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Tajikistan

Autonomous adaptation to climate change: economic opportunities and institutional constraints for farming households

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CURRENCY AND EQUIVALENT UNITS

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WEIGHTS AND MEASURES

Metric system

ABBREVIATIONS

CA	Conservation Agriculture
CEDAW	Convention on the Elimination of All Forms of Discrimination against Women
ECA	Europe and Central Asia
ELMRL	Environmental and Land Management and Rural Livelihoods
FAO	Food and Agricultural Organization
GDP	Gross Domestic Product
IPCC	Intergovernmental Panel on Climate Change
IPM	Integrated Pest Management
LAC	Legal Aid Center
LRCSP	Land Registration and Cadastre System for Sustainable Agriculture Project
MDGs	Millennium Development Goals
PPCR	Pilot Program on Climate Resilience
PREM	Poverty Reduction and Economic Management
PRS	Poverty Reduction Strategy
SLM	Sustainable Land Management
TJICCA	Tajikistan Institutions for Climate Change Adaptation survey
WUA	Water User Association

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PREFACE

This policy note analyzes the role of institutional factors such as land tenure security and gender agency in enabling climate change adaptation in Tajikistan through reduced vulnerability and adaptation of farming practices.

This note extends the findings of a previous report on *Economic and Distributional Impacts of Climate change* (World Bank, 2011), which established a vulnerability map for Tajikistan's agro-ecological zones, suggested a ranking of regions by vulnerability to help with prioritization, and proposed priorities for spending. The report concluded that effective adaptation would require building greater resilience (by investing in agriculture and rural infrastructure, economic diversification and preventive health care) and strengthening risk management. It also underscored the importance of institutional factors in climate change adaptation.

This note also builds on other recent reports, including *Assessing Development Impacts on Rural Vulnerability and Resilience: Evidence from Land Reform and Sustainable Agriculture Efforts in Tajikistan* (World Bank, DFID and USAID, 2011). It provides information on household behaviors and outcomes related to land registration and sustainable land management, which have been active areas of World Bank engagement in Tajikistan, through the Land Registration and Cadastral Survey Project (LRCSP) (2005-2015) and the Environmental and Land Management and Rural Livelihoods (ELMRL) project (2013).

EXECUTIVE SUMMARY

1. **The objective of this policy note is to assess the role of institutional factors (land tenure, legal security, and gender agency) in enabling autonomous adaptation to climate change and reducing vulnerability in Tajikistan.** The World Bank has been active in supporting sustainability through interventions such as support to farmland restructuring or the promotion of innovative rural production and land management practices. Achieving these objectives will rest on the incentives to raise productivity and adopt sustainable practices, and the behavioral responses of beneficiaries. In this context, assessing existing practices, as well as understanding institutional constraints to adaptation is crucial to improving economic opportunities for Tajik households and reducing vulnerability. This note examines autonomous adaptation and improved resilience of rural households through strategies for coping with climate-related shocks, adoption of sustainable land management practices and income diversification.

2. **Climate change threatens livelihoods in Tajikistan, mostly because of low adaptive capacity.** Vulnerability to climate change stems from inadequate productive structures, high income vulnerability, and numerous institutional constraints, especially in the agricultural sector.

3. **This note uses a survey of farming households and a qualitative study that were specifically conducted in Khatlon and Sughd to analyze the relationship between land rights and adaptation strategies and outcomes.** As households with different types of tenure may also have different endowments and constraints, the analysis accounts for household characteristics (including income, education and household composition) and relies on changes across time in land tenure and land management practices. Statistics are also analyzed separately for female-headed households to explore how differentiated access to and control over knowledge, resources and decision-making within rural communities can affect autonomous adaptation.

4. **The main findings indicate that:**

- ***Climate-related shocks (and particularly droughts) are experienced by a majority of farmers.*** Small (individual or family) farms are more likely to have been affected by floods, crop pests and disease, and shocks on input or output prices.
- ***International migration is the main strategy adopted by households to cope with shocks.***
- ***Few households change crops or farming practices as a main response to shocks and climatic events.*** In addition to migration, the main coping strategies are sales of livestock and increased labor supply. Credit markets (including informal credit markets) provide insurance against idiosyncratic shocks, but not the village-wide events that are typically made more frequent and severe by climate change.
- ***Adoption of sustainable practices has been accelerating in recent years, but overall levels remain low, and increased tenure security (in the form of certification for individual or family farms) is not systematically associated with greater adoption.*** This suggests continuing and significant constraints for accelerating adaptation through on-farm investments and underscores the need to address such constraints through "second generation reforms" to fully harness the opportunities created by land reform and freedom to farm, as outlined in the recent Rural Investment Climate Assessment (further protecting land rights, improving access to credit,

rehabilitating irrigation schemes and establishing an institutional framework for water regulation and delivery, building sustainable rural advisory services, etc.)

- ***Knowledge about sustainable practices remains low, and differs by gender.*** The main sources of knowledge about sustainable practices are other farmers. However, within villages, female-headed households do not seem to benefit from the knowledge-sharing networks that male farm heads enjoy. Also, lack of knowledge seems to be a key barrier for female-headed households: conditional on having knowledge, they are as likely to adopt sustainable practices as male-headed households.
- ***Women have little decision-making authority in farming operations, and this imbalance is even greater in individual or family farms than in collective farms.***
- ***Increased tenure security through ongoing land reforms is associated with lower economic vulnerability,*** including when it is not systematically associated with more sustainable practices or greater on-farm investments. Farmers who have established individual or family farms generally have more assets and enjoy greater food security. They report increased subjective well-being (compared to when they worked in collective farms).

5. The analysis suggests the following :

- ***The trend of increasing adoption of various sustainable land management practices and the existence of spillovers could be capitalized upon by interventions aiming to raise adaptation capacity.*** Program design can take advantage of within-villages spillovers to accelerate adoption of sustainable land-management practices.
- ***Knowledge of sustainable land management practices could be improved from current levels, and dissemination should also leverage spillovers within villages.*** There could be an important role for village-level SLM demonstration activities (included targeted incentive schemes, and farmer-to-farmer exchange of information).
- ***From an M&E perspective, current trends and the existence of spillovers should be accounted for in results attribution and impact measurement.*** Without careful evaluation frameworks for environmental or land management programs (with adequate control groups), these patterns will make attribution, impact measurement and progress monitoring difficult.
- ***Female-headed households could be targeted for specific activities to increase their knowledge of sustainable land management activities.*** The constraints faced by female farmers can limit autonomous adaptation, and warrant consideration of gender-specific strategies to address existing imbalances. Reducing the knowledge gap is all the more crucial that migration increases the share of female-headed households. Also, the weaker agency of women in individual and family farms could lead to further segmentation of information networks as these land use models become more prevalent.

1. INTRODUCTION

1.1 **Climate change presents significant threats to sustainable poverty reduction in Tajikistan.**

The country has been ranked the most vulnerable¹ of twenty-eight countries in the World Bank's Europe and Central Asia (ECA) region (World Bank 2009a). Sensitivity to the impacts of increased exposure to climatic risks is high, especially for the rural poor. While economic growth in recent years has resulted in high consumption growth for the bottom 40 percent of the population and steady poverty declines, vulnerability remains high². Poverty rates, as measured in reference to the national poverty line, dropped from 73 percent in 2003 to 47 percent in 2009, owing mostly to increased labor earnings and remittances³ but remain among the highest in the ECA region.

1.2 **Physical manifestations of climate change in Tajikistan are observed through increases in average annual temperatures, changes in precipitation, melting of glaciers and the increased frequency and severity of disasters.** In addition to water shortages and disasters, other potentially significant impacts of climate change may include pest and disease spread, worsening of soil conditions and desertification, as well as ill-adapted seed stocks and animal breeds (see Appendix A).

1.3 **The primary impacts on rural livelihoods are expected to stem from reduced water quantity and quality (affecting agriculture), and increased frequency and severity of disasters.** The country is highly reliant on agriculture⁴, a sector characterized by inefficient water use and low productivity (Heltberg et al, 2012) and already suffering from land degradation, water scarcity and a high frequency of disasters – all of which may be exacerbated by climate change. During the early 2000s, agricultural output and productivity increased significantly (and caught up following a period of collapse in agricultural value added between 1990 and 1998) owing to successful implementation of the first wave of land reform, farm reorganization, freedom to farm and cotton debt resolution policies. This was driven by the emergence of private dehqan farms, with higher yields across a broad range of crops and livestock types, and a more rational allocation of land to cotton and high value crops (World Bank 2013b). Nevertheless, agricultural value added growth subsequently slowed down, and overall levels of productivity and degree of commercialization remain low. 74 percent of the country's poor live in rural areas. While rural households that have migrant workers are more likely to escape poverty, the poor are still highly dependent on agriculture for their livelihood.

1.4 **Even more than exposure and sensitivity, Tajikistan's vulnerability is compounded by its very low adaptive capacity⁵.** Vulnerability to climate change stems from inadequate productive structures, high poverty levels and income vulnerability, and numerous institutional constraints, especially in the agricultural sector. Those factors have been found to have greater influence than

¹ Vulnerability is a function of exposure to climate change and variability; sensitivity to the impacts of that exposure; and ability to adapt to ongoing and future changes (Hahn, Riederer, and Foster, 2009).

² Over 2007-2009, 32% of the vulnerable became poor, and even the "middle class" had a significant likelihood of becoming poor.

³ Remittances amounted to 49 percent of GDP in 2013.

⁴ Agriculture employs 42 percent of men and 75 percent of women (World Bank, 2013).

⁵ Adaptive capacity in Tajikistan was assessed to be the second lowest in ECA after Turkmenistan (World Bank, June 2009)

geography and exposure.⁶ In this context, it is important to enable autonomous adaptation at community levels.⁷

1.5 Options for farming households to autonomously adapt (and thereby move from climate vulnerability to resilience) include adoption of *on-farm* and *off-farm* measures:

a. *On-farm measures* may include diversification (of agricultural product mixes to reduce production risks), intensification of the sustainable use of natural resources via improvement of farm services, including access to quality inputs, farm machinery, finances and extension services, expansion of land holdings and productive land uses by entrepreneurial farmers using functioning land markets, and protection of land and livelihoods against extreme weather events⁸.

b. *Off-farm measures* may include diversification of income sources to reduce income risks, including through remittances and local off-farm employment.

1.6 While public awareness of the consequences of climate change is high in Tajikistan, the ability of individuals and communities to autonomously adapt is dependent on supportive institutions and adequate incentives. Public awareness is comparable to that in much wealthier countries (World Bank, 2011a). Most communities have already suffered from some change impacts, particularly water scarcity and disasters. Also, many communities have been exposed to various projects with a climate resilience focus. At the same time, adaptive capacity depends on having access to finance and information, as well as the ability to operate within a system which incentivizes and rewards productivity and sustainable practices. Effective governance and institutional arrangements – such as enforceable rule of law, efficient tax schemes, and secure land tenure – can help facilitate more effective autonomous adaptation by rural communities.

1.7 Farmland restructuring and the promotion of innovative rural production and land management measures have the potential to incentivize productivity and sustainable practices and reduce vulnerability, but achieving these objectives will rest on the behavioral responses of beneficiaries. Recognizing that both village-based and larger-scale initiatives are needed to support sustainable individual and community land management, the World Bank *Environmental Land Management and Rural Livelihoods Project* aims to enable people in rural areas to increase their productive assets in ways that improve natural resource management and resilience to climate change in selected climate vulnerable sites. It notably provides financing in the form of small grants to promote the adoption of innovative rural production and land management measures, and related small-scale infrastructure investments. Another important element in improving the incentive framework for sustainability has been to improve land tenure through land registration and the provision of land use

⁶ Significant challenges to adaptation at the national level are being tackled through initiatives such as the Pilot Program on Climate Resilience (PPCR). The PPCR focuses on six areas of intervention: (i) building capacity for climate resilience; (ii) improvement of weather, climate and hydrological service delivery; (iii) climate science and modeling program; (iv) enhancing the climate resilience of the energy sector; (v) agriculture and sustainable land management; and (vi) building climate resilience in the Pyanj River Basin (World Bank 2011).

⁷ The IPCC (2007) defines three general types of adaptation: anticipatory, autonomous, and planned adaptation. Anticipatory adaptation takes place before impacts of climate change are observed. It is also referred to as proactive adaptation. Planned adaptation is the result of a deliberate policy decision, based on an awareness that conditions have changed or are about to change and that action is required to return to, maintain, or achieve a desired state. Autonomous adaptation (also referred to as spontaneous adaptation) “does not constitute a conscious response to climatic stimuli but is triggered by ecological changes in natural systems and by market or welfare changes in human systems” (IPCC 2007).

⁸ Wolfgramm et al. (2011).

certificates⁹. Empirical studies of the impact of land rights on farm investments have focused on productivity-enhancing investments.¹⁰ Theoretical arguments for the link between property rights and investment incentives are related to security of tenure (freedom from expropriation), using land as collateral, and more efficient land use through gains from trade. At the same time, land rights may be endogenous, that is, farmers may make investments to make their rights more secure (Besley, 1995).

1.8 **In this context, assessing existing practices, as well as understanding institutional constraints to adaptation is crucial to improving economic opportunities for Tajik households and reducing vulnerability through well-designed interventions.** While an emerging body of qualitative assessments suggest that institutional weaknesses are at the heart of low adaptive capacity in Tajikistan, quantifying the effects and uncovering the channels of existing constraints will help make environmental or land management programs more effective.

1.9 **This note examines the role of institutional factors (land tenure, legal security, and gender agency) in autonomous adaptation and improved resilience of rural communities through strategies for coping with climate-related shocks, sustainable land management practices and income diversification.** In particular, the note analyzes the extent to which differences in land rights are associated with differences in adaptation strategies and outcomes. Statistics are also analyzed separately for female-headed households to explore how differentiated access to and control over knowledge, resources and decision-making within rural communities can affect autonomous adaptation. In order to account for selection¹¹ into various forms of land tenure, the analysis accounts for farmers characteristics (income, education, household composition) and relies on changes across time in land tenure and land management practices.

1.10 **The study focuses on two of Tajikistan's four main administrative divisions: Khatlon and Sughd districts.** These two districts account for about two-thirds of the national population and contain most of the arable land, with the highest percentage of irrigated land (20-30%)¹². Both provinces include upland and lowland areas, with varied levels of exposure and sensitivity to climate change¹³.

⁹ The World Bank's ongoing (2006-15) Land Registration and Cadastral System for Sustainable Agriculture Project (LRCSP) has the objective to expand farmland restructuring activities under the farm privatization support project to enable more rural people to become independent farmers and take management decisions in response to market forces. It also supports on-farm irrigation and water management systems rehabilitation, and environmental land management through improved agro-ecological practices, for the enhancement of sustainable productivity.

¹⁰ Using empirical evidence from Ghana, Besley (1995) finds that land rights can be associated with greater investment in trees. Jacoby et al. (2002) find that higher expropriation risk in rural China significantly reduces application of organic fertilizer.

¹¹ Recent land reforms have aimed to restructure large farm enterprises and cooperatives and convert them into individual or family "dehkan" farms operating independently with strong legal rights to land provided by marketable land use certificates. Farmers that have established family farms have reported improved productivity and working conditions compared to when they worked in collective farms. However, self-selection into various farm types makes such statements difficult to evaluate. Farmers face multiple obstacles to land security, including unsupportive collective farm heads, lack of finance to operate independently, lack of awareness of individual rights, lack of transparency of the reform process or demands for payments from local government authorities above the official fee amount to process certificate applications. As a result, comparisons between collective and individual or family farms are likely to be biased and it is necessary to take into account selection into different land tenure systems to assess the role of tenure in adoption of sustainable land management practices.

¹² Wolfgramm et al. 2011.

¹³ Southern Khatlon has one of the country's highest reliance on agriculture. The rural areas of the Southern Sughd hills and Khatlon hills and lowlands are among the agro-ecological zones with the highest vulnerability to climate

1.11 **This note relies on a survey of farming households and a qualitative study that were undertaken specifically for this analysis.** *The Tajikistan Institutions for Climate Change Adaptation (TJICCA)* survey data was collected in July-August 2012 (see Appendix C for an overview of the survey methodology and data)¹⁴. Collection of primary data allowed quantitatively relating the institutional settings in which farmers operate (land tenure regimes, farm type, gender agency, etc.) and the climate shocks they experience to their choices of adaptive and sustainable land management practices. Information was collected on household composition and characteristics (including migration, assets, education, subjective poverty and food security, and consumption), land tenure, land use and practices, taxation, livestock, agricultural extension services, and shocks experienced. The survey is representative at the district level (Khatlon and Sughd)¹⁵. In addition, focus group discussions and interviews with key informants were conducted¹⁶ to complement the quantitative analysis with qualitative information (see Appendix B for a summary of focus group discussions).

1.12 **The note is structured as follows:** Section 2 describes land tenure arrangements, gender-related constraints, and sustainable land management practices in Tajikistan. Section 3 discusses the shocks experienced by households and the coping strategies used (including on-farm and off-farm strategies). Section 4 analyzes the determinants of knowledge and adoption of sustainable land management practices and on-farm investment. Section 5 concludes with policy recommendations to enable effective climate change adaptation by farming households.

2. LAND TENURE, GENDER AND SUSTAINABLE LAND MANAGEMENT PRACTICES

A. LAND RIGHTS AND ADAPTIVE CAPACITY

Land tenure regimes in Tajikistan

2.1 **Land reforms are progressing but remain incomplete.** Recent land reforms have aimed to restructure large farm enterprises and cooperatives and convert them into individual or family dehkan farms operating independently with strong legal rights to land provided by marketable land use certificates. Agricultural production in Tajikistan is now dominated by four

change (World Bank, 2011). They share a high degree of sensitivity to climate change, high food insecurity, disaster sensitivity, and reliance on agriculture. They also have weak adaptive capacity, in part stemming from low income and education levels. Their exposure is generally only moderate but their high sensitivity and fairly moderate adaptive capacity render these areas vulnerable. The South Khatlon lowlands are considered one of the most exposed areas in the country due to high frequency of extreme temperatures and the broad range of intra-monthly temperature fluctuations (World Bank 2011).

¹⁴ Within the provinces, rayons were selected to include upland and lowland areas, as well as areas that had received different exposure levels to the World Bank LRCSP. A total of 17 rayons and 100 primary sampling units were selected. One thousand households were interviewed. Households were selected using a random-walk method.

¹⁵ The sample was stratified to include upland and lowland areas, as well as areas that had received different exposure levels to a World Bank land titling project (Land Registration and Cadastral Survey Project).

¹⁶ Eight focus group discussions were conducted with gender, location and land tenure determining composition and location. Focus groups included assessments of: (i) the role of legal aid centers in supporting climate adaptation and resilience, demand for and use of legal aid services; (ii) gender issues in access to information and enforcement of legal right with respect to land and rural livelihoods; (iii) preferences, incentives and barriers to land restructuring.

types of farms: (i) large farm enterprises (collective dehkan farm), (ii) cooperative farms, (iii) individual / family dehkan farms, and (iv) household plots¹⁷ (see Box 1). Despite government strategies and major assistance projects¹⁸, challenges to land reform include lack of awareness of individual rights, low transparency of land reform processes, and local government interference. Barriers and obstacles to restructuring cited by farmers in focus group discussions included unresponsive collective farm heads, a lack of finance to operate independently, and demands for payments from government authorities above the official fee amount to process certificate applications. In response, the government, as well as various donors and NGOs (including legal aid centers¹⁹), have led information campaigns and provided legal advice to farmers.

2.2 The pace and extent of farmland restructuring varies by region. A number of interacting factors can contribute to this variation: (i) the degree to which local government leadership supports restructuring, or at the least, does not actively discourage the process; (ii) the presence and duration of donor-financed land reform interventions; (iii) lowland, cotton-growing areas have generally seen a slower pace of restructuring, and more frequent incidence of government interference in freedom to farm (in both on-farm production and off-farm processing decisions); (iv) upland areas have tended to operate even within collective farms on a *de facto* family farm basis or similar arrangements with less government interference in the ability of farmers to operate independently. These factors are taken into consideration in the analysis of adoption of land management practices (section 4 below).

Box 1 – Rural Land Use Types

Family dehkan farm – established on the basis of land and other property jointly controlled by the members of one family. They resulted from the restructuring of cooperative farms based on general agreement with less than 25 members and areas of approximately 5 hectares.

Individual dehkan farm – established on the basis of land and other property controlled by an individual. Their average size is approximately 5 hectares.

Collective dehkan farm (Partnership dehkan farm) – established on the basis of land and property shares contributed by members from different families and governed by a joint activity agreement. Most cotton farms were ‘privatized’ by giving collective land tenure rights to farmers. Their average size is between 100-200 hectares, but some can exceed 1000ha. The number of collective dehkan farms is reducing as part of the government’s program to reallocate land to individual farmers. Though farmers can opt out of the collective farm, this could result in a farmer receiving land that is noncontiguous and possibly below average in quality. These farms may continue to use outdated technologies and practices, employ low-skilled farm workers, some specialists and a farm manager.

Production cooperative – a group of citizens organized through voluntary membership (or partnership) to join their labor in order to establish joint production or other joint business activities.

Household plot – a small plot of land assigned to a rural family for agricultural production that serves the family’s subsistence needs and optimally allows sale of surplus products; the household plot usually consists of a parcel

¹⁷ All rural families have a household plot, however not every rural resident is a dehkan farmer.

¹⁸ As of March 2013, the World Bank LRCSP had issued 54,625 certificates to individual and family farms and had supported an enabling decree for property registration to be merged into a single, unified system. It has made significant progress in bringing greater awareness to farmers regarding land registration policies and benefits, as well as effectively reducing transaction costs associated with obtaining land certificates.

¹⁹ The objective of LACs is “to defend the rights of the rural population in Tajikistan by raising their awareness, understanding and access to justice”. Accordingly, LACs manage various types of land law cases, including property/management issues in dehkan farms, access to irrigation, freedom to farm, or land titling issues.

adjoining the family's house plus one or several parcels in fields surrounding the village (also see Presidential land). This represents traditional smallholder "private" agriculture that continues from the Soviet era. Plots average 0.3 hectares and every rural family has one. The increase of land resources in household plots has led to an increase of their share in agricultural production. Households effectively have complete freedom of choice of what crops to grow in these plots.

Presidential land – land distributed to rural families for household farming (similar to household plots) by two presidential decrees (1995: Presidential Decree "On Assignment of 50,000 hectares of Land for Household Farming"; 1997: Presidential Decree "On Allocation of 25,000 hectares of Land for Household Farming"). Households have a high level of freedom of choice of what crops to grow on this land. Registration of transactions and other changes occurring on Presidential land have not been well maintained, potentially compromising the security of land use rights. This issue is compounded because Presidential land is often located far from household plots since it was reallocated from the unused land of the collective state farms. These plots were intended to supplement household plots and contribute to household food security. A study by Action Against Hunger (2003) found that approximately 70% of rural households had Presidential land, which averaged 0.115ha in area.

Sources: Wolfgramm et al. 2011, Action Against Hunger 2003, Sattar & Mohib 2006, ECA 2011, USAID 2004, FAO 2008

N.B.: In this note, individual and family dehqan farms are referred to as 'small farms'.

2.3 The World Bank's Land Registration and Cadastral System for Sustainable Agriculture Project (LRCSP, 2006-2015) promoted farmland restructuring to enable more rural people to become independent farmers. A cumulative total of 54,625 land use certificates were issued to individual and family farms under the LRCSP between 2007 and March 2013.²⁰ Information campaigns aimed to increase farmers' awareness of land registration policies and benefits. In addition, the project facilitated obtaining certificates in target areas, thus reducing transaction costs associated with obtaining land certificates.²¹

2.4 The Tajikistan Institutions for Climate Change Adaptation survey includes farmers in both individual/family farms and collective farms in Khatlon and Sughd. 38 percent of respondents worked in individual and family farms, 30 percent had presidential land only, and 26 percent were working in collective farms and 6 percent in cooperatives²². Summary statistics by farm type and location are presented in table D1 in Appendix D.

Land rights and climate change adaptation

2.5 Secure land rights can increase incentives to undertake productivity-enhancing investments, and to use land in an environmentally sustainable manner (World Bank 2013b, FAO 2009). Secure rights help farmers internalize the benefits of sound management practices, and in conjunction with a well-functioning land market, can promote more efficient allocation of land and improve access to credit. In TJICCA focus group discussions, those that have established family farms generally reported that their lives have improved compared to when they worked collective farms. Farmers also reported improved productivity and working conditions compared to collective farms. Such statements do not imply causality, however, as farmers self-selected into various farm types.

²⁰ The roll-out of information campaigns and the Bank's land registration project were non-random.

²¹ The TJICCA data shows that non-official expenses (as opposed to other costs of obtaining a land certificate) were reduced to a greater extent in the areas where certificates were delivered under the LRCSP project.

²² The median size of cultivated area in individual / family dehqan farms was 2 hectares and 0.1 hectare for presidential land.

2.6 **The size of restructured farm plots (and their distance from each other, if multiple small units) and collective action/coordination failures can pose challenges to adaptation.** In focus group discussions, farmers of restructured farms recognized that their operations were very sensitive to the impacts of shocks and stresses and that their new independence came with increased responsibility (Appendix B). Some land types, particularly presidential plots, can be small and located far from the household. Difficult access, coupled with constraints on labor, lack of access to water, poor soil quality, and lack of capital may make productive and sustainable use of such lands difficult (World Bank 2013). Also, some practices and technologies are labor-intensive or present economies of scale or require knowledge and experience, which may constrain adoption by small, restructured farms.²³ Accordingly, the analysis in section 4 takes into account farm type, security of tenure, household size and farm size.

B. GENDER AND ADAPTATION

2.7 **Women and female-headed households are particularly vulnerable to climate change due to their higher likelihood of being poor.** The most vulnerable households include female-headed households and households with an uneducated head (who are mainly women). As indicated in the World Bank Tajikistan Gender diagnostic (2013a), women are disproportionately present in the agricultural sector, i.e. in low-productivity, low-paid activities, with little decision-making power. In 2004, three quarters of employed women worked in agriculture.

2.8 **Women also face specific constraints in obtaining land rights.** Women's names are often omitted from individual or family dehkan farm certificates. Also, women generally have lower awareness on the land reform process in general, and less knowledge on how to learn about and claim for rights to land (with a result that they sometimes do not seek information nor know that they are being unfairly treated or misinformed). They also often lack the necessary documentation to proceed with land restructuring and obtaining certificates. Discriminatory practices and customs flourish despite the law, due largely to entrenched patriarchal customs and attitudes²⁴. Women are rarely the legal holders of title to any land; rather, they have access to land resources via the household unit in which males hold formal rights (where they exist). As such, the majority of women in collective farms work as de facto hired labor.

2.9 **Women have little decision-making capability in farming operations, and this imbalance is even greater in restructured individual or family farms than in collective farms.** While decision-making authority for farm operations in dehkan farms could not be measured, in both Khatlon and Sughd, the TJICCA data indicate that only in less than a quarter of households is any woman among the main decision-makers for farming decisions such as what to grow on presidential land or the house garden plot, or whether and where to sell agricultural produce (Table 1). Female household members seldom participate in making financial decisions or deciding on the allocation of household labor supply. Their agency is greater for child well-being and education issues. It is remarkable that for most decisions (including farming decisions), even fewer women participate in "small" farms (i.e. individual or family dehkan farms) than in collective farms²⁵. It is also notable that even in female-headed households women

²³ This note focuses on adoption of sustainable land management practices with private returns. It does not examine the impact of the land ownership structure on the provision of public goods such as irrigation or the management of common property resources. While a large economic literature supports the view that small farms are more efficient than large farms and that a more egalitarian agrarian structure is more conducive to overcoming collective action problems related to irrigation, the reverse may also be true (Bardhan et al., 2007).

²⁴ Djusaeva, 2012.

²⁵ Women's agency is also very low in large farms. A social assessment conducted in Konibodom, Bobojon Ghafurov and Yovon found that women working at large farms have little bargaining power and remain trapped in low-wage, low-productivity labor, contributing to rural poverty. Men, in contrast, are able to access higher income-earning opportunities, both on and off the farm, or through migration (World Bank, 2009b).

are not always associated to farming and other decisions, suggesting that absentee migrants or their male relatives in a different household continue to make decisions.

Table 1: Proportion of households in which a woman is among the main decision-makers

	All farms	Small farms	Collective Farms	Difference (small-collective)	Presidential land only	Difference (presidential-collective)	Male-Headed	Female-Headed	Difference (Male-Female)
<i>Farm decisions</i>									
What to grow on presidential land	0.235	0.149	0.293	-0.145***	0.263	-0.030	0.117	0.794	-0.677***
How to use the money from agricultural produce	0.196	0.162	0.224	-0.062*	0.230	0.006	0.120	0.767	-0.647***
What to grow in house garden	0.177	0.124	0.249	-0.125***	0.217	-0.032	0.096	0.778	-0.682***
Whether and where to sell agricultural produce	0.169	0.134	0.179	-0.045	0.246	0.067*	0.091	0.725	-0.635***
<i>Financial decisions</i>									
How to use resources remitted from abroad	0.287	0.207	0.333	-0.126**	0.349	0.016	0.176	0.828	-0.652***
How much to save of household income	0.228	0.172	0.227	-0.055	0.303	0.076*	0.145	0.805	-0.660***
How much to spend of household income	0.226	0.174	0.246	-0.072**	0.272	0.026	0.137	0.806	-0.669***
Where to invest household money	0.219	0.174	0.232	-0.059*	0.261	0.029	0.135	0.787	-0.652***
Lending money to others	0.216	0.172	0.215	-0.042	0.257	0.042	0.123	0.787	-0.664***
Buying major items	0.209	0.126	0.221	-0.095***	0.265	0.044	0.112	0.745	-0.633***
Whether or not to borrow money	0.198	0.148	0.196	-0.048	0.233	0.037	0.099	0.763	-0.664***
Where to shop	0.189	0.112	0.198	-0.087***	0.242	0.043	0.092	0.723	-0.632***
<i>Labor supply</i>									
Where female member should work	0.275	0.216	0.347	-0.131***	0.265	-0.081**	0.198	0.766	-0.567***
A household member migrating to seek work	0.237	0.210	0.262	-0.052	0.261	-0.002	0.167	0.702	-0.535***
Where male members should work	0.236	0.170	0.280	-0.110***	0.252	-0.028	0.157	0.702	-0.546***
<i>Household welfare, education, marriage</i>									
Children's well-being	0.553	0.488	0.690	-0.202***	0.583	-0.107***	0.536	0.916	-0.380***
Children's school attendance	0.517	0.500	0.612	-0.112***	0.570	-0.042	0.511	0.886	-0.375***
Marriage of a female household member	0.391	0.380	0.444	-0.064	0.425	-0.020	0.352	0.908	-0.556***
Marriage of a male household member	0.366	0.330	0.390	-0.060	0.420	0.030	0.301	0.882	-0.581***
Observations	972	341	262		298		831	141	

Significance: * 0.10, ** 0.05, *** 0.01

Source: TJICCA survey

2.10 The constraints faced by female farmers can limit autonomous adaptation and warrant consideration of gender-specific strategies to address existing imbalances. Women farmers' restrictions extend beyond land tenure into irrigation network access. Membership of Water Users' Associations is often linked to land ownership (FAO, 2009). Hence, women's limited water entitlements force them to use ineffective agricultural practices. Women's lower levels of knowledge about sustainable land management (see section 4 below) and low levels of business skills can hamper their ability to run family and individual farms effectively. Also, women face difficulties in dealing with tax issues (particularly when they are not officially members of/shareholders in collective farms and are unable to access or understand the relevant information, but do most of the farm work since the registered men have migrated.)

C. SUSTAINABLE LAND MANAGEMENT PRACTICES

2.11 Sustainable land management (SLM) practices²⁶ offer options for autonomous adaptation through more resilient, efficient and diversified practices. Yet, unsustainable use

²⁶ SLM is the "use of land resources, including soils, water, animals and plants, for the production of goods to meet changing human needs, while simultaneously ensuring the long-term productive potential of these resources and ensuring their environmental functions" (WOCAT 2007).

of land resources is widespread in Tajikistan (UNECE 2004, UNEP 2006). Box 2 describes challenges for sustainable land management in Tajikistan.

Box 2 – Challenges for sustainable land management in Tajikistan

Land degradation – degraded environmental systems not only reduce agricultural productivity but also increase the risk of disasters. Mechanisms to reduce land degradation include planting cover crops and mulching (to conserve organic matter and moisture), contour cultivation and strip farming on sloping lands, introduction of crop rotations and application of fertilizers to increase nutrients level.

Water - More efficient water use will be required to adapt to climate change. Water tariffs for irrigation are low (and often not collected) and do not cover operation and maintenance costs (TLSS 2007). Problems such as lack of individual meters and inadequate knowledge of farmers of the water requirements of different crops result in overconsumption of water for irrigation; deterioration of the irrigation infrastructure, as well as planting of crops that would not be viable under economically efficient water prices. Environmental consequences, such as soil salinity and water logging have been caused by poor irrigation practices in many areas.

Pastures & Livestock – Small numbers of animals per household (2.2 cattle and 4.6 sheep/goats (TAJSTAT 2011)) are reflected in low levels of livestock production (milk, meat, fattened live animals) and low levels of livestock-related wealth, which can increase the vulnerability of rural households. While livestock numbers have increased over the past decade, the area of pastures decreased. Widespread deterioration of pastures has occurred due to overgrazing and insufficient incentives for sustainable pasture use.

Source: World Bank (2011), PREM (2011), Wolfgramm et al. 2011.

2.12 A broad range of sustainable land management practices can enable adaptation to climate change in rural Tajikistan. SLM responses include improved water sourcing and efficiency (irrigation measures and retention / harvesting techniques), structural and vegetative measures to reduce erosion / disasters and improve productivity (such as stabilization practices, contour farming and terracing, windbreaks, intercropping of trees and crops, and pasture improvements), crop improvements (such as pest management and organic fertilizers), and indirect measures (such as clean energy generation techniques). Table 2 describes the SLM technologies and practices considered in this policy note and their expected benefits²⁷.

²⁷ The list of SLM practices in Table 1 is not exhaustive. Wolfgramm et al. (2011) outline a range of SLM technologies relevant to Tajikistan. Other practices considered relevant to Tajikistan include for example, conservation agriculture and crop rotation, tree belts, reforestation plantations, etc. Additionally, technologies may also be designed to help combat the threat of disaster risks by providing protective function.

Table 2: Sustainable land management practices and expected benefits

Technologies and practices	Description and expected benefits
<i>Improved water sourcing and efficiency</i>	
Water-saving practices such as drip irrigation Water harvesting or retention practices Irrigation and pump technologies*	Climatic changes may lead to reduced availability of water during critical growing seasons. Water harvesting technologies allow land users to effectively collect and store water for irrigation and domestic use during drought periods, which will help secure, and improve crop yields. Irrigation and pump technologies can improve water distribution infrastructure, elevating available water to the point of use by using water-powered pumps, and optimizing the final use of water to irrigate trees, plants and crops.
<i>Structural measures to reduce erosion / disasters:</i>	
River bank stabilization and protection Windbreaks (trees, shrubs) Erosion control such as contour farming or terracing land	Sloping lands may be degraded through erosion processes. Terraces lined with trees can be constructed for reinforcement, or uncultivated buffer strips can be used to impede surface water run-off. Such technologies can be combined with shallow contour ditches that control the surface water run and prevent soil erosion after heavy rainfall events. The development of terraces and drainage ditches are labor intensive, and require regular maintenance and cleaning to remain effective.
<i>Vegetative measures to reduce erosion / disasters and improve productivity</i>	
Pasture improvement	Degraded pasture land has resulted in low levels of livestock production. A range of technologies exist to improve fodder productivity, through species selection, rotational grazing, construction of strategic watering stations, and planting perennials on low productivity steep slopes. Such technologies require initial investment, but have relatively short payback periods.
Intercropping trees and crops Planting trees or other permanent crops for fruit/nuts, etc.	Agroforestry ²⁸ can be used to increase crop diversity, stabilize slopes, expand productive lands, rehabilitate soil, etc. Technologies exist on the establishment of tree stocks and nurseries appropriate to climatic and geographic conditions, through to the establishment of fruit tree orchards intercropped with perennials for livestock fodder. However, continued investment is required to safeguard against pests and disease.
<i>Indirect SLM measures for household energy needs</i>	
Installation of biogas, solar energy or small hydro-power systems	Indirect SLM technologies can provide practical and effective energy efficient measures to reduce the quantities of organic material burnt for household energy needs (and therefore not utilized as fertilizer to enrich the soil). They include the adaptation of the traditional stove, the construction of brick stoves, use of heat exchangers and the insulation of rooms using locally available resources. More high technology options include biogas, solar and pico / micro hydro power generation units. Such indirect SLM technologies can complement and enhance the effectiveness of other SLM technologies applied to the land.
<i>Crop improvements</i>	
Use of integrated pest management techniques instead of pesticides	An increase in pests has been widely recorded by community workshops and in the PPCR farm surveys. Integrated pest management programs use current, comprehensive information on the life cycles of pests and their interaction with the environment to manage pest damage. Two low cost technologies exist in Tajikistan: (i) using pheromone traps and (ii) phytopesticides to reduce the risk of crop damage from pests.
Organic fertilizer or other soil conditioners	Organic production methods are not widely practiced in Tajikistan. Benefits include lower input costs and improved soil quality; costs may include lower yields or higher workload.

Source: Wolfgramm et al. (2011), World Bank TJICCA Survey, EPA (2012)

²⁸ The combined cultivation of annual or perennial crops with trees in fields.

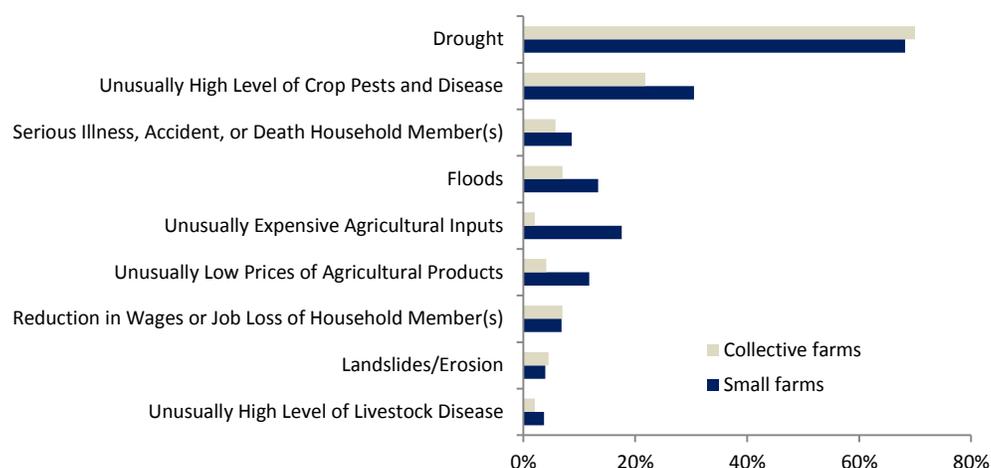
2.13 **Constraints to adoption of sustainable land management practices include limited knowledge and lack of incentives and resources.** Government inducements to plant cotton, ineffective mechanisms for pasture use control and forest management, and farmer lack of knowledge and experience of modern crop and land management techniques combine to yield unsustainable practices (World Bank 2011).

3. CLIMATE-RELATED SHOCKS AND COPING STRATEGIES

A. INCIDENCE OF SHOCKS

3.1 **Climate-related shocks have been experienced by a majority of farmers:** about 70 percent of small and collective farmers have experienced drought in the past five years (figure 1). The incidence of drought was equally high in Sughd and Khatlon (see Table D2 in appendix D). While all farm types were equally affected by drought and landslides, there was a significantly higher incidence of floods and crop pests and disease in small farms²⁹. Small farms were also more likely to have been affected by shocks on input or output prices.

Figure 1. Incidence of shocks over the past five years, by farm type.



Source: TJICCA survey

B. COPING STRATEGIES

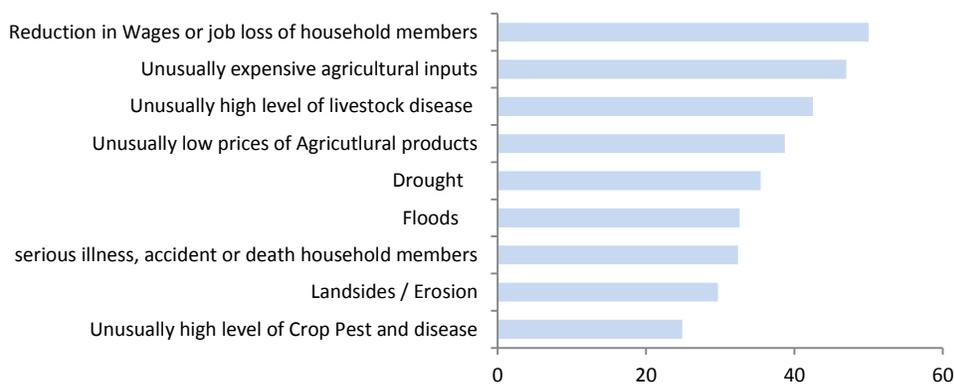
Migration

3.2 **International migration is the most common strategy adopted by households to cope with shocks.** Half of households who experienced a wage reduction or job loss resorted to migration as a coping strategy. Migration was also most frequent in response to shocks to input or output prices and livestock diseases. More than a third of drought events triggered migration by at least one household member. 42 percent of households in the sample received monetary transfers from someone not living in

²⁹ This is consistent with qualitative findings: in focus group discussions, the most commonly reported events were hail storms; extremes of temperature; water-related issues, namely problematic ground water levels, drought, flooding and salinity; and pests.

the household (and 36 percent received remittances from abroad) in the past year.³⁰ Those who received any foreign remittance received on average 5,700 TJS per household (and 645 TJS per capita) per year, equivalent to a quarter of the average annual wage in the agriculture sector in 2012.

Figure 2. Proportion of households where at least one member migrated as a response to shock within the past 5 years.



Source: TJICCA survey

3.3 The likely impacts of migration on adaptive capacity are ambiguous. Lower availability of labor may reduce investment on farms and adaptive capacity in agriculture. On the other hand, transfers from migrant workers can reduce vulnerability and (provided there are sufficient incentives for sustainable environmental management) allow adoption of sustainable practices and investment in on-farm operations.

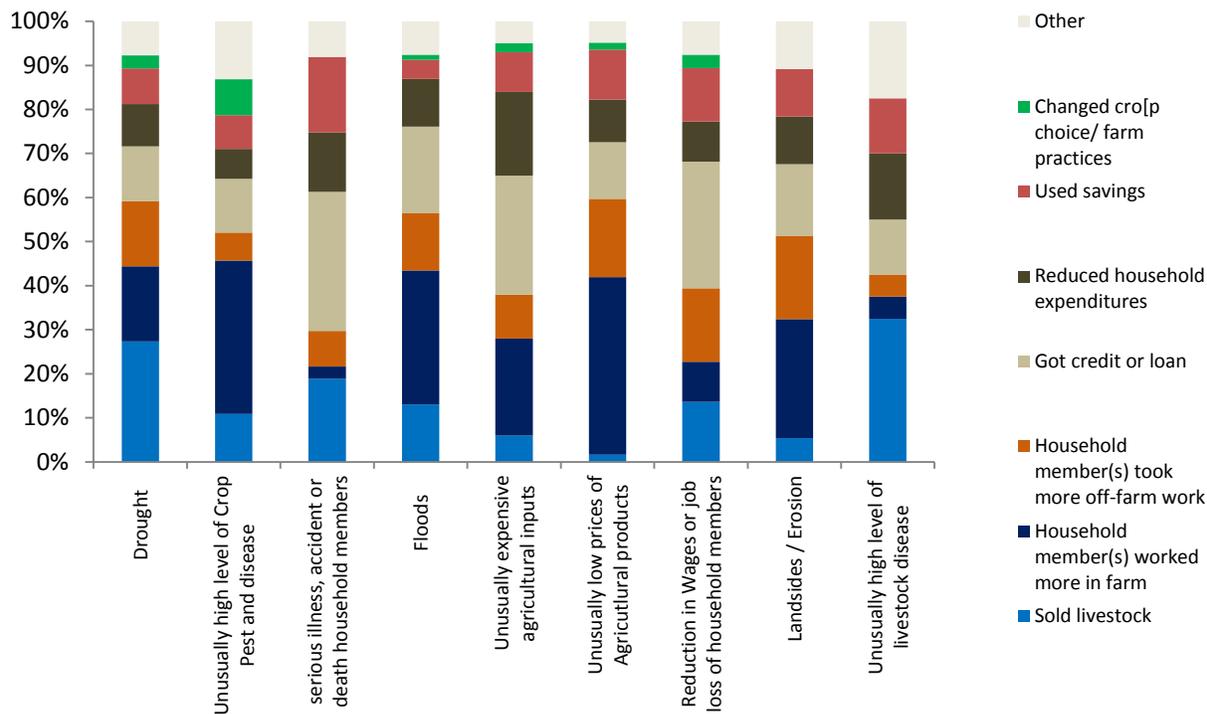
Other mitigation and adaptation strategies

3.4 Reflecting the variety of their income sources, households employ both on-farm and off-farm strategies to cope with climatic and other shocks. Other than migration, the main strategies employed by households to cope with shocks are sales of livestock and increased labor supply (in-farm and, to a lesser extent, off-farm)³¹. Among the numerous other coping strategies, it is notable that sending children to live away is the main response for 5.5 percent of households who experienced a flood. Through these various coping strategies, most households succeed in smoothing consumption: for any shock experienced, fewer than 15 percent of all households reduced expenditures.

³⁰ According to the Rural Investment Climate Assessment (RICA, 2013), 50 percent of rural households receive remittances. Poorer households are less likely to have a migrant worker, and receive lower remittance amounts. Remittances account for 12 percent of the income of the poorest 20 percent of households, and 40 percent of the income of the richest 20 percent.

³¹ Beyond remittances from household members working away from the farm, the most frequently cited sources of local livelihoods for households were “salary or wages” (56%), “pensions” (50%), “income from self-employment” (39%) and “sales or bartering of farm products” (37%). Salaries and wages are earned by those who work in collective and cooperative farms.

Figure 3. Household coping strategies (other than migration), by shock type



Source: TJICCA survey

3.5 Predictably, credit markets provide insurance against idiosyncratic shocks but are seldom used as a coping strategy in village-wide events (such as droughts). Receiving a credit or loan was the main coping strategy in about a third of household-specific shocks (such as experiencing a serious illness, accident or death, or a wage reduction or job loss), but it was the main coping strategy in only 12 percent of drought events.

3.6 Few households changed crops or farm practices as a main response to shocks and climatic events. Changes in crop choice/farm practices are cited as the main action taken by 8 percent of farmers who experienced unusually high levels of crop pests and disease, but by a negligible proportion of farmers for other shocks (less than 3 percent). There is also a low and insignificant correlation between experiencing various shocks (at the village or household levels) and adopting sustainable land management practices.

4. SUSTAINABLE LAND MANAGEMENT PRACTICES: KNOWLEDGE, ADOPTION AND INVESTMENT

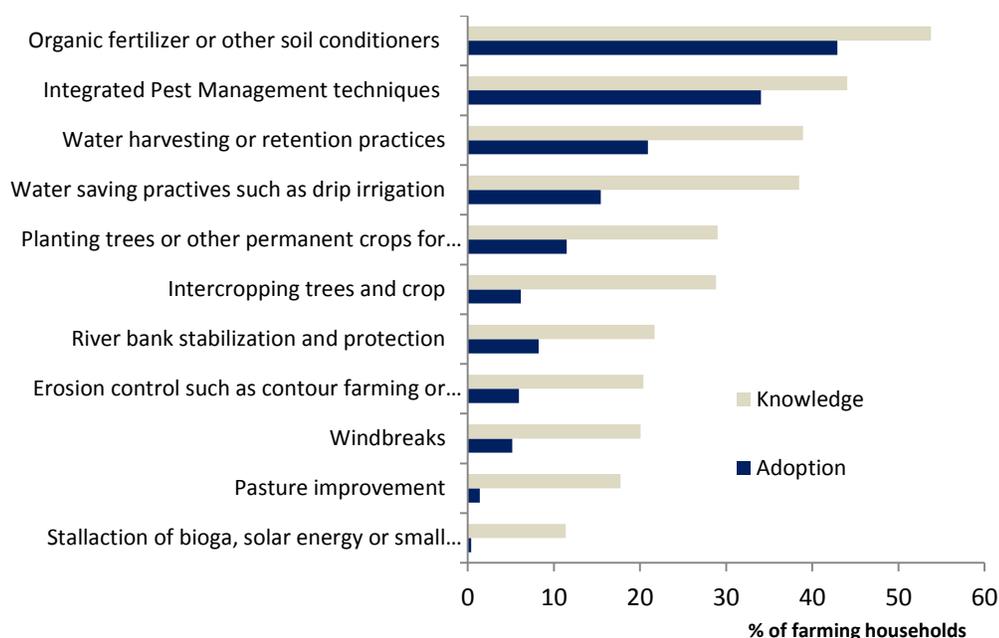
A. KNOWLEDGE OF SUSTAINABLE LAND MANAGEMENT PRACTICES

4.1 Many sustainable land management practices are unknown to a majority of farmers. Levels of knowledge of sustainable land management practices only exceeded 50% for one practice type³²

³² There may be some variation in people’s interpretation of specific SLM activities, and their implementation can vary. This is acknowledged as a potential analytical limitation of this study.

(figure 4). Farmers had greatest knowledge of “organic fertilizers and other soil conditioners” (54%), “integrated pest management” (44%), “water harvesting / retention practices” (39%) and “water saving practices” (38%). The least widely known improvement practices were “installation of biogas, solar energy or small hydro” (11%) and “pasture improvement” (18%).

Figure 4. Knowledge and adoption of sustainable land management practices



Source: TJICCA survey

4.2 The main sources of knowledge about sustainable land management practices are other farmers. Farmers have knowledge of practices that were adopted by other farmers in the village: significantly higher levels of knowledge of “river bank stabilization and protection” and “windbreaks” existed where another household in the village had adopted those SLM practices³³. This is consistent with the main sources of advice for farming practices, as reported by farmers: heads of dehkans, other farmers and Hukumat, for all farming practices.³⁴ In fact, there is generally only a weak correlation between extension services and knowledge of SLM practices. The exceptions are for knowledge of pest management techniques (which is correlated with having received advice on pest control) and knowledge of organic fertilizers, which is negatively associated with having received advice on fertilizer use.

4.3 Female-headed households have significantly lower levels of knowledge about some of the SLM practices Within villages, accounting for observable farm and household characteristics, female-headed households are 8 percent less likely to know about water harvesting, 10 percent less likely to

³³ Analysis based on OLS regressions, with village fixed-effects, and controls for household and farms characteristics.

³⁴ The RICA results suggest near complete absence of advisory services in rural Tajikistan. Less than 2 percent of farmers cited use of government agencies, private experts or any other formal providers of advisory services. Less than 2 percent of farmers participated in any type of training programs.

know about river bank stabilization or intercropping, and fifteen percent less likely to know about windbreaks.

4.4 **Education and farm type are correlated with knowledge of some practices.** Higher levels of education of the household head are significantly associated with greater knowledge of two practices: organic fertilizers and, to a lesser extent, water-saving practices. Also, farmers who only have presidential land generally have lower knowledge of SLM practices. Within villages, there is, however, no independent effect of wealth (measured by household assets) on knowledge, except for windbreaks, which are better known by the households that belong to the upper tercile. There is also no statistically significant difference in knowledge between farmers in small farms and collective farms.

B. ADOPTION OF SUSTAINABLE LAND MANAGEMENT PRACTICES

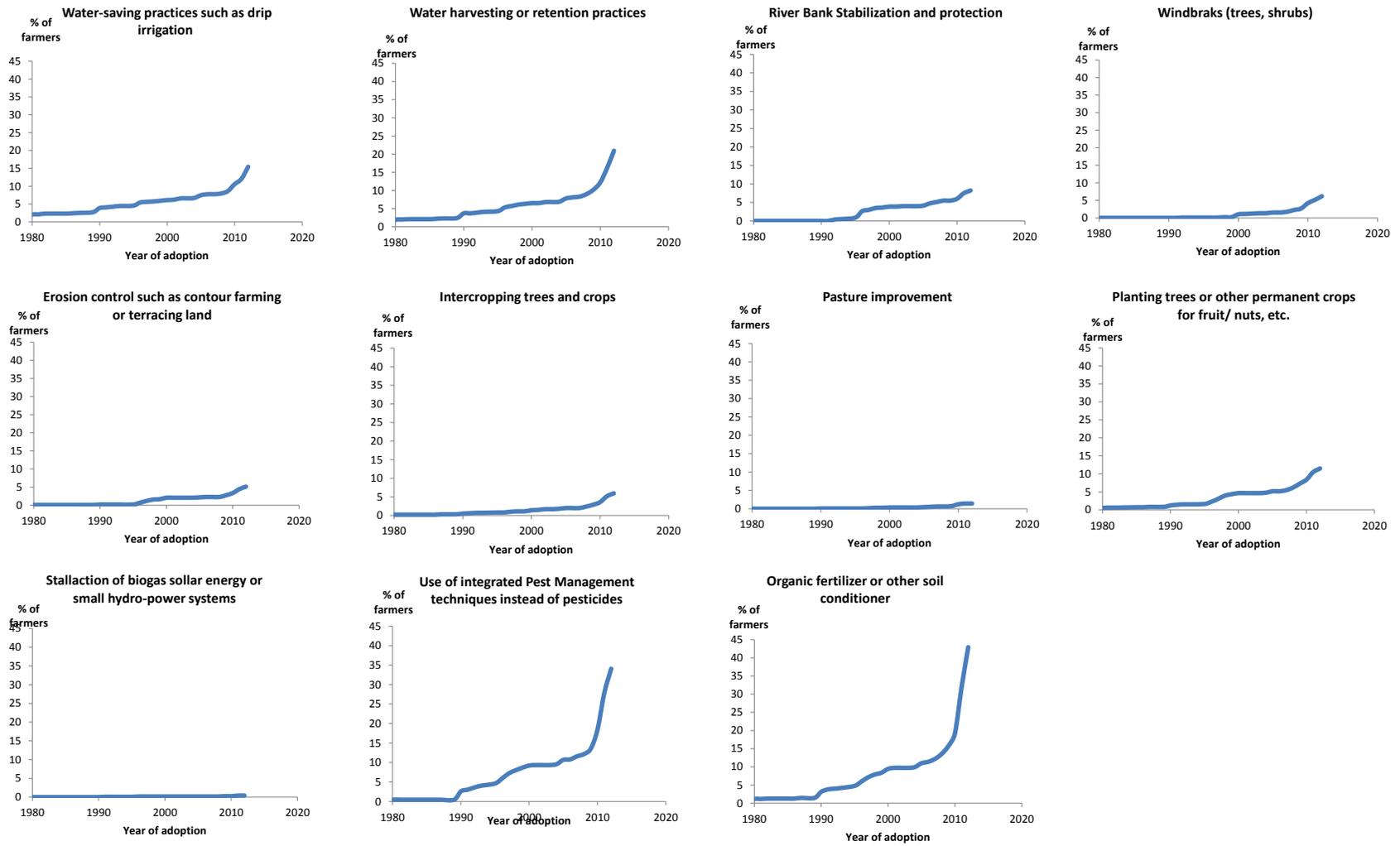
4.5 **Only two SLM practices had been adopted by more than one-third of households** (figure 4). The most commonly adopted SLM practice were “organic fertilizer or other soil conditioner” (43%), “use of integrated pest management techniques instead of pesticides” (34%) and “water harvesting or retention” (21%). Adoption is associated with higher education for windbreaks and erosion control.

4.6 **Unsurprisingly, the most adopted practices were those that had the most immediate direct effects on productivity levels (fertilizers, pest control, water).** Conversely, the least adopted SLM practices were “installation of biogas, solar energy or micro hydro-power” (<1%) and “pasture improvement” (1%). Low levels of adoption of clean energy generation technologies may be accounted for by relatively high up-front capital expenditure, complexity of installation and/or sufficiently cheap current energy generation alternatives. Also, unclear rights to pasture areas and/or lack of use of pasture areas may account for the low levels of improvements.

4.7 **The adoption of SLM practices accelerated over the past five years.** For most practices, the cumulative adoption curves are exponential, reflecting low base levels of adoption and high rates of recent uptake³⁵ (see figure 5). Some practices, such as erosion control and river bank stabilization and protection display step-wise periods of adoption, perhaps reflective of increasing donor support, or following disasters. Irrespective of the patterns of increase of rates of adoption, the trends represent an encouraging sign of autonomous adaptation under current arrangements.

³⁵ Dates of adoption in the survey were based on recall. They are therefore subject to measurement error.

Figure 5. Adoption of sustainable land management practices, 1980-2012

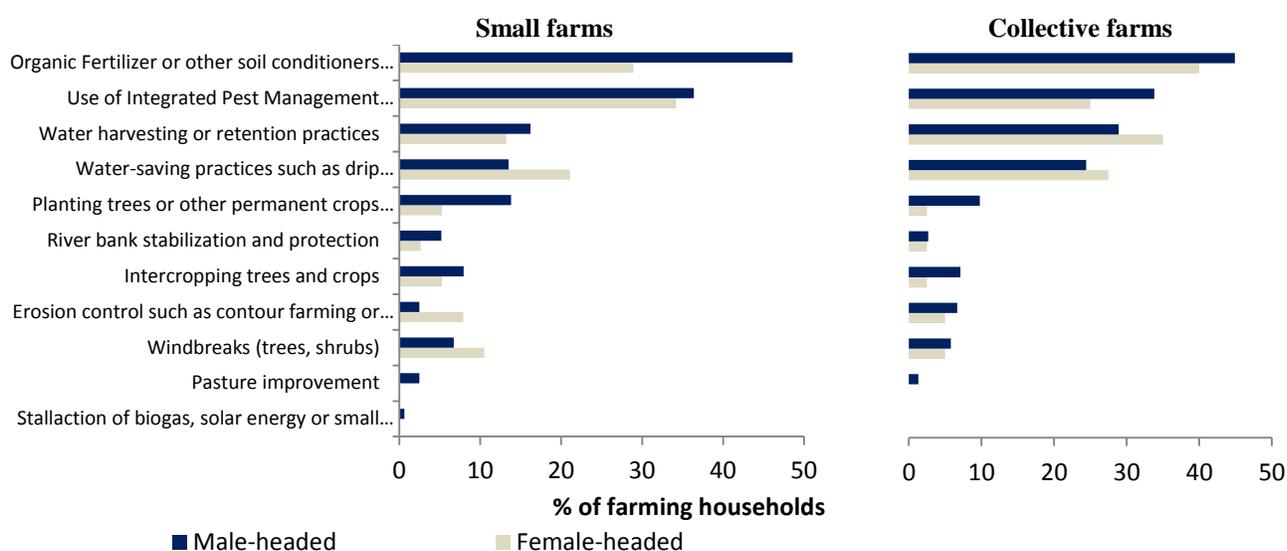


Source: TJICCA survey (2012)

4.8 **Greater land tenure security is currently not systematically associated with greater adoption of sustainable land management practices.** Small farms that received a land certificate are not more likely to have adopted sustainable land management practices in the few years before or after obtaining secure land rights³⁶.

4.9 **Conditional on having knowledge, female-headed households are equally likely to adopt sustainable land management practices.** Overall, adoption of sustainable land management practices is lower in female-headed households operating a small farm than in male-headed households. As could be expected, differences in adoption by gender are much smaller in collective farms (see Figure 6 below, and summary statistics on adoption by farm type, gender and location in table D4 in Appendix D). Nevertheless, within villages and after controlling for other characteristics, female headed households are more likely to have adopted erosion control practices and to use integrated pest management techniques.

Figure 6. Adoption of SLM practices by farm type and gender of the household head



C. ON-FARM INVESTMENTS

4.10 **Less than a quarter of farmers invested in irrigation systems, pumps and canals in the past two years.** There is no significant difference in the likelihood of making new investments in irrigation systems, pump and canals between small and collective farmers.³⁷ However, conditional on spending,

³⁶ Analytical models for adoption included: Ordinary Least Squares, Instrumental Variables and a hazard model of adoption (see Bauer and Diagne, 2014). To account for selection into different farm types, farm type was instrumented by the intensity of the World Bank Land Registration project in each raion. Specifications included household and farm characteristics, and village fixed-effects or village characteristics.

³⁷ Unlike the decision to adopt sustainable land management practices, the available data does not allow analyzing the decision to make investments in on-farm improvements after obtaining a land certificate. In the 2013 Rural Investment Climate Assessment (RICA), only 5 percent of farmers cited the lack of a land use certificate as a major or severe constraint in the operation of crop farms. The most cited major constraints were unstable input prices (32 percent), deficiencies in irrigation (31 percent), insufficient input availability (29 percent). Other major constraints included insufficient land as a result of very thin land rental and sales markets (21 percent), poor soil quality (23 percent) and natural disasters and climate change (19 percent).

average investment by small farmers is three times greater than investment by large farmers, which could reflect start-up costs for small farms and economies of scale for large farms.

Figure 7. Proportion of farmers who invested in on-farm improvements in the past two years

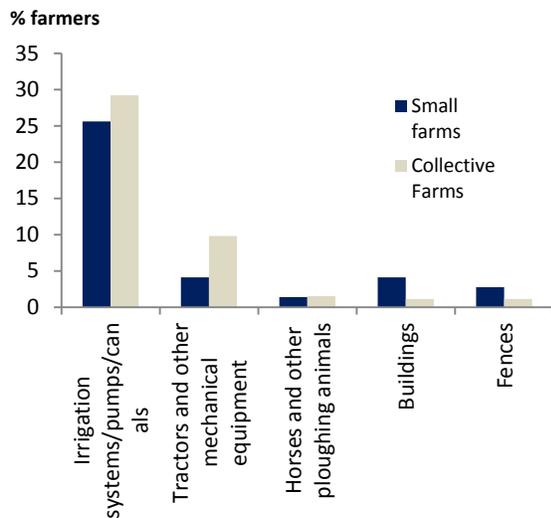
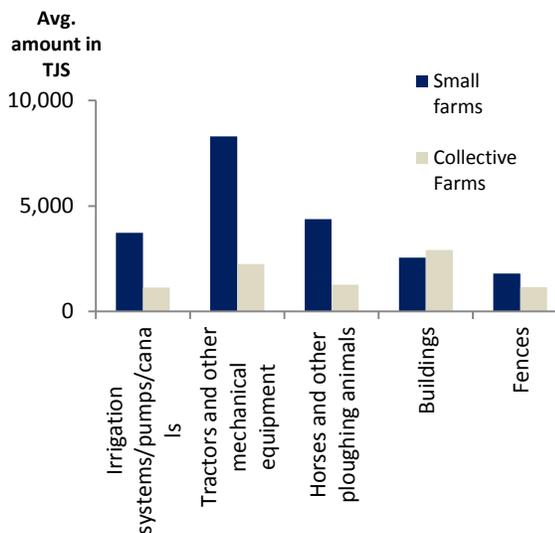


Figure 8. Average investment expenditure in on-farm improvements in the past two years



Source: TJICCA Survey

4.11 **Even fewer farmers invested in other farm equipment or infrastructure.** Consistent with the existence of economies of scale, small farmers are half as likely to have purchased tractors or other mechanical equipment in the past two years. But conditional on investing, the amount invested is greater than for households in collective farms.

5. CONCLUSIONS AND POLICY RECOMMENDATIONS

5.1 **Droughts are the most widespread shock experienced by households.** Adoption of sustainable land management practices (such as drip irrigation, water harvesting, and maintenance of irrigation systems) can help address the associated vulnerability.

5.2 **Farmers who have gained increased tenure security through ongoing land reforms report lower vulnerability.** Those who have established individual or family farms generally have greater assets and report greater food security and subjective wellbeing (compared to when they worked in collected farms).

5.3 **Gains from increased tenure security could be extended by addressing the remaining bottlenecks for land certification and registration and for freedom to farm.** In this respect, gender-aware certification processes and legal advice should be implemented to help alleviate the current barriers encountered by women. Information could be provided on land tenure arrangements, farm taxation, the role of local institutions in farm reform, and the rights of farmers. Legal aid centers have played a useful

role in this respect. Also, farmers should have freedom to select crops to grow and to sell their products to the buyers of their choice.

5.4 Nevertheless, greater land tenure security has yet to translate into greater adoption of sustainable land management practices. Also, the existence of economies of scale may not encourage investment in farm equipment or infrastructure by small farms. The theoretical relationship between stronger property rights and greater investments relates to security of tenure, the possibility of using land as collateral, and more efficient land use through gains from trade. According to the recent Rural Investment Climate Assessment (RICA), while few crop farmers indicate lack of land use certificates as a major or severe constraint, insufficient land (as a result of very thin land rental and sales market) and access to finance remain important constraints. This underscores the need to address such constraints through "second generation reforms" to fully harness the opportunities created by land reform and freedom to farm, as outlined in the RICA (further protecting land rights, improving access to credit, rehabilitating irrigation schemes and establishing an institutional framework for water regulation and delivery, building sustainable rural advisory services, etc.)

5.5 Rather than on-farm adaptation, migration is currently the main coping strategy among farming households. Very few households report changing crop choice or farm practices in response to climatic and other shocks.

5.6 There is however, some evidence of autonomous on-farm adaptation through increasing (albeit low) adoption of sustainable land management practices. Only a minority of farmers invests in general farm improvements. Water saving, water harvesting and irrigation systems are among the most widely implemented practices; the most common investment is in irrigation systems. This is consistent with the very high frequency of droughts. The recent increase in adoption rates also warrants caution in attributing impacts to environmental or land management projects, from an M&E perspective.

5.7 The ongoing trend of increasing adoption of various sustainable land management practices could be capitalized upon by interventions, especially given spillovers within villages. The adoption rates for many SLM practices are low but increasing. SLM practices which translate into direct productivity improvements and which are easy to implement (i.e. pest management and organic fertilizers) may require less policy support than more complex and capital-intensive SLM measures such as clean energy generation and erosion stabilization measures.

5.8 From an M&E perspective, these trends and the existence of spillovers warrant caution in results attribution and impact measurement. Without careful frameworks to attribute impacts (taking into account existing dynamics), these patterns will make impact measurement and progress monitoring difficult.

5.9 Knowledge of sustainable land management practices still requires improvement from current levels. Many farmers do not know about sustainable management practices. Knowledge of clean energy and pasture management is particularly low.

5.10 Dissemination of knowledge about sustainable land use must also leverage spillovers. Farmers who live in a village where another household has adopted a sustainable land management practice are significantly more likely to know about and adopt the practice, suggesting spillovers and demonstration effects. Conversely, there is generally only a weak correlation between extension services and knowledge. This suggests an important role for specific and village-level SLM demonstration activities, and farmer-to-farmer exchange of information.

5.11 Female-headed households could be targeted for specific knowledge-raising activities, as they seem not to benefit from the knowledge-sharing networks that male farm heads enjoy. Reducing the knowledge gap is all the more crucial that migration increases the share of female-headed households. Female household heads are significantly less knowledgeable about sustainable land management than male-headed households, even accounting for differences in income and education. Also, imbalances in intra-household decision making are even more pronounced in individual and family farms than in collective farms. This could lead to further segmentation of information networks, as the family and individual-farm model becomes more prevalent. Lack of knowledge seems to be a significant barrier to adoption of sustainable land management practices by female-headed households: conditional on having knowledge, they are just as likely to implement sustainable land management practices as male-headed households.

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APPENDIX A. PHYSICAL MANIFESTATIONS OF CLIMATE CHANGE AND THEIR CONSEQUENCES FOR RURAL COMMUNITIES IN TAJIKISTAN

Climatic observations, predictions and consequences

Observations to date	Predictions	Possible Consequences
<i>Temperature</i>		
<ul style="list-style-type: none"> • Ground air temperatures increased. • Average annual temperatures rose by about 0.5 -0.8°C across most parts of the country from the 1940s to the 2000s. • Number of days over 40°C increased. • Increased number of cold spells in mountain zones in spring. • Winters becoming warmer and duration of frost-free days increased. • Surveys indicate that people believe there is an increase in temperature and droughts. 	<ul style="list-style-type: none"> • Mean annual temperature will rise by 0.2-0.4°C in most areas of Tajikistan by 2030 in comparison with the period of 1961-1990. • Droughts will occur more intensively and frequently. • Maximum increase in temperature is expected in the winter (by 2°C). • Increase in winter temperatures means that run off peaks from snow melt will occur earlier in the spring whilst the summer runoff from glacial melting will decrease in the long term. • Higher temperatures will result in higher potential evapotranspiration increasing plant water consumption by 1-10% by 2030. 	<ul style="list-style-type: none"> • Drying up of water resources and periodic severe water stress. • Higher evapotranspiration rates & change of plant growth seasons. • Reduced snow accumulation in mountain glaciers. • Higher temperatures and potential evapotranspiration will put pressures on the poorly maintained irrigation system, whose efficiency is currently estimated at 55%. • Pest infestations can become more common. Some pest species can become active earlier, increase the intensiveness of their reproduction as well as expand the area of their spread. Potential outbreaks of cotton worms and locust are of particular concern. • Poor and not climate adjusted seed stocks and animal breeds. • Long dry periods, in combination with high temperatures in spring and summer seasons, will lead to desertification processes.
<i>Precipitation</i>		
<ul style="list-style-type: none"> • The amount of precipitation has generally remained relatively constant. • The amount of precipitation in areas <2500m has increased in summer/autumn. • The number of days with precipitation had decreased. • Surveys indicate that people believe there is less precipitation and snow fall. 	<ul style="list-style-type: none"> • Mountainous landscapes make precipitation predictions difficult. • Intensity and irregularity of heavy rainfall events will increase. Overall volume to remain relatively constant but becoming increasingly concentrated in fewer days. • Precipitation will change unevenly due to topography and altitude and be higher in winter, lower in summer. • Drought will occur more intensively and frequently. • Less snow cover in spring reduces recharge of water in soil & earlier drying, reducing crop/pasture productivity. 	<ul style="list-style-type: none"> • Agriculture will be exposed to increasingly low and erratic rainfall. • Increased frequency of extreme events. • Fluctuations in the hydrological cycle. • Flow of rivers will decrease in summer in the long-term due to diminished inputs from snow, rain and glaciers. Groundwater reserves will likely decrease as well due to reduction of recharge from surface water and precipitation.
<i>Glaciers</i>		
<ul style="list-style-type: none"> • Glaciers contribute 10-20% of runoff of the major regional river systems (up to 70% during dry season). • Since 1930 the total area of glaciers in Tajikistan declined by one-third. • The accelerated melting of glaciers has been well documented in recent years. 	<ul style="list-style-type: none"> • Glaciers will continue to melt earlier in the year. • Glacial area is expected to fall a further 15-20% over the next 30-40 years, with many small glaciers disappearing. • Climate warming will intensify the melting of glaciers, which will initially increase the summer water flow but in the long-term will reduce water availability. 	<ul style="list-style-type: none"> • Flow of rivers will decrease in summer in the long-term due to diminished inputs. • Risks of glacial lake outbursts will increase. • Fluctuations in the hydrological cycle - especially from glacial retreat and flash floods – with downstream consequences. Downstream states are dependent on Amu Darya basin flows.
<i>Disasters</i>		
<ul style="list-style-type: none"> • The number of disaster risks recorded in Tajikistan is approximately 3000 per year. Mudflows, landslides and floods are among the most common disaster risks. • Already resulting in significant human/financial losses. • Mountain, hill and lowland communities have all been impacted by floods and mudflows. • Drought is a recurring extreme event, with 9 drought years recorded in 1992-2010. 	<ul style="list-style-type: none"> • Agricultural sector will suffer from the increased frequency and severity of the extreme weather events: droughts, mudflows and floods that can destroy crops and livestock and threaten people's livelihoods. • Increase in heavy rainfall events would indicate that the likelihood of disaster risks will increase. • The frequency and severity of extreme events such as droughts, floods, mudslides, are expected to increase. 	<ul style="list-style-type: none"> • The population at risk will also increase as pressure on land will intensify with the current growth in population of 2.2% per year. • The poor tend to be disproportionately affected by disasters as their housing is of inferior quality and often constructed in hazardous locations. It generally takes them longer to restore their livelihoods as they tend to have non-diversified incomes and little savings. • Pest infestations can become more common. Potential outbreaks of cotton worms and locust are of particular concern.

Sources: Christensen et al. 2007, Hydromet 2008, World Bank 2009, 2011, 2013, Wolfgramm et al. 2011, Government of Republic of Tajikistan 2008, TAJSTAT 2011, UKAID 2011

An overview of the scale and frequency of recurring physical challenges in Tajikistan is outlined in Appendix A. Disasters affect almost all sectors of the economy, primarily through the damage of infrastructure and Tajikistan has had the highest number of casualties associated with disasters in ECA (World Bank 2011). Wolfgramm et al. (2011) report over 3,000 recorded disaster risks per annum and expect continued land degradation to serve to intensify the magnitude of disasters yet to come.

Overview of Major Types of Natural Hazards in Tajikistan

Event	Description
Heavy rain	Can cause localized or regional flooding, damage crops and cause erosion (which is associated with mudflows, landslides, etc.).
Mudflow	An estimated 85% of Tajikistan's area is threatened by mudflows.
Flood	The frequency and magnitude of floods will rise as warming temperatures increase the rate of snow melting and lead to overflowing of river banks. Flooding can introduce a host of illnesses (such as typhoid fever) if water supplies are contaminated with sewage and wastewater from farms and factories.
Wind	High wind events can cause infrastructure damage, mobilize dust, cause wind erosion and damage crops.
Hail	Hail can damage crops and reduce sales price of produce.
Landslide	50,000 minor and major incidents reported across the country during the 1990s. Climate change can potentially affect the incidence of avalanches whose occurrence is dependent on temperature and the amount of solid precipitation in the zone starting at 1500 meters above sea level and higher.
Earthquake	Earthquakes can cause severe localized damage and significant regional damage. Better monitoring and response strategies are required.
Drought	Drought occurrences have increased and aridity is expected to increase further. The 2000 and 2001 droughts in the region were estimated to have cost Tajikistan 5% of their GDP.

Sources: UN Office for the Coordination of Humanitarian Affairs 2006, World Bank 2006, 2009, 2011, IMAC/CoES in UNDP DRMP 2011

In addition to the more formal historical records, the most commonly cited potential impacts of concern for surveyed rural citizens appear to be: (i) increase in natural disasters, (ii) extreme hot/cold seasons that are harmful to health, (iii) unpredictable and extreme weather that harms agricultural production, and (iv) decline in freshwater availability (PREM 2011). Given the significant social and economic impacts of disasters, disaster risk management should be an integral part of national and local adaptation strategies (World Bank 2011).

APPENDIX B: SUMMARY OF FOCUS GROUP DISCUSSIONS ON ISSUES AND CHALLENGES ARISING FROM LAND RESTRUCTURING AND CLIMATE CHANGE

Focus group discussions were held with male and female farmers and farm workers, and personnel at five legal aid centers (LACs)³⁸ in the study sites of Sughd and Khatlon.

The distribution of focus group discussions across sites and farm types is given in the Table below. In total there were 63 participants, with 30 men and 33 women. Restructured farms are family-based created out of collective farms. Generally these have 25 members/shareholders or less, while collective farms are larger with 25 or more members/shareholders.

Male/lowland Restructured farm members and workers (Shaartuz)	Male/upland Restructured farm members and workers (Isfara)	Male/lowland Collective or other farm members/workers (Bokhtar)	Male/upland Collective or other farm members/workers (Isfara)
Female/lowland Restructured farm members and workers (Shaartuz)	Female/upland Restructured farm members and workers (Sharistan)	Female/lowland Collective or other farm members/workers (Bokhtar)	Female/upland Collective or other farm members/workers (Isfara)

Issues discussed included farmer and farm worker experience with the farmland restructuring process, interactions with LACs, agricultural operations on farms, and farmers’ perceptions of climate and environmental problems in agriculture. To account for gender aspects, the findings were differentiated by gender where possible.

The focus group discussions (FGD) provided some insight into issues related to land tenure and agricultural operations drawing on the experience, opinions and perceptions of farmers and farm workers. A summary of key findings and assessments is shown in Table B1. The following discussion provides additional details on these issues. Comparisons are drawn where appropriate and specific examples given to highlight farmer experience and perceptions, noting the challenges faced, and interactions with LACs. Examples of current challenges in farming operations are also presented.

³⁸ The LACs were Public Organization "Bonuvoni Fardo" (covering Sharituz, N. Khrisrav), Public Organization "Ilhom" (Kulob, Hamadoni, and Farkhor), Public Organization "Centr Zashiti I Sotrudnichestva" (Isfara and Konibodom), Public Organization "Markazi Dastgirii Huquqi Shahrivandon", Istaravshan, Shahrison, Zafarobod, and Ghonchi) and Public Organization "Women and Society, (Khujand). All five LACs in this study had been or were being supported at the time of the interviews by USAID’s Land Reform Project. Other current and previous donors supporting these LACs included Helvetas, Aga Khan Foundation (AKF) and German International Cooperation (GIZ).

Table B1. Summary of Findings from Focus Group Discussion (missing responses due to lack of information in reports)

	Male/lowland Restructured farm members and workers (Shaartuz)	Male/upland Restructured farm members and workers (Isfara)	Male/lowland Collective or other farm members/workers (Bokhtar)	Male/upland Collective or other farm members/workers (Isfara)
Awareness of restructuring	High – seminars, TV radio, brochures, newspapers	High – seminars, brochures, newspapers	Low	High – some attendance in seminars, etc.
Interest in restructuring	High	High	High	Low to medium
Legal Assistance from LAC	Establishing family farms Some still without certificates, farm debt	Social tax, inconsistent certification fees,	Cost of inputs, uncertainty about parcel allocation	Land parcel size and location, organizing inputs, time to get certificates
Challenges in the process	Elected farm head, shareholders	Farm head, shareholders No evidence of interference	Farm head/brigade supervisors	Farm head/elected commission
Decision-making	Restrictions on cotton sales	Salinity, flooding, high temperatures	Mandated cotton growing	Unclear on orchard production
Freedom to Farm	Drought,	Plant diversity, irrigation management, trenches	Pests, water levels	Hail, pests,
Climate/Environmental Issues	Irrigation management	Taxes and record-keeping, machinery leasing,	Pesticides, salinity	Pesticides (some biological control),
Response suggested	Farm debt, taxes, finance, access to water		Establishing family farms	Access to machinery, seeds, harvesting, water management
Assistance requested				
	Female/lowland Restructured farm members and workers (Shaartuz)	Female/upland Restructured farm members and workers (Sharistan)	Female/lowland Collective or other farm members/workers (Bokhtar)	Female/upland Collective or other farm members/workers (Isfara)
Awareness of restructuring	High – seminars, TV, radio, brochures, newspapers	High – seminars, TV, radio, family, books, newspapers, High	Low – from actions of others,	Medium to High – TV, magazines, brochures,
Interest in restructuring	High	High	Low	Low –satisfied with collective
Legal Assistance sought	Dispute over land appropriation	Establishing family farms	Other jobs, perceive barriers of cost, time, need for patronage	Lack of labor (migration)
Challenges in the process	Quality of land parcels	Tax burden, who is a shareholder, time to get certificates	Farm head	Shareholder group
Decision-making	Elected farm head, shareholders	Farm head, shareholders	Follow instructions of farm head	Unclear on orchard production
Freedom to Farm	Restrictions on cotton sales	No evidence of interference		Extremes of cold and heat,
Climate/Environmental Issues	High rainfall, extremes in temperature, hail, pests, siltation	Hail, high moisture levels, cold temperatures,		
Response suggested		Joint action on water supply,		Water management,
Assistance requested	Irrigation management, resistant seeds, pesticides, Land capability assessment, taxes based on revenue targets, agricultural production, legal entity/natural persons designation for farms	Taxes, marketing produce (road to Uzbekistan closed), water management, erosion prevention,		Agriculture and horticultural production and processing

Awareness of and Interest in Restructuring. The key issue here is the establishment of family/individual farms from collectives and the issuance of land use rights certificates for these farms. Generally, it is assumed that the first phase of farmland restructuring has occurred with the breakdown of kolkhozes, etc., into collectives and large cooperatives. Therefore, it is not surprising that participants in both family and collective farms were aware of the general notion of farmland restructuring, but their knowledge of the full scope of the legislation and its implications was a more mixed set of findings and experiences.

In the cotton-growing areas of Shaartuz and Bokhtar, women who are working in family and collective farms respectively, provide some contrasting examples of experience and perceptions of restructuring. In Shaartuz women knew of and had interacted with a range of civil society organizations including a LAC and an association of dekhkan farms. Women operating family farms spoke of learning about relevant legislation and rights through participation in seminars, reading booklets, brochures and newspapers, and through television and radio.

“Let me tell me what we learned from the workshops. A simple thing that we did not know was that we had equal rights with men as it concerned running or managing the farm. When we organized our dekhkan farm, there were only two women who ran their farms. We have been working for several years. Fortunately, today there are eighteen women now and all this is achieved thanks to those workshops. We learned that we have equal rights with men for work despite of the fact that ninety eight percent of women work in the fields. We had a project implemented under rural development, which trained us for six months. Fortunately, this year we managed to make four women heads of dekhkan farms.” Participant in FGD

In contrast, the women working on collective farms in Bokhtar represent a different segment of the rural population. Many of those participating in the discussion were temporary workers whose names were not officially registered as shareholders. Several worked on behalf of relatives who had migrated or could not work and had other full-time occupations such as teachers (see comment below), or on a temporary basis receiving a small salary on occasion, a share of the cotton by-products and some non-cotton crops. Not all who considered themselves as shareholders were able to confirm that they had seen documentation that showed their status. Although aware that creation of smaller family farms was possible, having seen some others establish them in Bokhtar and elsewhere through television, they expressed reluctance in not proceeding, with some expressing more interest in acquiring presidential plots.³⁹ They also expressed a perception that it would be difficult to proceed with creating family farms without the support and permission of farm heads, as well as connections in local government. Those with other occupations felt that they did not have the time or even sufficient interest to obtain certificates.

“It requires lots of money.” Participant in FGD

³⁹ **Presidential land/plot** – land distributed to rural families for household farming by two presidential decrees (1995: Presidential Decree “On Assignment of 50,000 hectares of Land for Household Farming”; 1997: Presidential Decree “On Allocation of 25,000 hectares of Land for Household Farming”).

“One has to leave other work and work only on land then.” Participant in FGD

Participants in the Bokhtar FGD had interacted on a very limited basis with organizations working in land reform, most being unaware that assistance was available, but then again as noted above their overall interest in restructuring was also low. A comparison of men working on different farm types in both areas showed similar differences with regard to interactions with organizations working in land reform. Those operating family farms in Shaartuz had participated in numerous organized activities promoting farmland restructuring, and were also aware of LRCSP operations. Like their female counterparts, the men working on collective farms in Bokhtar were generally unclear about their current shareholdings and land allocations. What they knew about land reform and restructuring came primarily from their own efforts in trying to obtain access to presidential plots, observing the actions of others in capturing plots of land for cultivation, and from newspapers, television and radio. None of the participants had participated in any organized activities in land reform. However, unlike the women, most expressed an interest in establishing family farms, but were concerned about the costs and availability of inputs should they proceed.

The women working on a collective farm in the upland area of Isfara, provide another contrast. Although aware of the restructuring process and the options to establish family farms, in their current circumstances where labor is limited due to migration, and where they are able to exercise freedom in choice of crops to grow, they mostly prefer to continue working as family groups within the collective farm. Male shareholders in collective farms in Isfara showed more interest in obtaining land use rights for family farms. Their concerns in taking the next steps included the difficulties of farming small parcel sizes, the location of these parcels and in obtaining and organizing inputs, such as machinery, to operate family farms.

Decision-making on Farms and Freedom to Farm. On family and individual farms, shareholders were generally aware of their rights and responsibilities.

On family farms decision-making on actions such as choice of crops and cultivation was in the hands of the shareholders.

“Before adoption of the Decision No.111, the agriculture department used to urge us to sow cotton in a certain area of land. It is the second year that we feel ourselves free. We sow crops according to our own plans and grow those crops that could generate more income.” Participant in FGD

“...We plant whatever we want and get the profit.” Participant in FGD

“Before we were giving the harvest to the farm, now we have it ourselves.” Participant in FGD

However, for cotton growers the greater concern were restrictions imposed on taking their cotton out of the district where they could sell for higher prices.

“Nowadays, everything is difficult in Shaartuz district. We were paid 636 US dollars, but the competition is higher in other districts, farmers in those districts were paid 750-800 US dollars for per ton of cotton. We are not able to take our cotton out of the district; if we do it the cost

[price] will be higher. We use those cotton gins that are close to us, which charge us the price set by them.” Participant in FGD

As expected decision-making on lowland collective farms was more likely to be in the hands of farm heads, who may or may not be under instructions to meet crop production quotas, especially of cotton. The situation in upland collective farms was more mixed. Some farmers had freedom to choose crops for agricultural plots. However, it was unclear to what extent any production requirements are imposed for orchard plots and horticultural crops, such as apricots, which are a major product for these areas.

Constraints/Problems Encountered and Sources of Assistance. As Table B1 shows those attempting to establish family/individual farms encountered a range of constraints and problems during establishment and afterwards in farms operations. Examples of challenges are summarized in Table B2 below with sources of assistance used.

Table B2. Legal Constraints and Sources of Assistance

Constraint/Problem/Issue	Source and Type of Assistance
Restructuring Process	
Obtaining land use rights certificates for family farms – documentation, time taken (several months or more), inconsistent fees for certificates	LACs, donor-financed projects (e.g., LRCSP), other public organizations Legal advice, document preparation, submission of applications, processing of certificates for free (only through LRCSP), training
Asserting equal rights for women farmers	LACs, other civil society organizations Legal representation, assistance in document preparation, submission of applications, training
Number of shareholders and the social tax	Decision for farmers, some have opted for farms with one name on certificate to reduce the social tax obligation
Passing on of farm debt to new family farms	LACs, other public organizations Legal advice, representation
Allocation of land parcels for family farms (e.g., quality of land parcels), land seizure (family and collective farms)	LACs, local government (hukumat) Legal representation, direct request by farmers to hukumat
Preparation of documents for establishing farms and obtaining certificates	LACs, other public organizations Consultations, assistance in preparation, submission of applications, training
Farm Operations	
Taxes – record keeping, complex tax code, social tax (absentee shareholders), land capability assessments	LACs, other public organization Consultations, training,
Irrigation supply (family and collective farms) – repairs, access to water,	LACs Representation to farm head, obtain information
Contracting and contract management	LACs Legal representation, document preparation, consultations
Farm debt burden	As above

Specific examples of some of the above issues provide additional insight into nature of the problems and the assistance sought and provided.

Land rights

Land seizure can occur at both individual and collective farm level, as seen in the cases below.

“I’ve been working in the farm for eight years. Two-three years ago, they took my three hectares and allocated among illegal shareholders. Now those people are using land. [...] They paid some money and took my land. I applied to Hukumat but nobody supported me. The Hukumat supported those people who violated the law. I was a legitimate shareholder and they did not have any right to seize my land. Higher authorities never considered my request. I am thankful to “Bonuvoni Fardo” organization to which I applied. With the assistance of a lawyer from this organization we went to the Hukumat, Land Committee and finally the problem was solved in my favor.” Participant in FGD

“There was an issue of a collective farm seizing the land of another farm using a letter drafted by a government official. The farm who had land seized had a certificate outlining its land boundaries and the LAC helped prove the government official’s letter wasn’t viable in court and the land was returned” From LAC success story (Khatlon)⁴⁰

Farm debt

Newly established farms may also have to tackle the issue of farm debt accumulated by the collective, especially in cotton-growing areas. LACs have been able to provide assistance in some cases, but as experience shows below not always to the satisfaction of farmers who may not understand the nature of the problem and the relevant legislation.

“The President once said that all debts had to be written off. The debts were written off but not the interests. The amount of interest grew and now it is more than the debt. I said that the President mentioned in one newspaper article that all debts were written off. I asked the lawyer the question about these interests, but he did not respond and never came back. If he was here, I would remind him that he promised to settle this issue and left ... I told him that he would not be able to solve it. I applied to all possible agencies but did not succeed. I had a debt, which was written off, but the penalty of 1.5 thousand US dollars still exist. I told them that they did not have the right to retain the penalty.” Participant in FGD

Taxes

Of all the issues mentioned by FGD participants, taxes and related issues were the most common. From the number of taxes to be paid to problems with the basis of tax calculations, restructured farms are struggling with this aspect of farming. In some cases, loans are being used to pay taxes. Taxes can be a factor when deciding how many shareholders to have on a certificate since all will need to pay a monthly social tax. If names are left off, these persons cannot inherit the land use rights. At the same time, shareholder composition can change over time with actions such as migration, which can create a different set of problems.

⁴⁰ LACs were asked to recount ‘success stories’ in terms of their work.

“We also have this problem with those farmers who have only 0.50 hectares with 5-6 members. In this situation, it is burdensome for these farmers to pay social tax. Therefore, they leave 1 person in the dehkan farm document as a shareholder and exclude the rest.” Participant in FGD

“The family members that currently work are not in the certificate. But we submit reports, pay taxes to the pension fund. We include them in the list of our own people, but they are not in the previous list. When we obtained the land we had different people, but now they do not work on the farm. All of them are in Russia, it would be good if they came and paid at least 100 USD as taxes annually, but they do not do this.” Participant in FGD

Other factors associated with taxation problems are worth highlighting. Farmers may have rights to land that in their opinion, has been incorrectly assessed for tax purposes.

“Some of the land are excluded from crop rotation and has become dry [fallow] land. The underground water level is high due to not digging canals and ditches. Today, no one from local authorities deals with these issues or ignores them. As a result they tax our land as arable and irrigated land.” Participant in FGD

Participants were unclear whether earlier land and soil classifications were still a factor in calculating the unit area yields that form the basis for collecting retail and land taxes. Regardless, women farmers in Shaartuz noted that no one had officially conducted soil tests for many years to inform them for technical or even tax purposes.

Nearly all those working on family farms wanted assistance with taxes and simplification of the tax code.

“ Yes. It keeps changing with regards to documents preparation. Believe me, ordinary people have no idea about taxes. They don’t have higher education or accounting skills. It is very difficult for us. We suggest to improve and simplify taxation procedures so that ordinary people could understand.” Participant in FGD.

Other challenges/needs for legal assistance

Other challenges and problems that participants raised in the discussion and for which they requested assistance included:

- Access to finance with favorable terms for their types of farms and operations;
- Processing and marketing of their produce, e.g., the closure of road access to Uzbekistan has affected some areas significantly, others have tried new crops, such as buckwheat, but lack knowledge about processing and marketing;
- Access to inputs such as machinery, fertilizer, seeds, etc.;
- General agricultural and horticultural production, e.g., greenhouses, water management, soil erosion prevention, soil conservation, new crop choices, etc.

Climate Change and Environmental Problems. Although these issues were not discussed as extensively as those above, participants did list a number of events and problems. see Table 1. Most commonly reported were:

- Hail storms;
- Extremes of temperature;
- Water-related issues, namely problematic ground water levels, drought, flooding and salinity; and
- Pests in nearly all types of farming systems represented.

Generally, the responses to address these concerns remained within the confines of procedures and activities already known to farmers, e.g., repair irrigation channels to supply water, use of pesticides (a few mentioned biological control methods). A few farmers in upland areas suggested planting different varieties of existing crops, as well as addressing risk through growing a variety of crops. One farmer mentioned working with a water user association to address siltation of irrigation channels, noting that measures would need to be taken again this season and that funds were needed. Women farmers in lowland areas wanted resistant cotton varieties to cope with climate variability. Very few farmers reported that they have any kind of reserves to cope with shocks, although some had mentioned that they had sold livestock to pay taxes. Migration remittances were not explicitly mentioned as coping strategies, but many participants acknowledged that without remittances farming would be very difficult.

Climate Change Adaptation, Land restructuring and Legal Aid.

Those that have established family farms generally feel that their lives have improved compared to when they worked collective farms.

“If we compare old kolkhoz with newly reorganized farms, we’ll notice the difference as farmers would have low yields in the past. After reorganization people started to think differently, they understand that it is their share and the outcome will depend on their own efforts. Therefore, the shareholders work and have good harvest and their living conditions have improved.”
Participant in FGD.

While the increased freedom to farm of restructured farms has the potential to contribute to building climate resilience through increasing farmers’ abilities to respond to shocks and stresses, farming remains sensitive to the impacts of these events and trends. However, farmers have identified areas requiring attention that will help reduce sensitivity, e.g., increase crop diversity, improve crop husbandry, better knowledge of and access to markets, improve the business operations of farms. Numerous factors can contribute to increasing the adaptive capacity to adapt to climate change including diverse sources of income, cash reserves, liquid assets, sustainable land management, farm investments, etc. Although farmers identified better soil and water management as an area needing attention, they will need to move away from the types of practices and production techniques that they are familiar with from collective farming to methods that are more in keeping with the current more limited availability of resources, farm size and that reflect more sustainable approaches.

Where LACs and other organizations have operated, farmers and farm workers have been able to capitalize on the assistance provided and proceed with restructuring collective farms and improving their rights irrespective of the type of farms in which they are shareholders or workers. Both farmers and NGOs expressed concern about support for land-related legal aid as some of the major funders have ceased financing or will change their geographical focus. At

present clients pay varying amounts for individual consultations, court representation, property appraisals, computer access and training and document preparation depending on the LAC approached but in general these services are highly subsidized. In the Focus Group Discussions farmers did express a willingness to pay for services which to date had been free, but whether this would be the full cost was not discussed.

APPENDIX C: THE TAJIKISTAN INSTITUTIONS FOR CLIMATE CHANGE ADAPTATION SURVEY

The survey data was collected in July-August 2012 in two districts of Tajikistan (Khatlon and Sughd).

Sample

The survey is representative at the district level (Khatlon and Sughd).

Within the two provinces, the sample was stratified to include upland and lowland areas, as well as areas that had received different exposure levels to a World Bank land titling project (Land Registration and Cadastral Survey Project).

A total of 17 rayons and 100 primary sampling units (PSUs) were selected. Within PSUs, households were selected using a random-walk method.

Survey instrument

The survey collected information on household composition and characteristics (including migration, assets, education, subjective poverty and food security, and consumption), land tenure, land use and practices, taxation, livestock, agricultural extension services, and climate-related shocks experienced.

It includes the following sections:

- A: Household roster (including family members residing abroad)
- B: Dwelling characteristics and distance to public service facilities
- C: Household energy use
- D: Household assets
- E: Inter-household transfers and taxes
- F: Short consumption module and sources of income
- G: Household decision making
- H: Subjective poverty and food security
- I: Farm information (titling and registration, experience of land restructuring); input use
- J: Crops planted and harvested and sold
- K: Livestock ownership and sales; rights to pasture
- L: Land management (improvements, leasing, investments)
- M: Access to agricultural extension services
- N: experience of shocks and coping strategies

APPENDIX D: SUMMARY STATISTICS

Table D1: Household and Farm Characteristics

	All farms	Khatlon	Sughd	Small farms	Collective farms	Difference (small-collective)	Presidential land only	Difference (presidential-collective)
Per capita consumption	135	139	137	137	131	5.487	143	12.06
Educational attainment								
PRIMARY (Grades 1-4)	0.002	0.000	0.002	0.003	0.000	0.003	0.000	0.000
BASIC (Grades 1-8/9)	0.032	0.027	0.033	0.024	0.037	-0.013	0.026	-0.011
SECONDARY GENERAL (Grades 9-10/11)	0.441	0.385	0.487	0.408	0.453	-0.045	0.472	0.019
SECONDARY SPECIAL	0.125	0.162	0.098	0.116	0.095	0.021	0.161	0.066**
SECONDARY TECHNICAL	0.122	0.152	0.075	0.121	0.115	0.006	0.092	-0.023
HIGHER EDUCATION	0.276	0.275	0.302	0.326	0.300	0.026	0.249	-0.051
GRADUATE SCHOOL/ASPIRANTURA	0.001	0.000	0.002	0.003	0.000	0.003	0.000	0.000
Asset index	-0.049	-0.228	0.247	0.086	-0.135	0.221	0.019	0.154
Number of people in the Household	8.074	8.787	7.048	8.218	7.502	0.716**	7.948	0.445
Number of people out of the Household	0.703	0.823	0.525	0.658	0.535	0.123	0.882	0.347***
Size of the cultivated area of land	7.0	5.4	9.7	10.2	12.4	-2.2	0.3	-12.1
Women-headed household	0.148	0.154	0.133	0.113	0.136	-0.023	0.200	0.064**
Does the household receive a transfer from outside	0.418	0.450	0.371	0.384	0.379	0.006	0.498	0.119***
Amount of transfers received from outside (in past 12 months, TJS)	2043	2044	2006	1735	1982	-248	2448	465
Sources of livelihood								
Income from self-employment	0.388	0.485	0.242	0.442	0.284	0.158***	0.308	0.024
Sales or bartering of farms products	0.372	0.319	0.417	0.461	0.473	-0.013	0.148	-0.326***
Pensions	0.504	0.519	0.483	0.468	0.465	0.003	0.590	0.125***
Benefits from the state	0.082	0.077	0.100	0.055	0.062	-0.006	0.154	0.092***
Help from relatives or friends	0.238	0.304	0.181	0.218	0.206	0.013	0.315	0.109***
Salary or Wages	0.558	0.558	0.565	0.508	0.514	-0.007	0.656	0.141***
Number of meals per day	2.704	2.662	2.823	2.792	2.675	0.117**	2.708	0.033
Subjective well-being								
Financial situation has improved in the past 3 years [subjective]	0.581	0.677	0.492	0.642	0.403	0.239***	0.669	0.266***
Food consumption of family is considered adequate [subjective]	0.630	0.654	0.585	0.713	0.572	0.141***	0.518	-0.054
Concerned about being able to provide family with food and basic necessities [subjective]	1.806	1.788	1.887	1.827	1.816	0.011	1.822	0.006
Subjective position on a 6-step ladder	2.943	2.994	2.981	3.063	2.938	0.125	2.898	-0.0399109
Household has livestock	0.840	0.887	0.779	0.847	0.823	0.024	0.823	0.000
Crop concentration index 2011	0.778	0.760	0.812	0.772	0.791	-0.020	0.806	0.015
Crop concentration index 2012	0.798	0.794	0.811	0.779	0.776	0.002	0.864	0.088***
Observations	1000	520	480	380	243		305	

Significance: * 0.10, ** 0.05, *** 0.01

Source: TJICCA survey

Table D2: Shocks experienced during the past 5 years

	General	Khatlon	Sughd	Small farms	Collective farms	Difference (small-collective)	Presidential land only	Difference (presidential-collective)
Drought	0.581	0.577	0.585	0.682	0.700	-0.018	0.374	-0.326***
Floods	0.100	0.140	0.040	0.134	0.070	0.064**	0.033	-0.037**
Landslides/Erosion	0.047	0.044	0.029	0.040	0.045	-0.006	0.020	-0.026*
Unusually High Level of Crop Pests and Disease	0.198	0.235	0.206	0.305	0.218	0.087**	0.128	-0.090***
Unusually High Level of Livestock Disease	0.036	0.058	0.021	0.037	0.021	0.016	0.036	0.0155
Unusually Expensive Agricultural Inputs	0.082	0.142	0.054	0.176	0.021	0.156***	0.059	0.038**
Unusually Low Prices of Agricultural Products	0.060	0.087	0.035	0.118	0.041	0.077***	0.016	-0.025*
Reduction in Wages or Job Loss of Household Member(s)	0.060	0.067	0.065	0.068	0.070	-0.002	0.056	-0.014
Serious Illness, Accident, or Death Household Member(s)	0.108	0.156	0.063	0.087	0.058	0.029	0.174	0.116***
Theft of Money/Valuables/Livestock/Crops/Agricultural Assets	0.008	0.017	0.000	0.013	0.000	0.014*	0.007	0.007
Conflict/Violence	0.005	0.004	0.008	0.000	0.000	0	0.016	0.016**
Fire	0.008	0.012	0.000	0.008	0.000	0.008	0.007	0.007
Other	0.078	0.140	0.029	0.132	0.045	0.087***	0.059	0.014
Observations	1000	520	480	380	243		305	

Significance: * 0.10, ** 0.05, *** 0.01

Source: TJICCA survey

Table D3: Proportion of households that have adopted SLM practices

	All farms	Khatlon	Sughd	Small farms	Collective Farms	Difference (small-big)	Presidential land only	Difference (presidential-big)	Male - Headed	Female - Headed	Difference in (Female - Male)
Water-saving practices such as drip irrigation	0.155	0.081	0.244	0.142	0.249	-0.107***	0.114	-0.135***	0.153	0.194	-0.041
Water harvesting or retention practices	0.209	0.096	0.331	0.159	0.298	-0.139***	0.177	-0.121***	0.210	0.201	0.009
River bank stabilization and protection	0.082	0.113	0.015	0.049	0.026	0.023	0.114	0.087***	0.068	0.056	0.012
Windbreaks (trees, shrubs)	0.051	0.058	0.063	0.071	0.057	0.015	0.047	-0.010	0.060	0.063	-0.003
Erosion control such as contour farming or terracing land	0.060	0.065	0.038	0.030	0.064	-0.034**	0.060	-0.004	0.048	0.076	-0.028
Intercropping trees and crops	0.062	0.071	0.048	0.077	0.064	0.013	0.023	-0.041**	0.063	0.042	0.021
Pasture improvement	0.014	0.021	0.010	0.022	0.011	0.011	0.007	-0.005	0.019	0.000	.0187*
Planting trees or other permanent crops for fruits/nuts, etc.	0.115	0.133	0.094	0.129	0.087	0.042*	0.107	0.020	0.118	0.090	0.028
Stallaction of biogas, solar energy or small hydro-power systems	0.004	0.008	0.002	0.005	0.000	0.005	0.010	0.010	0.006	0.000	0.006
Use of Integrated Pest Management techniques instead of pesticides	0.341	0.329	0.275	0.362	0.325	0.037	0.241	-0.083**	0.304	0.299	0.005
Organic Fertilizer or other soil conditioners for your land	0.429	0.346	0.544	0.466	0.442	0.024	0.398	-0.044	0.449	0.396	0.053
Observations	1000	520	480	365	265		299		856	144	

Significance: * 0.10, ** 0.05, *** 0.01

Source: TJICCA survey

Table D4. Summary statistics on adoption by gender, farm type and location

	Small farms			Collective farms			Khatlon			Sughd		
	Male-headed	Female-headed	Difference in Small farms (Female - Male-headed Household)	Male-headed	Female-headed	Difference in collective farms (Female - Male-headed Household)	Male-headed	Female-headed	Difference in Khatlon farms (Female - Male-headed Household)	Male-headed	Female-headed	Difference in Sughd farms (Female - Male-headed Household)
Water-saving practices such as drip irrigation	0.135	0.211	-0.076	0.244	0.275	-0.031	0.075	0.113	-0.038	0.236	0.297	-0.061
Water harvesting or retention practices	0.162	0.132	0.031	0.289	0.350	-0.061	0.100	0.075	0.025	0.327	0.359	-0.032
River bank stabilization and protection	0.052	0.026	0.026	0.027	0.025	0.002	0.118	0.088	0.031	0.014	0.016	-0.001
Windbreaks (trees, shrubs)	0.067	0.105	-0.038	0.058	0.050	0.008	0.052	0.088	-0.035	0.067	0.031	0.036
Erosion control such as contour farming or terracing land	0.025	0.079	-0.054*	0.067	0.050	0.017	0.059	0.100	-0.041	0.036	0.047	-0.011
Intercropping trees and crops	0.080	0.053	0.027	0.071	0.025	0.046	0.073	0.063	0.010	0.053	0.016	0.037
Pasture improvement	0.025	0.000	0.024	0.013	0.000	0.013	0.025	0.000	0.025	0.012	0.000	0.012
Planting trees or other permanent crops for fruits/nuts, etc.	0.138	0.053	0.085	0.098	0.025	0.073	0.130	0.150	-0.020	0.106	0.016	0.090**
Stallaction of biogas, solar energy or small hydro-power systems	0.006	0.000	0.006	0.000	0.000	0.000	0.009	0.000	0.009	0.002	0.000	0.002
Use of Integrated Pest Management techniques instead of pesticides	0.364	0.342	0.022	0.338	0.250	0.088	0.330	0.325	0.005	0.276	0.266	0.011
Organic Fertilizer or other soil conditioners for your land	0.486	0.289	0.197**	0.449	0.400	0.049	0.348	0.338	0.010	0.555	0.469	0.087
Observations	327	38	365	225	40	265	440	80	520	416	64	480

Significance: * 0.10, ** 0.05, *** 0.01

Source: TJICCA survey