

IMPACT ASSESSMENT

of

The COMMUNITY-OWNED SUSTAINABLE WATER USE AND AGRICULTURAL INITIATIVES (COSWA) PROJECT

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Acronyms

AZN – New Azerbaijan Manats

COSWA – Community- Owned Sustainable Water Use and Agricultural Initiatives project

FGDs - Focus Group Discussions

IOM – International Organization of Migration

N AR – Nakhchivan Autonomous Republic

SDC – Swiss Agency for Development and Cooperation

USD – United States Dollars

WUCs – Water User Committees

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Introduction

Since 2001 with support of the Swiss Agency for Development Cooperation (SDC) IOM has designed and implemented several community-driven development projects to renovate and repair traditional, eco-friendly and energy-free water systems called Chaheriz in Nakhchivan Autonomous Republic (NAR) and the western part of the mainland Azerbaijan. These projects pursued empowerment of the poor and mitigation of push factors for irregular domestic and cross-border economic migration largely driven by lack of jobs, low agricultural productivity and poor living standards in rural regions. Baseline livelihood assessments in NAR have found evidence that lack of access to regular potable and irrigation water was one of the main reasons of low agricultural productivity, widespread poverty and poor living standards.

A little more than two years into the current phase of the COSWA project IOM has been able to stick to the planned schedule of activities and undertake required community mobilization process in 21 communities. The project has nurtured the creation of 18 Water User Committees (WUCs) to ensure community ownership and maintenance of restored water systems and renovated 10 Chaheriz both in NAR and mainland. The renovation of 8 Chaheriz is ongoing and planned for completion by May 2007. By the end of 2006 communities have contributed up to \$20,634 into the cost of engineering and renovation work in 18 Chaheriz which accounted for almost 36 percent of total planned cost of all Chaheriz projects. 35 Cancans (refers to technicians undertaking engineering and construction work of Chaheriz) have received comprehensive training on Chaheriz engineering and construction.

Except regular project/donor monitoring and field visits to targeted communities, the project has not undergone external impact assessment exercise employing reliable, robust and representative research methods. This research therefore represents the first attempt to evaluate the project's impact on poverty and livelihood opportunities of communities who have renovated Chaheriz water systems with the support of IOM/SDC project.

This evaluation exercise has surveyed COSWA beneficiaries in target communities and examined project activities to answer the following questions: To what extent the project has improved access to potable and irrigation water? What is the magnitude and direction of the

project's impact on incomes of the population and agricultural productivity? Has project been successful in mitigating irregular labor migration? Has the project improved access to health care services? What have been effects of the project on asset accumulation and local infrastructure? To what extent the project has encouraged community initiatives to address other social and economic problems of the poor? Have the ownership, maintenance and use of water resources improved? What has been the impact of the project on women and children? How the project can leverage the impact of its interventions and improve the return on each dollar spent?

This assessment is not the performance evaluation of the project. It is not designed to appraise project achievements against performance indicators identified in the logical framework matrix (logframe) of the project. It is rather designed to pin down and analyze direct and indirect impact of the project on living standards and asset accumulation of households in targeted communities. In contrast to impact evaluation, a performance assessment study requires comparing the project achievements against the benchmark indicators identified in the logframe. When appropriate and as required this impact assessment task will incorporate performance assessment of the project to some extent.

This paper consists of three sections following the introduction. The first section provides detailed description of the multiple quantitative (Household-Level Impact Survey, Community-Level Impact Survey, Project Indicators, etc.) and qualitative research methods (focus group discussions, field visits, etc.) and sources of data employed in this assessment. The second section looks at the components of the COSWA project, the project development cycle process which blends traditional knowledge on eco-friendly sustainable water resources with the modern development concepts and technology. The third section investigates multi-pronged socio-economic benefits and impact of the project in target communities, specifically looking at and examining demographics and asset status of households, the magnitude and direction of changes in access to potable and irrigation water, productivity and household incomes, optimization of water use, irregular immigration, jobs created, access to health services, asset accumulation, food security, ownership of water resources, empowerment of women, etc.

Research Methodology and Data

The scope of this evaluation exercise is limited to examination of social and economic benefits of the COSWA project in communities who renovated Chaheriz water systems. Six communities (6) who renovated Chaheriz are located in NAR, whereas three (3) of them are in the mainland. As of this writing the renovation of eight (9) Chaherizes, six (6) in NAR and three (3) in the mainland, are continuing scheduled for completion by summer 2007.

For obtaining the most reliable, unbiased and representative picture of the impact of the project interventions in targeted regions, this study employed both quantitative and qualitative research methods. For quantitative analysis of the assessment the study has used descriptive and inferential statistical/data analysis methods. The qualitative research methods included field visits, focus group discussions, examination of project reports and operational manuals and other primary and secondary sources of policy research on the impact of improved access to water resources on agricultural productivity and sustainable livelihoods.

The study used three main data sources for the quantitative analysis of the project's impact. These included (i) COSWA Assessment Survey for measuring household impact of the project, (ii) COSWA Community Survey for measuring community level impact and (iii) Project Indicators.

This evaluation study has extensively used COSWA assessment survey to estimate population parameters and to draw conclusions on household-level effects of improved access to water resources in targeted regions. IOM hired an external consultant to design and administer this survey in 9 communities (6 in NAR and 3 in the mainland). These communities were chosen because they have finalized the renovation process of Chaheriz projects in their villages by the time when the survey actually started in January 2007. The entire survey lasted for about a month and finished in February 2007.

The consultant administered the entire process of data collection and processing. The survey questionnaire was designed in a way to measure multi-pronged benefits of the project on the

social and economic life (See Appendix 1 for the sample survey questionnaire). The consultant also conducted full-day training for the team of interviewers on the design of sample, interviewing techniques, recording responses and taking notes for open-ended questions to ensure quality and reliable data collection.

The survey sample was chosen through random probability sampling techniques from the entire population of 30,284 and 6436 households from 9 communities, which have received technical and financial assistance for improving access to water resources. The probability sampling design ensured that each household in the village has equal chance to be selected for the COSWA assessment survey. The interviewers were asked to visit every third household in row and interview one of the adult members (aged 16 or more) from each family in every village. First each household was introduced to the reason and purpose of the survey, after which interviewers requested respondents to answer questions listed in the questionnaire. In total the survey produced a simple random sample of 468 observations (7 percent of total beneficiary households), large enough to make estimates unbiased and closer to actual population parameters (See Appendix 2 for the summary statistics of the COSWA Assessment Study). Depending on the size of the community the survey duration varied from one village to another, therefore producing different samples proportional to the population of each village.

COSWA community survey provides aggregate data for each village. The COSWA project designed and conducted it to provide supplementary aggregate data and some qualitative information for the detailed COSWA assessment survey. The subjects of the community survey were the leaders of WUC in each community. This survey was designed to collect information on beneficiaries of each renovated Chaheriz, the history of each Chaheriz, details of the renovation work and cost, management and control over water resources, as well as changes in the socio-economic status of the population (See Appendix 3 for a sample COSWA Community Survey). In total the sample of this survey included 9 observations, one for each community which completed the Chaheriz project (see Appendix 4 for the summary statistics of the community survey).

Project indicators are drawn from the COSWA project reports as appropriate and when required. They provide data on inputs of the project, outputs produced, and results. Project indicators enable us to compare project reports on accomplishments and impact to the household and community perception on project's contribution to the welfare of the population.

Focus group discussions (FGDs) represent the major qualitative research technique used in the impact assessment of COSWA. FGDs aimed at collecting qualitative information on the benefits of the Chaheriz project, the form and level of impact on the community, concerns and limitations of the Chaheriz use, as well as future perspectives and recommendations for further interventions. The project staff designed and administered FGDs in 7 communities.

The subjects of FGDs were 10 - 32 water users in each community. Each discussion lasted up to an hour and half. FGDs were designed and conducted by the project staff according to the standard manual specifically put together for the administration of FGDs (See Appendix 5 for FDG manual). Every discussion started with the explanation of the purpose of the discussion. The interviewers ensured participants that information they provide will be used only for aggregate-level analysis of the project's impact on the community and will be kept confidential.

Interviewers facilitated discussions according to the list of standard questions used during each FDG. FGDs specifically sought to collect information on past and current socio-economic status of households in the community, Chaheriz water impact on availability of potable and irrigation water, the process of decision making during the renovation of Chaheriz, and gender as well as environmental concerns. FGDs were conducted in February 2007.

Other qualitative data sources used for this assessment study include project reports, project lessons learnt and field visits.

This study has used numerous research methods to collect adequate quantitative and qualitative data on the impact of the COSWA project in targeted communities. The combined use of

qualitative and quantitative research enables the study to examine multi-sectoral impact of the project and to draw robust conclusions.

Limitations of the Study

This study is the medium-term evaluation of the COSWA project. By definition this implies that not all the socio-economic impact of the project can be felt and assessed in this paper. Many socio-economic effects of the project will evolve gradually over time. Therefore, final impact evaluation of many development projects is usually undertaken several years after the completion of the project.

This particular impact assessment study has employed both quantitative and qualitative research techniques in an attempt to capture all realized socio-economic impact of the project. However, no good study can capture and assess the impact of development projects with long gestation periods, such as the COSWA project. Completion of the renovation process of some Chaherizes only couple of months before the surveys and focus group discussions, allowed the study to capture limited benefits of these Chaherizes.

More specifically the author would like to pin down following limitations of the study:

- Households with houses and cropland at higher altitudes have benefited from Chaherizes to a limited extend, thus biasing the results of the household survey downwards.
- Renovation of some Chaherizes finished after the end of the crop-growing season, generating no apparent positive impact on agricultural production. As such reported positive effects of the project in the study are conservative estimates.

Project Description

Blending proven traditional knowledge with modern technology & development concepts

The design and implementation of the COSWA project integrates traditional knowledge of sustainable and eco-friendly water resources with modern developmental concepts and technology to mitigate irregular labor migration and deleterious socio-economic impact of poverty on the population in NAR and mainland Azerbaijan.

The traditional and eco-friendly water systems are referred as Chaheriz (Kəhriz in Azerbaijani), horizontal underground tunnels dug along the slopes to direct ground water to the surface. They were widely built and used in Azerbaijan before the Soviet era to meet potable and irrigation water needs of communities and to extend agriculture to arid areas. Communities contracted *Cancans*, traditional title used for the profession referring to engineers of Chaheriz, to map, engineer and undertake the construction of these water resources. Developmental concepts IOM has infused into the COSWA project included community mobilization, community driven planning process, and technical and management expertise shared with communities to empower and enable them to renovate dilapidated Chaheriz. The application of winches and oval ring reinforcement technology reduces drudgery and provides safety to Cancans.

Historical evidence suggests that Chaheriz technology evolved in the territory of current Iran and spread across the desert and other semi-arid areas of Europe and Asia. As Chaheriz requires no energy to function, this technology lends itself ideal for energy scarce environments. Nearly all agricultural production in Azerbaijan is irrigation fed (World Bank. 2006. Country Partnership Strategy FY 07-10 for Azerbaijan. November 2006. p. 26) and mostly energy dependent. However, the rural electricity infrastructure and supply is highly unreliable with frequent and extensive power cuts and low voltage. This lends the current irrigation infrastructure sub-optimal in energy scarce environments.

Extensive application of the artesian technology for pumping out deep ground water for irrigation and potable water poses another major challenge for the environment and irrigation infrastructure of the country. Large scale exploitation of waters of deep aquifers through artesian technology results in rapid depletion of underground water reserves. This significantly shortens the life of artesian wells leading to ineffective use of scarce public resources. Field surveys in central regions of Azerbaijan show that numerous communities currently face this problem and suffer consequences of lost resources put into the development of dried up artesian wells. Estimates from recent artesian projects put costs for developing a single artesian well around 15,000 USD. In the long-run the extensive use of this technology will cause irreversible changes in the system of deep aquifers all over the country.

In addition using the artesian technology is very costly. Excluding some exceptions almost all artesian wells need electricity for pumping water out from aquifers. The need for electric power varies depending on discharge potential of artesian wells and the power of pumps. Reportedly the medium-scale artesian well needs a pump which requires 15 KWt/hr electric power on average. The current government regulated price of 1KWt/hr of electric power is 6 qapik (around 7 cents) (Khalg newspaper. January 12, 2007). If a community uses this artesian well for 10 hours a day, then the artesian water per day costs 9 AZN (10.5 USD) to the community. In a month this adds up to 270 AZN (315 USD), making the artesian water quite costly for many communities in general, and for poor water users in particular. .

In sharp contrast to the artesian technology, Chaheriz technology revived and promoted by the COSWA project in Azerbaijan effectively blends traditional knowledge with modern technologies and development concepts, and offers energy independent sustainable solution for drinking and irrigation water needs. Low-cost operation of Chaherizes makes them ideal source for irrigation and potable water for many communities and poor villagers.

For sustainable use and maintenance of Chaheriz water resources, the COSWA project has chosen to apply carefully tailored community-owned water distribution and management model for the planning and renovation of Chaheriz projects. The main building blocks of this

model are community mobilization process, establishment of fully functional and gender balanced WUCs, community contribution to the cost of the project through cash input and the credit re-payment scheme, training of the young generation of Cancans to revive the traditional profession and create jobs and demand driven provision of the technical know-how and expertise on project planning and finance, water distribution and sharing mechanisms to enhance the access to and effective use of water resources.

Chaheriz Project Cycle or Step-by-Step towards Sustainable Water Resource

The Chaheriz renovation project follows proven project cycle analysis to identify the project with the highest rate of return and the least cost to communities, the environment and the project. The project analysis begins with the identification of socio-economic problems in a given village and its sources. If roots of a problem are found to be related to availability and access to water, then the project analysis moves to the next phase: discussions with villagers, representatives of municipalities and executive committees, assessment of community livelihoods, the level of community synergy and its willingness to participate in the planning and execution of the renovation process. The examination of different alternatives (if it is very costly or impossible to renovate Chaherizes) for addressing the water problem is also undertaken in this phase.

Depending on the status of discussions and results of the assessment, the project team begins the community mobilization and capacity building of a community. The project brings together all the users of a Chaheriz), who then elect members of the Water User Committee (WUC) to manage and oversight the renovation process. Then the project engineer undertakes the technical assessment of potential two or three Chaheriz, which the community has prioritized for renovation. The technical assessment includes mapping of Chaheriz, estimation of water volume and the preliminary cost of renovation, preliminary hydro-geological report, and identifies potential Cancans who can undertake the final construction work.

The WUC based on the technical assessment report finalizes the cost of the project with the team of Cancans. Communities collect five (5) percent of the cost of the project in advance of

any agreement with IOM.¹ Then the community inks the cost and schedule agreement reached with Cancans and prepares the action plan identifying different stages. The agreement between WUA and IOM on opening of a credit line follows this agreement. Loan is provided at 18 percent per annum. The project makes all payments for the renovation of Chaheriz to WUC. WUC is also responsible for gradual collection of the credit from the community the project provides for Chaheriz renovation, which then COSWA. When the community repays the credit back, COSWA contributes the interest income to the maintenance fund established to undertake regular maintenance of Chahezires.

Community Ownership and Development

Community mobilization and planning process begins with the communication of essential project information to communities including but not limited to information on COSWA's objectives, requirements for community contribution and participation, maintenance issues, water user fees, gender issues, and repayment of the project credit to potential beneficiaries. The first community meeting is followed by detailed survey of potential beneficiaries of the Chaheriz project to determine socio-economic status of the community. Along with the community survey, the COSWA team reconnoiters all Chaherizes in the village and collects summary data on the history, current condition and feasibility of Chaherizes.

The backbone of the community mobilization process of the COSWA project is formation and training of WUCs. WUCs receive their legitimacy and authority from the community. The community can make decisions and elect WUC if 60 percent of all potential beneficiaries participate in the meeting organized by COSWA for the creation of WUC. The community also elects a leader, secretary, treasurer and the remaining 10-16 of WUCs. WUCs bear the responsibility for overall oversight and support of Chaheriz renovation projects. It also makes and records all payments for the renovation, collects user fees and necessary funds for

¹ COSWA requires 5 percent advance community contribution to measure the level of community mobilization around the project and to ensure community ownership of Chaherizes. In a sense the advance contribution corresponds to the "willingness to pay" concept in economics, which attempts to price a product/service to be produced/provided.

repayment of the credit to the COSWA project. For building planning and management capacity of WUC members, the project team provides 4-day training for each WUC.

WUCs are formed not only for addressing water/irrigation problems or the renovation of Chaheriz. They can also plan and mobilize communities for addressing other priority socio-economic problems and mobilize necessary resources for these purposes. The project instructs WUCs and makes utmost efforts to involve local Cancans in the renovation of Chaheriz thus contributing to local capacity building and job creation. Active community participation and say in the planning and execution of Chaherizes ensures and improves community ownership of renovated Chaheriz.

Funding Chaheriz Renovation

The renovation of Chaherizes is funded from three sources for best results and ensuring community ownership of the end product i.e. renovated Chaheriz. These sources include community contribution (in kind or cash), grant and credit the project provides to the community. In-kind or cash community contribution amounts to 10 percent of the total estimated cost of the project, 5 percent of which is collected and deposited at IOM prior to signing any agreement with WUC. Community contribution to the project cost serves as a signal of the urgency of the water problem for the community and community's willingness to take active part in the execution of the renovation process.

The project grant usually amounts to 70 percent of the total cost, whereas the project can provide credits (at 18 percent per annum) to the community up to 20 percent of the total cost of the project. COSWA returns the interest income to communities as its contribution to the maintenance fund. Communities may and have contributed more to the project cost, thus enabling the project to undertake the renovation of more than planned Chaherizes.

The described funding scheme of the renovation work ensures maximum ownership of renovated Chaherizes. The community contribution also measures the readiness of the community to contribute to the maintenance fund in post-renovation period to meet regular maintenance cost of Chaherizes, which requires 50-100 USD annually. Higher rate of

community contribution and project credit also releases funds, which the project can direct to the renovation of more Chaherizes.

Aggregate Achievements of COSWA

Computations based on the data from the Community-Level Impact Survey and “Chaheriz Fact Sheets” of COSWA point to significant deliverables. The project has completed the renovation of 9 Chaherizes in 9 villages with the total population of 30,284 people and 6,436 households (See appendix 4) Total cost of completed projects adds up to 93,347 USD, of which 60,673 USD were contributed by COSWA as grants to communities, 20,452 USD COSWA loaned to communities as credits (communities either repaid these loans or in the process of paying back for completed projects), 12,222 USD were contributed by communities as labor, in-kind or cash. The COSWA projects have increased the average 28.5 liters per second discharge of Chaherizes to 162.2 liters per second after the renovation. The renovated Chaherizes provide irrigation water for 1061 households and drinking water for 666 households. Chaherizes also enabled the irrigation of additional 303 ha land.

The Role of the Government

Government organizations (regional executive committees, regional divisions of line ministries, state committees, etc.) and municipalities have played active role in the execution of Chaheriz projects. In many communities they were advocates and active supporters of projects for the renovation of Chaharizes. In NAR, inspired by the positive impact and advantages of the Chaheriz technology introduced by COSWA, the NAR Government has established the Chaheriz Department to replicate the experience of IOM in other communities, to provide technical assistance to communities willing to renovate Chaherizes, to map Chaherizes, learn their history, and eventually address growing water needs of rural villages. By establishing this department the government has taken important step towards the institutionalization of Chaheriz water systems and integration of these water systems to the overall irrigation and melioration infrastructure of the country.

The active support of government organizations to the renovation of Chaherizes brought up in all focus group discussions. Community members identified the government as an important

supporter of Chaheriz projects. In Safikurd village in mainland, community members referred to the government support and real contribution in construction materials indispensable for the realization of the Rahimbeyli Chaheriz project. To make this project possible, the government contributed large diameter pipes to the Safikurd community estimated at 4,000 USD. This enabled the community and the project to undertake the project estimated at 14,000 USD, being one of the largest Chaheriz projects undertaken by COSWA. The executive committee of Goranboy, the district to which the Safikurd village belongs, requested COSWA to renovate more Chaherizes in the region and pledged their further support to projects similar to Rahimbeyli Chaheriz.

Socio-Economic Impact of the COSWA Project

Per its mission the COSWA project is a socio-economic development project. Its interventions and services have been designed to improve livelihood opportunities of communities by providing potable water for villagers and irrigation water for agriculture initiatives. The concept of empowerment of beneficiaries was an end objective itself and also part of Chaheriz renovation process through community mobilization, planning and capacity building. Job creation and productivity improvements resulting from the project activities are expected to nurture accumulation of physical, financial, human, social and land capital on the side of beneficiaries and empower the men and women to negotiate better deals for themselves vis-à-vis the state and markets.

In order to examine and specify the impact of the COSWA project on living standards of the population, this assessment task will first look at demographic characteristics of beneficiaries and take stock of their assets. Then it will examine and specify the impact of the project in details largely using the data from the COSWA household-level and community-level surveys. Specifically this task will examine the impact of the project on a) access to potable and irrigation water, b) optimizing water utilization c) incomes of local population, d) growth of productivity and the local economy e) migration f) access to health services g) asset accumulation h) local infrastructure development i) community participation and ownership of water resources j) women empowerment and k) capacity building.

Demographic Characteristics and Asset Status of Beneficiaries

The analysis of the Household Impact Survey data shows that on average beneficiary families consist of 4.82 persons, of which on average 2.56 persons are children (less than 16 years old), 1.75 persons are adult women and 1.69 are adult men. Such a distribution of basic demographic data demonstrates that women and children have been major beneficiaries of the COSWA project (See table 1 for more details). Almost 46 percent of beneficiary families have more than 2 children and 45 percent of families have more than one woman members. The share of women in families of different size for the most part exceeds the share of men. Large

families amount to the largest share of the project beneficiaries. 80 percent of families have more than 3 members.

Table 1: Demographics of beneficiaries

Count / family members	Distribution of households by				Family members engaged in farming
	Family	Children	Women	Men	
1	5.78	16.8	54.61	58.09	46.76
2	5.78	37.4	26.32	22.78	29.46
3	8.99	27.64	15.13	14.12	10
4	22.27	12.74	2.63	3.64	6.76
5	23.98	3.25	0.88	0.68	3.78
6	17.13	1.08	0.22	0.23	1.35
more than 6	16.06	1.08	0.22	0.46	1.89
Total	100	100	100	100	100

Source: COSWA Household Impact Survey & author's calculations.

However, participation rate of male members of beneficiary families in the Household Survey has been much higher than female members. 74 percent of respondents in the survey were men. Traditions which do not favor women's communication and interaction with outsiders, and larger socio-economic role assigned to men in rural communities largely explain the lower rate of female participation in the survey. Factors causing lower female participation in the survey are very likely to be at play in female participation in the community mobilization and planning process as well. Later we will look at community level aggregate data and focus group discussions to examine whether this is the case with female participation in other community development initiatives as well.

Table 2. Distribution of household survey respondents by gender.

Gender	Count	Percent	Cumulative	Cumulative
			Count	Percent
Men	347	74.15	347	74.15
Women	121	25.85	468	100.00
Total	468	100.00	468	100.00

Source: COSWA Household Impact Survey & author's calculations.

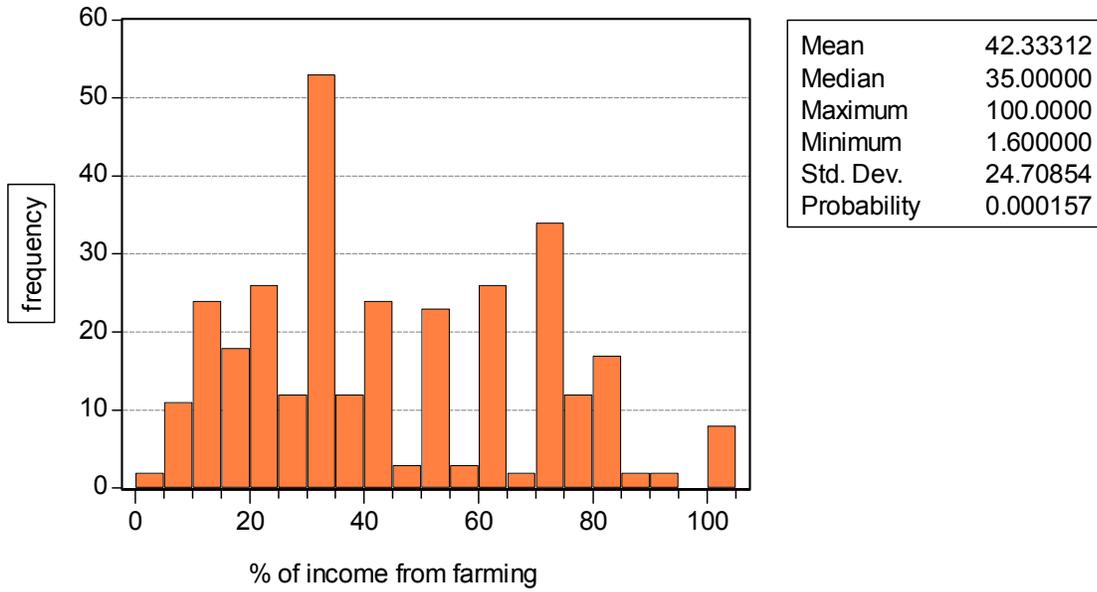
The survey data also points to importance of farming and agricultural employment for beneficiaries of the COSWA project. On average farming and agriculture provides employment for 2.04 persons in each family in the targeted region. The variance of the number of family members engaged in farming is 1.43 persons around the average. This implies that close to half of 4.82 persons per family is engaged in farming, which provides livelihoods and income for the entire family. In general the average employment figure per household corresponds to 13,129 jobs in 9 target regions², implying that agriculture employs 43 percent of total population.

The household survey data shows that for 24 percent of families, farming provides employment for more than 2 members of the family. One can easily imagine the scale of impact the COSWA project may have on the living standards of beneficiaries through improvement of productivity and income generated in rural agriculture. This evidence however justifies the effectiveness of project's focus on rural communities and farming for mitigation of push factors of labor migration and improving living standards.

Farming also provides substantial share of the annual income of households. On average it accounts for 42 percent of total annual income of households with 25 percent variation around the mean (See figure 1 for details). However disaggregating this average reveals that for 8 percent of households, farming accounts to 80 to 100 percent of income, whereas 67 percent of rural families earn up 60 percent of their income from agricultural activities (See table 3). Statistical analysis reveals that the probability of getting these results by chance is close to zero. More income from agriculture also translates into more employment opportunities. Simple regression model shows that 0.4 percent increase in farming income is associated with 1 percent increase in agricultural employment for households (See figure 2).

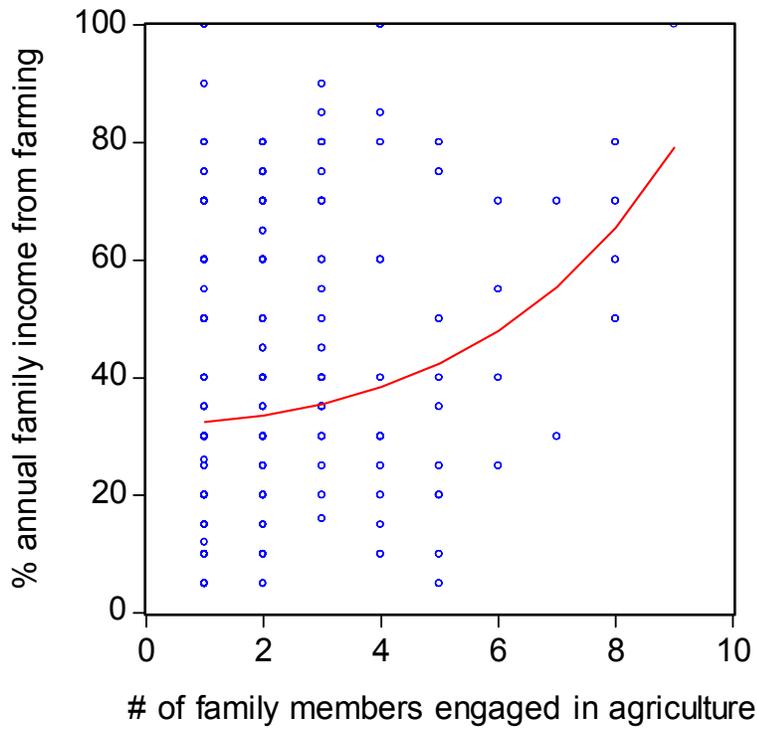
Figure 1. Frequency distribution of percent of income from farming

² Total number of jobs = total number of households (See appendix 4) X average number of family members employed in agriculture.



Source: COSWA Household Impact Survey & author's calculations.

Figure 2. Association between farming income and employment



Source: COSWA Household Impact Survey & author's calculations.

Table 3. Conditional distribution of “family members employed in agriculture” and “percent household income from farming”

# of family members engaged in agriculture	Percent household income from agriculture					
	[0-20)	[20-40)	[40-60)	[60- 80)	[80-100)	Total
1	24.63	36.57	14.93	18.66	5.23	100
2	13.13	29.29	17.17	33.33	7.07	100
3	3.03	27.27	27.27	24.24	18.18	100
4	15	35	5	15	30	100
5	20	40	20	10	10	100
6	0	25	50	25	0	100
7	0	50	0	50	0	100
8	0	0	25	50	25	100
9	0	0	0	0	100	100
Total	16.94	32.57	16.94	24.1	9.45	100

Source: COSWA Household Impact Survey& author’s calculations

Land assets of beneficiary households vary greatly from as small as 0.003 ha to as large as 196 ha of land. However, an average household owns 3.89 ha of land. Since the distribution of land holdings traditionally shows great inequality, the median as a measure of the center of the distribution is more advisable for use than the mean. According to the household impact survey, the median household owns 1 ha of land, which is used for farming of agricultural produce both for selling and household consumption. Almost 97 percent of households hold in possession land parcels up to 20 ha (See table 4). All these evidences point to more or less equal distribution of land assets in target communities.

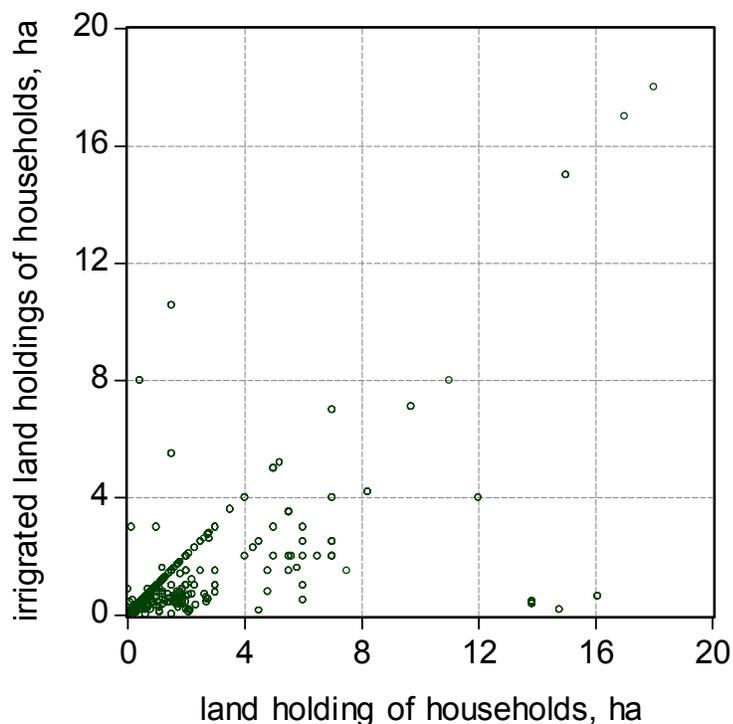
Table 4. Land assets of households

Ha land	Households		Cumulative	
	Percent	Count	Percent	
[0, 20)	96.72	443	96.72	
[20, 40)	1.09	448	97.82	
[60, 80)	1.09	453	98.91	
[80, 100)	0.66	456	99.56	
[120, 140)	0.22	457	99.78	
[180, 200)	0.22	458	100.00	
Total	100.00	458	100.00	

Source: COSWA Household Impact Survey& author’s calculations

The household survey data reveals acute problems with the irrigation of land holdings. On average, households can irrigate only 2.24 ha land out of 4 ha land they own.³ Whereas land area of individual households can be as large as 196 ha, the maximum land area irrigated currently remains at 84 ha according to the survey data. These findings point to large productivity and potential job losses due to inadequate irrigation in rural Azerbaijan. As seen in the **figure 3** large land parcels are left without irrigated by households due to limited availability of irrigation water. 98 percent of households own land assets up to 20 ha, of which 99 percent can irrigate only half of their land parcels. These evidences once more reveal the extent and urgency of irrigation problems in rural communities.

Figure 3. Land owned vs. irrigated by households. (the scale truncated at 20 ha for clarity of the graph)



Source: COSWA Household Impact Survey & author's calculations

Households in COSWA targeted rural communities grow several major agricultural crops in their land. They include but not limited to wheat, various fruits and melons, vegetables,

³ Source: COSWA Household Impact Survey Data.

Lucerne, potato, beet sugar and maize. However, the pattern of crops indicates that there are several preferred agricultural crops across households. Almost more than 90 percent of households prefer to grow wheat, various fruits, melons, vegetables, and Lucerne in their land (See table 5). It is worth to mention that this pattern holds true for the first, second and third crops grown by households.

Table 5. Crops grown by households

Crops grown	As a first crop		As a second crop		As a third crop	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Wheat	126	30.58	46	19.17	19	19.00
Fruits	73	17.72	50	20.83	32	32.00
Melons	38	9.22	31	12.92	4	4.00
Vegetables	75	18.20	38	15.83	27	27.00
Lucerne	86	20.87	60	25.00	12	12.00
Potato	8	1.94	5	2.08	0	0.00
Beet sugar	4	0.97	9	3.75	6	6.00
Maize	2	0.49	1	0.42	0	0.00
Total Counts & percent	412	100.00	240	100.00	100	100.00

Source: COSWA Household Impact Survey & author's calculations

Only around 6 percent of households grow potato, beet sugar and maize as their first, second or third choices in their land. Water intensive nature of these high-yield and cash crops lends itself as one of the reasons for lower number of households choosing to grow these agricultural crops in an environment of scarce water availability. Higher cost of energy, fertilizers and use of agricultural machines are other factors which might be at play in the sub-optimal pattern of household choice of crop farming in rural communities. This picture demonstrates the need for complex and integrated community-based interventions to address productivity issues in the agricultural sector for improving livelihood-making opportunities of people.

Access to Potable and Irrigation Water

Improving access of households to water from Chaherizes or in exceptional cases from other eco-friendly water systems has been one of the major objectives pursued by the COSWA project. The project planned to achieve this objective through mobilizing and organizing

around 25 communities, training 20 teams of Cancans and building or renovating 18 Chaherizes. The project reports and the community-level impact survey show that the project is well positioned to attain these results. So far the project has mobilized 21 communities, facilitated creation of 18 WUCs, trained 35 Cancans and completed the renovation of 9 Chaherizes while the renovation of 9 water systems are in process.

Statistics from the household impact survey verify results of the community-level impact survey and demonstrate substantial improvement in access of households to potable water in surveyed rural communities. The tabulation of household responses indicates 69 percent decline in poor access to drinking water across COSWA communities after the renovation of Chaherizes (See table 6). Whereas around 73 percent of households had inadequate access to drinking water before the interventions of, this rate declined to 4.1 percent in aftermath of interventions. The percent of households with satisfactory access to potable water shows several-fold increase. After the renovation of Chaherizes percentage of households with adequate access to potable water has increased from around 27 percent to 95 percent in total.

Table 6. Distribution of data on access to potable water before and after Chaheriz renovation

Access to water	Before Chaheriz		After Chaheriz	
	Frequency	Percent	Frequency	Percent
Not-available	0	0.0	1	0.51
Inadequate	167	73.25	8	4.08
Adequate	61	26.75	187	95.41
Total	228	100	228	100

Source: COSWA Household Impact Survey & author's calculations

The picture from the conditional distribution of households by access to drinking water before and after the renovation of Chaherizes also concurs with the results drawn from the simple tabulation of the data (See table 7). Renovation of Chaherizes improved access to potable water of 95 percent households with inadequate access to drinking water. This impact of the COSWA project bypasses only 4.3 percent of households in rural communities, who respond that their access to potable water with the renovation of Chaherizes has not improved in anyway. Of

those surveyed 0.6 percentage of households has no access to drinking water at all and this situation doesn't show any change after COSWA interventions.

Table 7. Conditional distribution of access to potable water before and after Chaheriz renovation

Frequency % Row	Access to potable water	AFTER Chaheriz renovation			
		Not available	Inadequate	Adequate	Total
BEFORE Chaheriz renovation	Inadequate	1	6	134	141
		0.71	4.26	95.04	100.00
	Adequate	0	0	15	15
		0.00	0.00	100.00	100.00
	Total	1	6	149	156
		0.64	3.85	95.51	100.00

Source: COSWA Household Impact Survey & author's calculations

Similar improvements are seen in access of households to irrigation water after the project interventions. The household impact survey data show that availability of irrigation water has improved by 11 percent after the renovation of Chaherizes in COSWA communities, whereas the number of households with inadequate access to irrigation water has declined by 44 percent. In similar lines the number of households with adequate access to irrigation water has increased by more than 53 percent (see table 8).

Table 8. Access to irrigation water before and after Chaheriz renovation

Access to water	Before Chaheriz		After Chaheriz		Difference before and after Percent
	Frequency	Percent	Frequency	Percent	
Not-available	70	27.67	47	16.73	↓10.94
Inadequate	126	49.80	18	6.41	↓43.39
Adequate	57	22.53	216	76.87	↑54.34
Total	253	100.00	281	100.00	

Source: COSWA Household Impact Survey & author's calculations

Tabulation of data on access to irrigation water finds statistically significant improvements in availability of irrigation water in targeted communities. Almost 66 percent of households who did not have access to irrigation water before the renovation of Chaherizes have gained access to adequate irrigation water after the COSWA interventions, while around 7.4 percent of households had somewhat improved their access to irrigation water (See table 9). The COSWA interventions have improved access to irrigation water for 62 percent of households who had inadequate access to irrigation water before the renovation of Chaherizes. The COSWA interventions did not have any impact on around 9 percent of households who had inadequate access to irrigation water.

The tabulation of the household survey data reveals one controversial finding. It appears that 29 percent of households, who had inadequate access to irrigation water, lost their access to irrigation water after Chaherizes. This percentage is quite lower compared to 62 percent of households who significantly improved their access to irrigation water. Nevertheless, the finding begs its explanation. The gradual deterioration of access to irrigation water driven by poor or no maintenance of state owned large-scale irrigation infrastructure, and rising average temperatures across rural communities which reduces overall availability of water appears to be the most reasonable explanation.

Table 9. Conditional distribution of access to irrigation water before and after Chaheriz renovation

Frequency % Row	Access to irrigation water	AFTER Chaheriz renovation			
		Not available	Inadequate	Adequate	Total
BEFORE Chaheriz renovation	Not available	18	5	45	68
		26.47	7.35	66.18	100.00
	Inadequate	29	9	62	100
		29.00	9.00	62.00	100.00
	Adequate	0	1	21	22
		0.00	4.55	95.45	100.00

Total	47	15	128	190
	24.74	7.89	67.37	100.00

Source: COSWA Household Impact Survey & author's calculations

The data also demonstrates significant positive association between access to irrigation and potable water in rural communities after the renovation of Chaherizes (See table 10). COSWA interventions have substantially improved access of 71 percent of households both to irrigation and potable water. Of those with adequate access to potable water 7 percent remained with inadequate access to irrigation water after Chaherizes, whereas for around 22 percent of households improvements in access to potable water have not had any impact on their access to irrigation water. On the other hand 25 percent of households, who have gained adequate access to irrigation water as a result of Chaherizes, remained with inadequate access to potable water after COSWA interventions.

The fact that communities renovated some Chaherizes to meet only irrigation or drinking water needs explains figures on no or little association between access to potable and irrigation water. According to project reports, 4 out of 9 Chaherizes were renovated only for irrigation water purposes and two Chaherizes were renovated to provide only drinking water (Appendix 4).

Table 10. Conditional distribution of access to potable water vs. irrigation water after Chaheriz renovation

Counts	Access to irrigation water after Chaheriz				
		Not-available	Inadequate	Adequate	Total
% Row					
Access to potable water after Chaheriz	Adequate	41	13	131	185
		22.16	7.03	70.81	100
	Total	46	14	134	194
		23.71	7.22	69.07	100

Source: COSWA Household Impact Survey & author's calculations

The renovation of Chaherizes by communities with the technical and financial support of COSWA has not only improved availability of and access to water as evident from the analysis so far, it has also reduced the distance of families to both potable and irrigation water as well.

The project interventions have reduced distance to potable water for almost 86 percent of households and distance to irrigation water for 84 percent of households in the rural communities targeted by COSWA (See table 11). Welfare gains of households from the reduced distance to water is difficult to measure, but the impact on the living standards of households of closer distance to water resources is usually immense. In rural communities closer distance to potable water provides immense benefits for the health of households and reduces work hours women spend for housekeeping.

Table 11. Distance to water resources

	Distance to potable water decreased after Chaheriz		Distance to irrigation water reduced with the Chaheriz	
	Frequency	Percent	Frequency	Percent
No	60	14.39	54	15.98
Yes	357	85.61	284	84.02
Total	417	100	338	100

Source: COSWA Household Impact Survey & author's calculations

Optimizing Water Utilization

Optimizing water utilization across communities which have renovated Chaherizes has been one of the major objectives of the COSWA project. The Household Impact Survey and Focus Group Discussions with WUC members reveal significant improvements in water utilization in COSWA communities. Every community which has renovated Chaherizes developed water sharing schemes for irrigation with assistance from the COSWA project. The use of water for irrigation depends on the scale of contribution of a household to the maintenance fund of Chaheriz, location and size of the land parcel and total number of users. Households use Chaheriz water for irrigation according to pre-determined order. The access to Chaheriz water for drinking and other household needs is unrestricted and open to all community members.

Geographical position of land areas and houses naturally restrict or exclude some households from benefits of Chaherizes. Community members singled out distance of households to Chaheriz water and location of land areas and houses at high altitudes as two major reasons restricting some households' use of Chaheriz water.

Active community participation in selection of Chaherizes in villages with more than one Chaheriz ensured that the Chaheriz with the potential and capability to benefit the most number of households is chosen. During focus group discussions across communities villagers singled out the project's involvement of communities in decision making at all levels as very useful practice, which enabled the selection of the most efficient Chaherizes with the highest potential to benefit the larger number of villagers.

The COSWA household impact survey also verifies the optimization of water use in selected communities after the project interventions. On average 2 ha of land out of irrigated average 2.24 ha land of households is irrigated by water resources of renovated Chaherizes. Since the distribution of land ownership in target villages shows great disparity, using median figures for estimates of land ownership and irrigated land would provide more reliable picture of the real situation. Again the household impact survey indicates that the median land parcel irrigated by Chaheriz water is 0.4 ha out of 0.62 ha irrigated in total. Tabulation of the survey data depicts similar picture (See table 12). 97 percent of land parcels up to 1 ha in COSWA communities are indeed irrigated by Chaheriz water. In similar lines water from Chaheriz is used for irrigation of 69 percent of land holdings between 1 - 2 ha. These results demonstrate that additional water resources from Chaherizes mostly benefit the households with small land parcels indicating good level of targeting of the COSWA project benefits. Tabulation of the survey data also finds evidence that water resources from Chaherizes have enabled some families to irrigate more of their land. For example 1.3 percent of households who could irrigate up to 1 ha of their land have been able to irrigate up to 4-5 ha of land with Chaheriz water. The tabulation results are statistically significant at 1 percent.

Table 12. Family land irrigated by Chaherizes vs. out of total family land irrigated

% Row	Household land irrigated with water from Chaherizes							Total
	Ha	[0-1)	[1-2)	[2-3)	[3-4)	[4-5)	[5-76)	
Total household land irrigated	[0-1)	97.37	1.32	0	0	1.32	0	100
	[1-2)	30.77	69.23	0	0	0	0	100
	[2-3)	66.67	11.11	0	11.11	0	11.11	100
	[3-4)	40	20	20	0	20	0	100
	[4-5)	0	0	0	50	50	0	100
	[5-6)	50	0	0	0	0	50	0

	(7-91)	33.3	33.3	0	0	0	33.3	100
	Total	79.28	11.71	0.9	1.8	3.6	2.7	100

Source: COSWA Household Impact Survey & author's calculations

Growth of Household Incomes

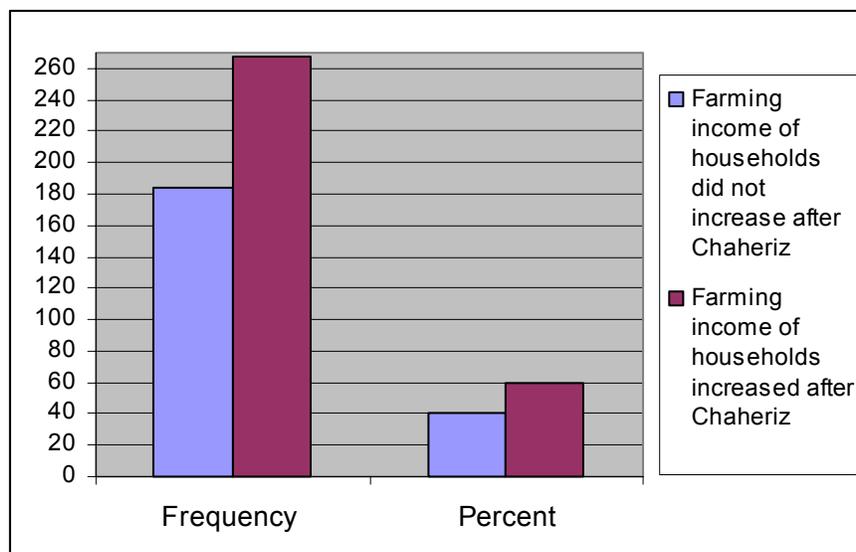
Focus group discussions in COSWA communities revealed that the major sources of income of families in rural villages are wage earnings, pensions, remittances⁴ and to a limited extent income earned from subsistence agriculture. Communities referred to lack of adequate irrigation water, initial seed capital and limited availability of profitable activities as their main concerns. They especially singled out the lack of sufficient level of irrigation water (despite the improved situation with renovated Chaherizes), seed capital for starting the business, and increased cost of farming activity as major barriers for improving agricultural income generation opportunities and raising their living standards.

The Household Impact Survey attempted to directly measure the impact of COSWA interventions, which found evidence of tangible effects of the project on income levels of households across communities. The renovation of Chaherizes has improved farming income of almost 59.2 percent of households. On the other hand, 41 percent of households reported no effect of the project on their income from farming (See figure 3).

Focus group discussions and project reports reveal two reasons for no effect of the project on incomes: 1) renovation of some Chaherizes finished after the end of crop-growing season, 2) cautious attitude of households to increasing the cultivated land before they test the adequateness of irrigation water as part of the risk management strategy. Some households conveyed their plans to expand the cultivated land during the up-coming season.

Figure 3. Effects of COSWA project on farming income of households

⁴ Field visits to villages and discussions with communities showed that around 80 percent of male population in these villages seasonally migrates to Turkey or other urban areas of the country for jobs and income generation.

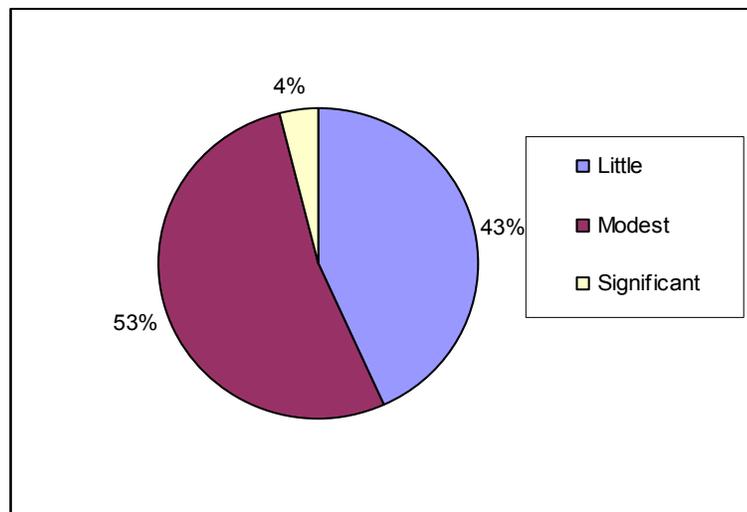


Source: COSWA Household Impact Survey & author's calculations

When households asked about the impact of the project on total family income, the portion of favorable responses grows by more than 10 percent. Only 27 percent of households reported no impact of the project on the total family income. This result is reasonable if the renovation of Chaherizes has enabled irrigation of more land area and employment of more family members in agricultural activities.

The magnitude of the project impact on total income of households varies (See figure 4). The survey data finds significant positive effect of COSWA interventions on total income of 4 percent of families. As explanations above (related to no-effect of the project on household incomes) would predict, 53 percent of households report modest positive effects of the project, while 43 percent report slight effects on total family income. In general the data reveals that Chaherizes have favorably affected total income level of large portion of households in rural communities and raised their living standards.

Figure 4. The magnitude of the project impact on total income of households



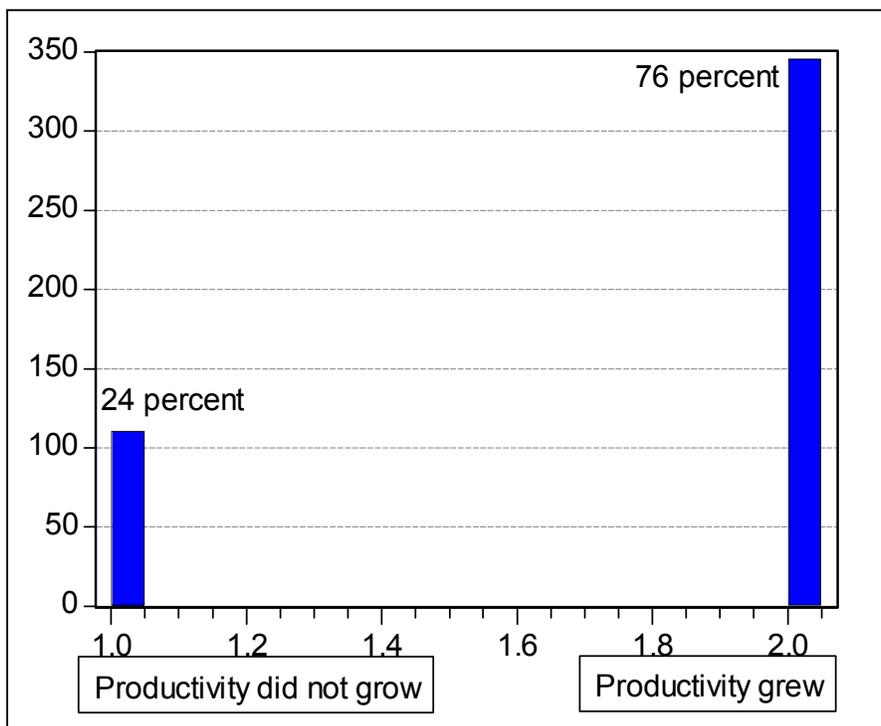
Source: COSWA Household Impact Survey & author's calculations

Productivity Improvements

Augmentation of productivity is fundamental for raising family income and living standards of households. As productivity rises, households have more goods to sell and therefore more income to make which translates into higher per family member income. The data from the COSWA Household Impact Survey reveals considerable expansion of productivity across COSWA communities, which is quite consistent with findings of this study about the increased income of households. The data reveals that community-driven planning and execution of the renovation of Chaherizes with support of the COSWA project has improved agricultural productivity for 76 percent of households (See figure 5). This figure is quite close to the portion of families (73 percent) who reported growth in their total family income due to Chaherizes in the preceding section. On the contrary the COSWA interventions did not have any impact on productivity of 24 percent of households.

As access to water and growth of income are directly related to productivity, factors which explained limited effect of Chaherizes on access to water and growth of household income in previous sections of this paper are at play here. These factors include a) distance to Chaheriz water b) houses or cropland located at higher altitudes c) completion of Chaherizes after the farming season d) households' cautious expansion of the cultivated land.

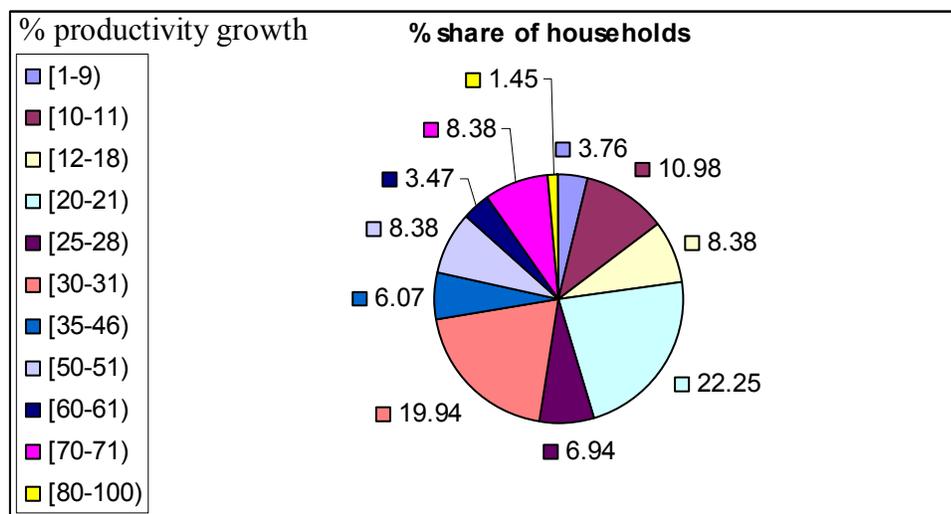
Figure 5. The impact of Chaherizes on agricultural productivity of communities



Source: COSWA Household Impact Survey & author's calculations

The tabulation of the survey data reveals that for larger portion of households productivity gains from the renovation of Chaherizes have been quite considerable (See figure 6). The productivity growth for 22.3 percent of households has been in the magnitude of 20-21 percent, whereas for 20 percent of households the growth rate has been between 30-31 percent.

Figure 6. The Range of Productivity Growth by Share of Households



Source: COSWA Household Impact Survey & author's calculations

The summary statistics also verify these findings. The average growth of productivity spurred by Chaherizes has been around 30 percent. The median productivity growth of households was 25 percent. The growth rate of productivity was in the range of 1-100 percent. The variance of productivity growth rates is quite large, hovering around 19 percent. These results are statistically significant.

The set of crops grown in additional land irrigation of which became possible with water of renovated Chaherizes also point to immense potential for augmentation of productivity in rural communities. The tabulation of the survey data shows that as distinct from usual crops in the additional land irrigated by Chaheriz households tend to grow high-yield and profitable crops such as potato, beet sugar and tobacco (See table 13). Compared to only 1.9 percent of households who choose to grow potato in traditionally irrigated land, almost 8.4 percent of households cultivate potato in additional land irrigated with Chaheriz. In similar lines significantly larger portions of families tend to farm beet sugar and tobacco in the additional land irrigated by Chaheriz compared to less than 1 percent of households who tend to grow similar high-yield crops in traditionally irrigated land. The earnings from the sale of these high-yield and expensive crops per definition of productivity translates into higher income per household growing these highly productive crops.

Table 13. Crops grown in additionally irrigated land vs. usual crops grown by households

Crops grown in additionally irrigated land			VS.	Usual crops grown by households		
	Frequency	Percent		Frequency	Percent	
Wheat	25	21.01	Wheat	126	30.58	
Fruits	2	1.68	Fruits	73	17.72	
Melons	23	19.33	Melons	38	9.22	
Vegetables	30	25.21	Vegetables	75	18.20	
Lucerne	19	15.97	Lucerne	86	20.87	
Potato	10	8.40	Potato	8	1.94	
Beet sugar	6	5.04	Beet sugar	4	0.97	
Tobacco	4	3.36	Maize	2	0.49	
Total	119	100.00		412	100.00	

Source: COSWA Household Impact Survey & author's calculations

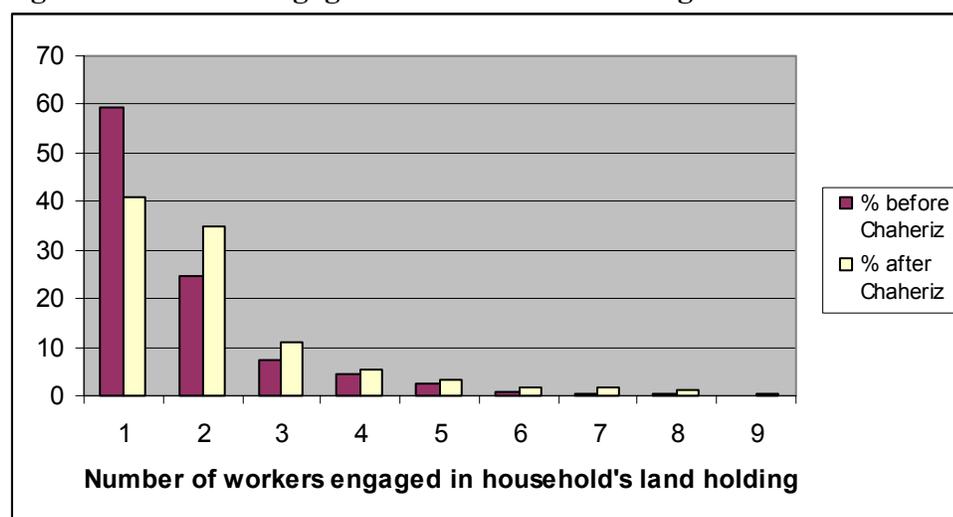
Employment & Labor Migration

Higher unemployment rate due to lower agricultural productivity and limitations to expanding farming because of limited water resources for irrigation has been identified by COSWA as the major push factor of labor migration in rural communities. Therefore by improving availability of drinking and irrigation water COSWA has been planning to create new jobs in the agricultural sector and mitigate push factors for cross-border and rural-to-urban labor migration.

The Household Impact Survey data finds evidence for positive impact of COSWA on job creation in rural communities. According to the data the average number of people engaged in farming activity of households has increased from 1.74 workers to 2.1 workers. This translates into more than 20 percent increase in number of workers engaged in farming due to increased water availability from Chaherizes. In median figures, the expansion of job opportunities is even more impressive. While the median number of workers from a household engaged in farming was 1 prior to the renovation of Chaherizes, the median number of workers involved in agriculture increased to 2 workers, thus almost 100 percent expansion of employment opportunities.

Tabulation of the data also finds significant difference in number of people employed in households' farming land prior to and after Chaherizes (See figure 7). Prior to Chaherizes only 1 worker were employed in each of almost 60 percent of land holdings, whereas each of around 25 percent of land holdings created 2 jobs. After Chaherizes the share of land holdings which provided employment opportunity only to 1 worker has shrunk by almost 20 percent and made up around 36 percent, whereas the share of land holdings providing job opportunities for 2 workers increased by almost 10 percent adding up to 35 percent. The share of land holdings providing job opportunities for more than 2 workers has also increased after the renovation of Chaherizes pointing to the positive impact of COSWA interventions across communities.

Figure 7. Workers engaged in household's farming lands before and after Chaherizes



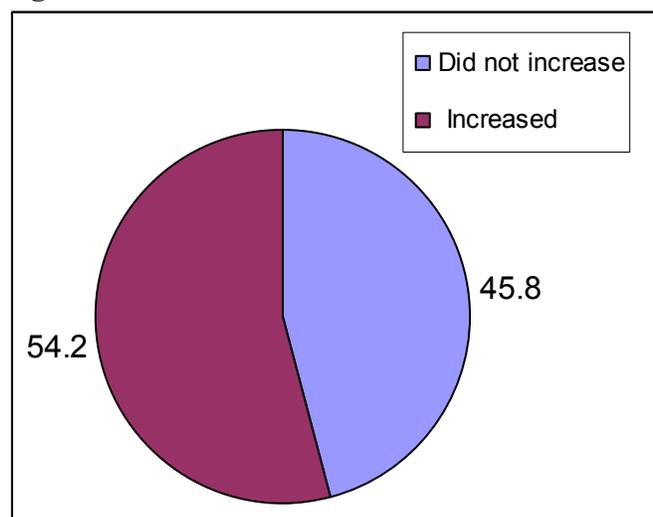
Source: COSWA Household Impact Survey & author's calculations

The household impact survey data points to favorable impact of the COSWA project on labor migration. On average the project interventions has reduced the number of labor migrants by 4 percent. According to the data prior to Chaherizes the number of average labor migrants from COSWA communities was 1.8 persons, whereas in aftermath of Chaherizes the number of labor migrants has gone down to 1.73 persons on average. The most likely channel through which effects of the project on labor migration works is job creation. The employment data from the survey indicates that job opportunities provided by the same land holdings have significantly increased in aftermath of Chaherizes.

Access to Health Services

Improving access of households to health services has not been one of the direct objectives of the COSWA project. However, assumption that the project interventions would favorably affect health of families working through increased income, improved job opportunities, improved availability of clean water for drinking and cleaning, etc is quite reasonable one. The data from the household impact survey provides supporting evidence for this assumption. 54 percent of households in the COSWA target communities have reported positive impact of COSWA interventions on their access to health services (See figure 8). This compares to 46 percent of household who reported no impact of Chaherizes on their access to health services.

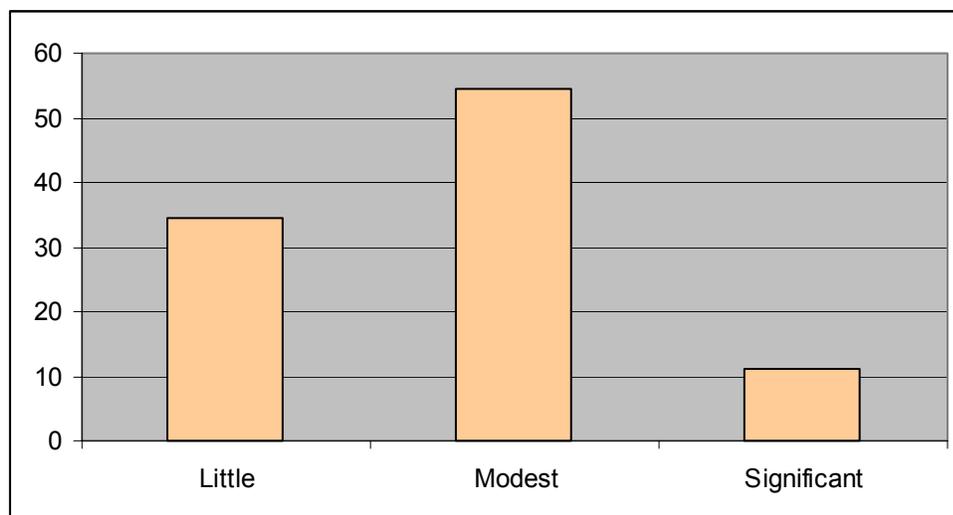
Figure 8. Household access to health services after Chaherizes



Source: COSWA Household Impact Survey & author's calculations

Disaggregating the data on reported positive impact of the project on access of families to health care reveals reasonable level of impact on access of families to health services. Only 11 percent of households report large positive impact of COSWA on their access to health services. On the other hand 54 percent of families report that COSWA had modest positive impact on the access to health services, whereas 35 percent of families report little improvement in their access to health services accruing from the project outputs. In line with the assumption disaggregating the data reveals favorable effects of Chaherizes on families' health status of reasonable magnitude.

Figure 9. The magnitude of improved household access to health services after Chaherizes



Source: COSWA Household Impact Survey & author's calculations

Focus group discussions with communities exposed us to other health benefits of Chaherizes. Many community members stressed that the quality of Chaheriz water is much better compared to the quality of water they had used prior to Chaherizes. As such the rate of water related diseases has significantly declined after Chaherizes in COSWA communities. Communities especially drew attention to the fact the water from Chaherizes undergoes standard tests of quality conducted by related research institutes, which have found that the quality of Chaheriz water matches the standards of drinking water.

Asset Accumulation

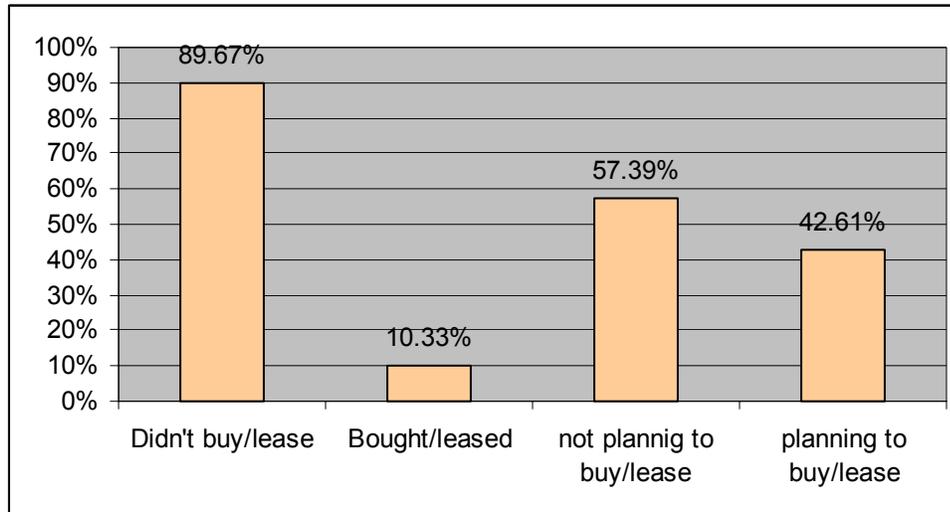
Several researches highlight the importance of asset accumulation for empowerment of the men and women and expansion of their choices. The set of assets that enhances ability and power of households to negotiate better deals for themselves include economic, physical, natural, social, political and human capital. The ***expansion of assets enables and encourages households to participate in, negotiate with, influence, control, and hold accountable the state, markets and other institutions that affect their lives.*** (Narayan, 2002, pp. 14-15).

For the COSWA project, community empowerment is an underlying element of the Chaheriz renovation process and also an expected essential outcome of the project. Therefore, asset accumulation lends itself crucial for delivering the planned outcome and producing expected impact of the project interventions.

The data from the Household Impact Survey finds evidence that the project interventions have favorably affected asset accumulation process across households, yet magnitude of the impact remained modest. The reported impact of Chaherizes on asset accumulation in communities mainly worked through two channels: (1) acquiring new land assets or buildings or (2) increased value of land or buildings already owned by households.

The impact of renovated Chaherizes and associated project interventions on asset accumulation of households through the first channel appears to be rather modest. The data demonstrates that only 10.33 of households have been able to purchase or rent more land after Chaherizes (See figure 10). The rest of households, i.e. 89.7 percent, reported no effect of the project on their ability to accumulate more assets either through buying or renting more land. On the other hand households in targeted rural communities are willing to buy or rent more land and appear hopeful that they will be able to do so in the near future. Around 43 percent of households have declared their plans to purchase or rent more land in the near future. The long-term gestation period of community-driven infrastructure development projects such as COSWA is the most likely reason behind the modest rise in the capability of households to acquire new land assets or buildings. However, greater willingness of households to improve their assets points to growing confidence of people in their income generation potential and financial capability in the future, which hopefully will translate into intensive asset accumulation for the majority of beneficiaries. Moreover, traditionally strong bonds of people to their original land also may explain some portion of limited ability of households to accumulate more land in an environment when not many people around are willing to sell their land plots.

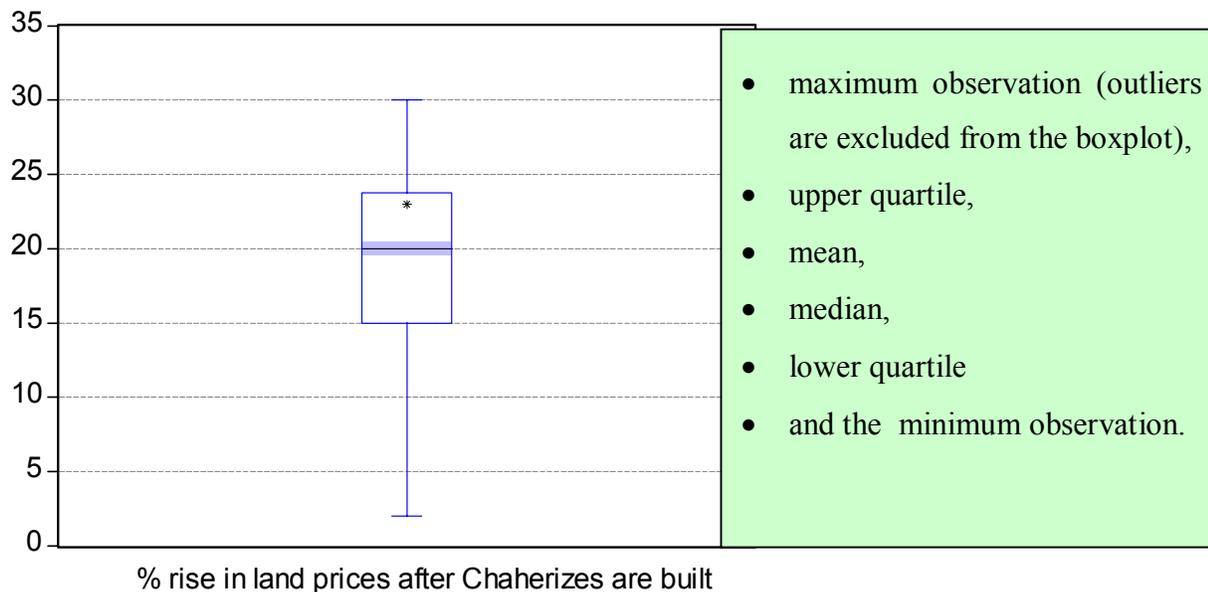
Figure 10. Bought/leased land after Chaherizes vs. planning to buy/lease land



Source: COSWA Household Impact Survey & author's calculations

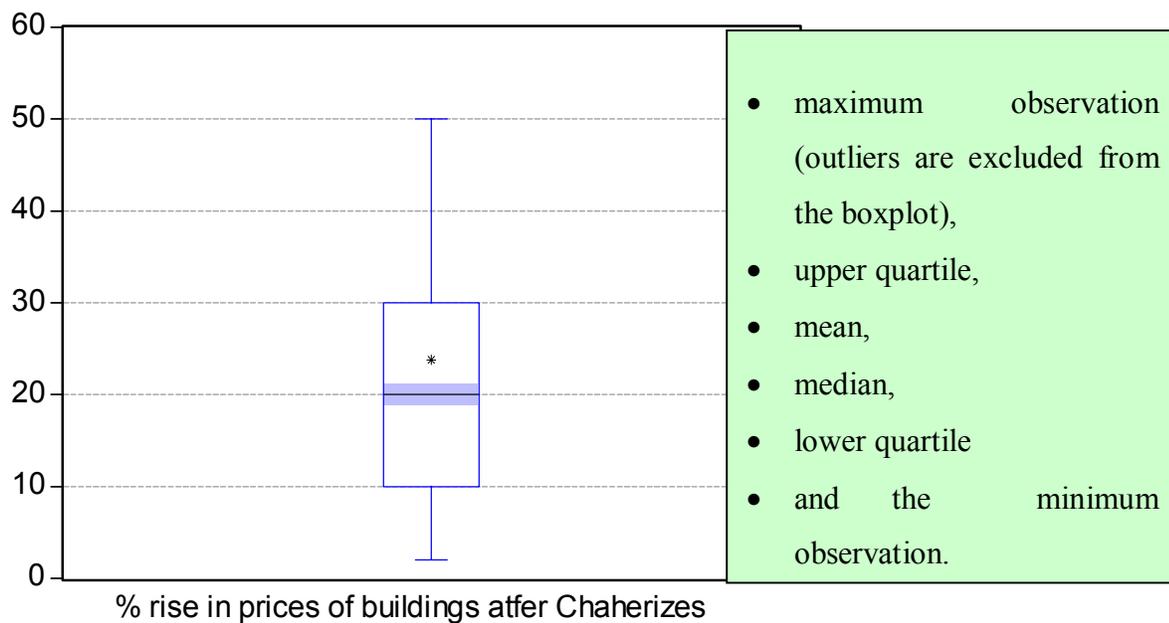
The data demonstrates that asset accumulation through increased value of physical assets, i.e. the second channel, has taken place on a larger scale in communities. Significant portion of households reported increased market value of their land holdings and buildings. More than 71 percent of households reported that the price of the land assets has gone up after the renovation of Chaherizes. 65 percent of households reported that Chaherizes have also increased the market value of their housing (See figures 11 & 12). In the economics literature such gains are also referred to as capitalization - the translation of the benefits of Chaherizes into the price of houses or land assets. The capitalization effects of Chaherizes on the price of both land assets and houses have been significant. On average the price of land assets increased by almost 23 percent after Chaherizes became functional, the price of houses on the other hand have jumped by almost 24 percent. The median increase on prices of lands and houses has been 20 percent.

Figure 11. A Boxplot (graphical depiction of five-number summary statistics) of the data on the capitalization effects of Chaherizes on the prices of land:



Source: COSWA Household Impact Survey & author's calculations

Figure 11. A Boxplot (graphical depiction of five-number summary statistics) of the data on the capitalization effects of Chaherizes on the prices of houses:

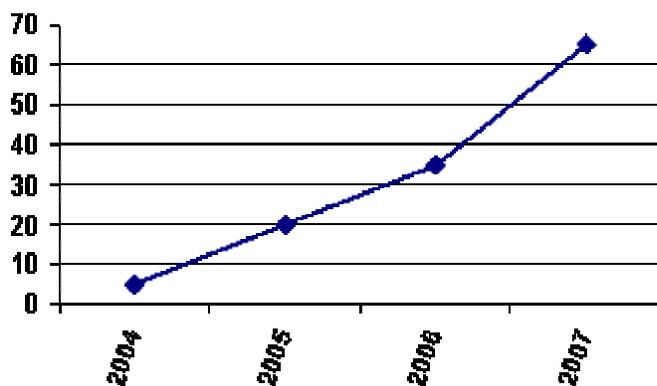


Source: COSWA Household Impact Survey & author's calculations

Improving Human Capital

Improving human capital, the stock of productive skills and technical knowledge of people, is one of the end goals of COSWA interventions and also a key project component. One of the direct channels COSWA uses to improve the stock of human capital in surveyed communities is investing in the training and capacity building of Cancans and WUC members. As of this writing COSWA has trained 65 Cancans since 2004, teaching them both the theory and practice of engineering and building Chaheriz projects (See figure 12). All members of WUCs in 9 surveyed communities have passed 4-day intensive and rigorous training on applied planning, mobilization and organization techniques. The training of WUCs represents an investment into the future of the community. Equipped with the modern planning and mobilization tools, these communities gain tangible capability to identify priority socio-economic problems, to mobilize resources and people for addressing these problems, to plan and organize the physical execution of community-level infrastructure projects and to demand accountability and quality in government services including public education and primary health care, which are indeed direct inputs into the human capital.

Figure 12: Number of Cancans trained over the life of the project



Source: IOM annual report to the Government of Switzerland. Reporting period January - December 2006 & project data as of April 2007.

Improved access to health care, to food, and growth of household incomes represent other indirect channels through which COSWA improves human capital. All these factors are necessary inputs for development of productive skills and technical knowledge. Focus group

discussions shed some light on these indirect channels. Several community members referred to their poor health as the major reason for their inability to participate in the renovation of Chaheriz, to cultivate more land, to take their produce to markets, etc. On the other hand modern day researches find evidence that poor nutrition is one of the major determinants of poor performance of children from poor families. As one community member in Safikurd village nicely put it “It is unreasonable to expect good performance from poorly fed or hungry students”. Therefore, COSWA indirectly improves human capital as long as it provides food security to households. Importance of the income and welfare of households for human capital is largely accepted across economists and social scientists of different backgrounds. Many researchers find positive correlation between the household income and the share of income spent on human capital. As income rises, households are more likely to invest larger share of their income in the health, education and skill development of their children and family members, thus investing in human capital.

Equal weights IOM has assigned to investment in human capital and investment in the physical water infrastructure (material capital) in the design of the COSWA project has been importance for leveraging the impact of the project. Hence without the productive capacity and technical knowledge in communities, no investment into the physical infrastructure would be sustainable and no community will have the capability in future to expand or reproduce material assets for sustaining the welfare of its members.

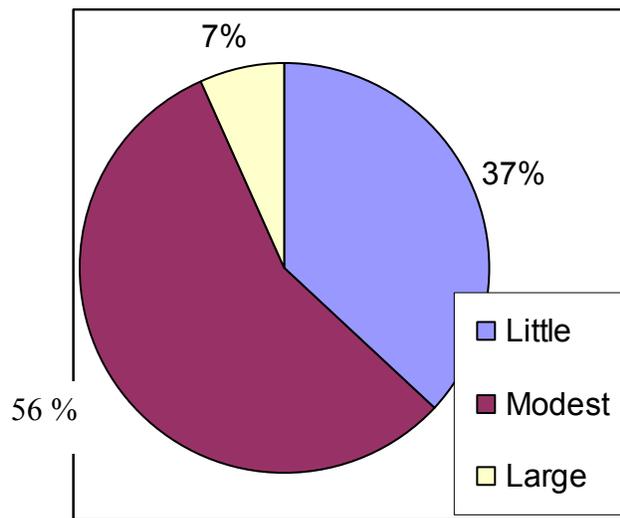
Food Security

Data from the household impact survey finds evidence for improvements in access to food and nutritional status of the poor men and women. The availability of more irrigation water from Chaherizes and larger land areas coming under irrigation is assumed to improve agricultural productivity, which in its turn would make more agricultural produce available for the direct consumption of households explaining the channel of this specific effect of COSWA interventions.

Tabulation of the data from the Household Impact Survey provides supporting evidence. 76 percent of households in COSWA communities report that the amount of agricultural produce

consumed by households has increased in this or another way after the renovation of Chaherizes. Of these families 7 percent report larger increase in the agricultural produce available for the household consumption, whereas 56 percent report modest and the rest (37 percent) report little change in the amount of food they consume after the renovation of Chaherizes (See figure 13).

Figure 13. The magnitude of change in the amount of food consumed by households after Chaherizes: percent of households reported positive change.



Source: COSWA Household Impact Survey & author's calculations

Focus group discussions also produced evidence for positive effects of Chaheriz on availability of food for domestic use of households. Several villagers in Yurdchular community specifically pointed to increased food production, larger share of which they chose to retain for domestic production. They explicitly linked the rise in agricultural productivity with the Chaheriz, which now discharges 50 liters of water per second vs. 12 liters before the renovation.

In similar lines to evidences found above, as food availability for domestic consumption increased, the share of household income spent for buying food declined. The data from the survey shows that the median share of household income spent for food after Chaherizes has declined by full 10 percent from 80 to 70 percent. One of the interesting evidences is that

families who used to spend less share of their income on food before Chaherizes started to spend larger share of their income on food, whereas families who spent more on food before Chaherizes, started to spend less after Chaherizes (See table 14). For example more of those families who spent between 30-40 percent of their household income on food before Chaheriz, started to spend more than 40 percent of their income on food after the project interventions. This relationship concurs with the mainstream economic theory, which stipulates that poor families spend larger share of their income on food, and as their income increases, they start to spend less and less share of their income for food. The fact that this relationship occurred in COSWA communities as well points to significant poverty reduction impact of the project and good level of targeting of the project benefits.

Table 14. Share of family income spent on food before and after Chaherizes

	Share of Family Income Spent on Food after Chaherizes									
		[10, 20)	[20, 30)	[30, 40)	[40, 50)	[50, 60)	[60, 70)	[70, 80)	[80, 90)	[90, 100)
Share of Family Income Spent on Food Before Chaherizes	[0, 20)	16.1	16.1	38.7	6.5	0.0	3.2	6.5	3.2	9.7
	[20, 30)	6.7	6.7	40.0	20.0	6.7	6.7	6.7	6.7	0.0
	[30, 40)	0.0	0.0	12.5	50.0	15.6	6.3	12.5	3.1	0.0
	[40, 50)	0.0	2.6	0.0	12.8	43.6	12.8	25.6	2.6	0.0
	[50, 60)	0.0	0.0	0.0	3.9	23.1	38.5	30.8	0.0	3.9
	[60, 70)	0.0	7.1	0.0	0.0	28.6	21.4	35.7	7.1	0.0
	[70, 80)	0.0	0.0	0.0	1.8	1.8	23.2	50.0	23.2	0.0
	[80, 90)	0.0	0.0	0.0	0.0	1.2	7.2	41.0	50.6	0.0
	[90,100)	0.6	0.0	0.6	0.6	7.1	2.6	14.8	11.6	61.9

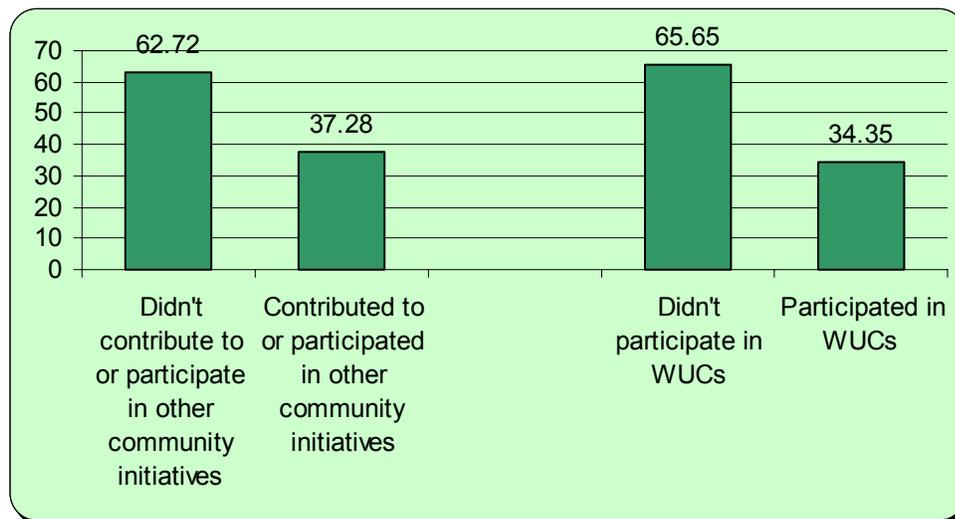
Source: COSWA Household Impact Survey & author's calculations

Community Participation and Ownership of Water Resources

Community sensitization, mobilization, planning and organization have been at the core of the COSWA design to ensure community ownership of Chaherizes and encourage further community mobilization and organization to address other socio-economic problems of communities. The project reports that by end of 2006, it has been able to mobilize 21 communities, nurture establishment of 18 WUCs to undertake the planning and execution of the Chaheriz renovation process and to link these communities to other projects offering financial and business development products.

The analysis of the data from the Household Impact Survey reveals crucial effect of the project on the mobilization of target communities. 34 percent of surveyed households reported their participation in WUCs and similarly 37 percent said at least one of their family members contributed to or participated in other community initiatives including but not limited to the renovation of schools, repair of roads, etc (See figure 14). While these statistics are not spectacular, they should be considered as admirable accomplishment in COSWA communities with little history and experience of community-driven initiatives to solve problems of the community.

Figure 14. Household participation and contribution to community initiatives and Chaheriz WUCs



Source: COSWA Household Impact Survey & author's calculations

The analysis of the relationship between the participation in WUCs and participation in subsequent community initiatives reveals that those households who participate in WUCs are more likely to participate in other community initiatives addressing socio-economic problems of the community. Simple "Binary Probit" regression analysis finds that those households who participated in Chaheriz WUCs are 68 percent more likely to participate in other community initiatives (See Appendix 6). This result is statistically significant at 1 percent and serves as the verification that community mobilization and organization efforts of the project have been effective. Tabulation of the data verifies the regression results (See table 15). Of those

households who participated in WUCs, 56 percent participated in subsequent community initiatives.

Table 15. The effect of WUC participation on participation in other community initiatives

		Contributed to or participated in other community initiatives		
		No	Yes	Total
Participated in WUCs	No	70.33	29.67	100.00
	Yes	44.07	55.93	100.00
	Total	61.81	38.19	100.00

Source: COSWA Household Impact Survey & author's calculations

The household impact survey data shows that on average families pay 6.6 AZN (around 7.6 USD) per month for the maintenance of Chaherizes as fee (See table 16). The median fee for to the maintenance fund of Chaherizes is 3 AZN. Households in COSWA communities on average contributed 16 AZN (around 18.6 USD) to the renovation of Chaherizes. The median contribution to the cost of Chaheriz renovation was 10 AZN (11.6).

Table 16. Statistics of user fee for Chaheriz water and contribution to Chaheriz renovation

	User fee for Chaheriz maintenance	Contribution to the cost of Chaheriz renovation
Mean	6.614904	15.74159
Median	3.000000	10.00000
Maximum	40.00000	264.0000
Minimum	0.000000	1.000000
Std. Dev.	8.898944	29.06570
Observations	208	339

Source: COSWA Household Impact Survey & author's calculations

Focus group discussions reveal that communities are willing to participate in and contribute to community initiatives that would help them to address socio-economic problems. Most of them ready to contribute their labor to any community project, to help with the maintenance and

operation of project. Only few expressed their ability and willingness to contribute cash to community initiatives. Rising cost of living due to increased prices for public utilities and energy puts immense constraints on household budgets.

Empowerment of Women

The COSWA project was designed with the needs and interests of women in mind. The traditional social framework in target communities, which assigns to women the role of child rearing and housekeeping, and somewhat limits their participation in decision making on community matters necessitated the project to develop and incorporate a gender approach to interventions. To this end the project pursued direct involvement of women in all phases of the community mobilization and planning and necessitated that at minimum 40 percent of WUC members should be women (See COSWA Operational Manual, updated 7 March, 2006). Additionally it has carried out information campaigns and discussions to sensitize men to the needs and interests of women.

This study finds that the project has been largely effective in addressing water problems of women. Focus group discussions across communities demonstrated that, renovation of Chaherizes reduced distance to water and time for getting water to home for large portions of women. The project also improved women's access to water leading to positive changes on nutritional and sanitation status of households. Participation of women in Chaheriz renovation enabled them to better communicate their needs, which led to concrete changes in the design of Chaherizes. Several communities built specially cemented and lined up sections in exits of Chaherizes to ease women's access to water. One community even extended electricity to these exits to make women's access to water safe and convenient in the evening time.

The household impact survey supports findings of the focus group discussion on positive effects of the project on the life of women. 53 percent of surveyed households reported that the renovation of Chaherizes have improved life of women and children. The listed benefits of the Chaherizes for women as reported by respondents include but not limited to a) solution of the drinking water problem b) making them more hopeful about the future c) reduced distance to

drinking water d) permanent availability of water e) easy to carry water to home f) improved cleanliness, etc

In terms of empowering women, the project has demonstrated capability to ensure participation of women in WUCs, but reports indicate that they have not gained significant voice over the decision making. Observably the strict social rules in rural communities still limit the active role of women outside the house. As such representation of women in WUCs varies across communities from as low as 13 to as large as 50 percent. On average however, women make up 29 percent of all WUCs in surveyed communities. This is somewhat lower than the ideal threshold desired by the project, but demonstrates significant improvement in taking women out of houses and involving them in discussions that would affect their life and the welfare of their children.

It is also reasonable to predict that positive effects of the project on women's access to water will eventually translate into more power for women both within the household and community. Easy access to water and shorter time required to clean the house, to carry water to home, to irrigate cultivated land will eventually provide women with more time to involve in civil and political life, to involve in education of their children, to pay more attention to health, thus translating into more bargaining power, which is the key to empowerment of women.

Conclusion

This study has undertaken thorough examination of socio-economic impact of the COSWA project in 9 surveyed rural communities. The balanced use of quantitative (household survey) and qualitative research (focus group discussion) techniques has enabled the study to investigate and determine multi-sectoral effects of the project. The design of the research methodology ensured collection of unbiased and reliable data. The comprehensive scope of the study also enabled looking at the channels through which numerous socio-economic effects reached communities.

The comparative analysis of the project design and components revealed unique features and advantages of COSWA. The project has employed modern and proven development concepts (community development, concessionary loans, capacity building) and technologies (modern winch technology, mapping and engineering of potential Chaherizes) to renovate eco-friendly, energy independent, low-cost and sustainable water resource systems. The study revealed that compared to artesian technology, Chaherizes do not have adverse effects on the system of aquifers in the country, they are cost-effective, and they are significantly cheaper to operate as there is no need for electric power, which on average can cost the community around hundreds of US dollars per month. Chaherizes are also less likely to dry up as distinct from artesian wells due to natural sources of the Chaheriz water.

COSWA is grounded on the proven project cycle in place, which has been important for securing planned achievements. The backbone of the project is WUCs elected and formed by communities to plan, oversee and execute the renovation projects. WUCs lead and organize mobilization of communities around the project, collection of community inputs, management of maintenance funds, collection of water user fees, management of water sharing schemes, etc.

The funding scheme for Chaheriz rehabilitation projects are designed in a way to ensure maximum community ownership, to measure urgency of water needs for a community, and to

ensure sustainable maintenance of Chaherizes. Communities are required to contribute 10 percent of the estimated project cost and to pay the interest (18% per annum) on the 20 percent of the project cost lent by COSWA to a community. When the community repays the loan and interest, COSWA returns the interest income to the community as seed money for the maintenance fund of a Chaheriz

The community survey reveals that in total COSWA has delivered important benefits to communities with a total population of around 30,284 people (6,436 households). COSWA interventions have increased water discharge of rehabilitated Chaherizes by almost 6 times. The rehabilitation currently allows irrigation of additional 303 ha of land.

The study finds evidence that larger share of project beneficiaries are women and children. This indicates to some success in targeting of project interventions. The agriculture appears to be the major employer in target communities, providing jobs close to the half of each household. 2.04 persons in an average household of 4.82 persons earn their life from agriculture. The agricultural income accounts to 42 percent of total annual income of households. These data proves critical importance of farming for the welfare of rural communities.

The study also sheds light on acute irrigation problems in target communities. On average households can irrigate only slightly more than half of the cultivated land. This implies the urgency of improving availability of water for enhancing agricultural productivity and income of households. Inadequate availability of irrigation water also affects the pattern of crops grown by households, which tends to favor less water-intensive, but also low-cash crops.

The study reveals large positive effects of the project on access to potable and irrigation water. Rehabilitation of Chaherizes has provided 68 percent of households with adequate access to drinking water and 54 percent of households with adequate access to irrigation water.

COSWA interventions also improved the use of water resources in communities. Evidences from focus group discussions and the household survey data demonstrate reduced conflicts over water resources, improved fairness of water sharing schemes, optimal use of additional

water provided by Chaherizes. The study found that the median land area irrigated by Chaheriz water is 0.4 ha out of 0.62 ha land irrigated in total.

The study also found evidence for favorable effects of the project on the income and productivity of households. Around 60 percent of households reported positive impact of the project on the income of households, whereas the project improved agricultural productivity for 76 percent of households. All these effects in combination reduced the labor migration on average by 4 percent in surveyed communities. The project interventions directly or indirectly created jobs for 20 percent of people currently employed in the agricultural sector. The average number of workers employed in agricultural activity of households has increased from 1.74 workers to 2.1 workers.

The increased availability of clean and healthy water resources also improved access to health care in communities. 54 percent of households reported positive effects of the project on their access to healthcare, reportedly (during focus group discussions) working through growth of the household income available for spending on health care and availability of much clean drinking water from Chaherizes.

The study also finds evidence of positive impact of the project on asset accumulation of households. Large share of households reported their willingness to buy or rent more land in future, while 10 percent reported that they have actually purchased land assets after the rehabilitation of Chaherizes. The capitalization effect of COSWA has been more substantial in scale, increasing the market prices of houses and cropland of more than 65 percent households.

The project has significantly improved the capability of communities to get mobilized and organized to solve other socio-economic problems in villages. Simple regression analysis indicated that those households who participate in WUCs are 68 percent more likely to participate in or contribute to other community initiatives.

The study also revealed favorable impact of the project on the bargaining power of women. The project has ensured representation of women in WUCs and their participation in decision making related to the rehabilitation of Chaherizes. Reportedly Chaherizes improved the life of women in a tangible way, reducing the time they used to spend for carrying water to home, for cleaning the home, for irrigation of cropland, etc. It is expected that these gains in time spent for housekeeping will in future translate into more time women can afford to spend for participating in civic life, discussion of community matters, education of their children, etc, boosting their bargaining power both inside and outside of households.

Finally, tangible positive impact of the project on the lives of children, women and households in general demonstrates the worth and significance of the COSWA project for rural communities. The study recommends to scale up the coverage of the project, to ensure continued provision of project's technical and loan services beyond the life of COSWA through optimal institutional and legal arrangement, to tap into the network and resources of the Azerbaijan Irrigation and Melioration Open Joint Stock Company and Azersu Open Joint Stock to facilitate the government ownership and support to the renovation of Chaherizes, and to start off an auxiliary service supporting development of market chains among agricultural producers.

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November 8, 2006

Appendices

Appendix 1. Sample Household Survey Questionnaire

COMMUNITY-OWNED SUSTAINABLE WATER USE AND AGRICULTURAL INITIATIVES (COSWA)

Questionnaire: Household-level Impact Assessment

Provide brief information about the survey to the person interviewed and thank the interviewee for agreeing to participate in it and for giving one's time to help us in the study/assessment. Please note that all information given in this survey will be kept strictly confidential and is only for the use of the International Organization for Migration (IOM). It should be made clear enough that the information gathered is to be used for statistical purposes only.

For Interviewer's use only:

Name of interviewee (optional) _____

Gender and age of interviewee _____

Date of Interview:

Location of Interview:

GENERAL INFORMATION

1. Size of the family persons; male female children
2. Number of people in the household fully or partially engaged in farming/agriculture
3. Approximately what percentage of your household's annual income comes from farming?
4. How much arable land is currently being owned by the household ha (including land plot adjunct to the house owned (həyətəni sahə))

5. How much of the land owned is being irrigated?

ha

6. Major crops grown or commodities produced:

Crop/Commodity 1 _____

Crop/Commodity 2 _____

Crop/Commodity 3 _____

INFORMATION ABOUT ECONOMIC AND SOCIAL IMPACT

1. How would you characterize your access to water?

		<i>adequate</i>	<i>not adequate</i>	<i>no access at all</i>
Drinking Water	Pre-Chaheriz	<input type="text"/>	<input type="text"/>	Not option for this question
	Post-Chaheriz	<input type="text"/>	<input type="text"/>	
Irrigation Water	Pre-Chaheriz	<input type="text"/>	<input type="text"/>	<input type="text"/>
	Post-Chaheriz	<input type="text"/>	<input type="text"/>	<input type="text"/>

2. How much additional land can you irrigate due to the renovation of chahe

ha

2.1 Major crop(s) grown on additionally irrigated land?

2.2 In your opinion did the production volume increase due to additional irrigation water obtained? If yes approx how much: _____ percent

2.3 Did your income from farming increase due to additional irrigation water?

YES NO

2.4 Did you purchase or rent more land after chaheriz was renovated?

YES NO

2.5 Do you have any plans to purchase or rent more land in the near future?

YES NO

2.6 Did renovation of Chaheriz help you to cultivate farm crops with higher returns?

YES NO

3. Did the distance to reliable water source reduce due to chaheriz renovation?

Drinking water: YES NO

Irrigation water: YES NO

4. Number of people employed in your land: Pre-Cha Post-Cha
Chaheriz

5. Members of family working/living out of NAR: Pre-Cha Post-Cha
Chaheriz

6. Have your family's consumable farm products increased after the renovation of Chaheriz? If yes to what extent: : marginally drastically fully
7. Has access of your family to health and medical services improved after Chaheriz? If yes to what extent: : marginally favorably drastically
8. Does your family have more water to use for cleaning and washing after Chaheriz?
YES NO
9. Has anyone in your household (including yourself) ever participated in the Water User Committee?

YES
NO

10. What is the monthly maintenance fee your family is paying for water use from Chaheriz?
AZN
How much has the household contributed into the chaheriz renovation project
AZN

11. Have you contributed (in kind or cash) to any community initiative (e.g. road construction, school renovation, community center building, etc) after the Chaheriz renovation? YES NO

12. In your opinion did the renovation of Chaheriz help the women in the community/village? If yes, how:

13. In your opinion has Chaheriz renovation contributed to the household income? If yes to what extent:
Marginally Favorably Drastically

14. Did the market value (price) of the property owned increase due to access to Chaheriz water?
house YES NO If yes, then approximately how much Percent
land YES NO If yes, then approximately how much?

Percent

15. Percentage of your monthly income spent on food consumption:

Pre-Chaheriz: percent

Post-Chaheriz: percent

16. Any other comment /note by interviewer

Appendix 2. Summary Statistics of the COSWA Household Survey

Variables	Mean	Median	Max.	Min.	Std. Dev.	Obs
AGE	48.58	46.00	95.0	17.00	14.36	464
# family members involved in agriculture	2.05	2.00	9.0	1.00	1.43	370
% of family income from agriculture	42.33	35.00	100.0	1.60	24.71	314
Have you purchased land after the Chaheriz renovation? Yes-2, No-1	1.10	1.00	2.0	1.00	0.30	426
Want to purchase more land in future? Yes -2, No-1	1.47	1.00	21.0	1.00	1.04	460
# of children in the family	2.57	2.00	10.0	1.00	1.22	369
Have you participated in community initiatives after the Chaheriz renovation? Yes-2, No-1	1.37	1.00	2.0	1.00	0.48	397
AZN contributed to the renovation of Chaheriz	15.74	10.00	264.0	1.00	29.07	339
Distance to irrigation water reduced after Chaheriz? Yes -2, No-1	1.86	2.00	2.0	1.00	0.35	417
Distance to potable water reduced after Chaheriz? Yes -2, No-1	1.84	2.00	2.0	1.00	0.37	338
# of family members	4.83	5.00	22.0	1.00	2.02	467
Has income from farming increased after the Chaheriz renovation? Yes -2, No-1	1.59	2.00	2.0	1.00	0.49	451
AZN your family monthly pays for using Chaheriz water	6.61	3.00	40.0	0.00	8.90	208

Access to healthcare increased after Chaheriz renovation? Yes -2, No-1	1.54	2.00	2.0	1.00	0.50	441
How much your access to health care increased? modest-1, average-2, a lot - 3	1.77	2.00	3.0	1.00	0.63	252
Has renovation of Chaheriz enabled farming of high yield produce? Yes -2, No-1	1.69	2.00	2.0	1.00	0.46	442
Price of your house increased after Chaheriz renovation? Yes -2, No-1	1.73	2.00	30.0	1.00	1.50	399
% price of your house increased	23.79	20.00	100.0	2.00	21.13	255
% of your family income spent on food after Chaheriz	69.25	70.00	100.0	0.35	20.99	451
% of your family income spent on food before Chaheriz	68.87	80.00	100.0	5.00	28.03	452
Has your family income increased after Chaheriz? Yes -2, No-1	1.73	2.00	2.0	1.00	0.44	444
How much family income increased after Chaheriz? Modest-1, average-2, a lot -3	1.60	2.00	3.0	1.00	0.56	344
Access to irrigation water after Chaheriz renovation: adequate-3, not-adequate-2, not available	2.60	3.00	3.0	1.00	0.76	281
Access to irrigation water before Chaheriz renovation: adequate-3, not-adequate-2, not available	1.95	2.00	3.0	1.00	0.71	253
Land irrigated with renovated Chaheriz (ha)	2.10	0.40	90.0	0.01	10.70	118
Produce farmed in irrigated land with renovated Chaheriz: wheat-1, fruits-2, water melon-3, vegetables-4, Lucerne(yonca)-5, potato-6, beet sugar-7, tobacco-8	3.76	4.00	8.0	1.00	1.90	119
Land plots of the family (ha)	3.90	1.00	196.0	0.00	14.68	458
Price of land plots increased after the renovation of Chaheriz? Yes -2, No-1	1.76	2.00	25.0	0.00	1.22	427
% price of land plots increased after the Chaheriz renovation	22.98	20.00	100.0	2.00	19.00	299
# of men in the family	1.69	1.00	9.0	1.00	1.02	439
# Workers outside of the village before the renovation of Chaheriz	2.20	1.00	30.0	0.00	3.63	74

# Workers outside of the village after the renovation of Chaheriz	2.04	1.00	28.0	0.00	3.12	90
Has your family members participated in WUC? Yes-2, No - 1	1.34	1.00	2.0	1.00	0.48	425
Access to potable water after Chaheriz renovation: adequate-3, not-adequate-2, not available	2.95	3.00	3.0	1.00	0.24	196
Access to potable water before Chaheriz renovation: adequate-3, not-adequate-2, not available	2.27	2.00	3.0	2.00	0.44	228
PRODUCE1: wheat-1, fruits-2, water melon-3, vegetables-4, lucerne-5, potato-6, beet sugar-7, maize-8	2.93	3.00	8.0	1.00	1.69	412
PRODUCE2:wheat-1, fruits-2, water melon-3, vegetables-4, lucerne-5, potato-6, beet sugar-7, maize-8	3.30	3.00	8.0	1.00	1.71	240
PRODUCE3: wheat-1, fruits-2, water melon-3, vegetables-4, lucerne-5, potato-6, beet sugar-7, maize-8	3.05	2.00	7.0	1.00	1.67	100
Has Chaheriz water increased productivity? Yes-2, no-1	1.76	2.00	2.0	1.00	0.43	457
% of productivity increased from Chaheriz water	30.38	25.00	100.0	1.00	19.12	346
Gender of respondents: men-1, women -2	1.26	1.00	2.0	1.00	0.44	468
Amount of food increased after the renovation of Chaheriz? Yes-2, No-1	1.76	2.00	2.0	1.00	0.43	448
How much the amount of food increased after the renovation of Chaheriz? Modest-1, average-2, a lot - 3	1.70	2.00	3.0	1.00	0.59	354
VILLAGE: coded yrudchu-1, qarabaglar-2, xanayeh-3, Chalxangala-4, Yuxari eylisli-5, Ashagi eylis-6, Alabashli-7, Safikurd-8	5.05	6.00	8.0	1.00	2.64	468
Ha of land irrigated currently	2.24	0.62	84.0	0.01	9.26	419
Do you access to water at home? Yes-2, No-1	1.63	2.00	8.0	1.00	0.58	426
# of women in the family	1.76	1.00	32.0	1.00	1.68	456
# of people working in your land plot after Chaheriz	2.13	2.00	9.0	1.00	1.48	386

# of people working in your land plot before Chaheriz	1.74	1.00	8.0	1.00	1.22	349
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Appendix 3. COSWA Community Survey Questionnaire

COMMUNITY-OWNED SUSTAINABLE WATER USE AND AGRICULTURAL INITIATIVES (COSWA)

Questionnaire: Community-level Impact Assessment

GENERAL INFORMATION

1. Name of Chaheriz:
2. Location: village
3. Purpose of use: drinki irrigati
4. Number of users (househol Total number of the family

HISTORY

5. When was chaheriz built? (how long does it date b
6. What was the priority use of the water in the past (before renov
7. What was the condition of chaheriz before renovation?

Working

8. What was the highest known record discharge amount of water throughout the past life of chaheriz l/sec

RENOVATION PROCESS

- 9. When did the renovation work start?
- 10. When was the renovation work complete?
- 11. Number of old wells before renovation
- 12. Number of old wells that has been renovated
- 13. Number of new wells built during renovation
- 14. What is the total tunnel length (meters)?

OUTPUTS AND COSTS

15. Water discharge from chaheriz (l/sec): before renovation after

16. Total area of irrigated land (ha): before renovation after renovation

17. What was the total cost of renovation AZN
Specifically from: credit

18. Community input Other sources (e.g. Ex

Did the community provide: cash labor materials

Other (please specify)
19. Estimated annual cost for maintenance AZN

OWNERSHIP AND MANAGEMENT

20. Who has control over the management and distribution of water from chaheriz? (e.g. WUC, local municipality, executive representative etc) _____

21. Number of members in WUC Female

22. How many people are responsible for maintenance and distribution of chaheriz water? _____

23. Has the chaheriz been recorded under the balance sheet of Chaheriz Department? YES NO

24. Are there any difficulties related to the distribution of water for irrigation? YES NO

If yes, please specify

–

25. How is the waste of chaheriz water being prevented?

–

26. Are there any environmental concerns related to the use of Chaheriz water?

YES NO

If yes, please specify

–

SPECIFIC SOCIAL AND ECONOMIC CHANGES

27. Did the renovation of Chaheriz help the women in the community/village?

YES NO

If yes, specify

–

28. Did seasonal migration out of the village decrease after chaheriz was renovated?

YES NO

29. Did any changes happen in the size of population? Increased Decreased

Stayed the same

30. Did the community participate in other initiatives or infrastructure projects after chaheriz renovation? YES NO If yes, please specify

31. Did any significant changes take place in the sanitary and health conditions in the life of community? YES NO If yes, please specify

32. Is the water from Chaheriz more suitable for drinking than water from other sources?

 YES NO

33. Any other comments

Appendix 4. Summary Statistics of the Community-Level Impact Survey

Name of Villages	Names of Renovated Chahez	Total Population	# of house-holds	Potential for irrigation, ha	# of Chahez feasible for renovation	# of WUC members	Share of women members of WUC, percent	Total cost of Chahez	of which share of grants	of which share of credit	of which share of community inputs	Water discharge before renovation	Water discharge after renovation	irrigation water for # of households	Additional land irrigated, ha	Drinking water for # of households
Konullu	Konullu-Alabashli	4,000	800	1,300	1	15	13	3,069	2,148	614	307	0	15	0	0	85
Alabashli		1,250	226	150	1	15	20	7,160	5,012	1,432	716	0	15	75	40	0
Safikurd	Rahimbeyli	7,000	1,079	6,266	9	15	40%	22,940	11,027	2,409	9,504	0	30	400	75	400
Yurdchular	Agsu	1,101	265	308	8	10	50	21,750	15,659	6,091	0	12	50	233	80	35
Garabaghar	Mashadi ibrahim	5,766	1,622	1,055	22	10	40	7,398	5,179	2,219	0	3	8	27	23	0
Khanagah	Elinje	1,226	365	205	1	12	25	4,000	2,800	800	400	0	0.2	0	0	50
Chalxangala	Kamil	2,176	534	382	26	10	50	8,138	5,623	2,515	0	0	10	117	49.2	0
Yuxari aylis	Nuhgedin	1,880	560	130	16	12	17	5,954	4,168	1,191	595	3.5	12	47	7	20
Ashagi aylis	Nov	1,880	560	130	16	12	50	5,938	4,157	1,781	0	6	12	86	11.3	0
	Agamali	2,125	425	300	7	12	25	7,000	4,900	1,400	700	4	10	76	17	76
Total /average		30,284	6,436	10,226	107	12.3*	29.04*	93,347	60,673	20,452	12,222	28.5*	162.2*	1061	303	666

Source: Community-Level Surveys & Chahez Fact Sheets as of January 2007

Note: * marks average figure

Appendix 5. Instructions on Focus Group Discussions

COSWA Impact Assessment FOCUS GROUP DISCUSSIONS

Purpose: to collect qualitative data and information based on participants' perceptions, concerns, and ideas particularly on:

- ✓ The impact of Chaheriz on the community and specific benefits
- ✓ Breadth and coverage of impact: location-wise and livelihood-wise
- ✓ Specific concerns and limitations of Chaheriz use
- ✓ The long-term impact and future perspectives
- ✓ Needs and recommendations for further intervention

Use: The data and information obtained will be used to prepare impact assessment report, technical analysis and research, and statistical needs for future reporting.

Methods: The discussion groups will consist of *6-12* water users who are *members of the Water Users Association*. During group discussions participants will be motivated to talk freely and spontaneously about specific topics. FGDs will serve as a complement to individual household and community survey which focus on quantitative data. Therefore, FGDs will mainly be based on questions that seek qualitative information.

Most communities are considered to be relatively homogeneous and therefore there is no need to select special categories of participants. Confidentiality of opinions and information must be ensured particularly for women's concerns.

Communication and interaction during the FGD should be encouraged in every way possible. Arrange the chairs in a circle. Make sure that there will be no

disturbances, sufficient quietness, adequate lighting, etc. Try to hold the FGD in a neutral setting which encourages participants to freely express their views.

There is a **written** list of topics to be covered. It is formulated as a series of open-ended questions.

Limitations: FGDs should consider gender issues. If there are both men and women in the group, there may be difficulties for women to express their ideas and concerns thoroughly. However, in case men pose barriers to women's participation, discussions of the benefits and the concerns of women with male community leaders are advisable.

Duration: up to an hour and a half

Location: preferable location for FGD would be a private house

Name of the Chaheriz: _____

INTRODUCTION

Participants introduce each other to the facilitator who describes the purpose of FGD.

Name	Description

MAIN ACTIVITIES OF PARTICIPANT FAMILIES AND THE LOCAL COMMUNITY

Basic information about the main activities of rural households, their economic situation, primary sources of income for the family, other.

PAST SITUATION OF THE FAMILIES/HOUSEHOLDS

What were the main concerns of the community/village during the last five years?

How did chaheriz renovation address any of those concerns/issues?

Who were the key participating parties and what were their roles?

Local Community/Government/IOM/SDC

CURRENT SITUATION OF THE FAMILIES/HOUSEHOLDS

What are the current issues in the community?

How can chaheriz and WUC contribute to solution of the current issues?

If there are new projects that are innovated by the community/WUC, would the community be willing to pay for it?

Is there any commitment to contribute by the local government?

*Which modes of contribution/participation do men and women favor?
(Decision-making in planning; cash contribution; labor contribution for
construction; training, operation, maintenance, organizational
management)*

CHAHERIZ IMPACT ON IRRIGATION WATER SUPPLY

*How did the situation with irrigating farmland changed once chaheriz
was renovated?*

CHAHERIZ IMPACT ON DRINKING WATER SUPPLY

How did renovation of chaheriz improve the conditions and quality of drinking water?

DECISION-MAKING:

Location of water source: how did the community participate in the location decision or was it a purely technical issue?

Are the benefits being distributed equitably among the users?

Is the irrigation water fairly being distributed?

Do users get sufficient water for irrigation during growing/cultivation seasons?

WOMEN'S CONCERNS:

Which specific women's concerns were addressed during chaheriz renovation?

What changes do women see in their lives?

How did chaheriz affect the health of children and elder family members?

Environmental concerns:

Are there any environmental threats to the existing chaheriz system (e.g. pollution, erosion, degradation etc)?

Do you see any potential or possible future environmental threats to the chaheriz system or chaheriz water from other external or internal factors?

Appendix 6.

Regression of “participation in Water User Committees” against the “participation in later community initiatives” using the Binary Probit regression technique

Dependent Variable: Participation in later community initiatives

Method: ML - Binary Probit (Quadratic hill climbing)

Sample (adjusted): 1 467

Included observations: 363 after adjustments

Convergence achieved after 3 iterations

Covariance matrix computed using second derivatives

Variable	Coefficient	Std. Error	z-Statistic	Prob.
Participation in Water User Committees	0.679530	0.143271	4.742968	0.0000
C	-0.530279	0.084300	-6.290384	0.0000
Mean dependent var	0.382920	S.D. dependent var	0.486770	
S.E. of regression	0.471732	Akaike info criterion	1.279309	
Sum squared resid	80.33373	Schwarz criterion	1.300766	
Log likelihood	-230.1946	Hannan-Quinn criter.	1.287838	
Restr. log likelihood	-241.5676	Avg. log likelihood	-0.634145	
LR statistic (1 df)	22.74613	McFadden R-squared	0.047080	
Probability(LR stat)	1.85E-06			
Obs with Dep=0	224	Total obs	363	
Obs with Dep=1	139			