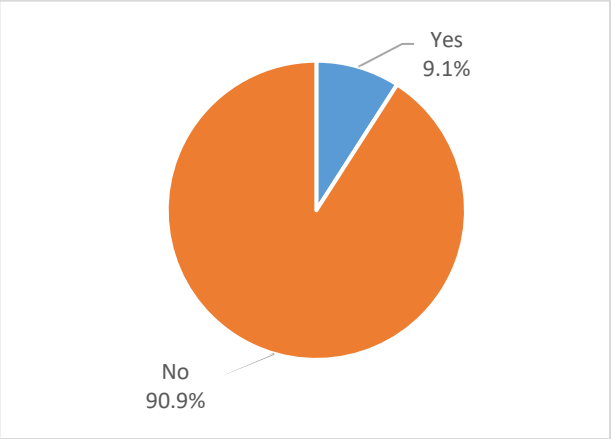


Figure 0.47. Payment of extra water fees



13 percent of the dehkan farmers have mentioned that they paid extra fees to branches of ALRI. Half of the farmers responded that they have paid extra fees to rehabilitate irrigation and drainage infrastructure. 20 percent of them mention that extra payment has been executed to clean irrigation canals and drainage infrastructure. According to the results of the survey, in average, farmers in Yavan pay TJS 483.0 annually for the WUA membership fee (see Figures 2.48 and 2.49).

Figure 0.48. Payment of extra water fees to:

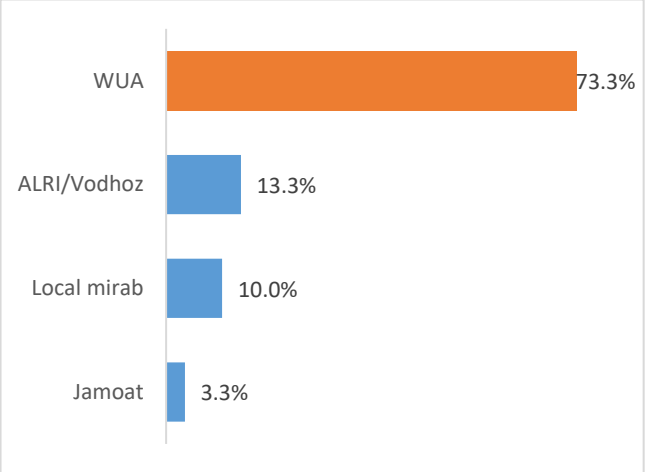
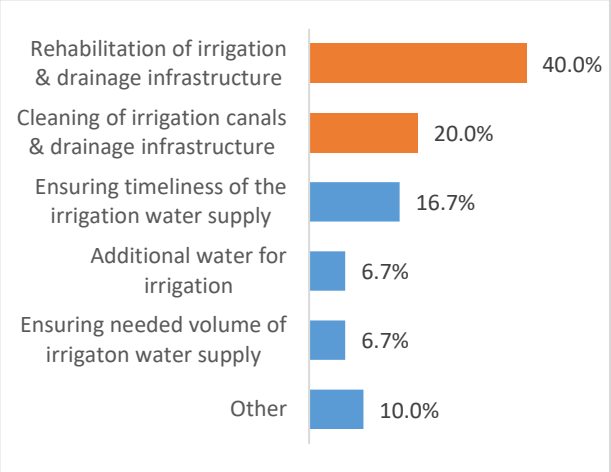
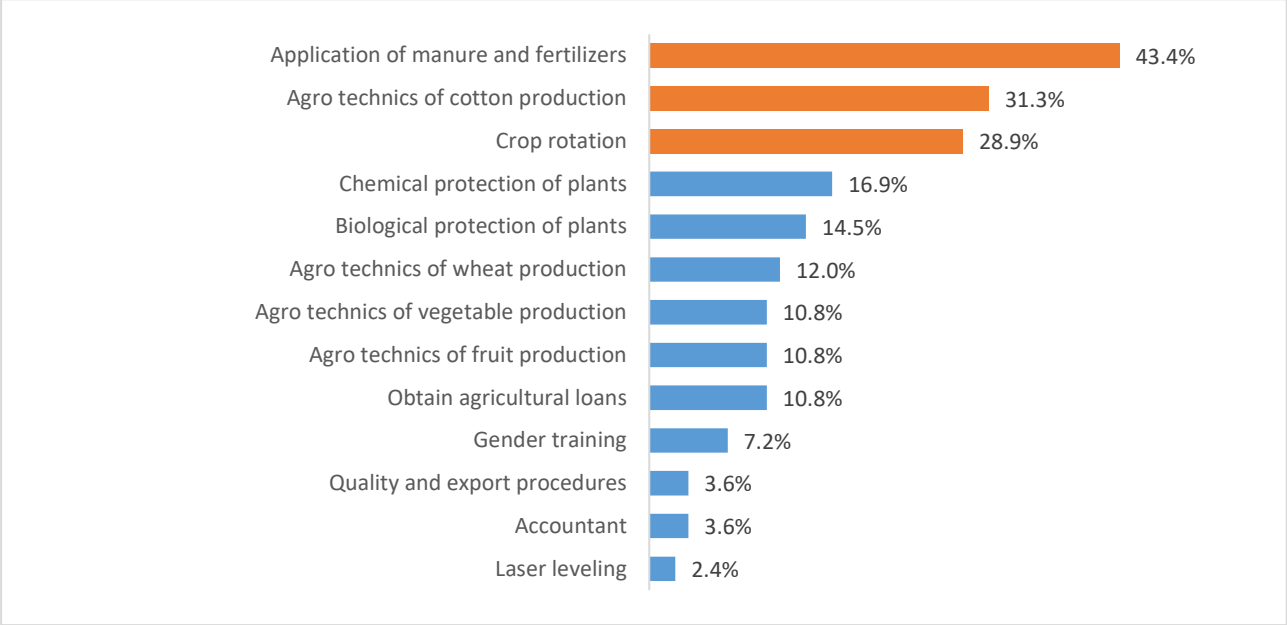


Figure 0.49. Reasons for paying extra water fees



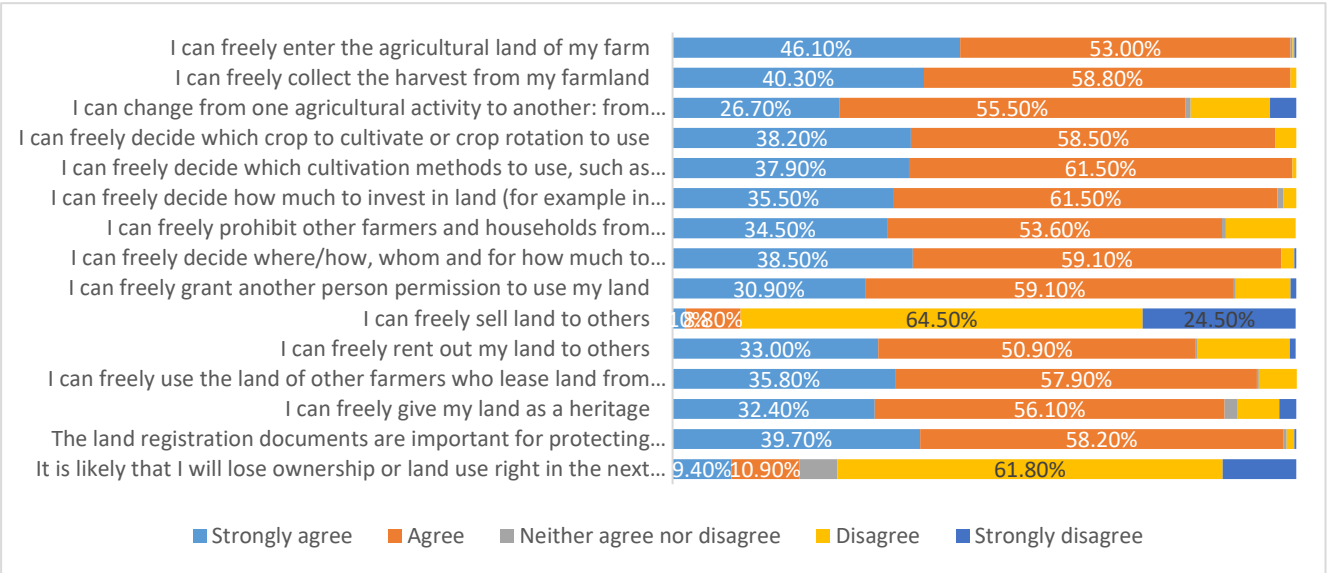
All respondents in Yavan I&D system have reported that they did not receive any kind of direct subsidies from government in the last 12 months. Slightly more than quarter (25.2% or n=83) of the respondents have participated in agriculture related trainings including "Application of manure and fertilizers" – 43.4%, "Agro technics of cotton production" – 31.3% and "Crop rotation" – 28.9% (see Figure 2.50).

Figure 0.50. Topics of trainings workshops and seminars, n=83 (multiple choice)



Majority of the farmers are confident about their rights on ownership and share the opinion on importance of registration documents on land. However, most of the farmers have mentioned that they are not able to freely sell or rent their land rights to others. At the same time the farmers can freely and easily decide on methods of harvesting, crop types, cultivation methods or on the amount of their investment when obtaining land. The only exception is land selling that is prohibited in Tajikistan (see Figure 2.51).

Figure 0.51. Farmers opinion on their rights



Farmers have reported about very small number of disputes and disagreement (7.9%) they faced in the last 12 months. From those who reported, disputes and disagreements were related to unfair water distribution (50.0%) and water theft (26.9%). Among other reasons farmers mentioned such problems as untimely water delivery by WUAs, violation of rules or contract terms set by WUAs and of the water schedule set by WUAs (see Figures 2.52 and 2.53).

Figure 0.52. Disputes and disagreements faced by dehkan farms in the last 12 months

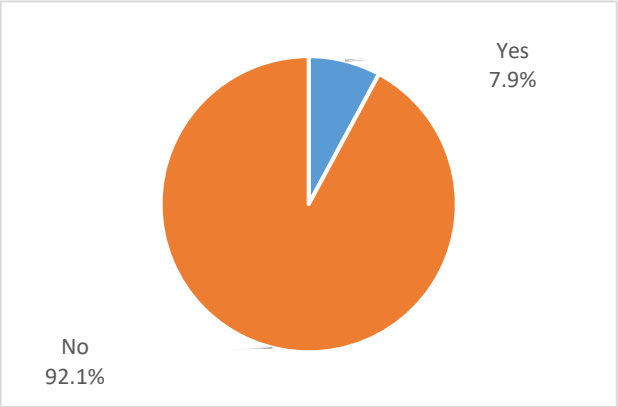


Figure 0.53. Types of faced disputes and disagreements

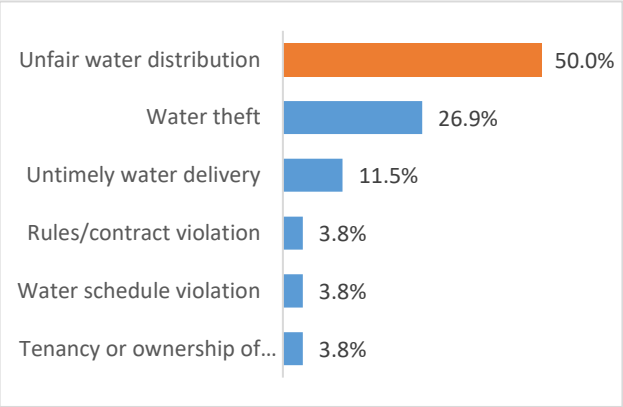
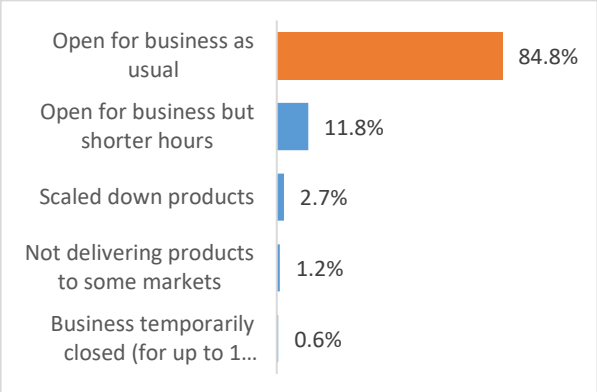


Figure 0.54. Current status of your dehkan farm's economic activity



Tajikistan is vulnerable to external shocks that firstly hurt the wellbeing of the poor and other vulnerable sectors of society. COVID-19 outbreak caused sever disruptions in the labour market and a sharp decrease in remittances flow. At the same time, on the one hand, this did not affect the activities of many respondents, since the majority of them noted that they worked as usual (84.8%), and only 1 percent said that they temporarily closed (for up to 1 month) their businesses (see Figure 2.54).

In addition, the absolute majority of respondents noted that the COVID-19 outbreak did not affect their dehkan farm's operations in any way (91.8%). Twenty-seven of respondents who noted that the COVID-19 outbreak affected their dehkan farm's operations, 74 percent faced its negative impacts. Relatively most often it was a loss of financial resources (77.8%) (see Figures 2.55 and 2.56).

Figure 0.55. Impact of COVID-19 outbreak to dehkan farm's operations

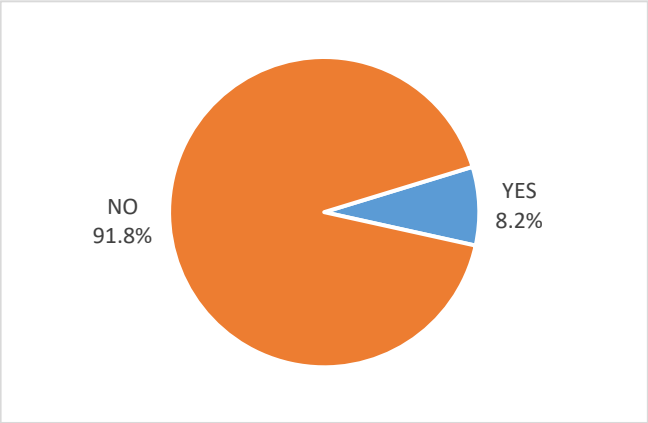
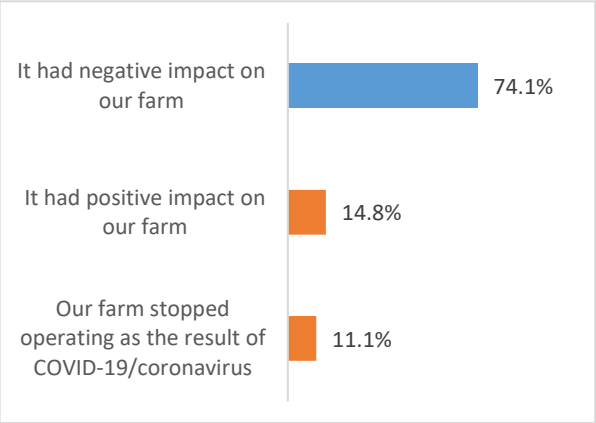
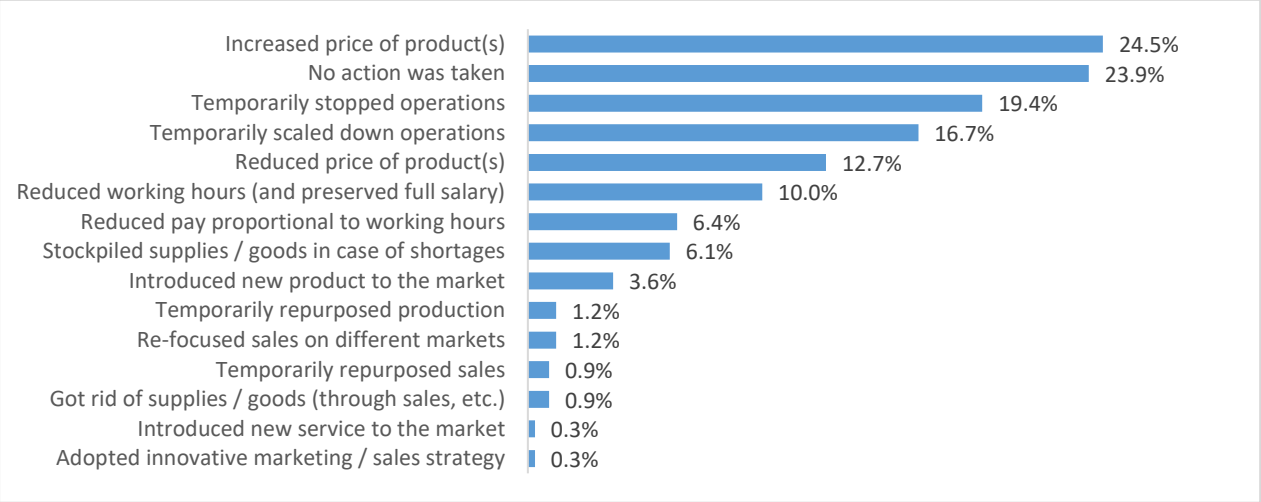


Figure 0.56. Type of impact of COVID-19 outbreak to dehkan farm's operations



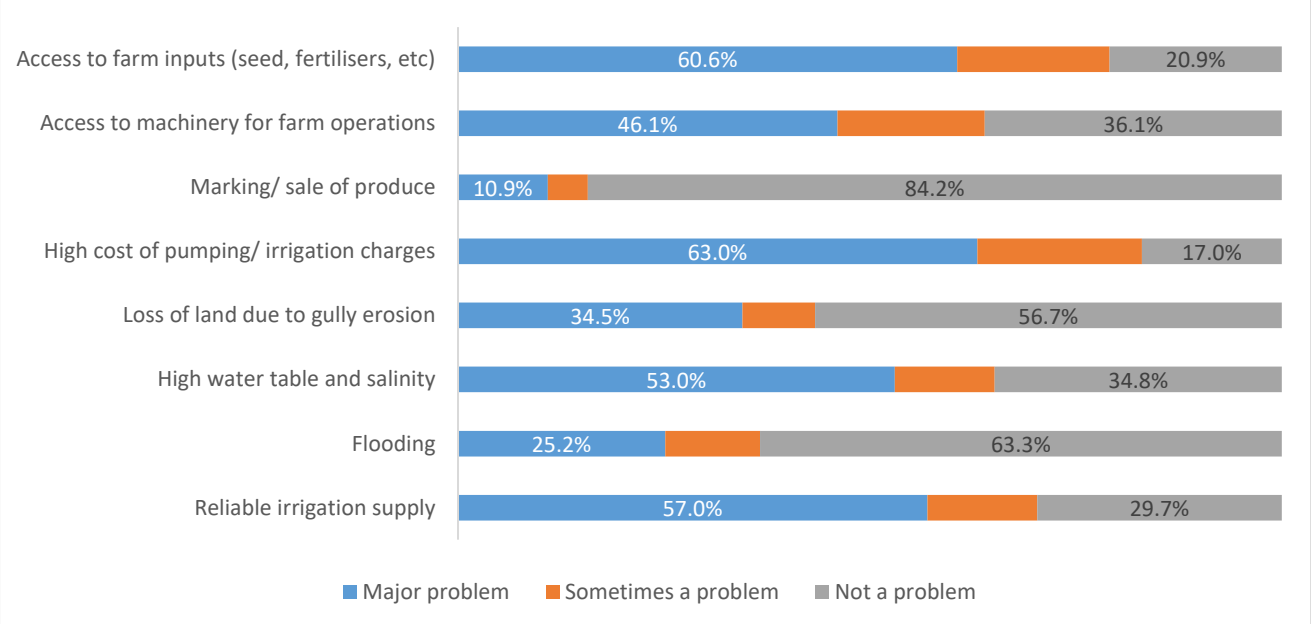
But on the other hand, this led to increase in local food prices. During the COVID-19 outbreak pandemic in 2020 around 25 percent of farmers faced difficulties and in response to the uncertainties, approximately quarter of farmers increased the prices on their products. About quarter of respondents (23.9%) reported not taking any counter measures from the list of measures in response to COVID-19 outbreak in Yavan. Other countermeasures mentioned by farmers included: temporarily stopping or scaling down agricultural operations and etc (see Figure 2.57).

Figure 0.57. Undertaken countermeasures by dehkan farms in response to COVID-19 in Tajikistan, multiple choices



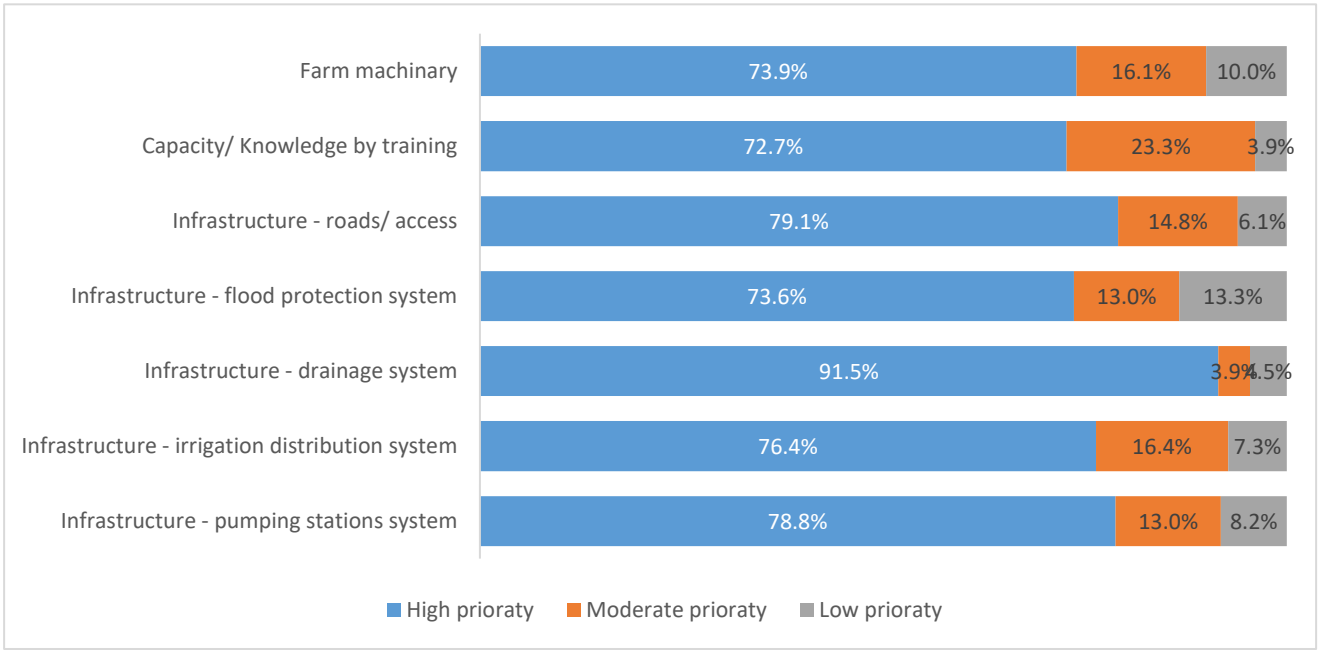
The results of the survey reveal that the major problems for the farmers related to their agricultural activities are high costs of irrigation charges (63.0%), access to farm inputs (60.6%) reliable irrigation supply (57.0%) and soil salinity (53.0%), access to machinery (46.1%). Such challenges as marketing or selling of their agricultural produce, impact of nature disasters like flooding and loss of land due to gully erosion have been also mentioned by several farmers (see Figure 2.58).

Figure 0.58. Problems faced for irrigated agriculture



Most of the farmers suggested giving higher priority to the improvement of drainage, pumping stations, improvement of roads. Moreover, the farmers suggest to enhance farm machinery, flood protection system, irrigation distribution system and capacity and knowledge through trainings (see Figure 2.59).

Figure 0.59. Aspects to be addressed by the proposed project



2.3. Results of the Kumsangir I&D system

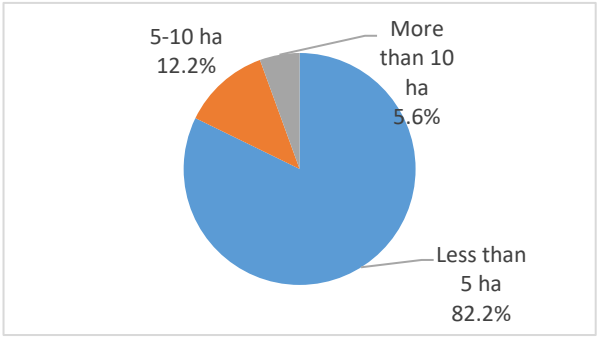
Land characteristics of farms

One of the main differences between Yavan's and Kumsangir's respondents is that respondents in Kumsangir did not report any unirrigated land. Thus, there no difference in area between irrigated land and cultivated land of the respondents. However, the average farm size among Kumsangir's respondents is 3.58 ha, which is smaller than in Yavan (see Table 2.2).

Table 2.9. Agricultural land area, ha (average)

Characteristics	Average land area, ha
Average cultivated land area	3.58
Average irrigated land area	3.58
Difference	(0.00)

Figure 0.60. Land characteristics distribution by size (land area), n=90



A big share of farms only has an area up to 5 ha (82.2%) (see Figure 2.60).

The most of Kumsangir's respondents grow in annual cropland (87.8%), while 10 percent of them use land for perennial.

The soil in Kumsangir is more fertile in comparison to results in Yavan I&D system. About a quarter of respondents reported high soil fertility of their plots that explains the reason for higher annual crop production. However, more than half of used land only has average soil fertility or not good enough for crop cultivation (see Figures 2.61 and 2.62).

Figure 0.61. Land characteristics - distribution by type (land area), n=90

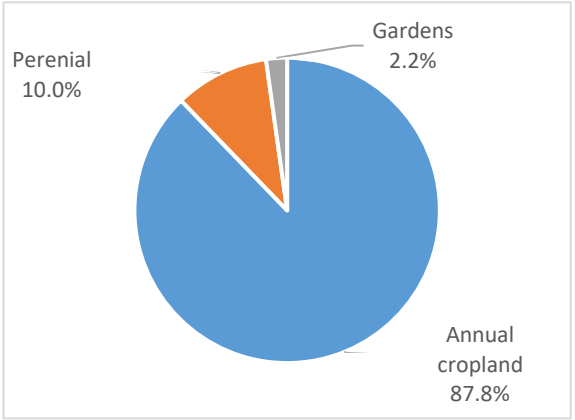
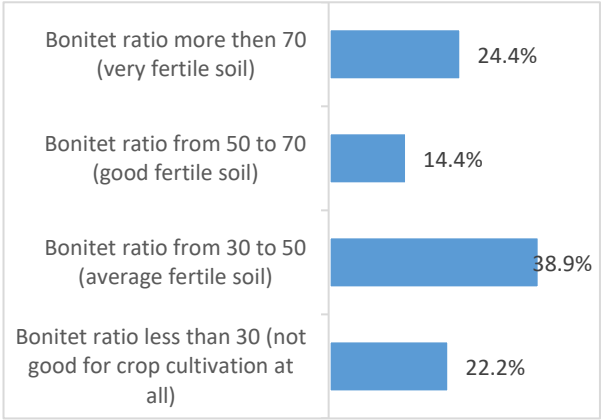


Figure 0.62. Land characteristics - distribution by average soil fertility rate, n=90



About two-thirds of dehkan farmers evaluate their average groundwater level as lower than 2 meters during the crop cultivation season.

31 percent of respondents reported high groundwater level, and 4 percent only have a medium level. Around half of respondents assess their soil as non-saline. Another half of respondents evaluate soil as highly saline and medium saline - 30.0% and 17.8% respectively (see Figures 2.63 and 2.64).

Figure 0.63. Evaluation of the average ground water level in the crop cultivation season, n=90

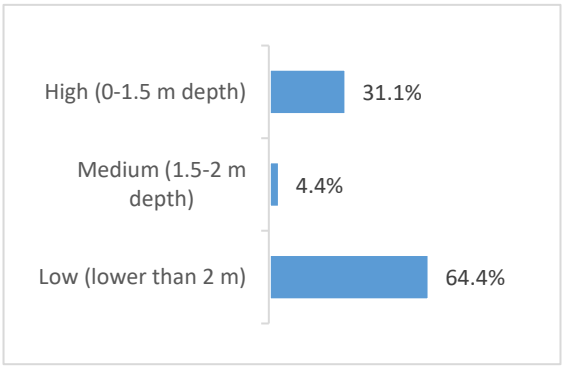
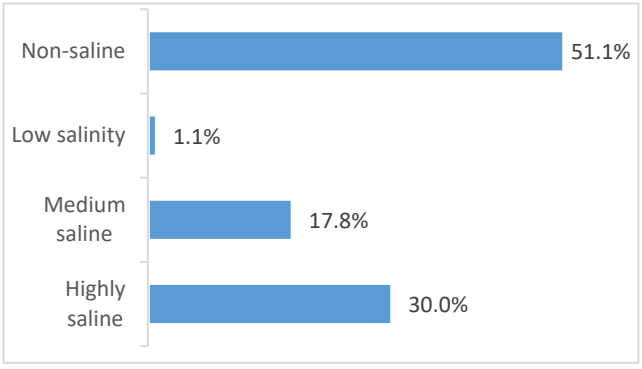


Figure 0.64. Evaluation of soil salinity level, n=90

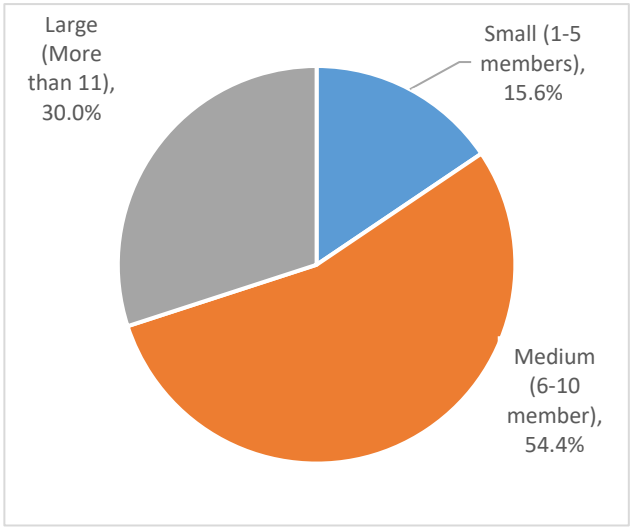


Households characteristics of dehkan farmers

Most indicators related to household characteristics in Kumsangir are slightly inferior to the indicators in Yavan. Thus, the average size of the household in Kumsangir is 9.1 persons (including those members who are away from home for more than 6 months), from which female members constitute roughly half of the household.

More than half of households (54.4%) have a medium-sized household (with 6-10 members). 16 percent of respondents have small-sized household (1-5 members), and 30 percent of farmers have large households (with more than 11 members) (see Figure 2.65).

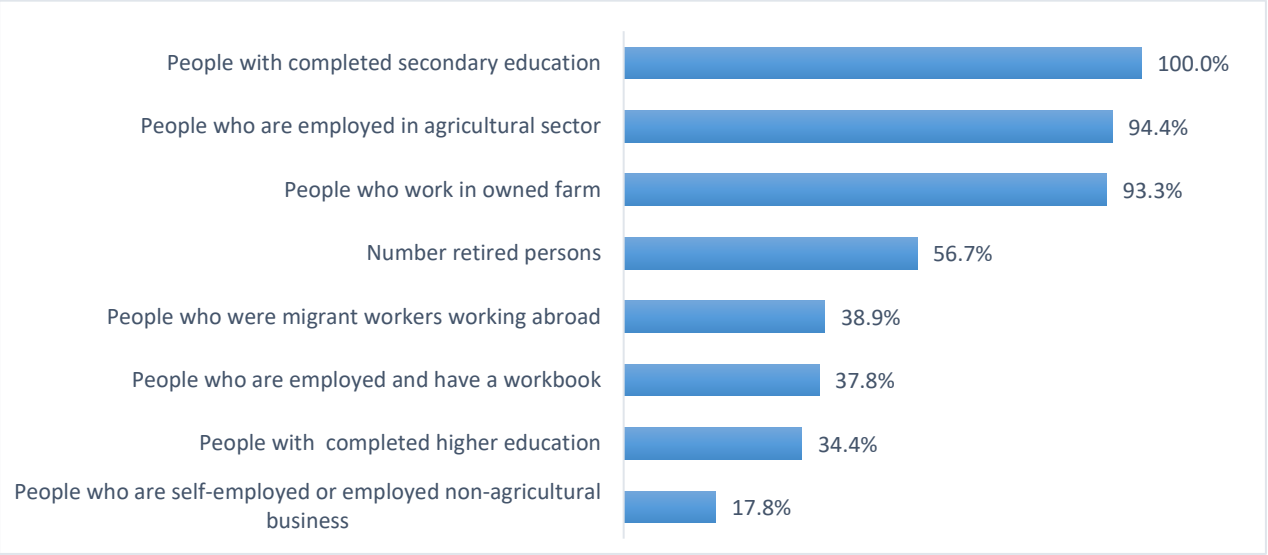
Figure 0.65. Household size, n=90



The survey results demonstrate that all respondents in Kumsangir reported that they have household members with at least secondary education and only 34 percent of them mentioned members with higher education. Households with members who are employed with workbook constitute 38 percent. Almost all households include members employed in the agricultural sector (94.4%); moreover, most of them work in their own farms (93.3%). Only 18 percent of households in Kumsangir have members

who are self-employed or work in the non-agricultural business. Less than half of households have members working abroad (38.9%) (see Figure 2.66).

Figure 0.66. Employment status and occupation of household members, n=90 (multiple choice)



Labour

The distribution of labour force in Kumsangir I&D system is similar to the distribution in Yavan. On average, 5.1 people are involved in agriculture, of which 2.3 work on a permanent basis, and 2.6 persons work seasonally or temporarily (see Table 2.10).

Table 2.10. Labour resources

	Person (average)
Household members involved in agriculture[20]	5.1
- ***Working on a permanent basis (with work book)***	2.3
- ***Working on a seasonal/temporary basis***	2.6
Numbers of permanent workers (with labour books)	0.8
Number of permanent workers (without labour books)	0.1
Number of hired workers involved in agricultural (short-term wage workers)	4.9
Number of managers	1.1
Number of main specialists involved in agricultural work	0.1

Note: average across households

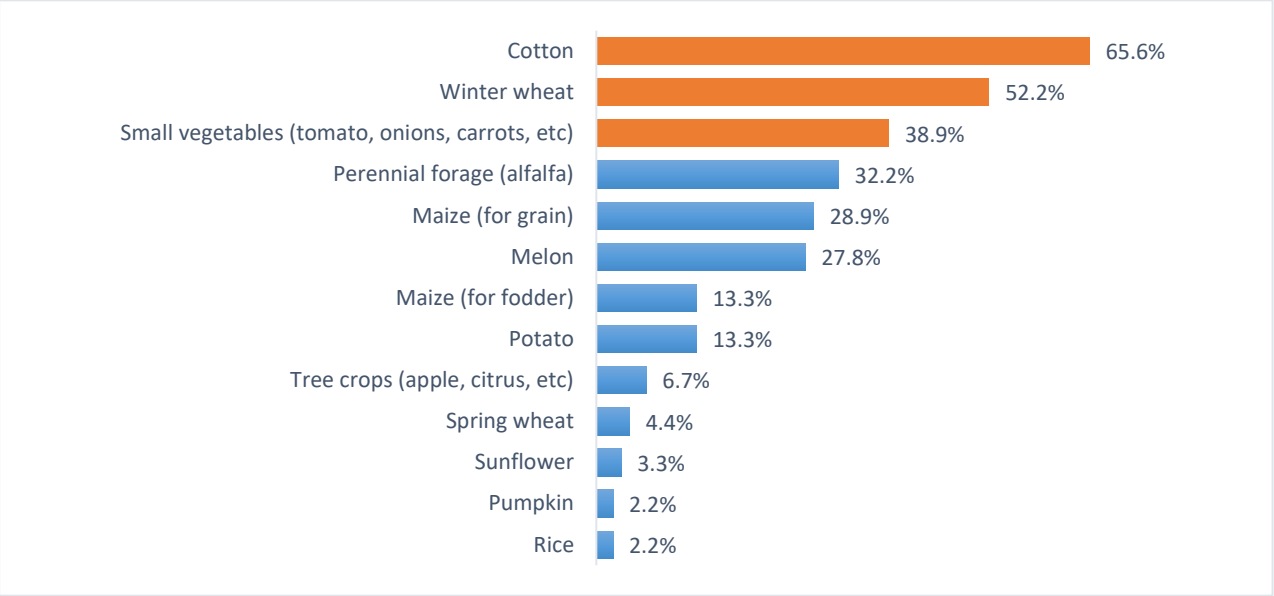
Agricultural production

The most popular crop cultivated in Kumsangir I&D system is cotton which is being produced by 66 percent of respondents. Winter wheat is cultivated by around half of respondents, because cotton and wheat are rotation crops. Vegetables such as tomato, onions, carrots and others are produced by 39 percent of respondents. Around 30 percent of respondents are involved in perennial forage, maize

[20] taking into account the absence of family members

(grain), and melon production. Other crop types (maize for fodder, potato, fruit trees, spring wheat, sunflower, pumpkin, and rice) were mentioned by less than 15 percent of farmers (see Figure 2.67).

Figure 0.67. Types of crops



Along with the highest total production, perennial forage (alfalfa) also has the highest yield in Kumsangir that is again followed by the productivity of melon and small vegetables. Similarly, to Yavan, cotton and tree crops that occupy the largest average area in Kumsangir have the lowest yields (see Table 2.11).

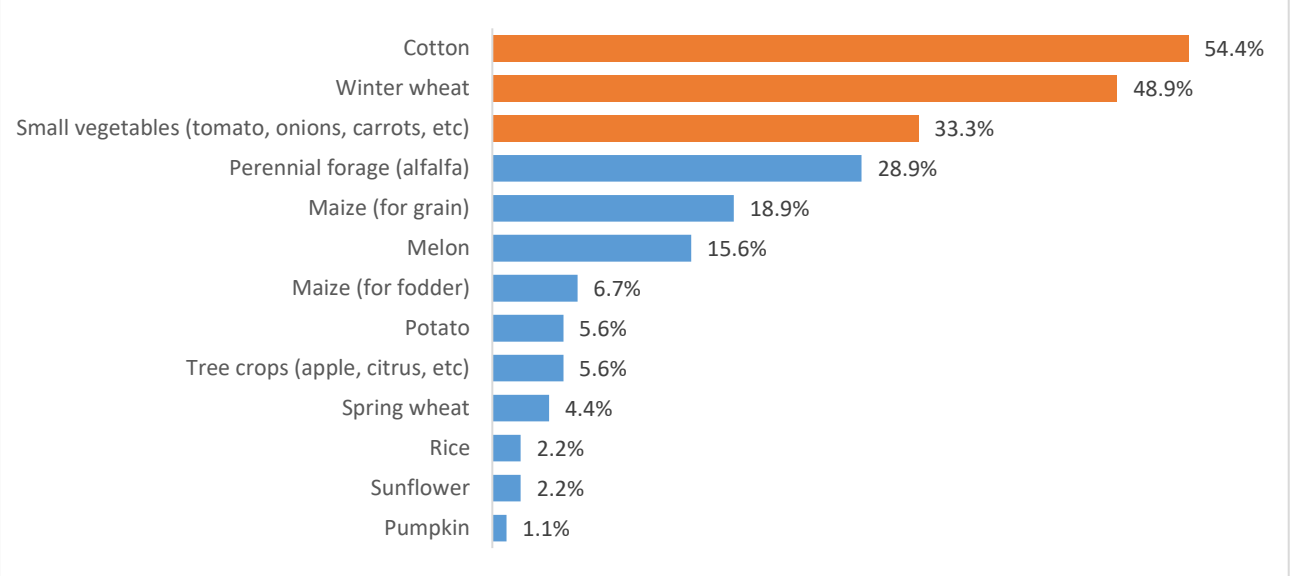
Table 2.11. Yield of crops in land

	Yield in irrigated area, kg/ha
Perennial forage (alfalfa)	50107.6
Melon	30558.2
Small vegetables (tomato, onions, carrots, etc)	27462.3
Potato	9742.7
Maize (for fodder)	6481.1
Pumpkin	6192.9
Maize (for grain)	4301.7
Spring wheat	3500.0
Rice	2925.9
Winter wheat	2806.7
Sunflower	2500.0
Cotton	1701.1
Tree crops (apple, citrus, etc)	707.3

The most important crops are cotton, winter wheat, small vegetables, and perennial forage. They were mentioned by more than 28 percent of dehkan farmers. Maize (for grain) and melon are important for

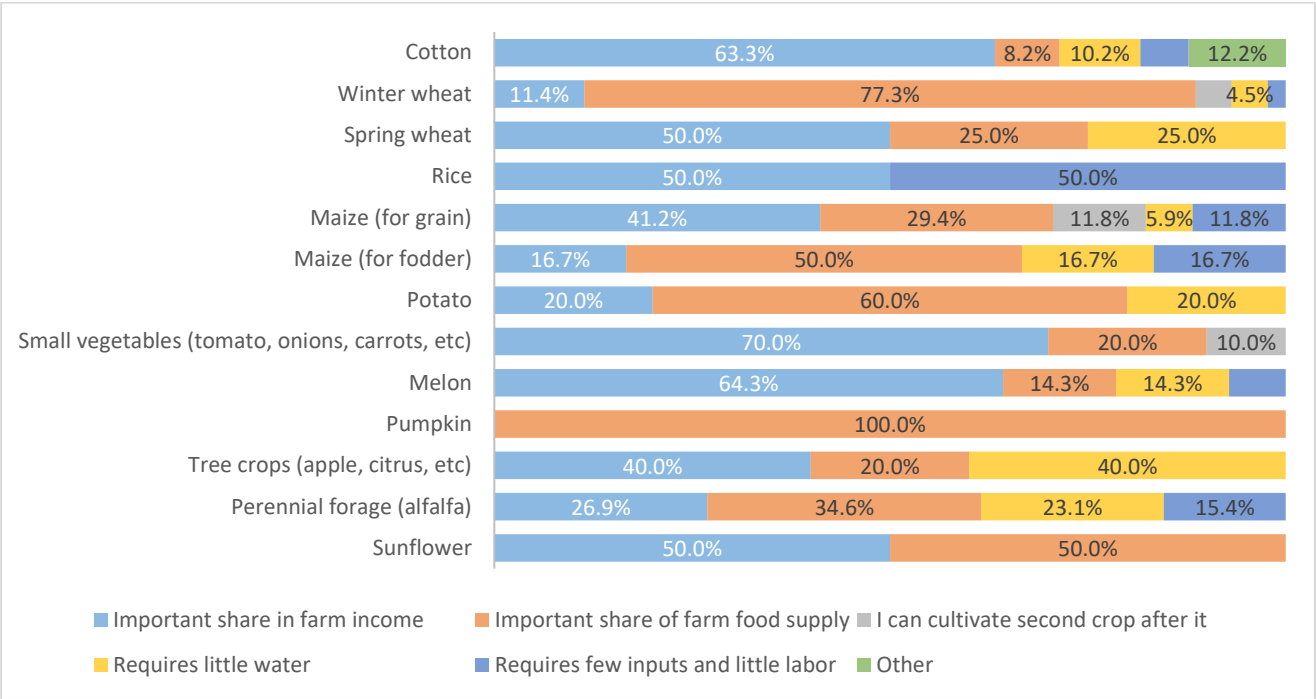
15-20 percent of farmers. All other crops are important for less than 7 percent of respondents (see Figure 2.68).

Figure 0.68. The most important cultivated crops (multiple choice)



According to the survey results, the main reasons for the importance of such crops as cotton, spring wheat, rice, small vegetables, melon, tree crops, maize (for grain), and sunflower is the fact that they constitute a big share of farm income (for 40-70 percent of respondents). However, such crops as winter wheat, potato, pumpkin, maize (for fodder), and perennial forage are important for farm food supply. In addition, farmers attach attention to crops that require less water, less labour force, and fewer inputs. The possibility to cultivate a second crop was also mentioned as an important reason for choosing the crop. Thus, less than 12 percent reported that they can cultivate second crop after winter wheat, maize (for grain), and small vegetables (see Figure 2.69).

Figure 0.69. Reasons why mentioned crop is important



Whereas big shares of cotton and small vegetables were sold (87.1% and 75.9%, respectively), winter wheat was mostly used for self-consumption. More than 15 percent of winter wheat was sold, and 17 percent of vegetables were consumed by producers (see Table 2.12).

Table 2.12. Usage of harvested crop

Usage	Cotton %	Winter wheat %	Small vegetables (tomato, onions, carrots, etc.)
Used for self-consumption	6.2	75.2	17.2
Sold	87.1	15.3	75.9
Provided as payment to workers	0.3	1.9	5.1
Left for next year planting	2.4	5.6	0.2
Used for self-destroyed	3.9	1.8	1.5

Inputs, expenditures and suppliers

Average costs of inputs in Kumsangir I&D system vary in accordance with input type and are slightly different from Yavan's costs. The costs of fertilizers per kilogram are generally cheaper than in Yavan ranging from TJS 3.3 to 4.5 per kg. Among three the most important crops, fertilizers for vegetables require the highest spending ranging from TJS 4 to 4.5 per kg. Fertilizers for cotton are cheaper than for winter wheat (between TJS 3.8 and 4.1 per kg for cotton and between TJS 3.8 and 4.1 per kg for winter wheat), but spending for pesticides used in cotton production is the highest among the three crops (TJS 115 per kg) (see Table 2.13).

Table 2.13. Costs of inputs (average)

	Cotton, TJS/kg	Winter wheat TJS/kg	Small vegetables (tomato, onions, carrots, etc.) TJS/kg
Costs for seeds	7.4	4.3	7.0
Costs for fertilizer			
- **Superphosphate (Nitrogen)**	3.6	3.8	4.4
- **Urea (Nitrogen)**	4.0	4.1	4.4
- **Saltpeter (Nitrogen)**	3.9	4.1	4.5
- **Phosphorus**	3.3	4.1	4.0
- **Potassium**	-	-	4.5
Costs for manure	4.5	3.1	2.5
Costs for plant protection			
- **Pesticide**	115.0	114.7	113.6
- **Herbicide**	77.5	50.0	66.2

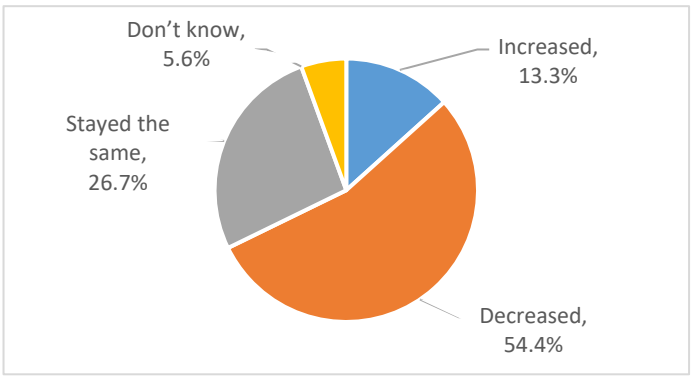
Similarly, to the costs of agricultural inputs mentioned above, average costs of machinery and irrigation in Kumsangir are lower than in Yavan. Average expenditures for machinery are the highest among the three most important crops. On average, farmers spent for machinery in cotton production TJS 3507.1 per kg, in wheat production TJS 506.8 per kg, and in vegetables production TJS 26.9 per kg. Yet, farmers in Kumsangir I&D system require more seasonal workers; and the price per person per day is considerably higher than in Yavan. On average for cotton farmers employed 55 workers for cotton, 44 for winter wheat, and 227 for vegetables. Payments to workers for particular work types are lower. Among the three crops, vegetables have the highest costs for land preparation and sowing (TJS 869.0 per kg), field works (TJS 86.6 per kg), and harvesting (TJS 730 per kg).

Irrigation in Kumsangir I&D system is much more intensive than in Yavan I&D system; each of the most important crops is being irrigated 4-5 times on average. The price for irrigation of cotton (TJS 448.9 per kg) is higher than the prices of irrigation for winter wheat (TJS 221.5 per kg) and vegetables (TJS 345.0 per kg), but almost two times lower than the price of cotton irrigation in Yavan (see Table 2.14).

Table 2.14. Average costs of machinery, labour and irrigation

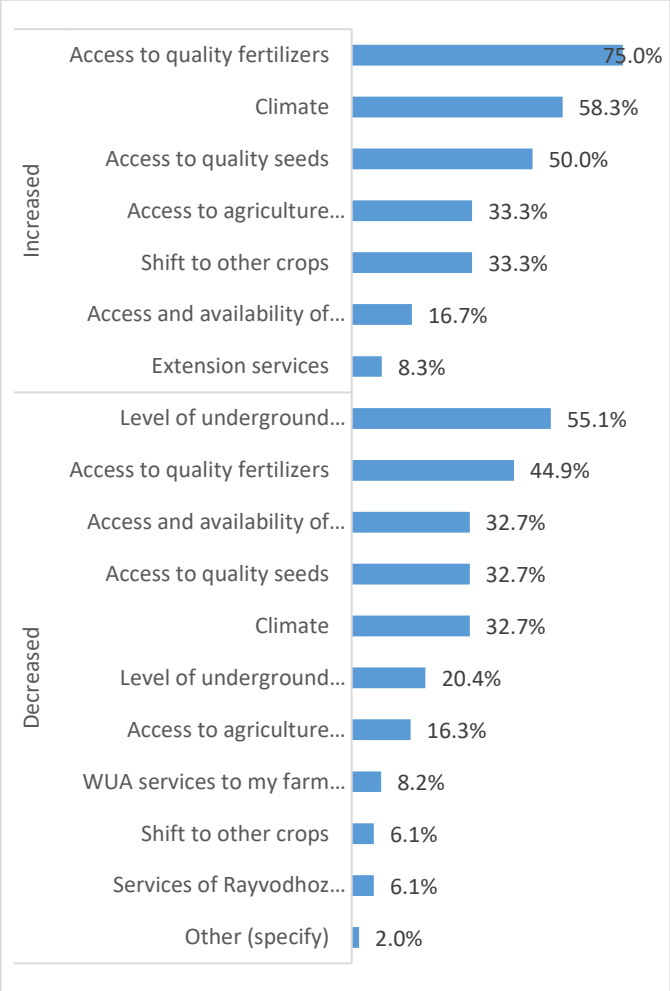
	Cotton	Winter wheat	Small vegetables (tomato, onions, carrots, etc.)
Machinery, TJS	3507.1	506.8	26.9
Oil/diesel and lubricants, TJS/l	6.7	6.5	0.0
Labour resources, person per TJS/day	19.0	9.7	34.6
Payments to workers (seasonal or permanent) for:			
- *land preparation and sowing, TJS/season*	303.0	468.1	869.0
- *field work during cultivation, TJS/season*	27.3	90.2	86.6
- *harvesting, TJS/season*	247.2	211.8	730.0
Number of times for irrigation	5	4	5
Price for irrigation, TJS/season	448.9	221.5	345.0
Other expenses	6.5	13.8	43.6

Figure 0.70. Changes in crops production



Likewise, in Yavan's I&D system, more than half (54.4%) of farmers in Kumsangir reported a decrease in crop production. 27 percent of dehkan farmers did not notice any changes, and only 13.3% reported that their production has increased (see Figure 2.70).

Figure 0.71. Reasons for increasing and decreasing crops production



Famers were asked about the reasons for changes in crop production (Figure 2.4.12.). The deteriorated drainage system was mentioned as the most important reason for a decrease in crop production by 55 percent of respondents. Poor access to high-quality fertilizers (44.9%) and seeds (32.7%), low availability of irrigation water (32.7%), and climate impact (32.7%) also play a significant role in decreasing production.

Those farmers, who denoted an increase, reported climate impact, shift to other crops, and better access to the high-quality seed's fertilizers, and machinery as the main reasons for an increase (see Figure 2.71).

A big share of farmers in Kumsangir uses nitrogen/carbamate (71.1%) and pesticides (76.7%) that they purchase from specialized private shops. All other inputs such as phosphorus, potassium, herbicides, and diesel for machinery are not used by more than 50 percent of respondents. Those who use these inputs also obtain them from specialized private shops: phosphorus- 43.3%; potassium-13.3%; herbicides-26.7%; diesel for machinery-20.0%. The cotton producers obtain cotton seeds from specialized private shops (21.1%), specialized state companies (8.9%), or other farms (12.2%). Wheat seeds are being supplied by private shops (27.8%), other farms (10%), or taken from own production (16.7%) (see Table 2.15).

Table 2.15. Source of inputs

Source of your inputs	Don't use	Purchased from:					
		Specialized private shops	Specialized state companies	Other farms	Processing enterprise as part of contract	Taken from own production	Public supplier
Nitrogen/ carbamide	26.7%	71.1%	0.0%	0.0%	1.1%	0.0%	1.1%
Phosphorus	53.3%	43.3%	0.0%	0.0%	1.1%	0.0%	2.2%
Potassium	84.4%	13.3%	1.1%	0.0%	1.1%	0.0%	0.0%
Pesticides	21.1%	76.7%	0.0%	0.0%	1.1%	0.0%	1.1%
Herbicide	73.3%	26.7%	0.0%	0.0%	0.0%	0.0%	0.0%
Diesel for machinery	65.6%	20.0%	0.0%	0.0%	1.1%	0.0%	13.3%
Cotton	35.6%	21.1%	8.9%	12.2%	4.4%	4.4%	13.3%
Wheat	44.4%	27.8%	1.1%	10.0%	0.0%	16.7%	0.0%
Vegetable	53.3%	33.3%	1.1%	4.4%	0.0%	3.3%	4.4%
Fodder	53.3%	28.9%	1.1%	7.8%	0.0%	8.9%	0.0%
Fruit seedlings	92.2%	4.4%	0.0%	2.2%	0.0%	1.1%	0.0%

Infrastructure

Almost all farmers in Kumsangir I&D system the distance from home to the source of inputs is less than 5 km. However, the distance from home to the nearest market is longer (5-20 km) for more than 60 percent of farmers. About half of respondents assess the condition of the road to the nearest market as bad or extremely bad. Another half reported that roads are in moderate or good conditions (see Figures 2.62 and 2.73)

Figure 0.72. Distance from home to source of inputs and farm to the nearest market

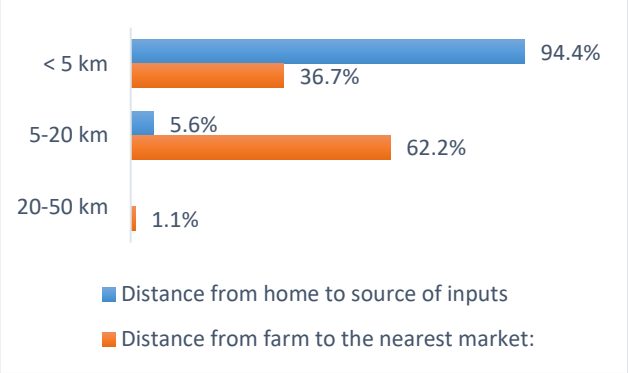
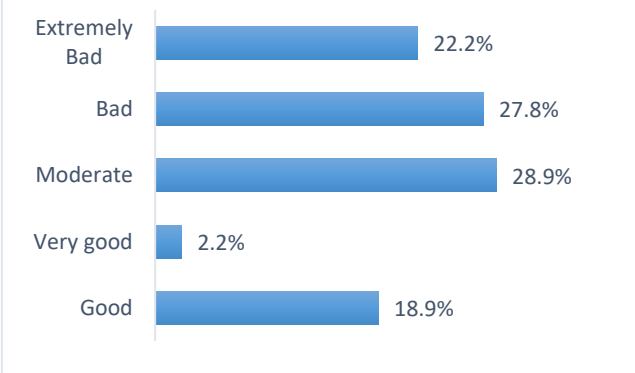


Figure 0.73. Assessment of the condition of the road to the nearest market

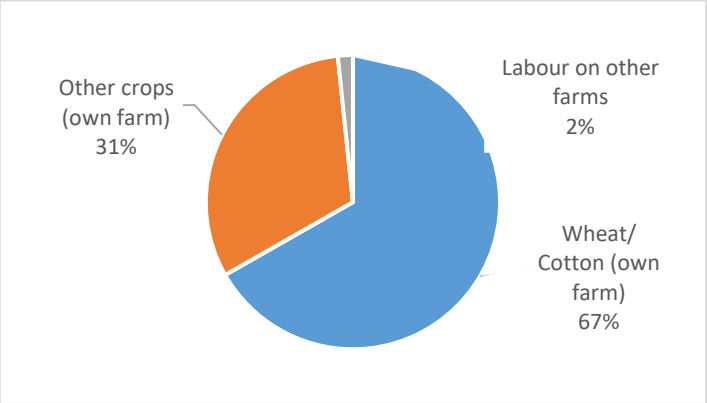


Agricultural income

The average annual income of farmers in Kumsangir I&D system is TJS 42,965.3.

Almost all of the income from agricultural production (98.4%) come from own farm. A great part of own farm income consists of earnings from wheat and cotton production (65.9%). Earning from other crops constitute 31 percent of the total agricultural income (see Figure 2.74).

Figure 0.74. Distribution of earned income, n=90



Irrigation and water source

The main water source for irrigation in Kumsangir I&D system is a surface water outlet from canal (81.1%). 14 percent of interviewed farmers obtain water directly from the river. The distribution of land locations relatively to irrigation water source is almost equal: one-third of respondents have their land in the tail, one-third have land in the middle, and one-third have lands in the head of water source (see Figures 2.75 and 2.76).

Figure 0.75. Main irrigation water source

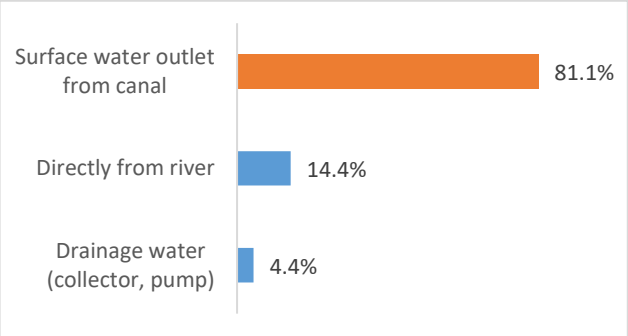
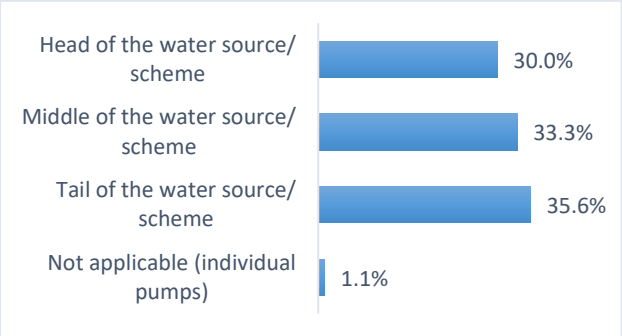


Figure 0.76. Land location relative to irrigation water source



More than half of Kumsangir's respondents reported that pumping is not required to bring the water to land. All others (37.7%), however, require 1-, 2-, or 3- stage lift to bring a water for irrigation. Of 90 respondents, more than half of farmers have sufficient or more than sufficient access to water, but for 38 percent of farmers, irrigation water is not sufficient (see Figures 2.77 and 2.78).

Figure 0.77. Pumping required to bring water to land

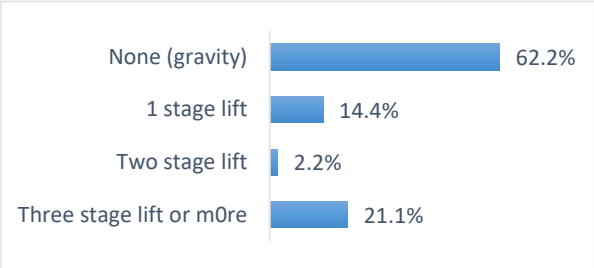
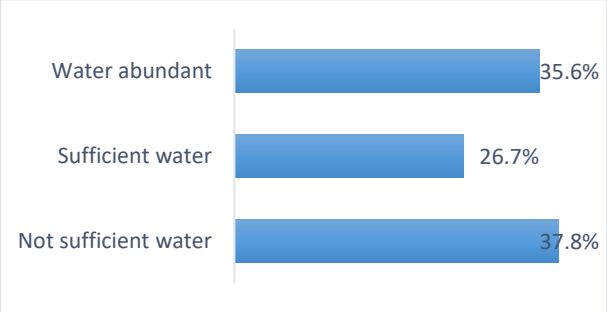


Figure 0.78. Sufficiency of water for irrigation



Forrow or "juyakiy" irrigation system is dominant in Kumsangir I&D system (100.0%). WUA was mentioned as the main manager of water supply by 76 percent of respondents; which is followed by local water user administration. Generally the quality of irrigation services was evaluated as good or fair. Only 17 percent assessed the service as poor or bad (see Figures 2.79 and 2.80).

Figure 0.79. Management of water supply

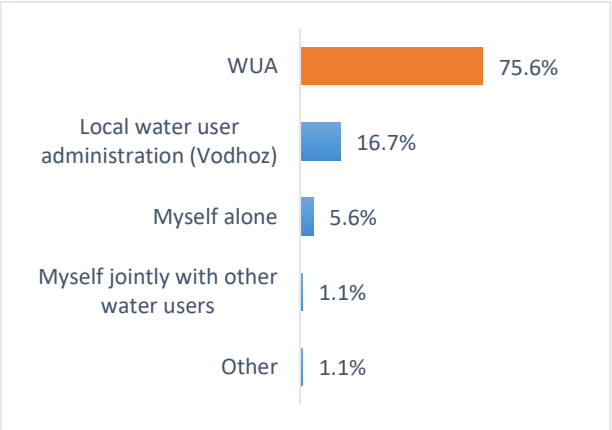
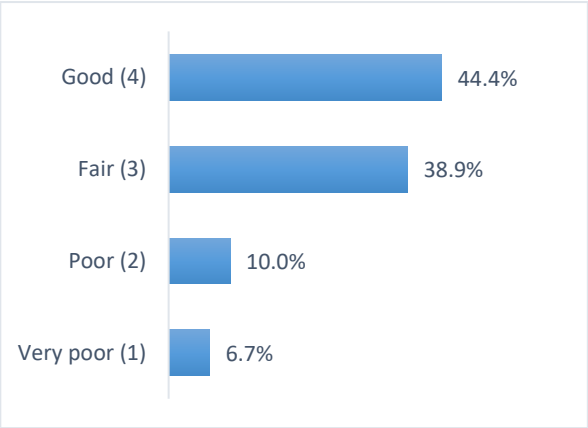


Figure 0.80. Assessment of quality of irrigation service provided



Almost all of the respondents in Kumsangir pay water fees to WUAs. Only 4 percent pay fees to ALRI branches. 11 percent of farmers reported that they pay extra water fees that go mainly to WUAs, and sometimes to local mirabs (local name for water wasters) (see Figures 2.81 and 2.82).

Figure 0.81. Water fees paid to

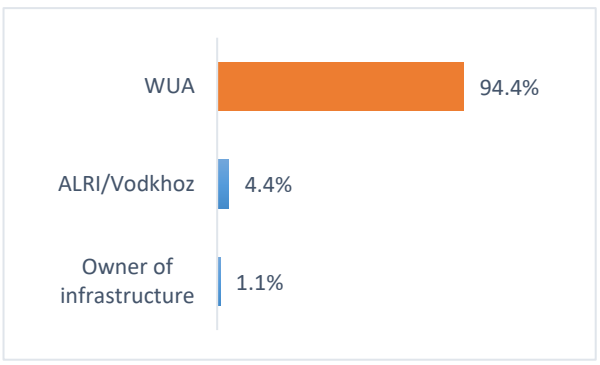
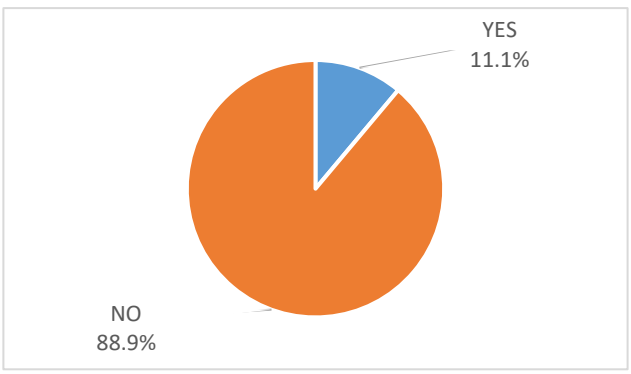


Figure 0.82. Payment of extra water fees



Half of respondents reported that the aim of extra fees is a rehabilitation of irrigation and drainage infrastructure. In addition, the supply of additional irrigation water, ensuring timeliness of the supply

and required water volume were mentioned by 20 percent and 10 percent respondents, respectively, who pay extra fee among the reasons of extra fees (see Figures 2.83 and 2.84).

Figure 0.83. Payment of extra water fees to

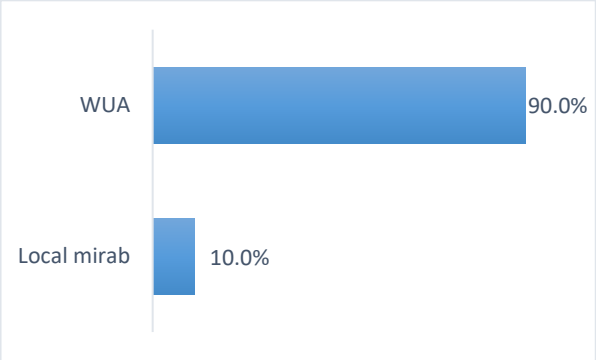
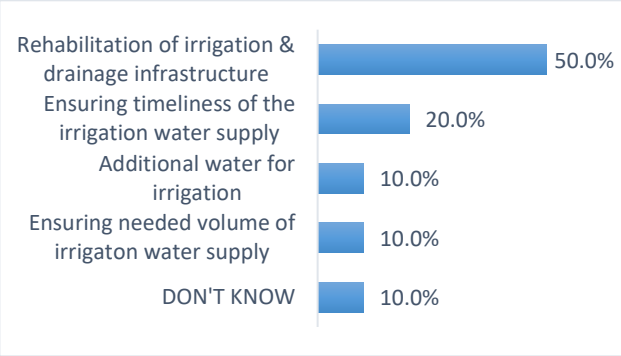


Figure 0.84. Reasons for paying extra water fees



Farmers state that they do not use drainage water in Kumsangir I&D system. Only 3 percent of respondents reported the usage due to insufficiency or untimeliness of water delivered from canals. One-third of drainage water users use drainage water during every irrigation, and others use occasionally (see Figures 2.85 and 2.86).

Figure 0.85. Usage of drainage water

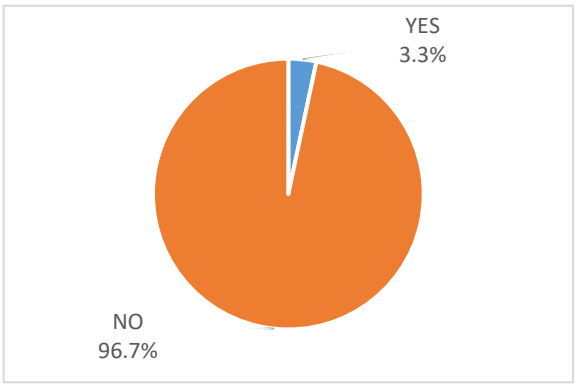
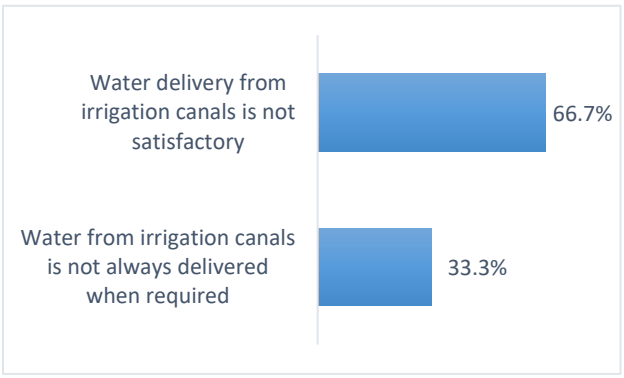


Figure 0.86. Reasons for using drainage water



Half of respondents assess the quality of irrigation pipes, hydrants, and canals as poor or very poor. For 38 percent of farmers the quality is fair, and for 13 percent the quality is good (see Figures 2.87 and 2.88).

Figure 0.87. Frequency of drainage water usage

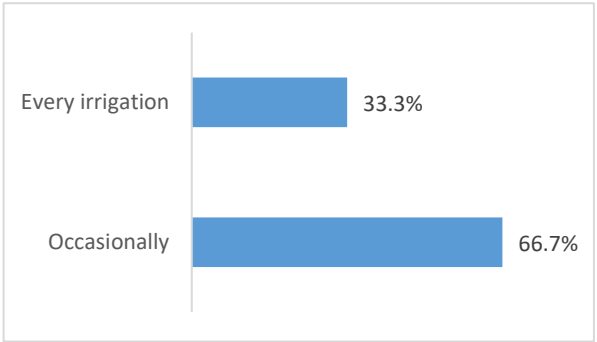
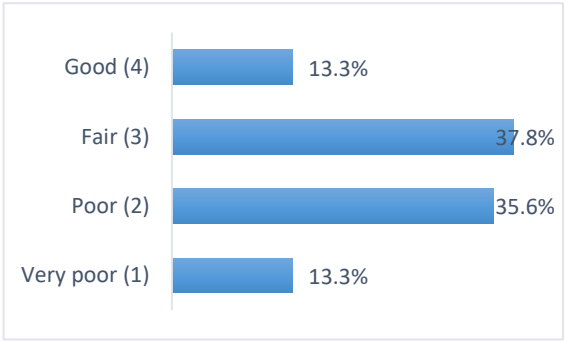


Figure 0.88. Assessment of quality of served irrigation pipes, hydrants, and canals



The quality of served drainage pipes and ditches was evaluated as poor or very poor by more than half of farmers (63.3%). Electric or motor pumps for irrigation are used only by 12 percent of farmers (see Figures 2.89 and 2.90).

Figure 0.89. Assessment of quality of served drainage pipes, and ditches

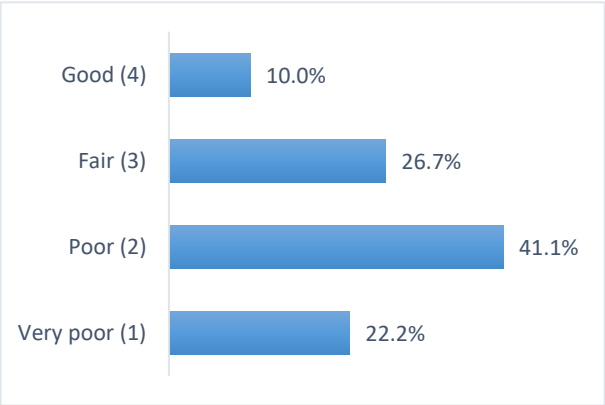
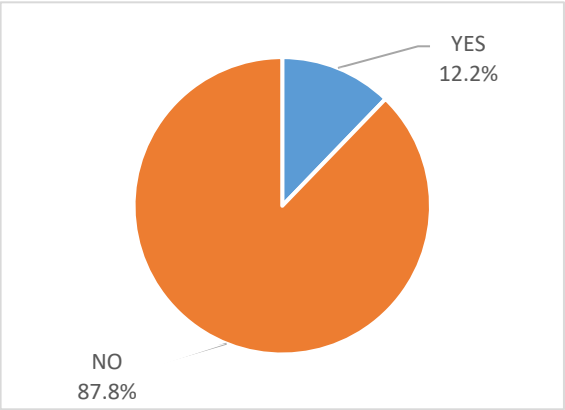


Figure 0.90. Usage of an electric/motor pump for irrigation



Membership to WUAs and other agricultural aspects

Almost all (97.8%) of Kumsangir's farmers interviewed have membership in WUAs. However, the membership to WUAs improved irrigation services for only 36 percent; one third of members did not notice any change after getting a membership in WUAs (see Figures 2.91 and 2.92).

Figure 0.91. Membership to WUAs

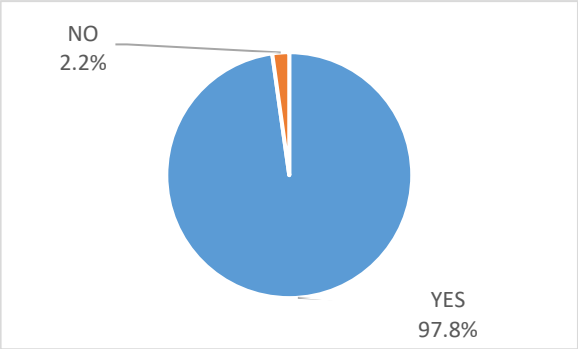
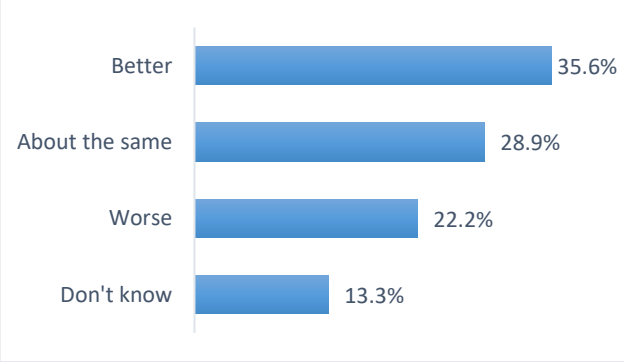
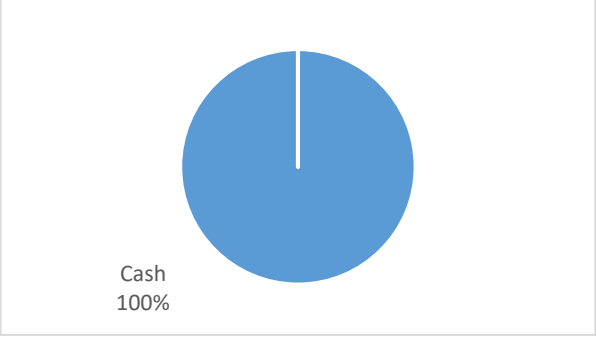


Figure 0.92. Operation of irrigation service after membership



All respondents reported that they pay membership fee and the payment is provided in cash (100.0%). The average annual membership fee is TJS 278.8 that is slightly lower than in Yavan (see Figure 2.93).

Figure 0.93. Ways to pay membership fee



Water problems during the last growing season were a case for more than one-third of interviewed farmers that complained about insufficiency (72.7%) and untimeliness (21.2%) of water supply.

Conflicts over the water with other farmers were a problem in 6 percent of cases (see Figures 2.94 and 2.95).

Figure 0.94. Encountered water problems during the last growing season

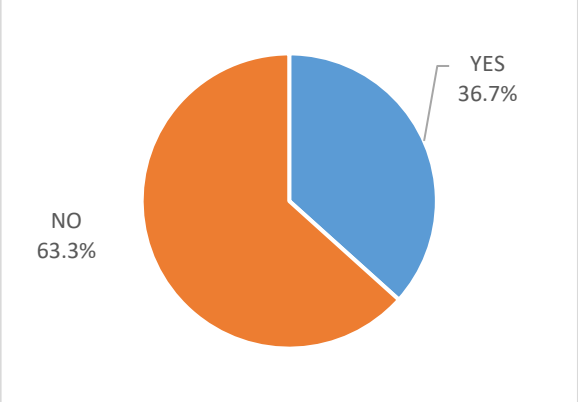
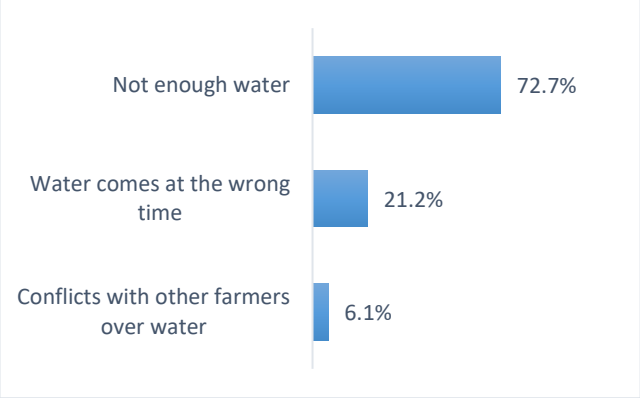


Figure 0.95. Kind of encountered water problems



Farmers were asked about their actions in case of water scarcity. 44 percent of respondents replied that they would stop growing and 27 percent would switch to a different crop. About half of farmers reported that they have no set rules in dealing with water distribution (division) (see Figures 2.96 and 2.97)

Figure 0.96. Actions taken in case of water is scarce

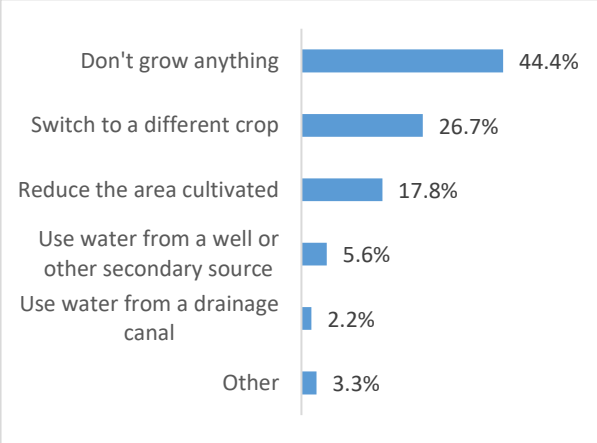
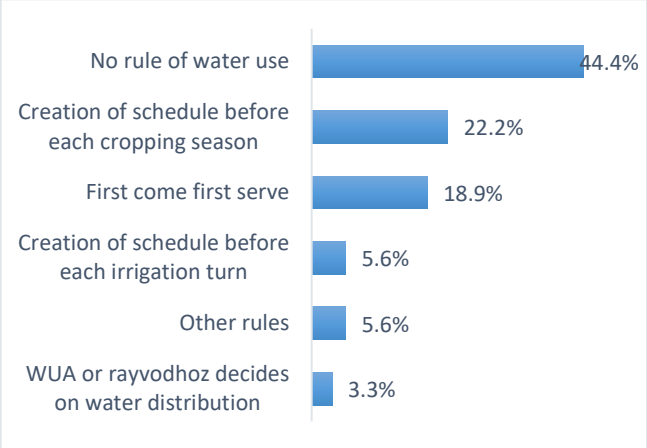
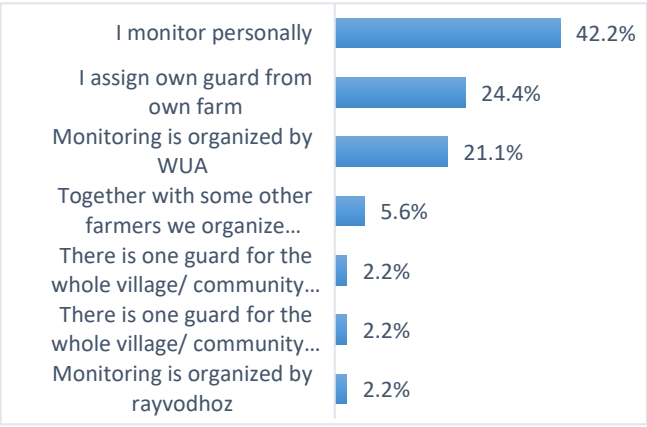


Figure 0.97. Ways to deal with water distribution



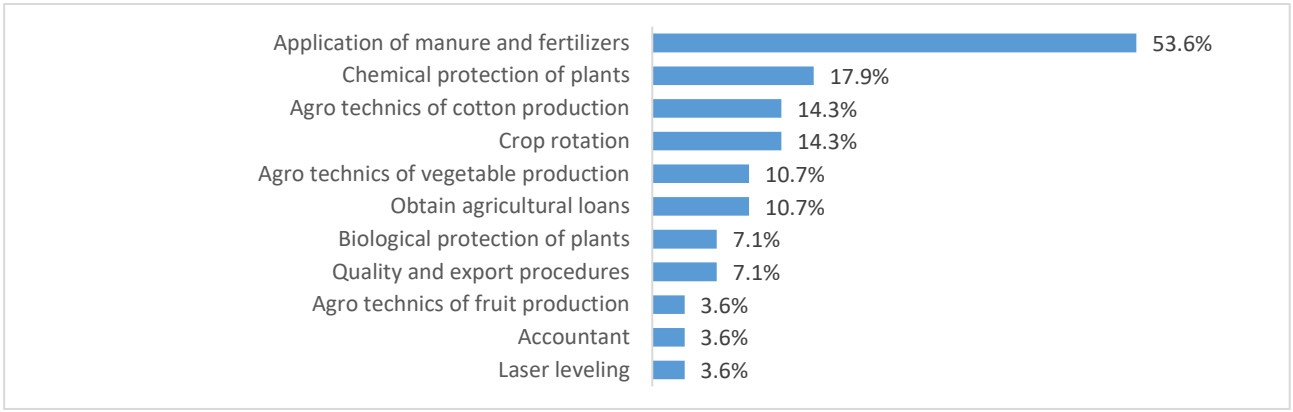
The "First come first serve" approach and the creation of schedule before each cropping season are also popular methods to distribute water in Kumsangir I&D system. Monitoring of the compliance with water use rules is implemented personally by farmers in 42 percent of the cases. 24 percent of respondents assign own guard from own farm, and 21 percent of respondents reported that monitoring over water distribution and division is organized by WUAs (see Figure 2.98).

Figure 0.98. Organization of monitoring of compliance to water use rule



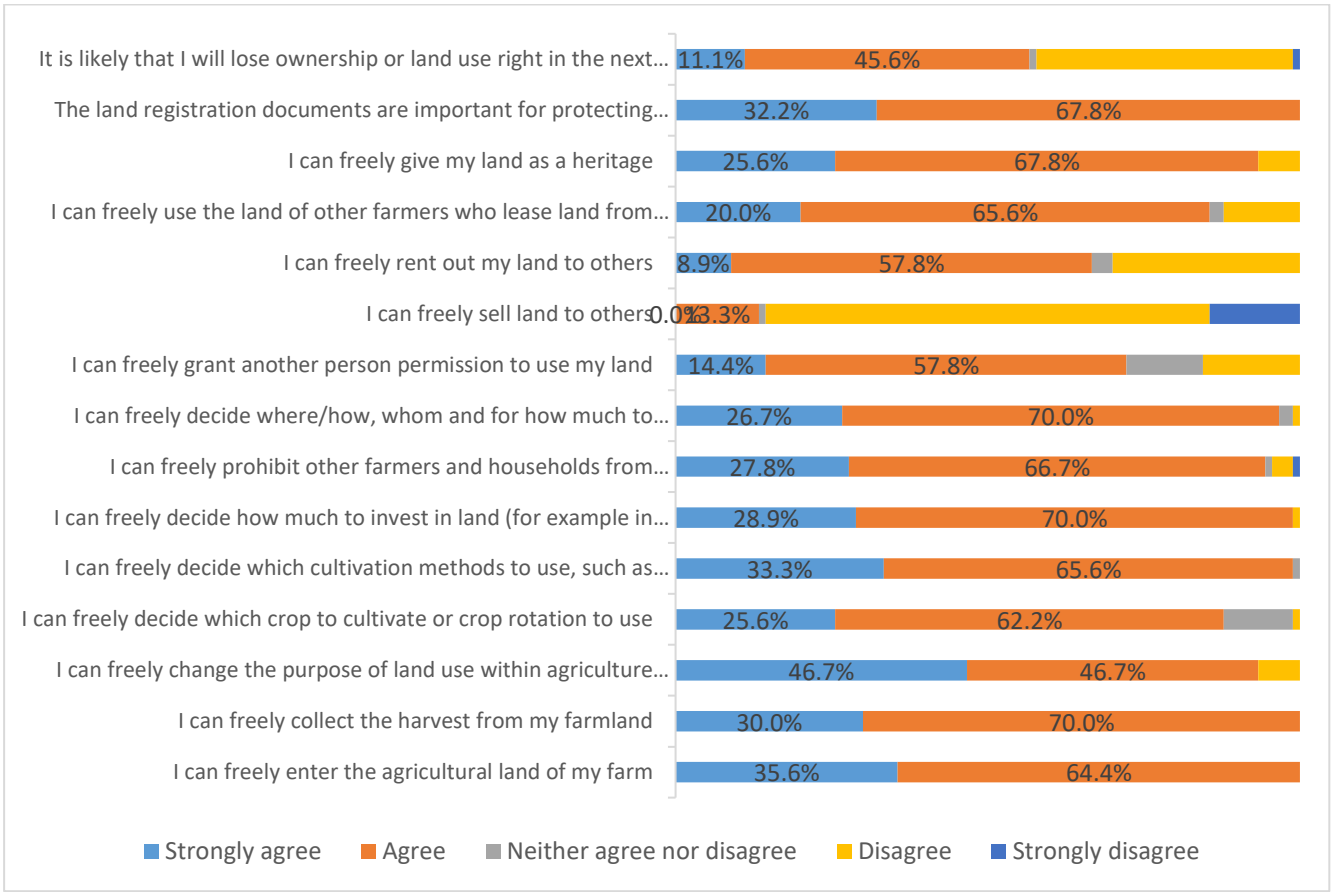
One third of respondents (31.1% or n=28) participated in various trainings relating to the farming activities. The most participated training was about application of manure and fertilizers (53.6%). All other trainings such as "Chemical protection of plants", "Crop rotation", etc. were participated by less than 12 percent of respondents who participated in trainings (see Figure 2.99).

Figure 0.99. Topics of trainings workshops and seminars, n=28 (multiple choice)



More than half of respondents expressed their concerns about the risk of loss land ownership or land rights in the next five years. However, most of them can use most of their land rights related to land access and management. The only exception is land selling that is prohibited in Tajikistan (see Figure 3.1).

Figure 3.100. Farmers opinion on their rights



Almost all interviewed farmers have not faced disputes and disagreements within agriculture in the last 12 months. Only one person experienced a water theft (see Figures 3.2 and 3.3)

Figure 3.101. Disputes and disagreements faced by dehkan farms in the last 12 months

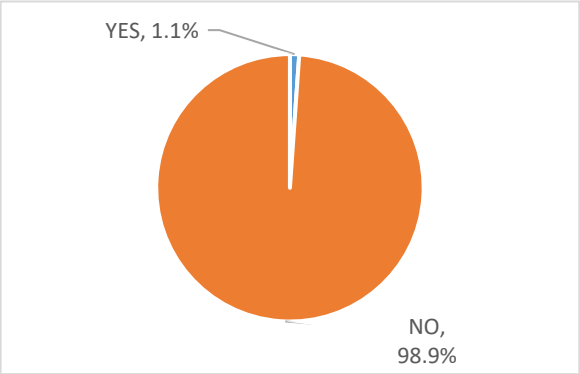


Figure 3.102. Types of faced disputes and disagreements

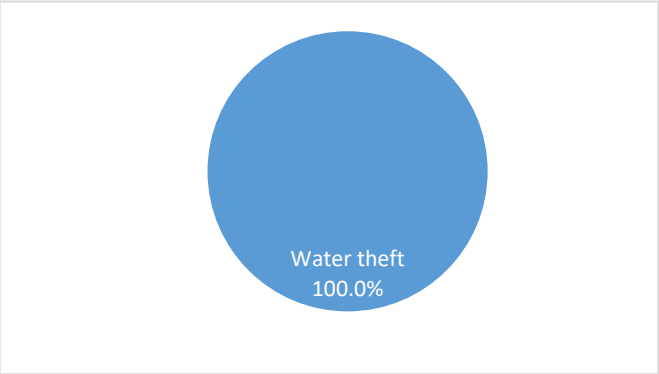
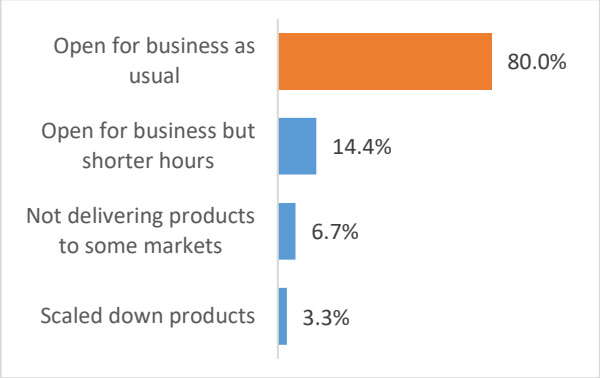


Figure 3.103. Current status of your dehkan farm's economic activity



The majority of respondents noted that they worked as usual (80.0%) (see Figure 3.4).

In addition, the majority of respondents noted that the COVID-19 outbreak did not affect their dehkan farm's operations in any way (81.1%). Twenty-seven of respondents who noted that the COVID-19 outbreak affected their dehkan farm's operations, 71 percent faced its negative impacts. Relatively most often it was a loss of financial and labor resources (58.8% in each) (see Figures 3.5 and 3.6).

Figure 3.104. Impact of COVID-19 outbreak to dehkan farm's operations

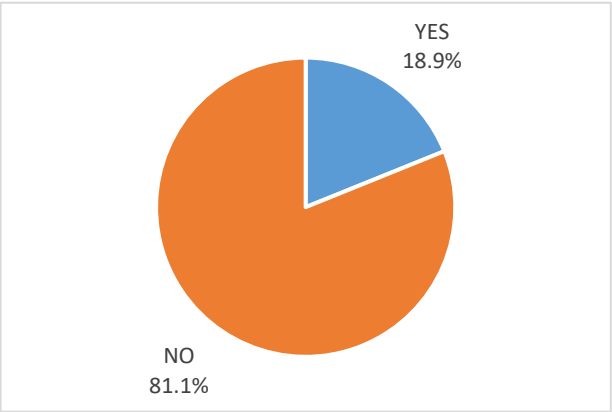
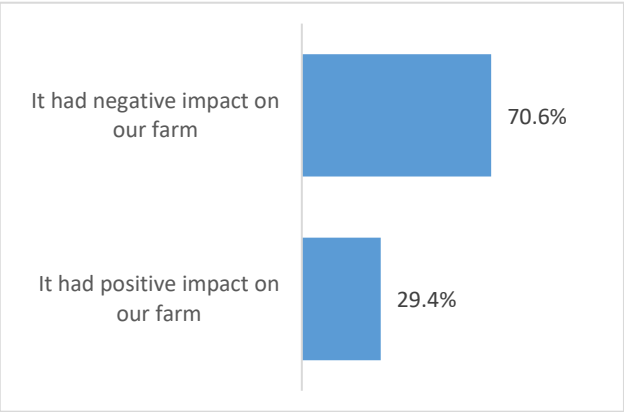


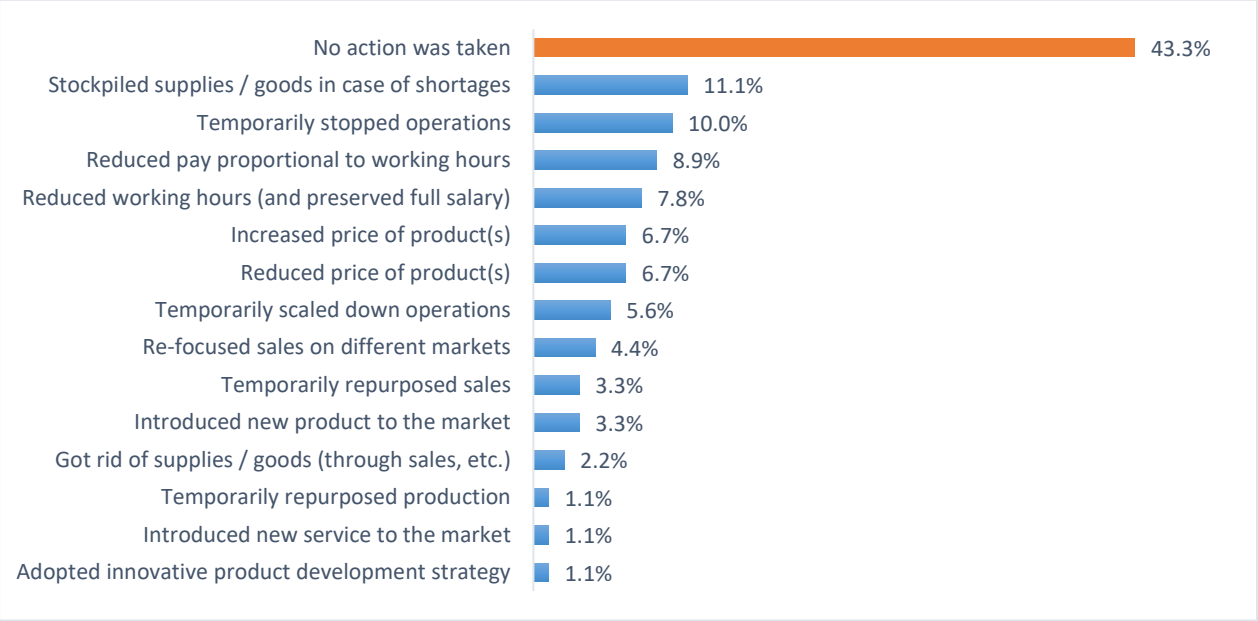
Figure 3.105. Type of impact of COVID-19 outbreak to dehkan farm's operations



The COVID-19 pandemic forced farmers to undertake some measures in response to possible risks to farming activities. Although 43 percent of respondents have not undertaken any actions, 11 percent

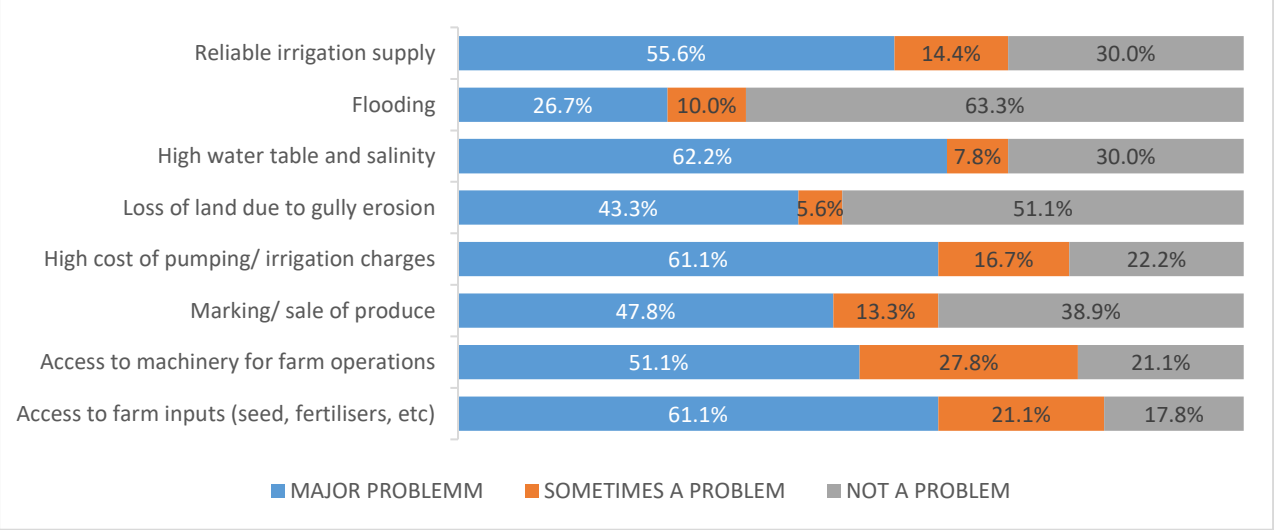
stockpiled goods in case of shortages. Some of them temporarily stopped operations (10.0%), reduced working hours (7.8%) and pay proportional to working hours (8.9%) (see Figure 3.7)

Figure 3.106. Undertaken countermeasures by dehkan farms in response to COVID-19 in Tajikistan, multiple choices



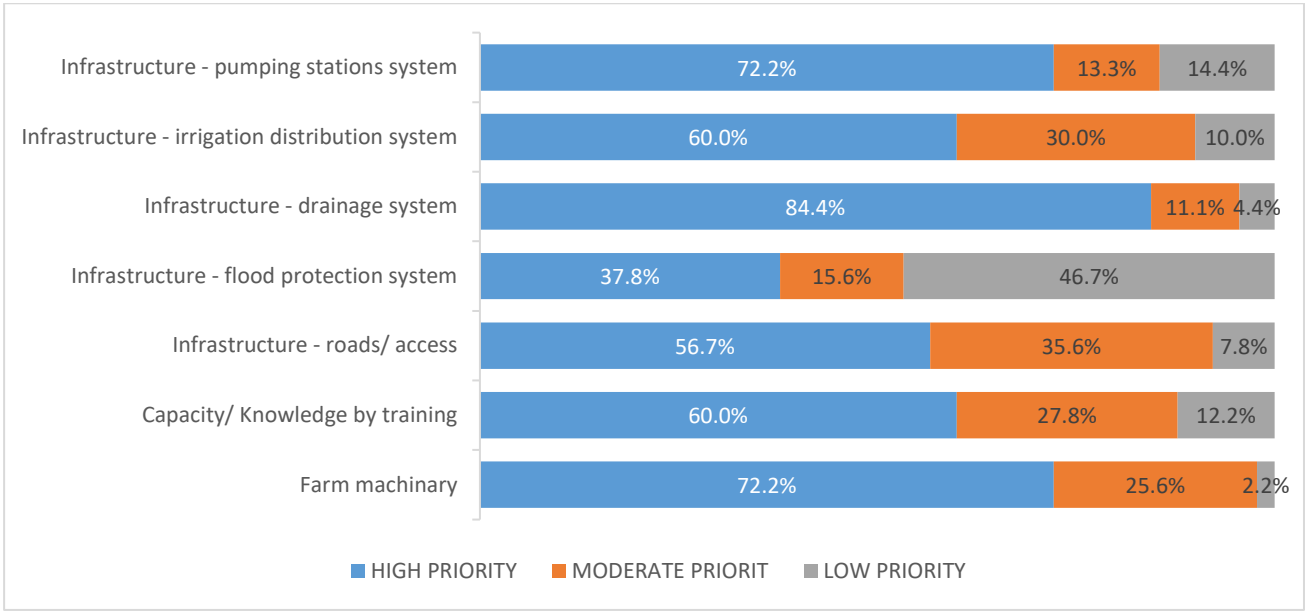
Farmers face various problems that might create risks for agricultural activities. Thus, more than half of respondents mentioned that access to farm inputs and machinery, high pumping costs and irrigation charges, high water table and salinity, and reliable irrigation supply as major problems. Marketing and sale of production, loss of land due to gully erosion is major problem for more than 40 percent of respondents (see Figure 3.8)

Figure 3.107. Problems faced in irrigated agriculture



Respondents were offered to make suggestions regarding the aspects to be addressed by the project. More than half of farmers suggested to improve infrastructure, particularly drainage system, pumping stations, irrigation distribution system, and roads; to enhance access to farm machinery; to provide more trainings (see Figure 3.9).

Figure 3.108. Aspects to be addressed by the proposed project



CONCLUSIONS AND RECOMMENDATIONS

Conclusion on dehkan farmers characteristics

- The survey has covered 420 dehkan farms in two I&D systems – Yavan and Kumsangir I&D systems. Most of the interviews have been carried out in Yavan I&D system (78.6%);
- Majority of respondents were male farmers (87.6%). According to the chosen sampling strategy equal number of the WUA members were randomly chosen and interviewed in each of the I&D systems;
- Almost all respondents have been the members of WUAs except 7 percent of non-WUA members from sampling size, primarily large farm who received irrigation water services from ALRI branches. At the same time, over 70 percent of interviewed farmers were owners, primary decision maker and manager of the dehkan farms.

Conclusion on dehkan farmers in Yavan I&D system

1. Households' characteristics

- All household members of farmers in Yavan I&D system have at least secondary education. At the same time, only half of the members have higher education. More than a half of household members were employed and reported to own a workbook. Members who are engaged in agricultural sector account for 99 percent and 39 percent members, in addition, work in non-agricultural sector;
- Majority of farms belong to the medium size households which have from 6 to 10 members.

2. Land and labour characteristics of farms in Yavan I&D system

- Average area of land of farmers is 5.22 ha (5.50 ha – male farmers, 3.48 – female farmers) and average area of irrigated lands is 5.10 ha (5.38 ha – male farmers, 3.41 – female farmers). Main part of the farmers has the land with the size less than 5 ha (63.3%) and major land type is annual cropland (89.7%);
- For most of the farmers the average ground water level is medium high (0-1.5) and one third of the farmers considers their soil salinity level as low;
- The average number of persons involved in agriculture is 4.9 (4.5 females) and the average number of permanent workers with and without labour books is the same 0.2 (0.1 females). The average number of managers is 1.1 (1.1 females);

3. Production and inputs in Yavan I&D system

- Majority of farmers plant cotton, winter wheat and perennial forage (alfalfa);
- Farmers use their irrigated areas (5.10 ha out of 5.22 on average) to plant cotton and rice. Perennial forage (alfalfa) (89980.1 kg/ha) and cotton (1851.7 kg/ha) have the highest production in irrigated areas. In non-irrigated areas, the most efficient crops are winter wheat (1082 kg/ha) and also perennial forage (alfalfa) (3000 kg/ha);
- Among all cultivated crops cotton (75.8%), winter wheat (65.2%) and perennial forage (34.5%) are the most important for the farmers. Even if cotton and rice are mostly cultivated in irrigated areas, their yield is much lower (more than 80000 kg/ha) than perennial forage

(alfalfa) and small vegetables. In addition, these crops are important in terms of farm income and for food supply. Among the three most important crops, most of the cotton harvest is sold and whereas, winter wheat is used for self-consumption. Perennial forage is both: used for self-consumption and is sold;

- Farmers spend mostly of their money on fertilizers and seeds. The most expensive seed among the crops chosen as most important is perennial forage (alfalfa) (TJS 32.3). The costs for machinery used for cotton is 4 times higher than the machinery used for other three most important crops.
- The most part of the farmers have faced decrease of the crop production in the last two years. According to the farmers' opinions, the main reason for decreasing is climate.
- Majority of the farmers purchase inputs from specialized private shops. The share of the entire income from agricultural production in total income earned by a household in 2019 was more than a half. Main sources of income from farming for most of the farmers are wheat and cotton from their own farm and other crops.

4. Irrigation and water source in Yavan I&D system

- The main source of irrigation for majority of farmers is surface water outlet from canal (87.0%). Majority of farmers do not need pumping due to the gravity (75.8%) and slightly less than half of farmers consider there is no sufficient water for irrigation (44.8%);
- Absolute majority of farmers use forrow or "juyakiy" irriation methods to irrigate their lands (99.4%) and Majority (77.6%) of respondents reported that WUAs manage and are responsible for the supply of water to their farm lands;
- Absolute majority of farmers pay water fees to WUAs. Almost half of the farmers have paid extra fees to rehabilitate irrigation and drainage infrastructure.
- For almost half of the farmers the quality of irrigation pipes, hydrants and canals is poor or very poor.

5. Membership to WUAs and other agricultural aspects in Yavan I&D system

- Absolute majority of the dehkan farmers mention that they are members of WUAs. However, almost half of the farmers says that the provided irrigation services stay the same. Absolute majority of farmers pays membership fee to WUAs mainly in cash (97.9%). In average, farmers pay TJS 483.0 annually for the WUA membership fee;
- Sharply half of the farmers mention that they have faced water problems during the two years (2018-2019). Among the most urgent problems they report the scarcity of water. In case of facing water scarcity, farmers switch to a different crop, stop growing any crops and reduce area cultivated;
- Almost half of the farmers do not set any rules to properly and on a rota basis distribute water and majority of the farmers personally monitor the compliance to water use rule;
- All respondents in Yavan I&D system have reported that they did not receive any kind of direct subsidies from the government in the last 12 months (2019);

- Slightly more than quarter (25.2%) of farmers (26.1% male farmers; 19.6% - female farmers) have participated in trainings on such topics as “Application of manure and fertilizers”, “Agro technics of cotton production” and “Crop rotation”;
- Majority of the farmers are confident about their rights on ownership and share the opinion on importance of registering and possessing documents on land. However, most of the farmers have mentioned that they are not able to freely send their allocate to others;
- The absolute majority of respondents noted that the COVID-19 outbreak did not affect their dehkan farm's operations in any way (91.8%). Twenty-seven of respondents who noted that the COVID-19 outbreak affected their dehkan farm's operations, 74 percent faced its negative impacts. Relatively most often it was a loss of financial resources (77.8%);
- The main problems for the farmers included: high cost of irrigation charges, unreliable irrigation supply, low access to farm inputs and most of the farmers suggests paying more attention to the improvement of drainage system, pumping stations, roads improvements.

Conclusion on dehkan farmers in Kumsangir I&D system

1. Households’ characteristics

- The average size of the household is 9.1 persons from which female members constitute roughly half of the household;
- On average, more than half of household members completed secondary education, and only 5 percent of the household members have higher education;
- About half of household members are employed in the agricultural sector and work on their farm;
- Respondents reported that they have household members with at least secondary education and only 34 percent of them mentioned members with higher education.
- Majority of farms belong to the medium size households which have from 6 to 10 members.

2. Land and labour characteristics of farms in Kumsangir I&D system

- Respondents did not report any unirrigated land;
- The average farm size among respondents is 3.58 ha (3.68 ha – male farmers, 2.25 – female farmers). A big share of farms only has an area up to 5 ha;
- On average, 5.1 (4.3 females) persons in each household are involved in agriculture, of which 2.3 (1.3 females) work on a permanent basis, and 2.6 (1.1 females) persons work seasonally or temporarily;
- Around half of respondents assess their soil as non-saline, and 30 percent reported high salinity;

3. Production and inputs in Kumsangir I&D system

- The largest average area is used under tree crops production (3.39 ha) followed by cotton (2.19 ha) and rice (1.48 ha) cultivation;
- Perennial forage (alfalfa) (50107.6 kg/ha), melon (30558.2 kg/ha) and small vegetables (27462.3 kg/ha) were reported to have the highest production among all cultivated crops;

- Such crops as cotton, spring wheat, rice, small vegetables, melon, tree crops, maize (for grain), and sunflower constitute a big share of farm income;
- Cotton and small vegetables are being sold; winter wheat is mainly used for self-consumption;
- The costs of fertilizers per kilogram in Kumsangir are lower than in Yavan; fertilizers for vegetables require the highest spending (TJS 4.0-4.5 per kg); average costs of machinery and irrigation in Kumsangir are lower than in Yavan;
- More than half of farmers in Kumsangir reported a decrease in crop production in the last two years; the deteriorated drainage system was mentioned as the most important reason for a decrease in crop production;
- The main source of inputs is specialized private shops;
- About half of respondents assess the condition of the road to the nearest market as bad or extremely bad.

4. Irrigation and water source in Kumsangir I&D system

- The main source of irrigation for majority of farmers (81.1%) is surface water outlet from canal. More than half of Kumsangir's respondents reported that pumping is not required to bring the water to land;
- Manual or juyakiy irrigation system is dominant in Kumsangir I&D system (100.0%);
- WUA is the main manager of water supply (75.6%);
- Almost all of the respondents in Kumsangir pay water fees to WUAs (94.4%);
- Half of respondents assess the quality of irrigation pipes, hydrants, and canals as poor or very poor.

5. Membership to WUAs and other agricultural aspects in Kumsangir I&D system

- Almost all of Kumsangir's farmers interviewed have membership in WUAs (TJS 278.8);
- The membership to WUAs improved irrigation services for one-third of respondents (35.6%);
- More than one-third of interviewed farmers complained about insufficiency and untimeliness of water supply;
- About half of farmers reported that they have no rules in dealing with water distribution;
- More than half of respondents expressed their concerns about the risk of loss land ownership or land rights in the next five years;
- Majority of respondents noted that the COVID-19 outbreak did not affect their dehkan farm's operations in any way (81.1%). Twenty-seven of respondents who noted that the COVID-19 outbreak affected their dehkan farm's operations, 71 percent faced its negative impacts. Relatively most often it was a loss of financial and labor resources (58.8% in each);
- Access to farm inputs and machinery, high pumping costs and irrigation charges, high water table and salinity, and reliable irrigation supply are major problems;
- Most farmers suggested to improve infrastructure, particularly drainage system, pumping stations, irrigation distribution system, and roads; to enhance access to farm machinery; to provide more trainings.