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Baseline Report on the Farming Practices Survey

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CHAPTER I

INTRODUCTION

The aim of the Millennium Challenge Account with Armenia (MCA-Armenia) is to increase household income and reduce poverty in rural Armenia through improved performance of the country's agricultural sector. Armenia plans to achieve this goal through an integrated, nationwide initiative to enhance three major components of the rural infrastructure. The first two components are improved lifeline roads and irrigation systems. The third component of the initiative is improved water management, which includes strengthening irrigation system entities and providing farmers access to technology and training in on-farm water management and higher value agricultural production, marketing, and better access to credit. By improving living standards among rural residents, these investments can in turn lead to future economic growth in rural areas and throughout the country as a whole.

To support the training initiatives, MCA has contracted with ACDI/VOCA and its partners, VISTAA and Euroconsult—hereafter referred to collectively as ACDI—to implement Water-to-Market (WtM) activities that include training farmers in water management and high-value agriculture, providing postproduction services, and facilitating eligible farmers' access to credit.[1] ACDI plans to train a total of 60,000 farmers in water management practices over a five-year period between 2007 and 2011. Of these farmers, 30,000 will be trained in high-value agriculture.

The Millennium Challenge Corporation (MCC) has commissioned a rigorous impact evaluation to separately examine each of the three main components of the MCA-Armenia program. This report focuses on the evaluation of WtM activities and in particular, the data being used for the WtM evaluation. The evaluation of the WtM activities uses a "phase-in" random assignment design, whereby villages were randomly assigned into a treatment group, whose farmers will be offered training, and a control group, whose farmers will not be offered training during the evaluation follow-up period. The impacts of the training components will be determined by comparing outcomes of the treatment group with

[1] ACDI provides technical assistance related to credit, but the Rural Finance Facility is the entity that provides and disburses loans through local loan providers.

outcomes of the control group over time. In particular, we will examine whether the program: (1) affected irrigation and agricultural practices of Armenian farmers; (2) led to improvements in agricultural productivity; and (3) improved household well-being for the targeted farmers, as defined by increased income and reduced poverty.

The impact analysis will be based on a survey of farmers in the treatment and control villages, including a baseline survey and three rounds of follow-up surveys. These surveys—called the Farming Practices Survey (FPS)—will serve as the primary data source for the WtM impact evaluation.[2] MCA-Armenia contracted with AREG and its partner Jen Consulting—hereafter referred to collectively as AREG—to field the baseline FPS survey in fall of 2007/winter 2008. The FPS will subsequently be conducted each year of the follow-up period, at the end of 2008, 2009, and 2010.

This report provides a summary of the findings from the baseline FPS. In particular, we describe farmer characteristics as well as baseline values of measures that will eventually be used to assess the impacts of WtM activities. This summary will provide an understanding of current farming practices and provide valuable context for the impact evaluation. Examining current farming practices is critical for determining whether the technologies taught as part of the training programs would constitute big departures from practices farmers currently use and, similarly, whether farmers are already cultivating the high-value crops that are central to ACDI's HVA initiative. Additionally, examining measures of household well-being before the program has been implemented is informative to provide a basis for comparison with household well-being following the WtM activities. This early analysis of the FPS is also useful in that it can provide us an opportunity to learn what worked well in this round with regard to data collection and survey instruments, and to identify improvements so that future iterations of the FPS best address the policy questions of greatest interest to the evaluation.

In the remainder of Chapter I, we briefly summarize the WtM activities, the impact evaluation design, and the general structure of the FPS. Chapter II discusses the content of the FPS instrument in more detail and presents summary statistics for the key characteristics of the households and farmers in the sample at baseline. Chapter III focuses on pre-intervention measures of farm productivity and household income. We conclude in Chapter IV with a summary of lessons learned, suggested changes for future rounds of the FPS, and the next steps for the impact evaluation.

A. WATER-TO-MARKET TRAINING

The goal of the WtM activities is to train farmers in a variety of techniques designed to help them improve the quality and quantity of crops, conserve water, and introduce new varieties of crops. The training has two components: water management and high-value agriculture (HVA). Farmers who participate in training will also be permitted to apply for agricultural credit programs as these programs are rolled out. Besides training and credit

[2] We are also hoping to use administrative data from participating Water User Associations (WUAs); these data may become available as part of the institutional strengthening component of the MCA initiatives.

programs, additional postharvest processing components will also be implemented across the country.[3]

Water Management. The goal of the water management activities is to train 60,000 farmers in region-specific water management techniques. Because the large majority of Armenian farmers have small plots of land that average less than two hectares, the focus of these training sessions is to teach farmers low-cost irrigation technologies that are especially suitable for small-scale farming operations. These methods are designed to help farmers use water more efficiently, which can promote both cost savings (through water conservation and decreased labor) and increased quantity and quality of crops. Specifically, the training emphasizes several irrigation techniques, including furrow row spacing, scientific scheduling, water meters and a variety of pressure and non-pressure irrigation techniques.

ACDI is tailoring the training techniques to agricultural conditions of the region, and the specific techniques featured in training vary across regions; however, the overall approach to training is reasonably similar throughout the country. Each training session involves 20 to 25 farmers from one community or several neighboring communities. Two to three days of the training are theoretical lessons taught in a classroom setting; these classroom sessions are supplemented with practical lessons taught on a demonstration farm that is set up and maintained for this purpose. In an effort to reinforce training throughout the year, ACDI also provides previously trained farmers with tours of demonstration farms during key months of the agricultural cycle.

The demonstration farm is a critical part of the initial training; it also can help reinforce the lessons even after training is completed. Practical training of farmers takes place on the demonstration farms, and the farms also serve as a resource to which farmers in the village can go to see the technologies in practice after the end of the official training session. Demonstration farm sites are selected based on their topography, soil characteristics, and proximity to other farmers in the village, as well as having farmers who are willing to adopt these new technologies on their farms and facilitate other farmers' understanding of these techniques. In return for farmers' willingness to set up their farm as a demonstration farm, ACDI provides the farmer the needed equipment for the demonstration farms.

Demonstration farms typically serve from one to five villages, depending on the number of eligible and interested farmers in those villages and their proximity to the demonstration farm. Some demonstration farms, particularly the initial farms, were adapted from farms that played a similar role in earlier periods. However, most demonstration farms are new. The trainers who provide the training are agricultural experts who come from the same region, to ensure familiarity with the local climatic and agricultural conditions. Once a demonstration farm is established, ACDI plans to provide several rounds of training at that farm to saturate

[3] Such nationally implemented processing components cannot be evaluated on their own. Therefore, the evaluation is designed to estimate the impact of the training programs and access to credit on top of any other services and programs that are available to farmers in these villages, including any information disseminated widely through mass media.

the associated villages as much as possible, because high participation rates will maximize the value of investments in demonstration farms.

High-Value Agriculture. Approximately half of the farmers who are trained in water management technologies are being trained in higher-value agricultural methods. This additional training is being implemented in a subset of villages that are best suited to utilize the training. An important objective of the HVA training is to increase the quantity and to improve the quality of crops, the same as for the water management training. However, special emphasis is placed on cultivating new, higher-revenue crops as well as higher-valued varieties of common crops, such as some organic versions.

The approach to HVA training is similar to the approach to water management training approaches, with trainings customized to the regions, and each training session including 20 to 25 farmers from one community or several neighboring communities. The training takes place over a 2 to 3 day period in a classroom setting supplemented with practical lessons on a demonstration farm that is set up to provide appropriate HVA training.

Access to Credit. Farmers who complete WtM training will be permitted to apply for agricultural credit, thus increasing their financial means to invest in equipment and supplies to implement the techniques taught in the training. Farmers must apply and be approved for credit. The details of who can apply for credit, the loan terms, and the criteria for loan approval are in development. This credit feature of the program is particularly important because many of the techniques advocated in the training require equipment that might not be affordable to farmers in the absence of credit.

Training Goals and Target Population. Overall, the goal of the MCA Compact is to train 60,000 farmers on improved water management techniques and 30,000 farmers on HVA over the five years of the Compact. ACDI has trained more than 2,000 farmers in the pilot phase (2007) and approximately 13,000 in the second Compact year (October 2007 through September 2008). ACDI plans to train an additional 19,000 farmers in each of the third and fourth Compact years (October 2008 through September 2010), and 7,000 farmers in the final year of the Compact (October 2010 through 2011). In the initial years, training is being implemented in villages that already have adequate water sources. Eventually, other villages that benefit from the improvements in irrigation infrastructure through the Compact-funded irrigation system rehabilitation efforts may also be served.

For both the water management training and the HVA training, coordinators are targeting farmers who are members of Water User Associations (WUAs), the organizations that manage the distribution of and payment for irrigation water. They work closely with village mayors to identify farmers who are particularly likely to participate, and these farmers are targeted for additional recruitment efforts. Coordinators also use posters and other methods to advertise at village centers and work with mayors to mobilize farmers to participate. As training gets rolled out and more farmers are aware of the opportunities, word of mouth becomes an important means for outreach and enrollment. There are no major restrictions on the type of farmers who can participate in training, except that ideally they are WUA members who pay for their water, but even this is not necessarily strictly enforced.

B. EVALUATION DESIGN FOR THE WTM ACTIVITIES

As mentioned earlier, the design for the evaluation of the WtM activities is a phased in random assignment of villages, where villages were randomly selected for training being offered in the earlier years of the compact versus in the later years of the compact. Random assignment is the most rigorous ways to measure program impacts, and when implemented carefully, leads to the creation of two statistically comparable groups at baseline, with the only difference being that only one group (the treatment group) is exposed to the intervention, whereas the other group (the control group) is not. As a result, any changes observed between the two groups over time can be attributed to the effects of the intervention with a known degree of statistical precision.

Unit of Random Assignment. Ideally, we would randomly assign individual farmers who are interested in training into a treatment group that is eligible to receive training or a control group that is ineligible to receive training, and compare outcomes for the two groups to accurately measure the impact of the training intervention. However, because the training sessions are community-level interventions—making it difficult to exclude individual farmers from receiving training—such an approach was not feasible in this context. Instead, we randomly assigned villages (or village clusters) to either the treatment group, in which farmers in the village are eligible for on-farm water management and HVA training over the evaluation timeframe, or to a control group, in which farmers in the village are not eligible to receive training over the same timeframe.[4] Because the two groups of farmers are identical except that only one group has access to training, comparing the outcomes of the treatment group farmers relative to the outcomes of the control group farmers provides an unbiased estimate of program effects. All farmers who are WUA members and live in a cluster of villages selected for the treatment group are permitted to participate in water management training, while farmers who are in the control group of village clusters will not be offered water management training for several years.[5] Most villages (except some with inadequate water) will ultimately be provided training, and random assignment is used to determine *when* they will be offered training.

Implementing Random Assignment. Random assignment of villages was conducted in August 2007 for the subset of villages that had adequate water and could potentially be served early in the Compact. The process was implemented using a computer program to ensure the results were replicable, secure, and transparent. The program was designed to produce research groups that were balanced along several dimensions, but with each village having an equal probability (within its agricultural zone) of being assigned to a given research group.

[4] ACDI has grouped villages into clusters to facilitate training implementation. Most clusters include only one village, but some include as many as five villages that are in close geographic proximity.

[5] Generally, ACDI has defined village clusters that are sufficiently far apart geographically to ensure that there is little chance that farmers in a control group village cluster will either participate in the training or learn about the water management techniques through other means.

We randomly assigned villages to one of three groups: those that are served in year 2 of the Compact; those that are served in either year 3 or year 4 of the Compact; and those that are served in the 5th and final year of the Compact.[6] The earliest group constitutes our treatment group, and the latest group our control group—impacts will be measured after the treatment group has received training but before the control group has been given the same training. Comparing the two groups with the largest temporal gap in implementation is necessary to ensure enough time elapses for program impacts to be realized. For this reason, the middle group, those villages that are served in the third or fourth year, will not be included in the impact evaluation. Only villages that were considered ready for WtM training were included in the randomization; some villages currently have poor sources of water and, thus, would not benefit from training until their irrigation systems are rehabilitated. Such villages may receive training in the future, but they will not be included in the impact evaluation. We also excluded from the random assignment all villages that were included in the pilot phase of the WtM training (year 1 villages) or those in which ACDI had already developed demonstration farms.

Random assignment was conducted within WUAs to preserve regional balance; this created balanced treatment and control groups along this dimension. The distribution of villages by treatment status for each agricultural zone is reported in Table I.1. The probability of a village being assigned to the treatment group was approximately the same for all WUAs, with most of the deviations occurring as a result of rounding. An exception, however, is the Mountainous Zone, in which a smaller proportion of villages were selected for the research groups (years 2 and 5), and most villages were assigned to the non-research group. This zone was underrepresented largely because of low prospects for improvement. A total of 120 clusters were assigned to the treatment group and 80 to the control group, with these 200 clusters containing 223 villages in total. (For simplicity of exposition, we hereafter refer to village clusters as "villages.") During the fieldwork, it was discovered that two villages had almost no active farmers; these were excluded from the analysis. Another village was inaccessible for the baseline FPS due to heavy snow, but will be included in the impact evaluation and future rounds of the survey.

Table I.1. Distribution of Village Clusters by Year of Training and Agricultural Zone

	Ararat Valley	Pre-Mountainous	Mountainous	Sub-Tropical	**Yearly Total**
Year 2: Treatment	44	58	12	6	**120**
Years 3 and 4: Non-Research	18	19	38	2	**77**
Year 5: Control	28	38	10	4	**80**
Total	**90**	**115**	**60**	**12**	**277**

[6] The second year of the Compact started in September 2007.

C. OVERVIEW OF FARMING PRACTICES SURVEY

The evaluation design for the WtM activities largely dictated the sampling frame and approach to the FPS. As discussed earlier, we have a total of 120 treatment villages and 80 control villages. Our target was to have completed interviews with approximately 25 farmers in each village (slightly fewer in the smaller villages, and more in the largest villages) for a total of 5,000 interviewed farmers. Determining whether training programs affect household well-being is the key research question, but because 25 or so farmers constitute a small fraction of farmers in most villages, it is important for us to identify farmers who are likely to participate in training so as to maximize the chance that farmers who would participate in the interviews also participate in training. This will give us the opportunity to detect potential impacts of the intervention. Although we could readily identify participating farmers in the treatment villages, it is difficult to get such a frame from the control villages, where training would not be offered for at least three or more years. Hence, there is a big challenge in identifying a relevant sample frame for the FPS. An alternate approach would have been to select a random set of farmers in the village without regard to whether they are likely to participate in training or not, and assess the percent of farmers who do participate. However, our goal is to assess how effective training is for those who receive it, and hence we want to maximize the chances of finding farmers that are likely to participate in training.

Our initial approach was to draw names of farmers from lists of members maintained by WUAs. However, early efforts to verify this approach revealed that many of these lists were outdated and could not be used to draw the sample. For instance, in some cases, the WUA member might be a grandmother who is no longer farming, and the actual farmers are various household members of her family that farm on different plots. In other cases, the actual WUA member was no longer in the village and had migrated to urban areas or out of the country. Based on these assessments, an alternate approach was suggested whereby MCA-Armenia requested that the WUAs work with village mayors to compile a list of farmers in each village who met some specific criteria related to actively being engaged in farming. The criteria were designed to align with the characteristics of farmers participating in ACDI's training programs, most notably, being actively engaged in farming, having modest farm area, living in the community for several years, and being of working age (between 25 and 70 years old). The number of farmers' names requested depended on the size of the village but averaged about 60.

Pretesting the lists provided by mayors revealed that even these lists were of mixed quality, often because the WUAs had not consulted with the mayors in compiling them. In some cases, the lists included farmers that were no longer in the village, individuals that were no longer farming, and deceased individuals. In such cases, AREG updated the sample list with the assistance of village mayors and marz officials, either at the marz offices or in the village itself. AREG and mayors targeted the households of farmers who were most likely to benefit from the training programs: those who were actively engaged in farming and had lived in the community for several years. In some villages, mayors were preoccupied with preparations for the presidential elections, and AREG either worked with other public

officials or was forced to verify the sample on its own. This was most pronounced in the areas interviewed shortly before the elections.[7]

Whenever possible, village mayors contacted the sampled households in advance to ensure they would be available for interviews on the day AREG visited their village. AREG also had reserve lists of farmers whom it could draw on to help reach its targets for completed interviews within each village. Ultimately, as part of the baseline FPS, a total of 4,854 farmers were interviewed beginning in mid-November 2007 and ending in mid-February 2008. Because of this non-systematic approach to creating a sample frame and completing interviews, reliable response rates could not be calculated.

[7] In subsequent rounds of the survey, interviews of the village mayors will be added. Besides providing village-level information, this will also serve to engage mayors, so that they will participate more actively in the sample verification process.

CHAPTER II

HOUSEHOLD CHARACTERISTICS AND FARMER PRACTICES AT BASELINE

The goal of MCA WtM activities is to improve farmers' use of water and other crop practices, and eventually improve farmer income and reduce rural poverty. The key measures included in the Farming Practices Survey (FPS) instrument were chosen to address the questions of most interest to MCA-Armenia, as described in Chapter I. Other descriptive information was also included to facilitate the impact analysis. Altogether, three broad categories of information were collected: household characteristics, variables intended to measure intermediate effects of the intervention such as farming practices, and variables intended to measure program effects such as crop production, revenue from crop production, and income and consumption. (The complete survey instrument is provided in Appendix A.) In this chapter, we examine the baseline characteristics of the households and farmers in our sample, as well as pre-intervention measures of intermediate outcomes such as farming practices. In the next chapter, we describe pre-intervention measures of key outcomes of interest to the evaluation.

Household Characteristics. Examining household characteristics provides important context about the sample, and allows us to understand the types of households included in the sample and how they compare with the broader population of rural Armenia. These characteristics will also serve as important explanatory variables in our regression models. Table II.1 summarizes the household characteristics included in the FPS instrument.

Table II.1. Measures of Household and Farm Characteristics

Household Information	Time Frame
Geographic Information. The village, marz, and WUA of the household.	As of Survey Date
Land Holdings. The amount of farmland owned and rented, and the size of the household's kitchen plot.	As of Survey Date
Household Roster. List of all household members, relationship to the head of household, gender, age, education level, years the household head has been farming.	As of Survey Date
Livestock. Number of cows, pigs, and sheep owned.	As of Survey Date

WUA = Water User Association.

Variables Measuring Potential Intermediate Effects. We would expect training to have an impact on households' incomes only if we observe that a substantial proportion of the targeted farmers are actually participating in training and, perhaps most important, are then applying the techniques they learn. Examining intermediate measures of participation and adoption also establishes the counterfactual—the services that farmers in villages would have received and the practices they would have adopted in the absence of the WtM programs. The findings reported in this chapter on farming practices prior to the intervention indicate that baseline utilization of these farming technologies is very low, suggesting that many farmers could potentially benefit greatly if they are to adopt the methods taught through the WtM training programs. Table II.2 summarizes the key intermediate variables that can be examined using the FPS data.

Table II.2. Measures of Intermediate Effects

Potential Intermediate Measures	Time Frame
Adoption of HVA and Irrigation Practices. Which irrigation practices were used, focusing on those taught in training sessions; whether those practices had perceived time or labor savings.	Last Agricultural Season
Investment in Agricultural Technology or Equipment. Ownership of personal reservoir or water pump; ownership or rental of trucks, tractors, combines, seed planters, and sprayers.	Last Agricultural Season
Cropping Patterns. Specific crops grown, especially high-value crops; amount of land devoted to cultivation of each crop; total hectares of land devoted to crops; whether household cultivates a kitchen plot; reason(s) for changes in cropping patterns.	Last Agricultural Season

HVA = high-value agriculture.

A. HOUSEHOLD CHARACTERISTICS

The demographics and structure of the households surveyed provide context for the types of households included in this evaluation. Tables II.3 and II.4 describe the characteristics of the households in our sample.[1] In Table II.3, we present a detailed summary of the heads of each household surveyed, or the person with the primary responsibility for making farming decisions. For reasons described below, we also present a detailed description of the survey respondent. While the head of household and the survey respondent were often the same person, 32 percent of FPS survey respondents identified another family member as the head of household.

[1] Here and throughout the report, baseline measures are reported for the pooled sample of treatment and control group farmers.

Table II.3. Head of Household and Respondent Characteristics (Percentages, Unless Otherwise Indicated)

Head of Household's Age		Respondent's Age	
<40	4.9	<40	18.7
40-49	26.4	40-49	35.5
50-59	30.0	50-59	27.7
60 and older	38.7	60 and older	18.1
(Average)	(57.3)	(Average)	(49.2)
Female-Headed Household	13.8	Female Respondent	11.9
Head of Household's Education		Respondent's Education	
Less than secondary	20.6	Less than secondary	13.6
Secondary	40.0	Secondary	40.8
Secondary (vocational)	24.6	Secondary (vocational)	28.0
More than secondary	14.8	More than secondary	17.6

Sample Size = 4,854

Source: 2007 Farming Practices Survey (FPS).

Note: All data are weighted to adjust for uneven treatment/control ratios across Water User Associations.

As shown in Table II.3, the plurality of heads of household was age 60 or older, and the average age of household heads was 57. Approximately 31 percent of the heads of household in the sample are younger than age 50. Nearly 14 percent of heads of household were females, and a substantial majority of the household heads (79 percent) had completed either secondary or vocational secondary school.

Because of the comparatively high average age of the heads of household and the substantial number of multigenerational families in our sample, there is some concern that respondents identified the head of household as the eldest person in the household regardless of whether that person was primarily responsible for the farming decisions. For example, the person who runs the farm may have identified his or her elderly mother or father as the head of household because the home belongs to that parent. Unfortunately, we have no way to verify how respondents interpreted this question. However, because the survey administrators were instructed to speak with the person in the household with primary responsibility for farming decisions, the respondent may serve as a better approximation of the person running the farm than does the reported head of household. For this reason, Table II.3 also includes key characteristics of the survey respondents. In contrast to those identified as the heads of household, respondents were on average almost eight years younger, and a greater percentage of respondents had finished more than secondary school.

As illustrated in Table II.4, most households in the survey are multigenerational families, with at least one grandparent residing in the household. The majority of families also include at least one child younger than age 18. On average, households in the villages in

Table II.4. Household Characteristics (Percentages, Unless Otherwise Indicated)

Multigenerational Family	52.2
Household Members	
4 or fewer	32.4
5	24.7
6	21.3
7 or more	21.6
(Average)	(5.3)
Children in Household	
0	31.1
1	22.7
2	27.8
3 or more	18.5
(Average)	(1.4)

Sample Size = 4,854

Source: 2007 Farming Practices Survey (FPS)

Note: All data are weighted to adjust for uneven treatment/control ratios across Water User Associations

our study have approximately 5.3 members. This is considerably larger than estimates from the 2007 Integrated Survey of Living Standards (ISLS), which found that a typical Armenian household comprises two adults and two children.

B. FARMS AND PRACTICES

A detailed description of the farms in our sample provides context for which type of farms may be reached and potentially influenced by the training. Likewise, a descriptive look at the farming practices in which the farmers are currently engaged illustrates how farms are operating and what potential the training program has to influence practices. In the section that follows, we describe the typical farm size and some of the farming practices in which the sample members were engaged prior to receiving training.

Each of the four agricultural zones—Ararat Valley, Pre-Mountainous, Mountainous, and Subtropical—has distinct agricultural conditions that lead to different practices and cropping patterns. Ararat Valley is the most fertile region, and its irrigation infrastructure is generally the best maintained. On the other end of the spectrum, the Mountainous Zone has poorer soil quality and harsher weather, and its irrigation infrastructure is also the most difficult to build and maintain. For these reasons, we also explore differences across agricultural zones in this section and throughout the remainder of Chapters II and III. In the next two sections, we will detail survey respondents' (1) farms and capital, and (2) farming practices.

1. Farms and Capital

As evident in Table II.5, most of the farms in our sample are small; about half (51 percent) of farmers cultivate one hectare (10,000 square meters) or less (Table II.5). However, nearly 30 percent of farmers cultivate two or more hectares, and the average land area cultivated by respondents was slightly less than two hectares. Thus, although the majority of farmers cultivate a hectare or less, a minority of farmers in the sample with relatively large farms cause the average farm size to be larger than the median farm.[2]

The overall distribution of farm sizes masks considerable variation across the four agricultural zones. Ararat Valley has the smallest farms, on average; 68 percent of farmers in Ararat Valley cultivate a land area smaller than one hectare. In contrast, only 17 percent of farmers in the Mountainous Zone cultivate less than one hectare. The Pre-Mountainous and Subtropical Zones have approximately the same proportion of farmers who cultivate an area of one hectare or smaller (between 42 and 43 percent), although the Pre-Mountainous Zone has relatively more farmers who cultivate an area smaller than 0.5 hectares (23 percent versus 11 percent in the Subtropical Zone). In addition, average land area cultivated for these two zones is quite similar and slightly above the average across all four zones.

Nearly all respondents in the survey (97 percent) reported having a kitchen plot in which they cultivate crops. The majority of kitchen plots (approximately 78 percent) are 2,000 square meters or smaller, and the average size is approximately 1,700 square meters. As with the overall farm size, the average farm is larger than the median (1,200 square meters). This indicates that a relative minority of farmers have large kitchen plots that drive up the average size of these plots.

As evident in Table II.5, much of the variation in farm size and other characteristics appears to result from differences in the zones. The largest farms are in the Mountainous Zone, which also has the most cows and a relatively high number of sheep, on average. This information suggests that a relatively larger proportion of farmers' land in the Mountainous Zone is dedicated to growing feed for animals.

[2] The median is the value in the exact middle of the distribution (the 50th percentile). Similar to an average (or mean), a median is a measure of the "typical" land area for farmers in the sample, but the advantage of the median is that it is not sensitive to distributional outliers that could skew the average area.

Table II.5. Respondents' Land and Livestock Holdings by Zone (Percentages, Unless Otherwise Indicated)

	All Zones	Ararat Valley	Pre-Mountainous	Mountainous	Subtropical
Area of Land Cultivated (square meters)					
5,000 or less	25.6	34.2	22.9	5.6	11.1
5,001 to 10,000	25.4	33.5	20.3	11.6	31.3
10,001 to 15,000	12.1	11.5	11.2	17.4	17.0
15,001 to 20,000	9.4	6.6	10.6	15.4	12.5
20,000 or more	27.5	14.3	35.0	50.0	28.1
(Average)	(19,845.5)	(14,274.4)	(22,445.1)	(30,776.1)	(23,638.3)
[Median]	[10,000]	[7,000]	[14,000]	[20,000]	[13,000]
Size of Kitchen Plot (square meters)					
1,000 or less	35.7	40.7	34.0	14.6	59.4
1,001 to 2,000	42.4	37.2	47.8	44.2	29.5
2,001 to 3,000	12.7	12.6	10.5	24.6	7.7
3,000 or more	9.2	9.5	7.7	16.5	3.4
(Average)	(1,721.8)	(1,700.1)	(1,629.9)	(2,377.4)	(1,246.8)
[Median]	[1,200]	[1,200]	[1,200]	[2,000]	[1,000]
Number of Cows Owned					
0	43.8	64.5	30.2	15.3	49.5
1	17.7	12.2	23.2	16.4	18.2
2	17.4	12.5	19.8	28.2	15.9
3 or more	21.0	10.8	26.8	40.0	16.4
(Average)	(1.8)	(1.1)	(2.2)	(3.0)	(1.9)
Number of Pigs Owned					
0	85.7	92.5	81.2	81.1	70.6
1	7.2	3.3	9.7	10.5	14.8
2	3.5	1.9	4.8	4.7	4.7
3 or more	3.6	2.4	4.3	3.8	9.8
(Average)	(0.5)	(0.3)	(0.6)	(0.5)	(2.0)
Number of Sheep and Goats Owned					
0	84.1	97.6	73.8	71.6	89.2
1–5	7.0	1.3	11.2	12.5	7.2
6–10	4.5	0.6	7.3	9.3	1.7
11 or more	4.4	0.5	7.7	6.6	1.9
(Average)	(2.1)	(0.4)	(3.5)	(2.7)	(1.5)

Sample Size = 4,854

Source: 2007 Farming Practices Survey (FPS).

Note: All data are weighted to adjust for uneven treatment/control ratios across Water User Associations.

Averages include respondents that reported no values.

Few farmers in our sample own their own heavy machinery or major farm equipment, as illustrated in Table II.6. A majority of the farmers who use trucks, tractors, combines and sprayers rent them.[3] There are few substantial differences in equipment ownership and rental among zones, as illustrated in Figure II.1. The most notable difference is that farmers in Ararat Valley appear to use combines with less frequency than do farmers in other zones. This could point to differences in crop production across zones, which is explored in Chapter III.

Table II.6. Respondents' Farm Equipment Ownership and Rental (Percentages)

	Respondents Owning	Respondents Renting
Trucks and tractors	13.1	76.6
Combine	1.4	54.4
Seed planter	1.4	43.4
Sprayer	0.4	6.1
Artesian well or tank	5.7	4.8

Sample Size = 4,854

Source: 2007 Farming Practices Survey (FPS).

Note: All data are weighted to adjust for uneven treatment/control ratios across Water User Associations.

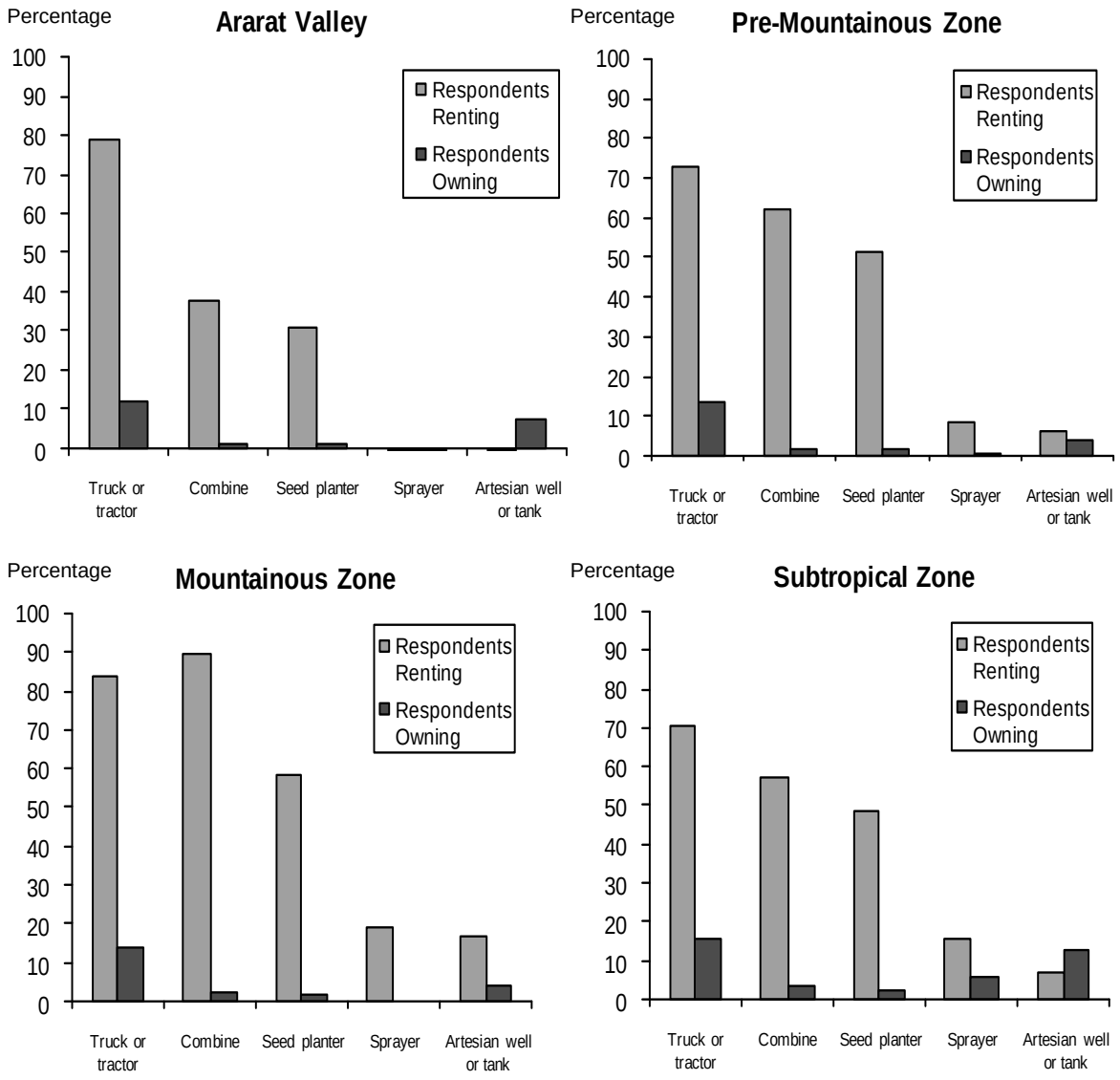
Table 11.7 describes the use of credit among respondents. Nearly one third of respondents reported taking credit in the last season, and the average amount of credit among respondents that reported taking credit was over 600,000 AMD. The large majority of respondents that reported taking credit last season listed a bank as their source of credit.

2. Farming Practices

At baseline, irrigating with canal or pipeline water was the most common type of crop watering. On average, farmers use canal or pipeline irrigation to water 43 percent of the land they cultivate, as illustrated in Table II.8. Farmers in Ararat Valley irrigate, on average, nearly 70 percent of their land. The percentage of land irrigated with canal or pipeline water in other regions is considerably lower. As before, the contrast between the Mountainous Zone and Ararat Valley is especially pronounced when comparing the percentage of land irrigated with canal or pipeline water versus the percentage of land that is watered through natural sources. Farmers in the Mountainous Zone use natural sources to water 62 percent of their land and canal or pipeline irrigation to water another 25 percent, compared with 8 and 70 percent, respectively, in Ararat Valley.

[3] The word "sprayers" was incorrectly translated into Armenian. As such, FPS findings regarding sprayers should be interpreted with caution. The translation will be corrected for subsequent rounds of the FPS.

Figure II.1. Respondents' Farm Equipment Ownership and Rental by Zone (Percentages)



Sample Size = 4,854

Source: 2007 Farming Practices Survey (FPS).

Note: All data are weighted to adjust for uneven treatment/control ratios across Water User Associations.

Table II.7. Use of Credit Among Respondents (Percentages Unless Otherwise Indicated)

Respondents that took credit last season:	32.4
Average Amount (in AMD, conditional on reporting)	631,685
Source of credit:	
Bank	94.7
State guaranteed project	1.8
International organization	2.1
Friends or others	0.6
Other source	0.9

Sample Size = 4,854

Source: 2007 Farming Practices Survey (FPS).

Note: All data are weighted to adjust for uneven treatment/control ratios across Water User Associations.

Table II.8. Respondents' Watered Land Area (Percentages)

	Percentage of Respondents' Total Land Cultivated That Is Watered Using this Source				
Water Source	All Zones	Ararat Valley	Pre-Mountainous	Mountainous	Subtropical
Irrigation water (pipeline/canal)	43.2	69.6	33.7	25.4	31.7
Well or other drinking water	0.8	1.7	0.4	0.5	0.1
Exclusively natural sources, rivers/rain water	26.3	7.6	26.3	61.6	36.3
Irrigation water and well or other drinking water	0.5	1.5	0.0	0.0	0.0
Irrigation and natural sources, rivers/rain water	2.5	3.4	1.9	2.9	0.5

Sample Size = 4,854

Source: 2007 Farming Practices Survey (FPS).

Note: All data are weighted to adjust for uneven treatment/control ratios across Water User Associations.

One of the key purposes of the water management training is to teach farmers more efficient techniques for watering crops. Few farmers in our survey reported using the irrigation practices that are the focus of ACDI water management training, as illustrated in Table II.9. The most commonly reported irrigation technique was furrow row spacing, which was practiced by slightly over 7 percent of farmers. All other techniques were used by less than 1 percent of farmers. Thus, it appears that training farmers in more efficient irrigation techniques has the potential to change practices among a substantial proportion of farmers.

Table II.9. Respondents' Irrigation Practices (Percentages)

Respondents Using	
Furrow row spacing	7.4
Scientific scheduling	0.1
Water meters	0.0
Non-pressure/pipe-irrigation	0.6
Pressure irrigation	0.3

Sample Size = 4,854

Source: 2007 Farming Practices Survey (FPS)

Note: All data are weighted to adjust for uneven treatment/control ratios across Water User Associations.

Table II.10 illustrates the variety of agricultural practices reported by FPS respondents. Over 75 percent of respondents reported using non-organic fertilizers, while over 45 percent reported using organic practices. In addition, a high portion of interviewed farmers reported using pesticides or other plant production material (48 percent) and buying high-quality seeds (24 percent). Few farmers engaged in the other agricultural practices listed in the survey.

Table II.10. Respondents' Agricultural Practices (Percentages)

Respondents that	
Used non-organic fertilizers	75.1
Used pesticides or other plant protection materials	47.5
Bought high-quality seeds	24.2
Transplanted from a seed bed to the field or from a nursery to a field	6.3
Changed time of seeding	0.6
Produced two or more crops per year	1.2
Introduced new crops, new trees, or an orchard they had not grown last year	0.5
Introduced new varieties of crops	1.3
Changed the way they cultivate or weed (timing, frequency, technique)	0.3
Used "organic" practices	45.1
Used plastic greenhouse or plastic tunnel during crop production	7.6
Planted dwarf root stock of trees	8.8

Sample Size = 4,854

Source: 2007 Farming Practices Survey (FPS)

Note: All data are weighted to adjust for uneven treatment/control ratios across Water User Associations.

The operation of a farm requires expenditures on inputs such as fertilizer, irrigation, and labor; these expenditures are an important component in measurements of profits from agriculture. Table II.11 details the expenditures for the farmers in our sample. The largest expenses were for labor, equipment, and parts, which accounted for more than 40 percent of the total expenditures. As with other measures described previously, the relationship of the average and the median on all cost measures suggests a distribution in which a minority of relatively large spenders causes the mean to be substantially higher than the median. For example, 18 percent of the full sample reported zero expenditure on pesticides or fertilizer, and 16 percent reported spending nothing on irrigation (not shown in table). The percentage of respondents reporting no expenditures on these two inputs varied across zones. Only 8 percent and 9 percent of respondents in Ararat Valley reported spending nothing on pesticides/fertilizer and irrigation, respectively, while the corresponding numbers were 29 percent and 27 percent of respondents in the Subtropical Zone.

Zone comparisons in Table II.11 show that farmers in Ararat Valley have the highest average farm expenditures of any zone, followed by farmers in the Subtropical Zone. In particular, farmers in Ararat Valley have higher expenditures on fertilizer and pesticides relative to farmers in other zones.

Table II.11. Respondents' Average Farm Expenditures (AMD)

Respondent Expense for	All Zones: Average [Median]	Ararat Valley: Average [Median]	Pre-Mountainous: Average [Median]	Mountainous: Average [Median]	Subtropical: Average [Median]
Fertilizer and pesticides	74,171 [35,000]	120,241 [80,000]	36,669 [20,000]	52,162 [30,000]	57,464 [15,000]
Irrigation	37,454 [20,000]	55,811 [35,000]	25,720 [10,000]	14,095 [4,000]	30,725 [10,000]
Hired labor and hired equipment or tools	115,197 [50,000]	134,399 [80,000]	93,242 [37,000]	110,821 [80,000]	186,912 [10,000]
Taxes and duties	27,752 [15,000]	30,420 [20,000]	20,799 [10,000]	28,995 [15,000]	89,910 [8,000]
Other major expenses	29,266 [0]	47,104 [0]	17,605 [0]	14,084 [0]	1,959 [0]
Total agricultural expenses	**283,839 [155,000]**	**387,975 [247,000]**	**194,035 [109,000]**	**220,157 [149,000]**	**366,970 [71,900]**

Sample Size = 4,854

Source: 2007 Farming Practices Survey (FPS).

Note: All data are weighted to adjust for uneven treatment/control ratios across Water User Associations.

Averages include respondents that reported no values

CHAPTER III

FARMER PRODUCTION AND INCOME AT BASELINE

The goal of training farmers to use more efficient farming techniques is to help them improve the productivity of their farms, leading to higher yields of valuable crops and ultimately to an improvement in their standard of living and a reduction in poverty. In this chapter, we describe the baseline, or pre-intervention, measures of farm production, income, and poverty. These are the key outcomes that MCC and MCA-Armenia aim to affect with WtM training.

Crop sales, wages, and other sources of income are an important focus of the FPS instrument. Because a full accounting of all sources of household income would require far longer to obtain than the allotted time for each interview, the survey concentrates on sources of income that are most directly affected by the training programs—specifically, income from agricultural production and employment by the farmer and his or her immediate family. In addition, we use the median sale price of specific crops for other farmers in the village to estimate the value of crops that are consumed by the household or bartered. Also related to household income, the FPS asks for estimates of expenditures on key categories of consumption and for income from other sources. Table III.1 summarizes the key measures of agricultural production and income that can be examined using the FPS data.

All of these measures will be included in subsequent rounds of the FPS as well, permitting comparisons of how they have changed over time, and in particular, how the outcomes at the end of the follow-up period (in 2011) compare to the values at baseline, before the WtM activities began. In the remainder of this chapter, we present summary statistics on the baseline measures of farm productivity and household income.

Table III.1. Measures of Agricultural Production and Income

Measures	Time Frame
***Agricultural Production*.** Total amount of specific crops grown; amount of crops grown per square meter; total value of all crops cultivated.	Last Agricultural Season
Revenue from Agricultural Production. Value of crops sold; total value of all crops (including those sold, bartered, or consumed).	Last Agricultural Season
Agricultural Costs. Expenditures on fertilizers, pesticides, irrigation water, hired labor, rented equipment and taxes (individually and in total).	Last Agricultural Season
Profit from Agricultural Production. Revenues minus costs—the income from agricultural activities.	Last Agricultural Season
Income from Employment. Whether household head, spouse, and any grown children were employed (besides work on the family farm); total earnings from employment.	Last Month
Income from Pensions, Remittances, or Social Programs. Can also be added to profits and employment income to construct a rough measure of total income.	Last Month
Household Consumption. Expenditure on purchased food, health care, housing products, utilities, and transportation; cost of purchased goods, plus value of crops consumed by the household.	Last Month

HVA = high-value agriculture.

A. CROP PRODUCTION AND SALES

An examination of respondents' crop production and sales (Table III.2) confirms the evidence of heterogeneity in our sample described in Chapter II. The majority of farmers grow some kind of nuts or fruit besides tomatoes or grapes.[1] However, no other type of crop is grown by a majority of farmers. Grains are the next most common (45 percent), followed by grass (38 percent), vegetables and herbs (35 percent), potatoes (26 percent), tomatoes (25 percent) and grapes (24 percent). Crops that do not fit in these categories (for example, planting stock, flowers and sorgo) are grown with considerably less frequency. (See Appendix Tables B.1 and B.2 for itemized frequencies of specific crops produced and sold.)

There is substantial variation in the types of crops that are sold by the household. The most commonly sold crop category is fruits and nuts, followed by vegetables and herbs, although only 20 percent of farmers sold fruits or nuts, and less than 18 percent sold vegetables or herbs. With the exception of grapes and tomatoes, the remaining crop

[1] Based on feedback from MCC and MCA-Armenia, grapes and tomatoes were classified apart from other fruits. Hereafter, references to "fruit" in this chapter exclude grapes and tomatoes. To consolidate and simplify crop types, nuts were combined with fruits, and herbs were combined with vegetables. Since nuts and herbs

Table III.2. Respondents' Crop Production and Sales (Percentages)

Crop	Respondents Growing	Respondents Selling
Grains	44.6	7.0
Grape	23.9	14.0
Other Fruits / Nuts	60.1	20.3
Tomato	25.0	12.6
Vegetables / Herbs	34.6	17.7
Potato	25.7	5.8
Grass	38.1	6.6
Other	13.8	4.7

Sample Size = 4,854

Source: 2007 Farming Practices Survey (FPS).

Note: All data are weighted to adjust for uneven treatment/control ratios across Water User Associations

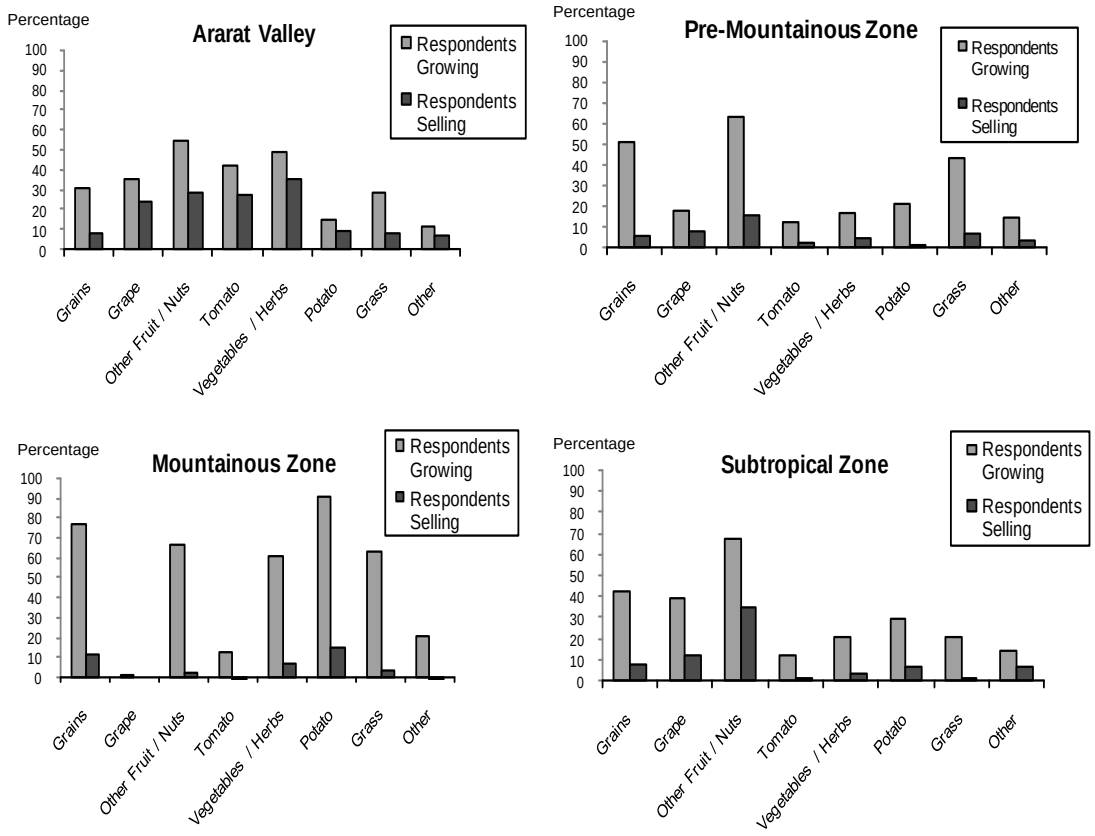
types were sold with much less frequency. Thus, it appears that many households grow crops exclusively for their own consumption, not as a source of income. In fact, 47 percent of the survey sample reported no sales of any crop, while 27 and 13 percent of the sample reported selling only one and two crops, respectively.

The farm characteristics outlined in Chapter II suggest substantial cross-zone variation in farm sizes, irrigation practices, and farm expenditures. An investigation of the types of crops grown and sold reveals similar variation across zones (Figure III.1). With the exception of grapes and tomatoes, a greater proportion of the Mountainous Zone farmers grow each type of crop than in any other zone, but few of the Mountainous Zone farmers who grow those crops sell them. In contrast, the farmers in Ararat Valley who grow each of the crops are more likely to sell them.

In contrast to other crops, fruit is grown relatively consistently across zones (ranging from under 55 percent in the Ararat Valley to around 65 percent in the Mountainous and Subtropical Zones). However, the number of farmers selling fruit varies dramatically among zones. In Ararat Valley, nearly 30 percent of the farmers sell their fruit, compared to fewer than 5 percent in the Mountainous Zone.

(*continued*)
account for a small portion of fruit and vegetable harvests, respectively, our analysis often refers to the fruit and nut category simply as "fruit," and the vegetable and herb category simply as "vegetables."

Figure III.1. Respondents' Crop Production and Sales by Zone (Percentages)



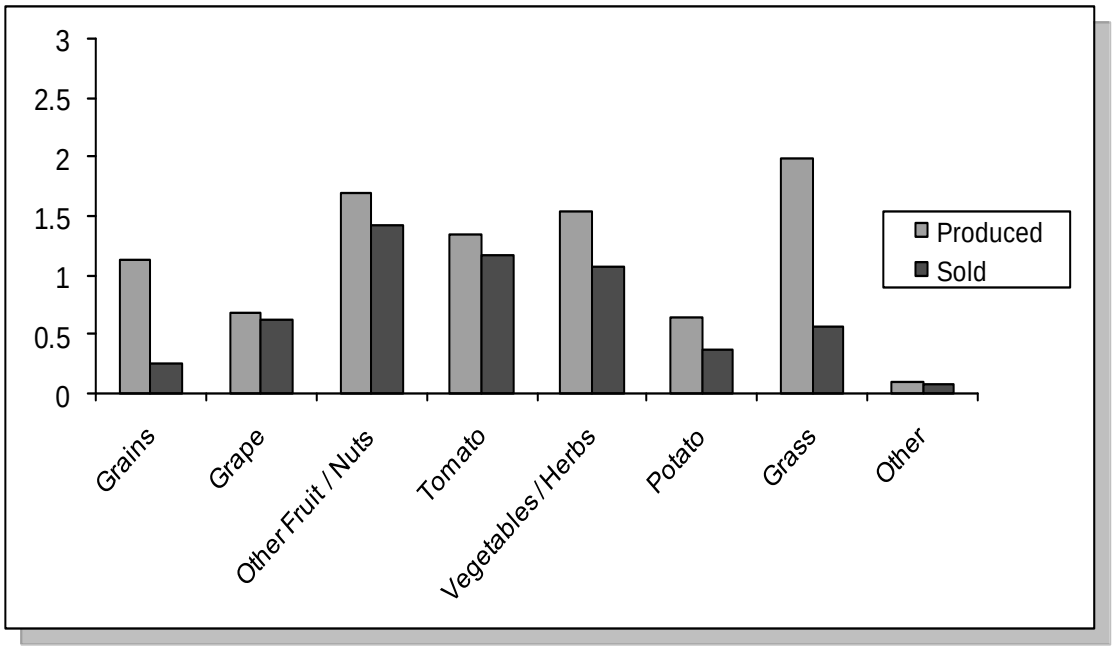
Sample Size = 4,854

Source: 2007 Farming Practices Survey (FPS).

Note: All data are weighted to adjust for uneven treatment/control ratios across Water User Associations.

Figure III.2 displays respondents' average farm production and sales. With the exception of grass and grains, the majority of each of the crops produced by farmers in the sample were sold. However, this seems at odds with the results in Table III.2, which reported that only around half of farmers who produced grapes, fruits, tomatoes or vegetables sold these crops, and slightly more than one in five farmers who grew potatoes sold some portion of their harvest. Taking these figures together indicates that there are many farmers growing small amounts of each of these crops, and there are relatively few who are growing large amounts of the crop and selling the majority of it. For example, the top 10 percent of the tomato growers surveyed produce 75 percent of the total reported tomato production, and likewise account for nearly 75 percent of the total reported tomato sales. This is to be expected, as some non-commercial farmers may produce a small amount of a given crop (for example, a few tomato vines) intended for home consumption, whereas other commercial farmers harvest a large amount of the crop with the intent to sell it at the market.

Figure III.2. Respondents' Average Farm Production and Sales (Metric Tons)



Sample Size = 4,854

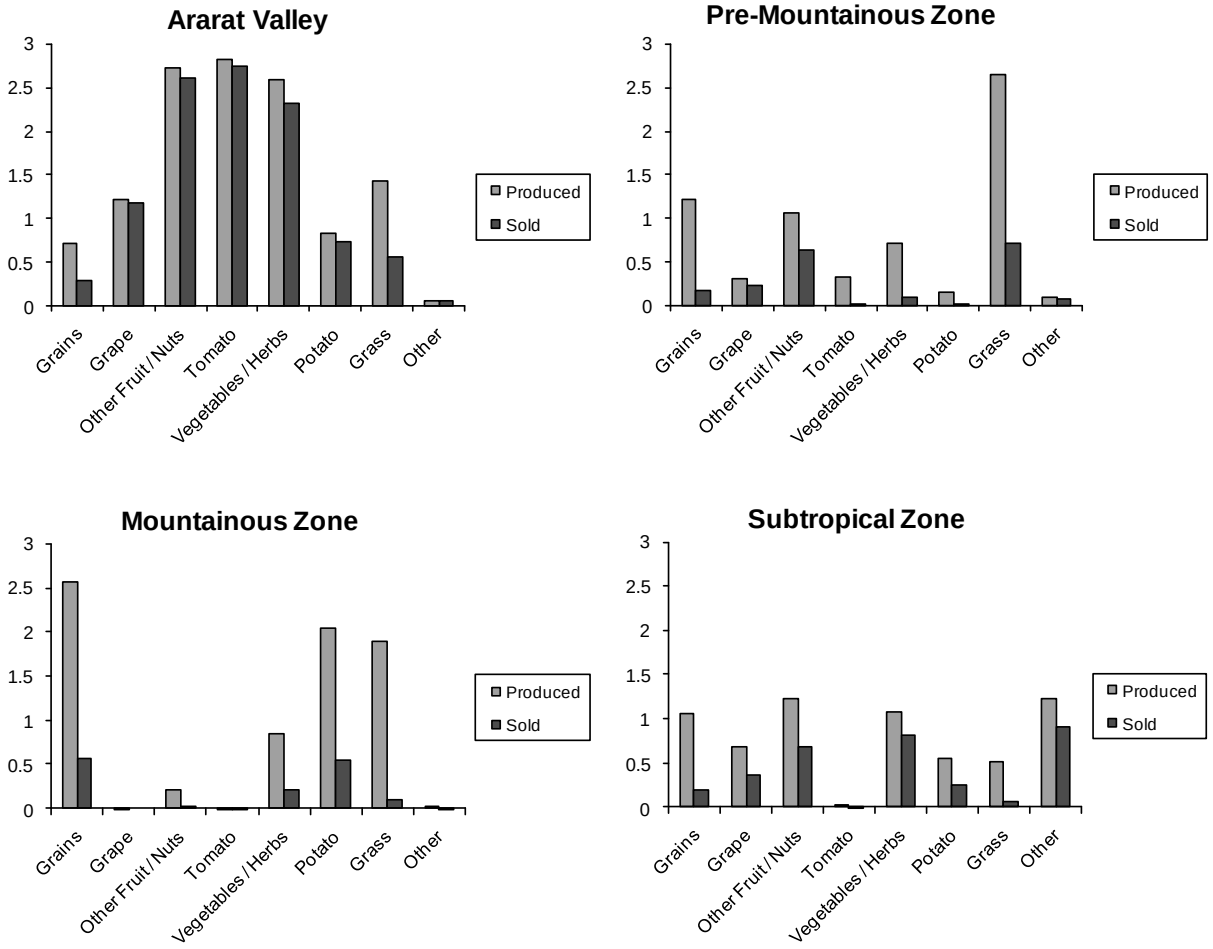
Source: 2007 Farming Practices Survey (FPS)

Note: All data are weighted to adjust for uneven treatment/control ratios across Water User Associations.

Figure III.3 displays respondents' average farm production and sales by zone; production and sales are *not* conditional on reporting producing or selling the crops in question.[2] Ararat Valley farmers produce and sell more grapes, fruit, tomatoes, and vegetables than any other zone by a considerable margin. Although the Mountainous Zone has many farmers who produce nearly all crop types, they are selling relatively small amounts per farm. For example, more than 90 percent of farmers in the Mountainous Zone grow potatoes, yet the average amount of potatoes sold per farm is lower than that in Ararat Valley, where only 15 percent of farmers grow potatoes. Thus, it appears that people in the Mountainous Zone are consuming a large portion of what they produce, whereas the farmers in Ararat Valley are selling the majority of their crops rather than consuming them. With the exception of the Mountainous Zone, respondents in all zones derive more than half of their total agricultural revenue from sales of grapes, fruits, and tomatoes (Figure III.4). Farmers in the Mountainous Zone, however, derive little income from fruit sales; the majority of their revenue comes from the sale of potatoes and grains

[2] In other words, the averages include zeroes for the farmers who do not grow or sell the crops. For example, the average reported grain production includes farmers who did not report growing any grain.

Figure III.3. Respondents' Average Farm Production and Sales by Zone (Metric Tons)

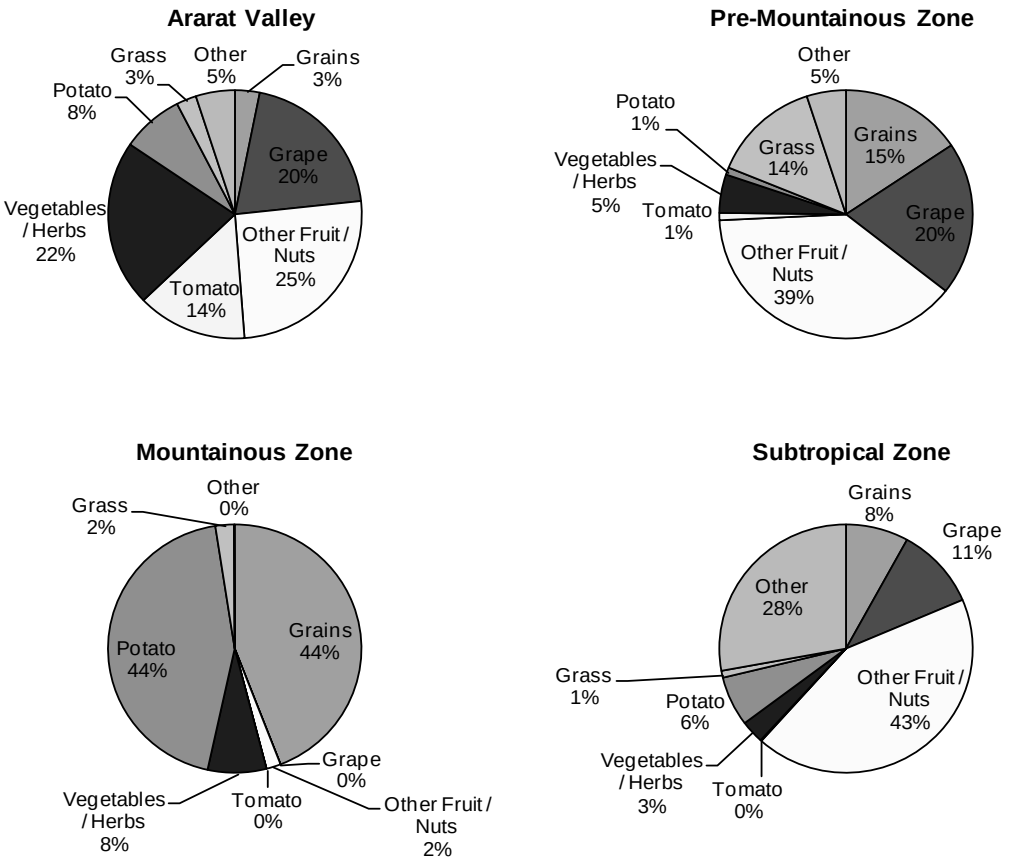


Sample Size = 4,854

Source: 2007 Farming Practices Survey (FPS).

Note: All data are weighted to adjust for uneven treatment/control ratios across Water User Associations.

Figure III.4. Respondents' Sales by Zone (AMD)



Sample Size = 4,854

Source: 2007 Farming Practices Survey (FPS).

Note: All data are weighted to adjust for uneven treatment/control ratios across Water User Associations.

The total income from the growth of crops is an important outcome that will be a focus of the evaluation. Table III.3 reports respondents' average sales figures by crop type. The average farm has revenues of 449,822 AMD. Not surprisingly, about three quarters of the total sales are grape, tomato, fruit or vegetable sales. This is followed distantly by sales of potatoes, grain, and grass. However, a substantial portion of crop production (particularly outside Ararat Valley) is not sold at market, but rather consumed by the household. These are crops that the household would otherwise have to purchase in the market. To account for this home consumption, we calculated the total value of crops produced, whether or not they were sold at market, using the median price per ton for each crop in each WUA and

Table III.3. Respondents' Average Crop Sales and Values (AMD)

	Sales	Value (Production x Price)
Grains	27,136	110,458
Grape	87,002	89,163
Other Fruits / Nuts	121,783	149,425
Tomato	51,432	72,409
Vegetables / Herbs	82,798	127,114
Potato	34,653	62,010
Grass	18,745	63,852
Other	23,785	29,293
Total	**449,822**	**703,724**

Sample Size = 4,854

Source: 2007 Farming Practices Survey (FPS).

Note: All data are weighted to adjust for uneven treatment/control ratios across Water User Associations.

Averages include zeros for respondents that did not produce and/or sell crops.

applying that median price to the number of tons of that crop produced by each farmer.[3,4] Because the training programs concentrate on technologies for improving agricultural production, and do not otherwise aim to directly affect agricultural sales, this measure of total production value will be more relevant for the impact evaluation than the measure of agricultural sales.[5]

Respondents' average crop values are presented in the second column of Table III.3. Crop values were calculated by multiplying the WUA-specific median price of each crop by the amount that each farmer produced. Although fruit is still the largest single component of the total value of the harvest, grains, vegetables, potatoes, and grass play a much larger relative role in the value of the total harvest than they do in the total sales. This is logical, as these crops are more likely than fruit to be harvested but not sold.

When examining total crop sales and value by zone, not surprisingly Ararat Valley has the largest average total crop sales and values per respondent of all the zones, as shown in Figure III.5. However, the differences among zones are most pronounced for crop sales. As

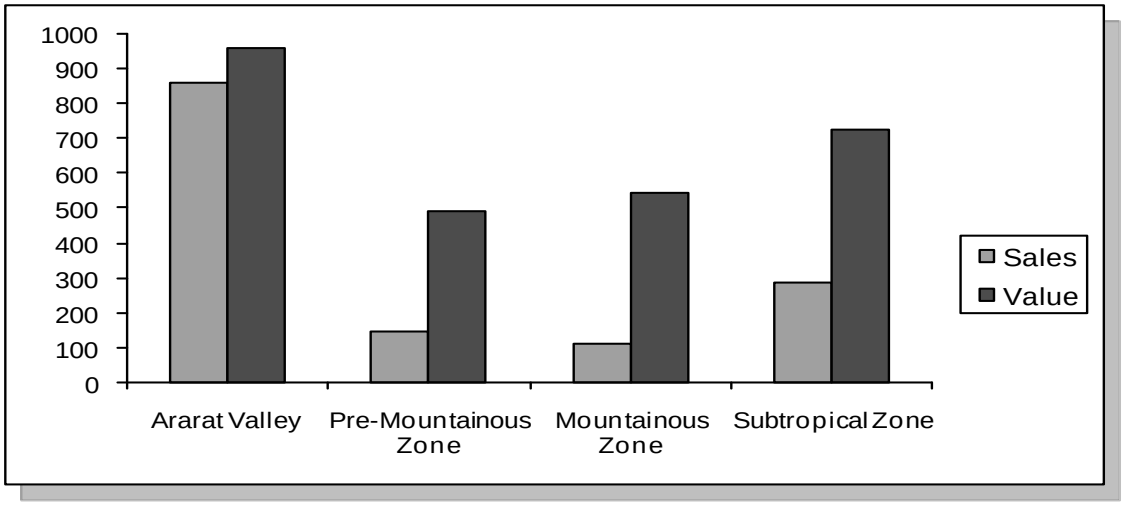
[3] We implemented these conversions for each specific type of crop. For example, we estimated the value of apples, grapes, and figs separately.

[4] The median is the value in the exact middle of the distribution (the 50th percentile). Similar to an average (or mean), a median is a measure of the "typical" price for farmers in the sample, but an advantage of the median is that it is not sensitive to distributional outliers that could skew the average price.

[5] As described previously, the WtM includes post-harvest processing and other activities that may affect farmers' sales; however, these are not part of the training programs that are the focus of the impact evaluation.

discussed earlier, this could arise because the farmers in Ararat Valley tend to produce crops to sell at the market, either because they have easier access to markets or because their land is more fertile for growing high-value crops. The differences among zones are less pronounced when focusing on the value of the harvest, suggesting that access to markets (especially in Yerevan) may be the key difference.

Figure III.5. Respondents' Average Total Crop Sales and Value by Zone (1,000 AMD)



Sample Size = 4,854

Source: 2007 Farming Practices Survey (FPS).

Note: All data are weighted to adjust for uneven treatment/control ratios across Water User Associations.

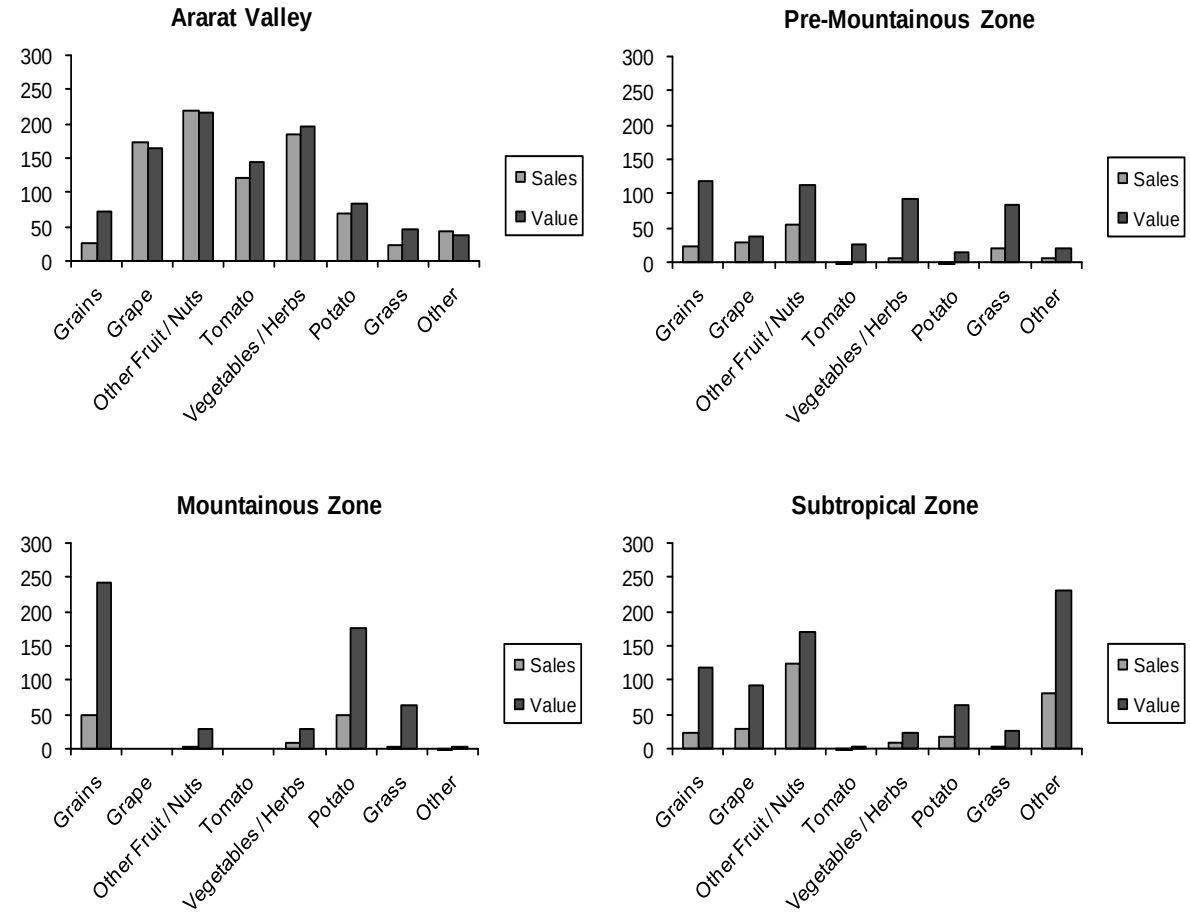
Averages include zeros for respondents that did not produce and/or sell crops.

Figure III.6 displays respondents' average crop sales and values by zone for each crop type. High values for crop sales and crop value from Ararat Valley are primarily due to fruit, tomato, grape and vegetable production. For the Pre-Mountainous and Subtropical Zones, the value of grain and fruit production plays a relatively large role in determining the overall value of the harvest.[6] In the Mountainous Zone, the values of the grain and potato harvests play the largest role in determining the overall value of the harvest in that zone.

The farmers in our sample are diverse in terms of the crops they grow and sell. Much of this heterogeneity is apparent along zone divisions. In Ararat Valley, farmers sell almost all of the crops they produce, consuming relatively little of their overall harvest. They grow a relatively large share of the fruit, and their sales of fruit and vegetables lead to Ararat Valley having higher average sales than any of the other zones. In contrast, farmers in the

[6] Tobacco production, captured in the "other" category, also makes a substantial contribution to the value of farmers' harvest in the Subtropical Zone.

Figure III.6. Respondents' Average Crop Sales and Values by Zone (1,000 AMD)



Sample Size = 4,854

Source: 2007 Farming Practices Survey (FPS).

Note: All data are weighted to adjust for uneven treatment/control ratios across Water User Associations. Averages include zeros for respondents that did not produce and/or sell crops.

Mountainous Zone have the lowest average sales and tend to consume a large portion of their overall harvest. The Mountainous Zone is the only zone in which the majority of sales revenue comes from something other than fruit: grains and potatoes. These differences indicate that the sample contains considerable variability in farm type that may result from access to markets and the fertility of the land. Moreover, these differences in farm types may lead to differences in how the intervention is received and the impact it will have among the different agricultural zones.

As a check on the reliability of FPS data, we compared the estimates of crop prices from the FPS to ACDI's market research on crop prices, and found that the estimates based

on FPS data closely match those based on ACDI data. Table III.4 displays price estimates, as well as average respondent sales and value estimates for several common Armenian crops.[7] In the first two columns, countrywide crop price estimates provided by ACDI are

Table III.4. ACDI and FPS Estimates for Prices, Average Respondent Sales, and Average Values of Respondents' Crops

	Prices (AMD/kg)		Average Sales (AMD)		Average Value (AMD)	
	ACDI	FPS	ACDI	FPS	ACDI	FPS
Fruits						
Apple	125	113	14,871	12,939	37,993	31,679
Grape	135	127	95,318	91,188	103,455	98,836
Apricot	200	300	6,611	9,916	8,393	12,589
Peaches	160	128	27,872	21,453	29,768	23,010
Sweet cherries	230	191	1,218	698	1,747	1,118
Watermelon	50	44	55,508	53,753	52,035	50,172
Tomato	40	71	58,576	88,046	63,833	97,933
Fruit Totals			259,973	277,994	297,225	315,337
Vegetables						
Eggplant	65	293	14,127	15,224	15,837	27,456
Onion	80	108	15,071	18,951	19,759	25,456
Cabbage	30	30	9,651	9,168	14,559	13,934
Cucumber	70	98	12,889	18,409	17,164	24,500
Vegetable Totals			51,739	61,752	67,320	91,346
Other Crops						
Potato	125	100.5	51,098	41,091	84,787	68,234
Wheat	80	100.8	18,082	22,623	66,839	83,782
Other Crop Totals			69,180	63,714	151,626	152,016
Grand Totals			**380,892**	**403,460**	**516,171**	**558,699**

Sample Size = 4,854

Source: 2007 Farming Practices Survey (FPS).

Note: All data are weighted to adjust for uneven treatment/control ratios across Water User Associations.

Averages include zeros for respondents that did not produce and/or sell crops.

[7] Table III.4 contains only crops for which price estimates were available in both sources of price data (FPS and ACDI). As such, total sales and values in this table should not be compared with total sales and values featured in Table III.3.

compared to countrywide crop price estimates constructed with FPS data.[8] Two of the notable exceptions, eggplant and apricot, are limited by relatively small sample sizes in the FPS; their deviations can, therefore, be attributed to chance. Differences in tomato prices also stand out, which may be explained by different methodologies. Whereas the FPS estimates are the price a typical farmer received, ACDI estimates are designed to be a minimum price that farmers can expect to receive at market. Because tomatoes are quite perishable and thus seasonal, this distinction is especially relevant for this crop.

The ACDI price estimates yield sales and value estimates that are similar to estimates that use the FPS prices (columns 3 through 6). Both are constructed by multiplying the prices by farmers' reported amount sold and produced, respectively. Combining all crops with estimates available from both sources, the overall values are similar. ACDI and FPS total sales estimates for these common crops are within 25,000 drams of each other, and ACDI and FPS total value estimates are within 45,000 drams of each other. Given the methodological differences described earlier, the slightly larger overall estimates using FPS data are to be expected. Taken altogether, ACDI's market research serves as a valuable confirmation of the reliability of the FPS crop value estimates.

B. INCOME AND POVERTY

Household income will be one of the primary outcomes of the evaluation. Table III.5 displays two alternative measures of respondents' annual household income. The upper section summarizes the average of respondents' annual net monetary income. The first row summarizes the annual net income of the respondent households from nonagricultural sources (most of which comes from employment in non-agricultural jobs).[9] The second row presents the average annual net monetary profits of the farms, equal to the total of the crop sales minus the total operating costs, and the average sum of the items in the first two rows is presented in the third row.[10] As shown in the table, the majority of net monetary income for households in our survey comes from nonagricultural sources.

Zone comparisons in the upper section of Table III.5 illustrate that annual net monetary income varies significantly across zones. Households in Ararat Valley have the highest average net monetary income at 1,133,503 Armenian drams, while households in the Mountainous Zone have the lowest average net monetary income at 395,285 drams. Net monetary incomes in the Pre-mountainous and Subtropical Zones lie between these two extremes at 627,141 and 628,218 drams, respectively.

[8] Price estimates constructed with FPS data are the median amount of drams paid per metric ton of each crop, weighted according to the zone in which the crop was sold.

[9] Yearly non-agricultural income was calculated by multiplying income reported in the last month by 12.

[10] All agricultural production and sales were reported for the last agricultural season. Since Armenia has only one major growing season, these reports were interpreted as farmers' annual agricultural production and sales.

As described earlier, many farmers (particularly in the Mountainous Zone) consume a large portion of the crops they produce rather than purchasing them in the marketplace. Thus, from an economic perspective, these consumed crops can be considered part of the household's income. The bottom panel of Table III.5 presents an alternative measure of annual net household income that includes the value of the crops that farmers consume. As with the top panel, nonagricultural income is included in the total. The economic profit, however, is calculated using the total value of the crops harvested minus the operating costs. The average of the total annual net economic income is presented in the final row. The difference between the monetary income and the economic income is due to the value of the crops that are consumed by the household. Accounting for the value of the consumed crops increases the total annual net income by approximately 31 percent on average.

Zone comparisons in the lower section of Table III.5 illustrate that annual net economic income varies across zones, but to a much lesser degree than net monetary income. Mirroring the distribution of monetary income, farms in Ararat Valley have the highest average economic income at 1,234,099 Armenian drams, while farms in the Mountainous Zone have the lowest average economic income at 829,778 drams. Net economic incomes in the Pre-mountainous and Subtropical Zones are 973,844 and 1,063,217 drams, respectively.

Table III.5. Respondents' Annual Household Income (AMD)

	All Zones: Average [Median]	Ararat Valley: Average [Median]	Pre-Mountainous: Average [Median]	Mountainous: Average [Median]	Subtropical: Average [Median]
Net Monetary Income					
Nonagricultural income	652,538 [384,000]	660,105 [396,000]	673,806 [420,000]	506,627 [288,000]	707,048 [360,000]
Monetary agricultural profit (crop sales – costs)	165,983 [-35,950]	473,398 [45,000]	-46,666 [-57,500]	-111,342 [-113,000]	-78,830 [-18,000]
Total Net Monetary Income	**818,520 [451,000]**	**1,133,503 [665,000]**	**627,141 [383,000]**	**395,285 [167,000]**	**628,218 [389,000]**
Net Economic Income					
Nonagricultural income	652,538 [384,000]	660,105 [396,000]	673,806 [420,000]	506,627 [288,000]	707,048 [360,000]
Economic agricultural profit (crop value – costs)	419,884 [114,000]	573,994 [166,200]	300,038 [78,000]	323,151 [122,914]	356,169 [178,000]
Total Net Economic Income	**1,072,422 [652,000]**	**1,234,099 [749,300]**	**973,844 [609,267]**	**829,778 [475,000]**	**1,063,217 [638,375]**

Sample Size = 4,854

Source: 2007 Farming Practices Survey (FPS).

Note: All data are weighted to adjust for uneven treatment/control ratios across Water User Associations.

Averages and medians include zeros for respondents that did not produce and/or sell crops.

AMD = Armenian drams.

Wages are an important component of non-agricultural income, and were reported in the survey for the previous month. Because the survey was administered during the winter months, the wages earned in the previous month might not be representative of months during the agricultural season. For example, farmers might work non-agricultural jobs only during the winter when their agricultural work has slowed. In Table III.6, we compare two methods of constructing monetary and economic income estimates under different assumptions. Under Method 1, reported monthly wages of all household members were multiplied by 12 to construct each household's annual wage income. Under Method 2, we made the assumption that farmers take part in wage employment only 6 months out of the year, and fully dedicate themselves to agriculture during the other 6 months. As such, the monthly wages of farmers in the household were multiplied by 6 to construct annual wage income, while the monthly wages of non-farmers in the household were multiplied by 12. Under Method 2, estimates for households' annual monetary and economic income were over 250,000 AMD lower than estimates using Method 1. Method 1 yielded an average net monetary income of 818,520 AMD and an average net economic income of 1,072,422 AMD, while Method 2 yielded an average net monetary income of 627,913 AMD and an average net economic income of 881,814 AMD.[11]

As a final measure of well-being, we calculated poverty rates for our sample. Calculations of poverty are complex, and formulating accurate estimates requires detailed information on a number of dimensions. Our approach is based on the poverty rate calculations used for the Integrated Survey of Living Standards (ISLS) and developed in collaboration with the World Bank. This approach first calculates the value (in AMD) of everything consumed by the household, including food, other nondurable goods, and durable goods. Total consumption is then compared to the poverty line. The ISLS uses two

Table III.6. Respondents' Annual Household Income, Calculated by Two Methods (AMD)

	Method 1 (wage x 12) Average [Median]	Method 2 (wage x 6) Average [Median]
Total Net Monetary Income	818,520 [451,000]	627,913 [344,000]
Total Net Economic Income	1,072,422 [652,000]	881,814 [522,577]

Sample Size = 4,854

Source: 2007 Farming Practices Survey (FPS).

Note: All data are weighted to adjust for uneven treatment/control ratios across Water User Associations.

Averages and medians include zeros for respondents that did not produce and/or sell crops.

AMD = Armenian drams.

[11] Given the importance of non-agricultural income even for farming households, future rounds of the FPS will feature modified questions regarding non-agricultural income. These modifications are primarily designed to more accurately reflect annual income from non-agricultural employment.

distinct poverty lines. The "food poverty line" is based on the cost to consume a minimum number of calories per day. The "complete poverty line" includes the cost of consuming a minimum number of calories per day plus an allowance for basic, nonfood needs, such as clothing and shelter. The poverty lines are adjusted based on the number of adults and children in the household. Both of these poverty lines are independently derived by NSS (in collaboration with the World Bank) and provided to us.

The ideal method for measuring household consumption is to use a household diary, which is completed each day. This approach minimizes reporting errors and is the methodology used for the ISLS. However, such an approach is also expensive and time consuming and was not feasible within the constraints of the FPS. Instead, our measure is based on reports of expenditures in the last month on food (purchased), health care costs, housing products, public utilities, transportation, and other expenses. These measures are then coupled with the estimated value of what was consumed by the household out of its agricultural production. The FPS did not ask about durable goods; therefore, we adjusted our estimates of consumption by a factor of 9.4 percent, based on the share of consumption attributable to durable goods in the ISLS.

The household's own production is clearly an important component of consumption. As shown in the first row of Table III.7, 11.5 percent of households in our sample are below the food poverty line and 26.1 percent are below the complete poverty line when consumption of own production is excluded. These poverty rates drop by about a third when consumption of own production is included.

We also estimate that the average household is above the poverty line. On average, household consumption equals 349 percent of the food poverty line and 238 percent of the complete poverty line. However, the majority of households have consumption no greater than four times the complete poverty line, as shown in Figure III.7; thus, even the farmers in our sample who are not impoverished are not very well off either. These will be important indicators to track in the impact analyses, since MCC's programs are likely to affect not only households near the poverty line, but households above it as well

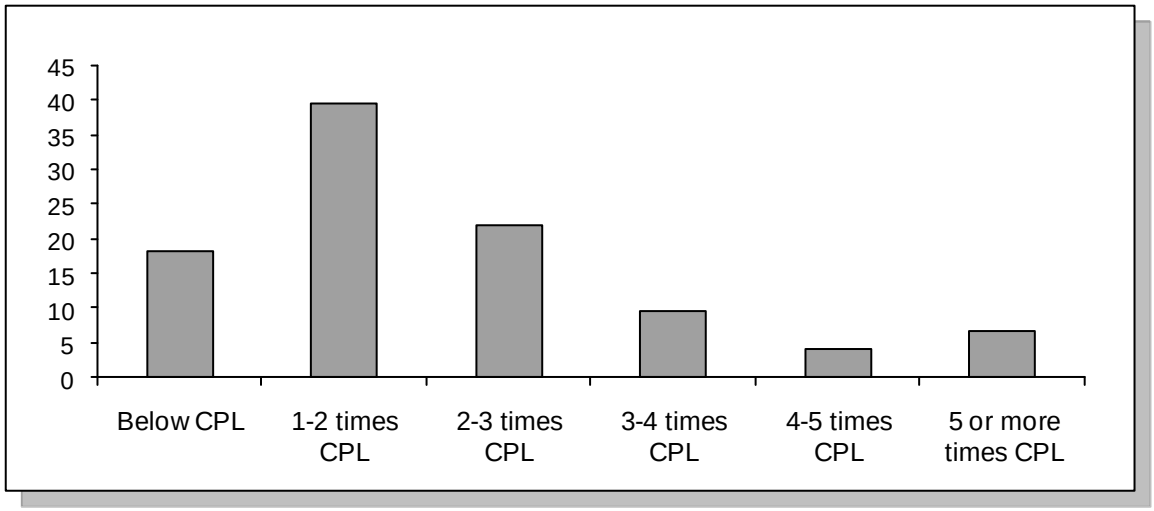
Table III.7. Respondent Households Living in Poverty (Percentages)

	Food Poverty	Complete Poverty
Excluding consumption of own crop production	11.5	26.1
Including consumption of own crop production	7.5	18.3
ISLS estimates for rural Armenia (2007)	2.3	25.5
Average household consumption relative to poverty line	349	238

Sample Size = 4,854

Source: Farming Practices Survey 2007 and Integrated Survey of Living Standards 2007.

Figure III.7. Percent of Respondent Households Above and Below Complete Poverty Line (CPL)



Sample Size = 4,854

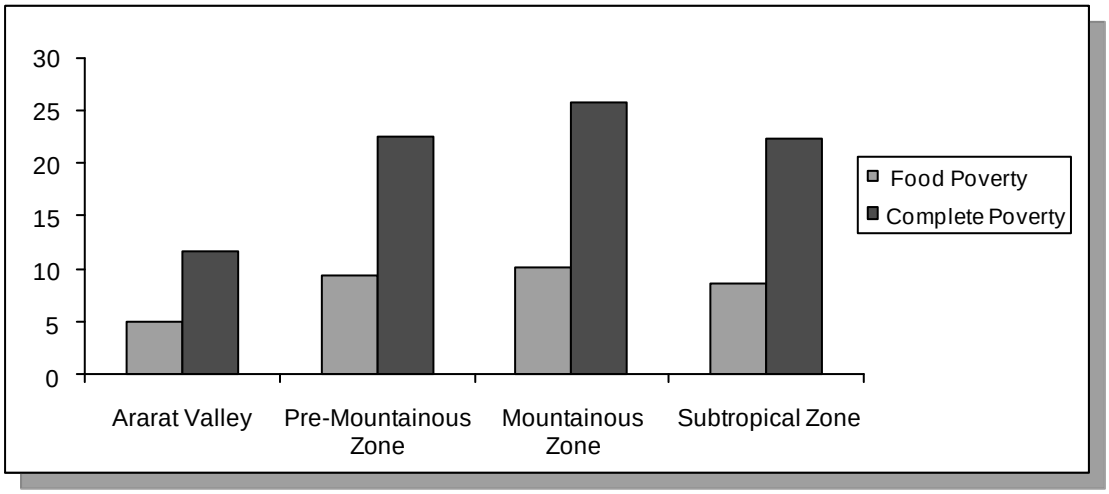
Source: 2007 Farming Practices Survey (FPS).

Note: All data are weighted to adjust for uneven treatment/control ratios across Water User Associations.

The magnitude of poverty rates relative to the complete poverty line estimated from the FPS is comparable to ISLS estimates for all rural Armenians, though the estimates of food poverty rates differ somewhat. The two sets of estimates differ for methodological reasons and because of differences in the sample. As described previously, the ISLS uses a more comprehensive methodology for estimating household consumption. The estimates also differ from ISLS estimates, however, because the FPS sample is not designed to be representative of all villages in Armenia; they are the villages in which the WtM activities will be implemented. Similarly, the FPS targets farmers specifically and, thus, is not a random sample of all households in rural Armenia.

An examination of poverty rates by zone indicates that the Ararat Valley has food poverty and complete poverty rates of approximately half the other zones (Figure III.8). Likewise, the average household in the Ararat Valley is living at 369 percent of the food poverty line and 251 percent of the complete poverty line, while average households in the other zones are living at 351 percent of the poverty line or lower, and at 238 percent of the poverty line or lower (Figure III.9). Thus, poverty may be a larger issue, and have a greater potential for impact, outside of Ararat Valley.

Figure III.8. Respondent Households Living in Poverty by Zone (Percentages)

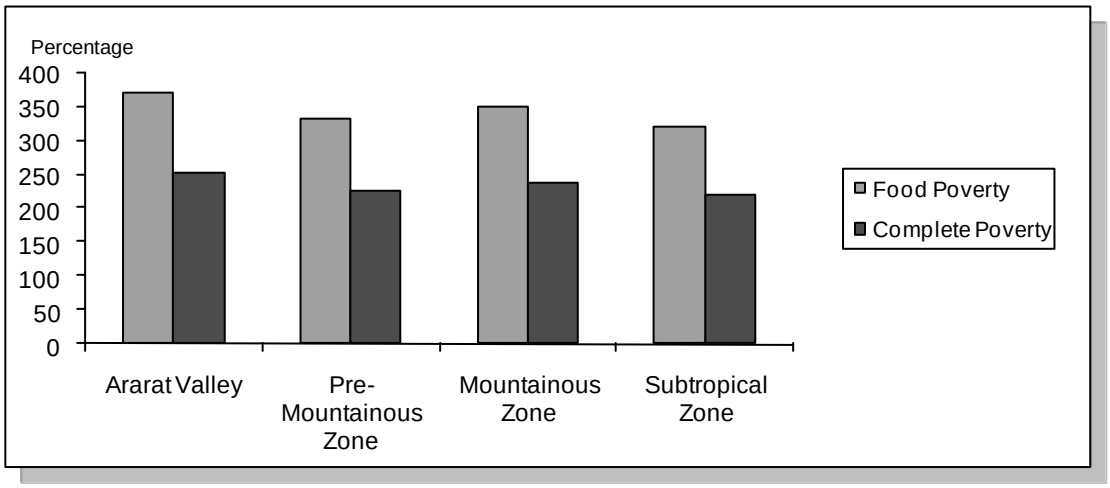


Sample Size = 4,854

Source: 2007 Farming Practices Survey (FPS).

Note: All data are weighted to adjust for uneven treatment/control ratios across Water User Associations.

Figure III.9. Respondents' Average Living Conditions in Relation to Food and Complete Poverty Lines, by Zone (Percentages)



Sample Size = 4,854

Source: 2007 Farming Practices Survey (FPS).

Note: All data are weighted to adjust for uneven treatment/control ratios across Water User Associations.

C. TREATMENT AND CONTROL GROUPS AT BASELINE

The evaluation of WtM activities uses a design in which villages are randomly assigned to either receive the treatment immediately or to receive it at a later date. This assignment serves both a logistical and a research purpose. Logistically, it is infeasible to serve all villages immediately, and they must be staggered over time; a random lottery was deemed the most fair way to decide which villages to serve first. Furthermore, this random assignment facilitates a research design whereby the outcomes of farmers in villages that received the training can be compared with those that have not yet received it. Because the villages were chosen at random, differences between the farmers in each group (treatment and control) are expected to be negligible, on average, prior to the training. Any measured differences following the training can confidently be attributed to an effect of the training.

One of the advantages of a baseline survey is that we can verify whether the farmers in the treatment villages are similar to the farmers in the control villages prior to receiving the intervention. For most of the outcome measures, the treatment and control groups are very similar.[12] For example, there are no significant treatment-control differences in the key outcomes that the WtM program seeks to affect: irrigation practices, crop cultivation and production, agricultural expenditures, or household poverty rates. However, when comparing so many outcome measures, some chance differences between the two groups are probabilistically likely. Indeed, the outcomes relating to agricultural sales exhibit sizeable, statistically significant differences. Although we consider agricultural sales to be less important than many other outcome measures, it will be important to control for these baseline differences in the impact analysis.

[12] See Appendix C for detailed treatment-control comparisons

CHAPTER IV

CONCLUSION

As described in Chapter I, the analysis of the baseline Farming Practices Survey (FPS) data has two main objectives. The first objective—which was the emphasis of Chapters II and III in this report—is to describe the sample of farming households at baseline. The second objective is to identify improvements so that future iterations of the FPS best address the policy questions of greatest interest to the Millennium Challenge Corporation (MCC) and the Millennium Challenge Account with Armenia (MCA-Armenia). Related to the first objective, Section A of this final chapter provides a summary of our findings in Chapters II and III. Related to the second objective, Section B focuses on improvements to the FPS, followed by plans for future analyses in Section C.

A. SUMMARY

The survey data give us important contextual information for the evaluation. Survey responses indicate that the heads of household in our sample are likely to have completed secondary school, and the households are often multigenerational with one or two children under the age of 18. The households work on farms that average less than two hectares, though farm size varies by agricultural zone. Although the sample was not designed to be representative of all rural Armenians, this contextual information will allow us to understand how the households in the study compare to the broader population of rural Armenia.

Baseline survey responses also illustrate the potential for the WtM activities to have an impact on farming practices. At baseline, few farmers engaged in any of the irrigation practices that are the focus of the training. With the exception of furrow row spacing (seven percent) all of the techniques were used by less than one percent of farmers. Likewise, summaries of crop production indicate that there are many farmers producing relatively low-value crops that is mostly for consumption by the household.

The key outcome that the WtM activity seeks to influence is to increase household well-being. The survey provides evidence that many of the households in our sample were living in poverty at baseline. Approximately 8 percent of our sample lives below Armenia's food poverty line, and 18 percent live below the complete poverty line. Moreover, income is low for other households in the sample as well, not just those below the poverty line. The average household in our sample reported consumption that would place them at just under

3.5 times the poverty line. These baseline results demonstrate room for the intervention to have an impact on poverty in our sample.

B. LESSONS LEARNED

Overall, the first round of the FPS was implemented well, and subsequent iterations will be modeled closely after the first. The majority of changes that were identified in the first round involve minor edits to the survey instrument to help clarify specific questions and/or distinguish between possible responses.

Two other changes would entail simple adjustments to the survey instrument, but they have important implications for future analyses.

First, changing the reference periods for some questions would improve their usefulness. One such case is the question on household consumption of certain goods, such as groceries that were purchased. The baseline survey asked about groceries purchased in the past month; but because many households were interviewed near the New Year celebration, their reported consumption in that month may not be representative of their consumption throughout the rest of the year. Thus, these items will be changed to refer to a typical month. Another case involves expenditures on education and health in the past month. Because these expenditures are infrequent, the past month may not be representative of the full year. For these items, the reference period will be changed to the past 12 months. In both cases, changing the reference period means that we will be unable to compare these items on future rounds of the FPS to their baseline analogs. However, we believe that the improved accuracy makes this trade-off worthwhile. Additionally, clarifying the questions pertaining to crop harvests will ensure that responses are referring to a consistent period and reflect all crops produced within the year. And finally, the relatively high proportion of income that comes from non-agricultural sources suggests that more precise questions about these sources may be needed.

Second, the analysis in Chapter II indicates that the definition of the head of household may vary. For some households, the person primarily responsible for farming decisions was identified as the head of household, as the survey instrument specified. In others, the person identified as the head of household was an elderly person who was unlikely to be actively engaged in agriculture. Because the majority of households in our sample are multigenerational families, this distinction is important. Ensuring that the definition is consistently applied will allow for consistent interpretation of data items pertaining to the head of household.

C. PLANS FOR FUTURE ANALYSES

As summarized in Chapter I, the main impact evaluation will be conducted based on the FPS data collected in 2010, the final year before training begins in the control group villages. At that point, we will analyze impacts three years after training began in the treatment group villages and compare these impacts to outcomes of control group villages that have had no WtM training.

This analysis may be supplemented with an earlier impact evaluation that uses data from the second year of the FPS (the first year after training began) to assess the short-term impact of the program. This intermediate impact evaluation would focus on outcomes that are likely to be affected more immediately, such as adoption of new irrigation technologies or cropping patterns—the key pathways through which the WtM training programs intend to affect household well-being.

Current plans also call for another round of the FPS in 2011,[1] after all villages have been offered WtM training. Even though both the treatment and control group villages will be eligible for training, informative comparisons of the two groups can still be made. In particular, analysis could be conducted to rigorously compare the long-term effects of training to the short-term effects—that is, how outcomes in villages that have had as much as four years to implement the new technologies compare to those villages that are newly trained. As some program impacts may take several years to be fully realized, such analyses could be valuable for capturing the full effect of the WtM activities.

[1] The decision to field the 2011 FPS is not yet finalized.

APPENDIX A

FARMING PRACTICES SURVEY INSTRUMENT

DATA COMPLETION FINAL REPORT

FARMING PRACTICES SURVEY 2007-2008

SURVEY INSTRUMENTS

Questionnaire
Card 1
Card 2
Card 3

YEREVAN 2008

DON'T KNOW 99

REFUSED TO ANSWER 0

FARMING PRACTICES SURVEY

Marz Code	Cluster/settlement Code	Respondent Current Number	Interviewer Code	Questionnaire is Valid Coordinator's Signature

Hello, my name is **(first name, last name):** I represent AREG SCYA NGO, which implements Farming practices survey in the RA marzes by the order of "Millennium Challenge Account-Armenia". The survey data will be used only in a summarized form and will greatly contribute to the elaboration of projects directed to the agricultural development in Armenia. Your reliable answers are very important for us.

Name of respondent

_____

First Name, Middle Name, Last Name

Contacts of the respondent (telephone) _____

Start time _____

End time _____

DON'T KNOW 99

REFUSED TO ANSWER 0

HOUSEHOLD DESCRIPTION

A. LAND AND LIVESTOCK

A1. How many years have you been farming (excluding years in which the kitchen plot was cultivated alone)?

1. less than 1
2. 1 - 5
3. 6 – 10
4. 11 – 16
5. More than 17

A2. What is the total area of the land currently cultivated by your household (not including kitchen plot)?

Type of land	Area in sq.m
1. Own cultivated land	
2. Rented/other cultivated land	

A3. Do you have a kitchen plot?

1. Yes
2. No (then => A6)

A4. How big is the plot?

_____ sq.m

A5. How do you water kitchen plot?

1. Mainly well or drinking water
2. Mainly irrigation water
3. Mainly rain water
4. Other (specify)_____

A6. Do you have livestock?

1. Yes, ***to the Interviewer: fill in the table* A7 *below.***
2. No (then =>B1)

A7. Information on households' livestock

N	Item	Available livestock
		1
1	Cow	
2	Pig	
3	Sheep and goat	

DON'T KNOW 99

REFUSED TO ANSWER 0

B. ROSTER OF CROPS GROWN DURING THE LAST AGRICULTURAL SEASON AND CHANGES THEREIN

B1. Crop production and utilization in the field (including kitchen plot).
To the Interviewer: Use Card 1 to fill in the table and fill the numbers in fixed format.

66. N/A

						Of which:		
N	Item (*Input Code using the Card 1*)	1. In the field 2.In the kitchen plot 3.Both	How much was cultivated? *If only several trees were cultivated, ask how many trees, writing down the number.*		Total amount harvested in the last season	How much was sold?		How much was bartered
			sq. m.	number of trees	t	t	AMD	t
		1	2	3	4	5	6	7
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								

B2. During the past agricultural season, did you do any of the following practices?
To the Interviewer: Provide the respondent with Card 2. Check all applicable answers

DON'T KNOW 99

REFUSED TO ANSWER 0

B3. During the recent agricultural season, did you grow different crops from the previous year?

1. Yes
2. No (then =>C1.)

B4. What is the main reason you changed your cropping pattern?

1. Improved irrigation
2. Lack of water
3. Weather
4. Market conditions
5. Cost of inputs
6. Government subsidies
7. Trying new varieties of crops
8. Access to training
9. Other (specify)_____

C. WATER USE

C1. How much of your land did you water through the following ways (not including your kitchen plot)?

1.	Irrigation water (pipeline/canal)	sq. m
2.	Well or other drinking water	sq. m
3.	Exclusively natural sources, rivers/ rain water	sq. m
4.	Irrigation water and well or other drinking water	sq. m
5.	Irrigation and natural sources, rivers/rain water	sq. m

C2. Do you have a personal tank or reservoir that you use to water crops?

1. Yes
2. No

C3. Do you have a pump that you use to pump water?

3. Yes
4. No

C4. What irrigation practices did you use during the last agricultural season?
To the Interviewer: Show CARD 3. Check all possible answers and fill the codes into the space below.

6. None of mentioned (then=>C7)

C5. Did any of these practices help you save water?

5. Yes
6. No

C6. Did any of these practices help you save labor?

1. Yes
2. No

C7. Did you incorporate any agricultural practices that changed the way you use fertilizers or pesticides?

1. Yes
2. No

DON'T KNOW 99

REFUSED TO ANSWER 0

D. FARMING EXPENDITURES

D1.

N	Items	How much was spent on the mentioned items during the last season? AMD (or foreign currency expressed in AMD)	How much was spent on the mentioned items during the last season? ***To the Interviewer: If items were bartered, write down the the quantity of mentioned products expressed in drams, for example potatoes for 5000 AMD***
		1	2
1	All kind of fertilizers and pesticides		
2	Irrigation		
3	Hired labor and hired equipment or tools (including spare parts, fuel etc.)		
4	Taxes and duties		
5	Other major expenses (specify)		

E. TRAININGS

E1. During the past year, was any farming or irrigation training offered in your community or nearby communities?

1. Yes
2. No (then =>F1)

99. Don't know (then =>F1)

E2. Did you attend any of the trainings?

1. Yes
2. No (then => F1)

E3. What kind of training was it? (*To the Interviewer: Check all that apply*)

1. Classroom training
2. Farm demonstration training
3. Video or computer in the classroom
4. Exchange of experience
5. Some other kind of training (describe)_____

E4. Did you receive a certificate at the end of training?

1. Yes
2. No

DON'T KNOW 99

REFUSED TO ANSWER 0

F. AGRICULTURE EQUIPMENT

F1. Do you currently own or rent any of the following?

No	Equipment	Check if **Yes owner**	Check if **Yes rent**
		1	2
1	Trucks and Tractors		
2	Combine		
3	Seed planter		
4	Sprayer		
5	Artesian well or tank		

55. I don't have it

F2. Did you take credit during the last season?

1. Yes, amount (AMD) _____
2. No (then =>G1)

F3. From whom did you receive the credit?

1. Bank
2. State guaranteed project
3. International organization
4. Parents
5. Friends or others
6. Other (specify)_____

G. CONSUMPTION AND MONETARY INCOME OF HH MEMBERS

G1. How much is spent by your family for the following purposes during the last month?

Cost Item	***Drams***
1. Food	
2. Healthcare costs	
3. Housing products (e.g. soup, washing powder etc).	
4. Public utilities (electricity, telephone, apartment rent, water)	
5. Transport	
6. Other ***(specify)***	

G2. How much is the generalized monetary income of your family members from the following sources in last month?

Income	***AMD***
1. Pension	
2. Remittances from HH absent members (abroad or other RA citizens)	
3. Other benefits (social)	

DON'T KNOW 99

REFUSED TO ANSWER 0

H1. I would like to make a complete list of all the members of your household, both present and absent. By saying a household I mean people who usually live together, share the same housekeeping and have the same budget. At first, I would like to write down the name of the head of the household, i.e. the person adopting primary decisions, then his spouse, their children and then other members of the household. Do not include the visitors.

To the Interviewer: Circle the number of respondent in the column of h/h members.
Questions from 5 to 9 should be asked for farmer, spouse and their children over 16 only.

No of h/h member	Household members and their relationship to the head of h/h 1.head 2.spouse 3.son/daughter 4.son in law/ daughter in law 5.grandchild 6.father/mother of head / spouse 7.other relatives of the head 8. persons that do not have any relationship to the head	Gender 1. male 2. female	Age (write down number)	If any of the household members who usually live here are currently absent, indicate by marking "**1**" in their row	During the last harvest, which people in the household were actively working in agriculture as their main activity? 1. Yes 2. No	Did any of your HH members have any paid work during the last month 1. Yes 2. No	How much was HH members' salary for the mentioned job in AMD?	Do the HH members receive any in-kind (non financial) payment? 1. Yes 2. No	What is the level of education completed? (from 16 years of age) 1.non-educated 2.incomplete primary 3.primary 4.incomplete general secondary 5.general secondary 6.incomplete secondary 7.secondary (full) 8.secondary vocational 9.incomplete higher 10. higher 11. post-graduate
	1	2		4	5	6	7	8	9
0									

Thank you for cooperation.

CARD 1

1. **Wheat**
2. **Barley**
3. **Maize**
4. **Apple**
5. **Grape**
6. **Peach**
7. **Appricot**
8. **Pear**
9. **Prunes**
10. **Plum**
11. **Fig**
12. **Pomegranate**
13. **Sweet Cherry**
14. **Cherry**
15. **Cornel**
16. **Quince**
17. **Water melon**
18. **Melon**
19. **Pumpkin**
20. **Lemon**
21. **Malta orange**
22. **Walnut, hazelnut**
23. **Strawberry**
24. **Tomato**
25. **Cucumber**
26. **Eggplant**
27. **Pepper**
28. **Cabbage**
29. **Carrot**
30. **Squash**
31. **Onion**
32. **Garlic**
33. **Potato**
34. **Red beet**
35. **Sunflower**
36. **Haricot**
37. **Tobacco**
38. **Greens (coriander, basil, parsley, tarragon, etc.)**
39. **Grass (natural)**
40. **Gramma or other special feed**
41. **Other fruits**
42. **Other vegetables**

DON'T KNOW	99
REFUSED TO ANSWER	0

Card 2

1. **Used non-organic fertilizers**
2. **Used pesticides or other plant protection material**
3. **Bought high quality seeds**
4. **Transplanted from a seed bed to the field or from a nursery to a field**
5. **Changed time of seeding**
6. **Produced two or more crops per year**
7. **Introduced new crops, new trees, or an orchard you had not grown last year**
8. **Introduced new varieties of crops**
9. **Changed the way you cultivate or weed (timing, frequency, technique)**
10. **Used "organic" practices**
11. **Used plastic greenhouse or plastic tunnel during crop production**
12. **Planted dwarf root stock or trees**
13. **Pruned (fruit or nut trees)**
14. **No**

CARD 3

1. **Verifying/modifying furrow row spacing**
2. **Scientific scheduling of when to irrigate, such as**
   - 2.1. Soil moisture sensors (Watermark)
   - 2.2. Tensiometers
   - 2.3. ET gauge
3. **Water meters (water pressure measuring devices)**
4. **Non-pressure/ pipe irrigation**
   - 4.1. Plastic or metal dams
   - 4.2. Siphon tubes
   - 4.3. Short pipes with valves
   - 4.4. Gated pipes
   - 4.5. Other (specify)
5. **Pressure irrigation**
   - 5.1. Undertree high pressure spray
   - 5.2. Drip irrigation
   - 5.3. Micro sprinklers

APPENDIX B

DETAILED SUMMARY OF CROP PRODUCTION

Table B.1. Detailed Summary of Crop Production

Crop	Percentage Growing	Average Harvest Area (Sq. Meters)	Average Tons Produced	Average Tons Produced Per Hectare	Average Value Produced (AMD)	Average Value Per Ton Produced (AMD)
Grains	44.6	6,702.5	1.1	1.7	110,458.4	97,828.4
Wheat	38.5	4,945.8	0.8	1.7	84,153.8	99,566.6
Barley	12.5	1,381.8	0.2	1.2	16,894.6	100,940.8
Maize	3.1	117.3	0.1	5.8	5,600.2	82,022.2
Emmer wheat	1.1	129.8	0.0	1.1	3,809.9	276,705.5
Grape	23.9	1,729.2	0.7	3.9	89,162.7	132,510.1
Other Fruits and Nuts	60.1	2,213.7	1.7	7.6	149,424.5	88,626.0
Apple	31.4	559.1	0.3	5.7	35,775.8	111,815.5
Peach	17.4	382.4	0.2	4.4	23,285.1	137,681.6
Apricot	23.8	460.7	0.0	0.9	12,671.5	322,081.1
Pear	10.6	29.7	0.0	4.5	1,800.5	133,815.6
Prunes	3.6	36.1	0.0	1.9	1,314.8	195,338.2
Plum	3.6	35.4	0.0	2.9	1,628.7	157,143.6
Fig	0.7	2.8	0.0	10.0	611.8	215,207.1
Pomegranate	0.4	4.2	0.0	3.5	717.7	486,991.0
Sweet Cherry	5.8	29.3	0.0	2.6	3,585.3	475,216.2
Cherry	3.2	8.6	0.0	23.6	867.6	42,726.3
Cornel	0.7	13.3	0.0	1.0	188.7	143,848.0
Quince	0.5	2.4	0.0	3.0	99.6	140,439.5
Water melon	5.0	379.7	0.9	23.2	42,387.2	48,143.7
Melon	2.1	97.1	0.1	15.4	9,683.4	64,923.9
Lemon	0.1	0.3	0.0	108.4	0.0	0.0
Malta orange	1.0	11.8	0.0	3.9	807.8	176,390.5
Strawberry	1.5	14.3	0.0	12.1	8,357.5	483,505.9
Other fruits	1.7	32.9	0.0	4.1	2,107.7	155,483.0
Walnut and hazelnut	6.3	34.1	0.0	1.2	3,533.9	862,476.7
Tomato	25.0	425.8	1.3	31.4	72,409.0	54,113.5
Other Vegetables and Herbs	34.6	1,216.1	1.5	1.5	127,113.7	82,769.0
Pumpkin	0.1	8.6	0.0	7.8	439.2	65,920.3
Cucumber	13.1	154.2	0.3	17.2	25,511.6	96,183.9
Eggplant	8.2	73.1	0.2	27.5	25,991.8	129,262.0
Pepper	9.0	116.3	0.2	12.9	14,483.6	96,224.8
Cabbage	9.5	169.3	0.5	26.9	13,115.3	28,832.1

Table B.1 *(continued)*

Crop	Percentage Growing	Average Harvest Area (Sq. Meters)	Average Tons Produced	Average Tons Produced Per Hectare	Average Value Produced (AMD)	Average Value Per Ton Produced (AMD)
Carrot	2.6	33.4	0.1	15.7	2,999.3	57,228.6
Squash	0.3	1.6	0.0	25.4	393.6	98,158.7
Onion	4.8	532.1	0.3	5.1	28,792.8	105,525.8
Red Beet	1.2	28.6	0.1	21.6	1,362.1	22,105.5
Other Vegetables	1.1	34.6	0.0	4.7	2,004.3	123,936.7
Garlic	0.4	0.6	0.0	5.5	144.2	452,006.6
Greens	4.7	60.6	0.0	3.3	11,876.0	588,862.9
Potato	25.7	659.7	0.6	9.7	62,010.0	97,006.9
Grass	38.1	5,141.4	2.0	3.9	63,852.3	31,987.9
Natural grass	20.6	2,834.8	0.6	2.0	18,036.8	31,053.1
Gramma	19.7	2,282.0	1.4	6.2	45,815.5	32,633.3
Other	13.8	244.7	0.2	8.6	32,702.1	155,753.5
Sunflower	0.3	20.4	0.0	2.7	1,844.7	340,932.6
Haricot	11.6	137.7	0.0	2.2	8,566.3	279,438.8
Tobacco	0.3	43.2	0.1	15.7	4,617.7	68,014.4
Sorgo	0.6	34.6	0.0	0.0	1,258.8	0.0
Flowers	1.0	6.0	0.0	1.1	12,435.7	19,720,440.8
Planting stock	0.1	0.6	0.0	0.0	570.0	0.0

Source: 2007 Farming Practices Survey (FPS).

Note: All data are weighted to adjust for uneven treatment/control ratios across water user associations.

Table B.2. Detailed Summary of Crop Sales

Crop	Percentage Selling	Percentage Selling Among Respondents Growing	Average Tons Sold	Average Value Sold (AMD)	Average Value Per Ton Sold (AMD)
Grains	7.0	15.8	0.3	27,136.0	104,009.0
Wheat	6.0	15.5	0.2	20,819.3	89,887.0
Barley	0.9	7.3	0.0	1,613.4	86,479.9
Maize	0.3	9.3	0.0	631.1	137,019.3
Emmer wheat	0.3	27.3	0.0	639.0	240,819.9
Grape	14.0	58.8	0.6	87,002.0	141,769.8
Other Fruits and Nuts	20.3	33.8	1.6	121,782.6	76,270.0
Apple	4.8	15.3	0.1	16,014.3	119,983.9
Peach	6.7	38.4	0.2	23,352.1	143,902.0
Appricot	1.9	8.1	0.0	12,018.0	392,074.6
Pear	0.6	5.6	0.0	562.5	23,998.2
Prunes	0.6	16.5	0.0	823.6	167,028.3
Plum	0.6	17.0	0.0	1,161.3	192,024.7
Fig	0.4	63.6	0.0	1,095.3	500,354.0
Pomegranate	0.1	27.3	0.0	244.5	446,825.3
Sweet Cherry	1.3	22.2	0.1	2,432.1	24,580.3
Cherry	0.1	2.3	0.0	725.6	38,703.3
Cornel	0.3	41.7	0.0	128.7	171,891.8
Quince	0.1	22.2	0.0	61.6	225,208.8
Water melon	4.5	90.5	0.9	46,363.7	49,452.3
Melon	1.9	92.1	0.1	9,525.1	64,572.3
Lemon	0.0	0.0	0.0	0.0	0.0
Malta orange	0.3	24.8	0.0	357.2	147,440.1
Strawberry	1.2	81.6	0.0	5,378.8	343,817.9
Other fruits	0.3	18.1	0.0	388.9	226,497.1
Walnut and hazelnut	0.7	11.2	0.0	589.6	605,473.3
Tomato	12.6	50.2	1.2	51,431.8	43,887.9
Other Vegetables and Herbs	17.7	51.1	1.1	82,798.3	77,271.7
Pumpkin	0.1	45.6	0.0	293.4	50,998.2
Cucumber	6.2	47.3	0.2	17,600.7	98,847.3
Eggplant	4.6	55.9	0.2	10,518.2	61,371.3
Pepper	4.5	50.4	0.1	13,723.9	95,427.6
Cabbage	3.2	33.4	0.3	8,708.9	28,742.5
Carrot	0.7	28.8	0.0	981.1	57,936.5
Squash	0.2	63.9	0.0	352.6	107,125.4

Table B.2 *(continued)*

Crop	Percentage Selling	Percentage Selling Among Respondents Growing	Average Tons Sold	Average Value Sold (AMD)	Average Value Per Ton Sold (AMD)
Onion	2.8	58.2	0.2	18,475.4	102,905.4
Red Beet	0.1	9.3	0.0	658.3	21,554.1
Other Vegetables	0.6	57.6	0.0	1,545.4	136,671.6
Garlic	0.1	29.3	0.0	23.7	368,681.1
Greens	2.0	41.6	0.0	9,560.9	390,477.6
Potato	5.8	22.4	0.4	34,652.8	92,091.5
Grass	6.6	17.3	0.6	18,745.2	33,080.8
Natural grass	1.7	8.3	0.1	2,328.8	28,267.9
Gramma	5.0	25.4	0.5	16,416.4	33,899.6
Other	4.7	33.8	0.2	23,784.5	123,514.9
Sunflower	0.2	61.9	0.0	400.7	292,257.1
Haricot	2.9	24.8	0.0	3,750.6	216,330.7
Tobacco	0.3	89.7	0.1	4,538.9	66,892.6
Sorgo	0.3	52.2	0.0	914.8	0.0
Flowers	1.0	96.2	0.0	12,351.9	19,587,551.5
Planting stock	0.1	80.9	0.0	213.3	0.0

Source: 2007 Farming Practices Survey (FPS).

Note: All data are weighted to adjust for uneven treatment/control ratios across water user associations.

APPENDIX C

TREATMENT AND CONTROL COMPARISONS

Table C.1. Individual and Household Characteristics (Percentages Except Where Indicated)

	Treatment Group Mean	Control Group Mean	Difference	*p*-Value	
Head of Household's Age (years)	57.4	57.3	0.1	0.89	
Female-Headed Household	15.2	12.4	2.9	0.02	**
Head of Household's Education					
Less than secondary	21.2	20.0	1.2	0.52	
Full secondary	39.5	40.4	-0.9	0.60	
Secondary vocational	25.4	23.7	1.6	0.23	
More than secondary	13.8	15.8	-2.0	0.18	
Respondent's Age (years)	49.2	49.2	0.0	0.99	
Female Respondent	13.0	10.8	2.3	0.19	
Respondent's Education					
Less than secondary	13.8	13.4	0.5	0.77	
Full secondary	40.6	41.1	-0.5	0.77	
Secondary vocational	28.9	27.1	1.8	0.22	
More than secondary	16.7	18.4	-1.8	0.29	
Total People in Household	5.3	5.3	0.0	0.58	
Number of Children in Household	1.4	1.4	0.0	0.21	
Land Owned (square meters)	15,759	14,703	1,057	0.54	
Land Rented (square meters)	4,120	5,110	-990	0.51	
Area of Land Cultivated	19,879	19,812	67	0.98	
Kitchen Plot Size (square meters)	1,731	1,713	17	0.88	
			F-test:	0.15	

Source: 2007 Farming Practices Survey (FPS).

Notes: All data are weighted to adjust for uneven treatment/control ratios across Water User Associations. ** indicates the treatment/control difference is statistically significant at the 5 percent level.

Table C.2. Irrigation Practices (Percentages)

	Treatment	Control	Difference	*p*-Value
Varying Furrow Spacing	7.5	7.4	0.1	0.95
Scientifically Scheduled Irrigation	0.1	0.1	0	0.82
Water Meters	0.0	0.0	0	0.32
Non-Pressure/Pipe Irrigation	0.9	0.4	0.5	0.36
Pressure Irrigation	0.3	0.3	0	0.62
			F-Test:	0.78

Source: 2007 Farming Practices Survey (FPS).

Notes: All data are weighted to adjust for uneven treatment/control ratios across Water User Associations.

Table C.3. Farm Expenditures (AMD)

	Treatment Group Mean	Control Group Mean	Difference	*p*-Value
Fertilizer and Pesticide	77,940	70,423	7,517	0.48
Irrigation	37,063	37,842	-780	0.89
Hired Labor, Equipment, and Parts	117,177	113,227	3,950	0.80
Taxes and Duties	26,135	29,360	-3,224	0.43
Other Expenses	36,554	22,017	14,537	0.31
			F-Test:	0.75

Source: 2007 Farming Practices Survey (FPS).

Notes: All data are weighted to adjust for uneven treatment/control ratios across Water User Associations. AMD = Armenian drams.

Table C.4. Crops Cultivated, Harvested, and Sold (Percentages and AMD)

	Treatment Group Mean	Control Group Mean	Difference	*p*-Value	
Percentage Cultivating Each Crop					
Grain	45.7	43.5	2.2	0.62	
Grape	24.7	23.1	1.6	0.71	
Other Fruits / Nuts	58.9	61.2	-2.3	0.59	
Tomato	25.6	24.4	1.3	0.74	
Vegetables / Herbs	33.7	35.5	-1.8	0.69	
Potato	27.4	24.1	3.4	0.48	
Grass	36.1	40.1	-3.9	0.37	
Revenue from Crops Sold (AMD)					
Grain	21,711	32,531	-10,820	0.28	
Grape	101,838	72,245	29,594	0.36	
Other Fruits / Nuts	141,517	102,154	39,363	0.35	
Tomato	72,967	30,012	42,955	0.02	**
Vegetables / Herbs	104,759	60,955	43,803	0.11	
Potato	49,073	20,309	28,764	0.09	
Grass	19,617	17,878	1,739	0.81	
Market Value of Harvest (AMD)					
Grain	112,784	108,144	4,640	0.81	
Grape	97,333	81,036	16,298	0.59	
Other Fruits / Nuts	153,338	145,532	7,807	0.84	
Tomato	84,717	60,167	24,550	0.43	
Vegetables / Herbs	111,067	143,074	-32,007	0.66	
Potato	73,934	50,148	23,786	0.33	
Grass	59,910	67,772	-7,862	0.63	
			F-Test:	0.00	**

Source: 2007 Farming Practices Survey (FPS).

Notes: All data are weighted to adjust for uneven treatment/control ratios across Water User Associations. AMD = Armenian drams

Table C.5. Household Income, Full Sample (AMD)

	Treatment Group Mean	Control Group Mean	Difference	*p*-Value	
Nonagricultural Income	674,780	630,414	44,365	0.28	
Total Agricultural Sales	549,682	350,495	199,187	0.05	**
Monetary Profits (Sales – Costs)	254,813	77,627	177,186	0.02	**
Monetary Income	929,592	708,041	221,551	0.02	**
Total Value of Harvest	735,195	672,419	62,775	0.61	
Economic Profit (Value–Costs)	440,326	399,552	40,774	0.71	
Economic Income	1,115,105	1,029,966	85,139	0.48	
			F-Test:	0.00	**

Source: 2007 Farming Practices Survey (FPS).

Notes: All data are weighted to adjust for uneven treatment/control ratios across Water User Associations. AMD = Armenian drams.

** indicates the treatment/control difference is statistically significant at the 5 percent level.

Table C.6. Households Living in Poverty (Percentages)

	Treatment Group	Control Group	Difference	*p*-Value
Households in food poverty	7.1	8.1	-1.0	0.51
Households in complete poverty	17.9	18.7	-0.8	0.71
Household consumption relative to food poverty line	350	349	1	0.97
Household consumption relative to complete poverty line	238	237	1	0.97
			F-Test:	0.47

Source: 2007 Farming Practices Survey (FPS) and Integrated Survey of Living Standards (ISLS).

Notes: All data are weighted to adjust for uneven treatment/control ratios across Water User Associations. These calculations of poverty assume that crop consumption in the past month is equal to 1/12 of total crop consumption for the year.