

THE HASHEMITE KINGDOM OF JORDAN



*“Water and Livelihoods Initiative project (WLI)”*

## **Socio-economic characterization Muharib and Al Majidyya Jordan**

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### ***FINAL REPORT***

***Submitted By***

**Dr. Masnat Al Hiary/ Socio-economic Team Leader/ NCARE**  
Eng. Tayseer Abu Al Amash, Eng. Omamah Al Hadidi, Eng. Lana Abu Nowar,  
Eng. Malik Abu Roman, from NCARE

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## **I. Introduction:**

Jordan is one of the three most water-scarce countries in the world. The severe shortage of water has been exacerbated by drought, depletion of groundwater reserves, population growth, inflow of migrant workers and climate change.

The Badia of Jordan, the natural grazing lands, is severely degraded due to continuous grazing, cutting, plowing and severe water shortages. Rainfall is limited (100-200 mm/year) and often many factors such as (low rainfall, uneven distribution, high losses due to intensity, evaporation and runoff, and increased demand on water due to population growth) decrease the available water in any case.

Understanding the socio-economic pattern(s) of any system(s) is essential for adapting to water scarcity. Vulnerability to water scarcity depends on the interactions between changing socio-economic conditions and water scarcity hazards. So this study comes to recommend actions for water management by using water harvesting technique in the agricultural area and to empower the farmers and rural communities.

## **II. Characterization of the Socioeconomic of the Communities:**

A socio-economic survey of the selected sites was conducted to collect a broad range of information about the selected sites to gain data from farmers in a structured way according to specific questions.

### ***2.1 Objective of the Survey:***

The purpose of this survey is to solicit information on the livelihood strategies and natural resource management practices used by the community.

The survey is organized around three main areas of inquiry:

1. Community organization and governance structures.
2. Role of eco-system services in livelihood strategies pursued.
3. Natural Resource Management practices.

## **2.2 Method:**

A focus group meeting was held in Al Majidyya and Muharab communities to identify the most important agricultural problems in the community and to find the role of rural women in income generating activities, especially the manufacturing of dairy products.

A socio-economic questionnaire was also designed to elicit basic numerical data on plant production, livestock, inputs and expenditures. The farmer was questioned on size and age of the family, size of the land holding, cropping system, livestock, sources of income, level of education, and agricultural practices. The study also explored socio economic conditions, main planted crops, livestock, dairy processing, marketing livestock products, source of fodder and animal feed, water sources and water management, water harvesting technology (WHT) characteristics, farmers knowledge of the WHT, in addition to the climatic changes.

## **2.3 Activities:**

1. Agree on the purpose and information needs of the questions.
2. Pre-test the questions to ensure that they are appropriate, and accurate enough.
3. Collect and analyze the data. From the selected sites, 50 farmers were personally interviewed.

## **2.4 Location Identification:**

The survey was conducted in Amman governorate, namely in three villages, they are Muhareb, Al Majidyya, and Al Ektefeh. (Table 1)

**Table 1: Villages and Demonstration Sites**

<b>Village</b>	<b>Frequency</b>	<b>Percent (%)</b>
Al Majidyya	24	48
Al Ektefeh	17	34
Muhareb	9	18
Total	50	100

Source: Research Sample

### III. Community Characterization:

A focus group meeting was held in Al Majidyya community on 25 April, 2017, there were 18 women attended the meeting in addition to five men. Dr.Masnat Al Hiary and the socioeconomic team Eng. Tayseer Abu AlAmash, Eng. Omamah Al Hadidi, Eng. Lana Abu Nowar, Eng. Malik Abu Roman,Eng. Waed Al Shoreiqi from NCARE also attended the meeting. Dr. Masnat Al Hiary described the main goal of the visit which was to identify the most important agricultural problems in the community and to find the role of rural women in income generating activities, especially the manufacturing of dairy products and to define the modern methods that contribute to save time and effort and to reduce the consumption of electricity and water to reach a high quality product at a reasonable price, within the Water and Livelihoods Initiative project activities (WLI).

#### THEMES OF FOCUS GROUP MEETING DISCUSSION IN AL MAJIDYYA:

##### *General information about the village:*

- **Population:** Al Majidyya village is a rural village within Al Muwaqer district and located southeast of Amman, with a population of (250) inhabitants, and the number of households is (37) families. Family number ranges from 5 to 12 members. Al Majidyya community members traditionally used their land for grazing. They plant barley which is used as fodder for livestock. The village has suffered from water shortage issues and degradation of arable land.
- **Education:** primary school is mixed in Al Majidyya of the first grade to the eighth grade (six teachers). For the stage of the 9th and 10<sup>th</sup> classes, they send the students to a nearby school in another village called Ktefah village and the Ministry of education compensate the student for transportation for secondary education (first and second), students go to school at Al Nqera region.
- Only 20% of females completed their university studies (five females) and three male students are studying now in the university. The reasons behind this were: the village is far away from universities, lack of transportation and financial support.
- The village land cannot be sold for less than ten dunums. The most important problems the village is facing are the lack of drinking water network, where they buy water tanks and place them in wells, and each house has a well to collect water for household purposes. The cost of the water tank (7-8 m3) is about 20 JD, as Majidyya lacks sanitation, and also lacks a health center where the nearest health center is located in Al Muwaqar and the nearest hospital (Al-Totajji hospital) is located in Sahab.
- **Income sources:** The main sources are military and retirees, as well as some of private business. The cultivation of barley is used as a source of animal feed. These jobs are for men, while women raising sheep and processing dairy products.

##### *Previous projects:*

The farmers explained that there are a number of projects that have been implemented in the village:

- Projects implemented by the National Center for Agricultural Research and Extension: Pastoral plants were planted, such as Qataf, Routha shrubs, in addition to digging water collection wells and maintaining water ponds and water collection wells.
- A project of the Hashemite Fund: goat breeding.
- Canadian project (Ministry of Agriculture): carried out for 11 years ago to build water collection wells.

### ***Livestock:***

- Sheep are the main source of income for 30% of the population, and the source of income for the rest of the region's population is the private works and work in military.
- 75% of the village residents raise sheep, 70% of them have 20 heads of sheep and 30% of them have 200-300 heads of sheep.
- Farmers have clarified that due to drought and lack of rain, the majority of them are planting only barley in their own land.
- Farmers indicated that the pasture in the village covers the cost of livestock feed for one month only. For the rest of the year, livestock is fed from the purchased feed, where the average price of barley is 200 JD/ ton.

### ***Dairy processing***

- Most of livestock breeders in the village manufactured the milk products such as Jameed, Yoghurt, butter and ghee for household consumption only. They still use the traditional and manual manufacturing methods.

- They sell fresh milk to milk buyer (Al-Jabban) at 2.25 JD/ 3 kg. The reason for not producing milk is that they cannot market milk products, and if there is a surplus of ghee, they sell it at 10 JD/ kg and Jameed at (27-30) JD/ 3 kg.

- Women showed a willingness to learn how to manufacture milk products at a lower cost and by using the best modern methods, if modern dairy equipment is provided (Khadadah, packaging machine, ice machine, etc...). They asked about the modern method in manufacturing and drying of Jameed in a short period while maintaining the same taste of Jameed.

- The manufacturing method of Jameed and ghee by the women: boiling milk and then adding (rubeih) and converting milk to yoghurt, and separation of butter from the yoghurt, heating the yoghurt on the heat, putting the yoghurt that is heated in a piece of cloth to separate milk from the serum almost for a week then taking the hard yoghurt and adding the ice and it is done in a circular way (Tamris) on the dish and put in the air and sun for the final drying.



***Climate change:***

- In 1980s, Al Majidyya was better in agriculture, but nowadays the planted areas declined due to climatic conditions. Rainfall becomes almost (Ashrawyah) once every 10 years, and barley cultivation since the last 10 years is used for feeding the sheep.

- Women said that Al Majidyya suffers from the impact of climate change, where changes in the region are observed in terms of lack of rain and lateness of winter season and short spring season, poor barley production, dry climate, increased of diseases, allergies and the disappearance of some wild herbs such as Sheeh.

***Majidyya Charity Association:***

The Association was established in 2011, the number of memberships is about 30 members, including 8 women, a meeting of the general association is held once a year, and the meeting of the administrative staff is held once monthly.

- The activities of the association include:
  - Providing assistance to the local community
  - Building a hall used as a meeting hall and used for social events, it is owned by all the people of the region.
  - Providing many families a 10 heads of sheep from the Hashemite Fund for development of Jordanian Badia.
  - Supporting three university students by money (50 JD).
  - Holding lectures in the association hall by NCARE.
- The Local Partners: The Hashemite Fund for development of Jordanian Badia, Noor Al Hussein Foundation, Petra Factory.





At the end of the visit, Dr. Masnat Al Hiary recommended the local community to cooperate with all the different institutions in order to promote the region. Al Majidyya Women have different skills, some of them have skills in the manufacturing of pastries, sweets and others have skills in the manufacturing of ghee and Jameed, but they are suffering from lack of finance, marketing problems, lack of cooperation of men in the process of transportation and marketing, and lack of processing equipment.

### 3.1 Climate:

Jordan is part of Mediterranean and Arid zone climate. Mediterranean climate dominates in north and west regions, while arid climate dominates in the rest part of Jordan, whereas the arid climate is dominate in the communities' project areas and the rainfall ranged between 100-200 mm.

### 3.2 Crop Production:

The major planted crop in the selected sites were barley in addition to olive trees. Results showed that about 80% of the sample were planting barley, the average yield is 32 Kg/du, and 10% were planting olives, the average yield is 16 Kg/du. Only 8% of farmers were planting barley in addition to olives. (Table 2)

**Table 2: Crop Production and Season**

Crops			Season		
Crop	Frequency	Percent (%)	Season	Frequency	Percent (%)
Barley	40	80	Autumn	19	47.5
			Winter	21	52.5
Olives	1	2	Autumn	1	100
Barley & Olives	4	8	Autumn	4	100
Do not grow any thing	5	10			
Total	50	100			

Source: Research Sample

Table 3 below shows the average, minimum, and maximum of Barley and Olive production yield.

**Table 3: Barley and Olive yield (kg/du)**

Yield kg/du	N	Min	Max	Mean
Yield of Barley	6	0	113	31.68
Yield of Olive	3	0.90	45	16.36

Source: Research Sample

If barley is not harvested due to the low productivity, some farmers rent their land to livestock holders for feeding their animals by grazing the land. The price is varied between 0.5 JD/du to 4 JD/du with an average of 1.7 JD/du. (Table 4)

**Table 4: The Price of Land Guarantee (JD/ Du) in case of Non-Harvesting**

Renting cost	N	Min	Max	Mean
The price of land renting (JD/ Du) in case of non-harvesting	36	0.50	4.00	1.66

Source: Research Sample

More than 90% of farmers mentioned that the crop yield of barley was bad during the last four years (2009-2012), and from 3% to 9% of them mentioned that the yield was medium during the same period, and it is clear that the yield is decreasing during 2009-2011 (Table 5).

**Table 5: Categorize Crop Yield for the Last Four Years (2009-2012)**

Status	Barley yield							
	Good		Medium		Bad		Total	
	N	%	N	%	N	%	N	%
2009			3	3.7	42	93.3	45	100
2010			4	8.9	41	91.1	45	100
2011			4	8.5	43	91.5	47	100
2012			2	4.7	41	95.3	43	100

Source: Research Sample

As shown in the following table, 90% of farmers didn't sell the production because the yield of barley was bad, but only 10% mentioned that they have sold the product. (Table 6)

**Table 6: Selling agricultural product**

<b>Selling</b>	<b>Frequency</b>	<b>Percent (%)</b>
Yes	5	10
No	45	90
Total	50	100

Source: Research Sample

Results showed that farmers sell Barley in the neighboring villages to Muharib and Al Majidieh. Table shows that they sell Barley in Summer season Sahab and Muhareb Market. (Table 7)

**Table 7: Selling agricultural product Market**

<b>Market</b>	<b>Frequency</b>	<b>Percent (%)</b>
Sahab Market	2	66.7
Muhareb	1	33.3
Total	3	100

Source: Research Sample

## **IV. Livelihood Characterization:**

### **4.1 Family Member:**

#### **4.1.1 Household Demographics and Farmer Age:**

All the interviewed persons were men, and there is no household in the sample were headed by women. Farmer's age ranged from 25 years to 77 years with an average of 48 years old. Table 8 below shows that about 68% of farmers are less than 55 years old, and 32% are greater than 55 years old.

**Table 8: Farmer's Age**

<b>Farmer's age (Years)</b>	<b>Frequency</b>	<b>Percent (%)</b>
25-34	11	22
35-44	7	14
45-54	16	32
> 55	16	32
Total	50	100

Source: Research Sample

#### 4.1.2 Average Number of Family Members:

Table 9 shows that the average number of family was 4 members which indicated that it is a large family, and farmers like to increase the number of family members in order to help them in plant and livestock activities, and the number ranges from one member to 9 members.

**Table 9: Average Number of Family Members**

Category	Average
Farmers age (year)	48
Number of family members	4

Source: Research Sample

And regarding to the total number of people who are living in the in the same house, it was found that it ranges from one member to twelve members, and the average was 6 persons.

**Table 10: Average Number of Household Members**

Number of people in the household	N	Minimum	Maximum	Mean
	50	1	12	6

Source: Research Sample

Table 11 contains details about household members and shows that the percentage of male in the community is 56% and the female percentage is 44%.

**Table 11: Sex of members of the household**

Sex	Frequency	Percent (%)
Male	168	55.6
Female	134	44.4
Total	302	100

Source: Research Sample

Table 12 below shows that 98% of household members are sons or spouse, only 2% of them mentioned that their father, brother, or sisters are living with them.

**Table 12: Relation of members of the household**

Relation	Frequency	Percentage (%)
Spouse	103	34.1
Son	193	63.9
Father	1	0.3
Brother	2	0.7
Sister	2	0.7
Single	1	0.3
Total	302	100

Source: Research Sample

### 4.1.3 Jobs of Members of the Household

Table 13 below shows that 15% of household members are farmers, 29% are students, only 14% of them mentioned that they are working either in governmental jobs, Military or private business.

**Table 13: Jobs of Members of the Household**

Members' Job	Responses		% of Cases
	N	%	
Farmer	51	15	16.9
Gov't employee	26	7.6	8.6
Private business	18	5.3	6
Student	100	29.3	33.1
House wife	50	14.7	16.6
Unemployed	39	11.4	12.9
Retired	18	5.3	6
Military	4	1.2	1.3
Child	34	10	11.3
Shepherd	1	0.3	0.3
Total	341	100	112.9

Source: Research Sample

### 4.2 Educational Level:

Regarding to farmer's educational level, results showed that 30% of farmers have finished high school, and 8% have higher education as showed in table 14 below.

**Table 14: Educational Level**

Education Level	Frequency	Percent (%)
Illiterate	7	14
Can write and read	12	24
Elementary	12	24
Secondary	15	30
Diploma	1	2
Bs.C	3	6
Total	50	100

Source: Research Sample

Table 15 below shows that only 10% of the family member has finished Diploma and Bs.C, 62% of them have finished high school or less, and 21% of them are illiterate.

**Table 15: Educational Level of Members of the Household**

Education Level	Frequency	Percent (%)
None	63	20.9
Read & write	22	7.3
Elementary	109	36.1
High school graduate	77	25.5
Vocational training	1	0.3
Intermediate Diploma	3	1
Bs.C	27	8.9
Total	302	100

Source: Research Sample

Regarding to male's educational level, results showed that 11% of them have finished higher education (diploma, BsC, High education), and regarding to female educational level about 9% have higher education as shown in table 16 below. The illiteracy rate is 25% in female, but in male it is only 18%, and this is due to the lack of schools in the selected villages, which make it difficult to study, and the nearest school is also far away from the village.

**Table 16: Educational Level**

Education Level	The educational level of male		The educational level of female	
	Frequency	Percent (%)	Frequency	Percent (%)

Illiterate	30	17.9	33	24.6
Read & write	11	6.5	11	8.2
Elementary	63	37.5	46	34.3
High school graduate	45	26.8	32	23.9
Vocational training	1	0.6	-----	-----
Intermediate diploma	2	1.2	1	0.7
B.S	16	9.5	11	8.2
Total	168	100	134	100

Source: Research Sample

### **4.3 Marital Status:**

All the interviewed farmers were men; this implies that men in this community are leading this kind of agriculture. Regarding to the marital status of farmers, about 96% of them is married, and about 4% of them is single (table 17).

**Table 17: Marital Status**

Marital Status	Frequency	Percent (%)
Married	48	96
Single	2	4
Total	50	100.0

Source: Research Sample

## **V. Land Tenure:**

### **5.1 Land Ownership**

Privately owned and rented land tenure were found in the surveyed community. Results showed that 78% of the respondents own land (Table 18).

**Table 18: Land Ownership**

Own Land	Frequency	Percent (%)
Yes	39	78
No	11	22
Total	50	100

Source: Research Sample

The owned area is between 0.3 ha and 60.0 ha with an average of 11 ha (Table 19).

**Table 19: Ownership size (Ha)**

Size of Farmer Ownership land (ha)	N	Minimum	Maximum	Mean
	39	0.3	60	10.528

The owned area is mostly in Al Majidiyah, 31% of owned area is in Al-Ektefeh, and 18% of the owned area is in Muhareb (Table 20).

**Table 20: Land Ownership Village**

Village	Owners Frequency	Percent (%)	Renters Frequency	Percentage (%)
Muhareb	7	17.9	2	18
Majidiyah	20	51.3	4	36
Al-Ektefeh	12	30.8	5	46
Total	39	100	11	100

Source: Research Sample

About 36% of farmers own land less than 3 ha, 18% own land from 3-5 ha, and about 26% own land more than 11 ha. (Table 21)

**Table 21: Land Ownership Size (Ha)**

Owned Land size (Ha)	Frequency	Percentage (%)
<3	14	35.9
3.1-5	7	17.9
5.1-7	3	7.7
7.1-9	2	5.1
9.1-11	3	7.7
>11	10	25.6
Total	39	100

Source: Research Sample

Results showed that 52% of the respondents rent land as shown in table 22.

**Table 22: Land rent**



Land rent	Frequency	Percent (%)
Yes	26	52
No	24	48
Total	50	100

Source: Research Sample

There are 50% of farmers rent land in Al Majidyya, 27% of farmers rent land in Al Ektefeh, 19% of farmers rent land in Muhareb, and only 4% rent land from outside the selected communities in Al Qnetrah for the purpose of Planting (Table 23).

**Table 23: Land rent Village**

Village	Frequency	Percentage (%)
Muhareb	5	19.2
Al Majidiyah	13	50
Al Ektefeh	7	26.9
Al Qnetrah	1	3.8
Total	26	100

Source: Research Sample

The land rent size is between 0.8 ha and 100.0 ha with an average of 26 ha (Table 24).

**Table 24: Land rent size (Ha)**

The Size of Farm Land (ha)	N	Minimum	Maximum	Mean
	26	0.8	100	25.95

Source: Research Sample

Table 25 showed that 42% of farmers rent land less than 10 ha, about 35% rent land between 10-30 ha, and only 12% rent land more than 90 ha.

**Table 25: Land Rented Size (Ha)**

land Rent Size	Frequency	Percentage (%)
<10	11	42.3
10.1-30	9	34.6
30.1-50	1	3.8
50.1-70	1	3.8
70.1-90	1	3.8
<90	3	11.5
Total	26	100

Source: Research Sample

Farmers cultivated an average of 24 ha of the owned and rented land; the cultivated area is between 1.5 ha to 160 ha (Table 26).

**Table 26: The size of farmer cultivated land (Ha)**

Cultivated Land Size (ha)	N	Minimum	Maximum	Mean
	45	1.5	160	23.59

Source: Research Sample

## VI. Living Period in the community:

50 % of Farmers mentioned that they used to live in this community since they were born; the period of living is varied from two years to seventy-seven years with an average of thirty-five years as shown in the table 27 below.

**Table 27: Farmers Living Period in the community (Years)**

Years lived in this community	N	Minimum	Maximum	Mean
	50	2	77	35

Source: Research Sample

The other 50% were living in neighboring communities and then move to this community as shown in table 28 below.

**Table 28: Farmer Places lived before moving to the community**

Places	Frequency	Percent (%)
Born and live in Muhareb	4	8
Born and live in Al Majidyaa	9	18
Born and live in Ektefeh	12	24
Sahab	12	24
Thabaa	3	6
Tent houses	1	2
Moqqar	6	12
Elthhebah	1	2
Al-Tnab	1	2
Al- Qunetrah	1	2
Total	50	100

Source: Research Sample

Regarding to each village of the selected sites, it was shown that most of them (71%) were born in Ektefeh, 44% of them were born in Muhareb, 38% of them were born in Al Majidiyah, and most of them move from Sahab and Mouqqar, because they are the nearest villages, and they have already private lands in the selected communities as shown in table 29 below.

**Table 29: Places where Farmer lived before moving to village**

Location		Frequency	Percent (%)
<b>Muhareb</b>	Born and live in Muhareb	4	44.4
	Sahab	1	11.1
	Thabaa	3	33.3
	Tent houses	1	11.1
	Total	9	100
<b>Al Majidiyah</b>	Sahab	11	45.8
	Mouqqar	4	16.7
	Born and live in Majidiyah	9	37.5
	Total	24	100
<b>Al Ektefeh</b>	Moqqar	2	11.8
	Elthhebah	1	5.9
	Al-Tnab	1	5.9
	Al- Qunetrah	1	5.9
	Born and live in Elktefeh	12	70.6
	Total	17	100

Source: Research Sample

The next table 30 also shows that they were living mostly in Sahab and Mouqqar before moving to the selected Villages.

**Table 30: Farmer Places lived before moving to the community**

Period	N	Minimum	Maximum	Mean
Sahab	12	6	45	25.25
Thabaa	3	10	53	27.3
Tent houses	1	32	32	32
Moqqar	6	13	43	28.83
Elthhebah	1	8	8	8
Al-Tnab	1	20	20	20
Al- Qunetrah	1	22	22	22

Source: Research Sample

86% of them mentioned that there is a growing trend for the Bedouin community to become more sedentary as compared to grandfathers”. The next table 31 showed the response to the statement that “There is a growing trend for the Bedouin community to become more sedentary as compared to your grandfathers”.

**Table 31: Farmer Places lived before moving to the community**

Agree of the Statement	Frequency	Percent (%)
Yes	43	86
No	7	14
Total	50	100

Source: Research Sample

## VII. Farmer's Income Sources:

Source of income is used as a good indicator for community welfare. The survey examined ‘farm income’. This section will mainly focus on the level and sources of income of the households (including farm and non-farm sources).

The percentage of farmers who are depending on plant production source was 88%, 66% of them depend on livestock, while 18% of farmers mentioned that they are not depending on the animal production sources on their living, and 6% are depending mainly on the off-farm income. Table 32 below presented the sources of income.

**Table 32: The Income Sources for the Farmer**

Income source	Frequency	Percent (%)
All (Agriculture & livestock & employment)	24	48
cultivated barley & Jobs	13	26
Agriculture & livestock	6	12
Job & Livestock	2	4
cultivated barley	1	2
Livestock	1	2
Jobs	3	6
Total	50	100

Source: Research Sample

It was found that most of the households (76%) in these communities receive less than 3000 JD/year, there is 20% of them receive from 3000-5000JDs/year, and only 4% of them receive more than 5000/year as shown in the next table 33.

**Table 33: The Net household income**

Income level	Frequency	Percent (%)
<1000	6	12
1001-3000	32	64
3001-5000	10	20
>5000	2	4
Total	50	100

Source: Research Sample

## **VIII. Farmers' Practices:**

### ***8.1 Water or soil conservation technologies on farm land:***

56% of farmers mentioned that they have water or soil conservation technologies on farm land and 44% mentioned that they haven't any method for water or soil conservation (Table 34).

**Table 34: Water or Soil Conservation Techniques on Farm Land**

Do you have any technologies?	Frequency	Percent (%)
Yes	28	56
No	22	44
Total	50	100

Source: Research Sample

58% of farmers have soil dam, 36% of farmers have wells for collecting Water, and only 6% have Marab in their lands (Table 35).

**Table 35: Type of Water or Soil Conservation Techniques**

Structure Type	Responses		% of Cases
	Frequency	Percent (%)	
Soil Dam	19	57.6	67.9
Well Collection Water	12	36.4	42.9
Marab	2	6.1	7.1
Total	33	100	117.9

Source: Research Sample

Farmers mentioned that they have these dams, wells and Marabs since 18 years ago as an average, and the period of having these techniques varies between 3 to 100 years. (Table 36)

**Table 36: Years of Water and Soil Techniques in the land**

Response	N	Min	Max	Mean
Years of soil structure	20	3	100	18.3

Source: Research Sample

Many farmers have these techniques from 18 years ago, 70% of them have these techniques less than 18 years, 25% of them have it between 19-34 years, and only one farmer mentioned that he has it since hundred years ago (Table 37).

**Table 37: Years of Water and Soil Techniques in the land**

Years interval	Frequency	Percent (%)
3-10	8	40
11-18	6	30
19-26	2	10
27-34	3	15
>35	1	5
Total	20	100

Source: Research Sample

The water or soil conservation techniques have made a difference in farmer's crop yield as mentioned by 32% of farmers who have already applied these techniques, but 18% of them mentioned that these techniques haven't made any differences in the total production (Table 38).

**Table 38: Water and Soil Techniques Impact**

Conservation Techniques have made a difference	Frequency	Percent (%)
Yes	16	32
No	9	18
No response	25	50
Total	50	100

Source: Research Sample

The conservation techniques made a difference in farmer crop yield; the percentage is varied between 20% to 60%. About 44% of them mentioned that there is an increase 20% in their yield because of using these techniques, and 19% thought that the yield increased by 50%, and 6% mentioned that the yield has increased either 30% or 60% (Table39 ).

**Table 39: Water and Soil Techniques Impact Percentage**

Difference in percentage	Frequency	Percent (%)
Increase 50 %	3	18.8
Increase 30 %	1	6.3
Increase 60 %	1	6.3
Increase 20 %	7	43.8
The well is used for irrigation livestock not for cultivated	1	6.3
No response	3	18.8
Total	16	100

Source: Research Sample

## **8.2 Water Use and Management**

Results in table 40 below shows that buying water tanks is considered the main source of water for home and Livestock in both Winter and Spring seasons, but the rainfall is considered the major source for agricultural activities according to season. 25% mentioned that they depend on wells for livestock watering. Only 3% depend on water harvesting for agricultural and livestock activities.

Results in table 41 below show that buying water tanks is considered the main source of water for home and Livestock in both Summer & Autumn seasons, but the rainfall is considered the major source for agricultural activities according to season. 22% mentioned that they depend on wells for livestock watering. Only 7% depend on water harvesting for agricultural and livestock activities.

**Table 40: Main source of water for home and agricultural activities according to season (Winter & Spring)**

Season	Winter										Spring									
Activities	Drinking		Cooking		Cleaning		Agri_activities		Livestock		Drinking		Cooking		Cleaning		Agri_activities		Livestock	
Water source	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Municipal	8	16.7	8	16.7	8	17			2	5.6	2	4.2	2	4.2	2	4.3			2	5.6
Tanked water	37	77.1	38	79.2	38	80.9	2	6.7	19	52.8	43	89.6	44	91.7	44	93.6	3	10	23	63.9
Bottled water	2	4.2	1	2.1							2	4.2	1	2.1						
Rainfall							22	73.3	1	2.8							23	76.7	1	2.8
Harvested water							1	3.3	1	2.8							1	3.3	1	2.8
Wells									2	5.6									3	8.3
Wells & Tanks	1	2.1	1	2.1	1	2.1			4	11.1	1	2.1	1	2.1	1	2.1			3	8.3
Harvested & rainfall							3	10									2	6.7		
Rainfall & soil dams							1	3.3									1	3.3		
Tanks & rainfall							1	3.3	4	11.1										
wells & rainfall									3	8.3									3	8.3
Total	48	100	48	100	47	100	30	100	36	100	48	100	48	100	47	100	30	100	36	100

Source: Research Sample



**Table 41: Main source of water for home and agricultural activities according to season (Summer & Autumn)**

Season	Summer										Autumn									
Activities	Drinking		Cooking		Cleaning		Agri activities		Livestock		Drinking		Cooking		Cleaning		Agri. activities		Livestock	
Water source	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Municipal	2	4.2	2	4.2	2	4.3			2	5.6	2	4.2	2	4.2	2	4.3			2	5.6
Tanked water	41	85.4	43	89.6	44	93.6	2	6.7	24	66.7	43	89.6	44	91.7	44	93.6	2	6.7	24	66.7
Bottled water	4	8.3	2	4.2							2	4.2	1	2.1						
Rainfall							23	76.7	1	2.8							23	76.7	1	2.8
Harvested water							2	6.7	1	2.8							2	6.7	1	2.8
Wells									2	5.6									2	5.6
Wells & Tanks	1	2.1	1	2.1	1	2.1			4	11.1	1	2.1	1	2.1	1	2.1			4	11.1
Harvested & rainfall							2	6.7									2	6.7		
Rainfall & soil dams							1	3.3									1	3.3		
Wells & rainfall									1	2.8									2	5.6
Tanks & wells & rainfall									1	2.8										
Total	48	100	48	100	47	100	30	100	36	100	48	100	48	100	47	100	30	100	36	100

Source: Research Sample

|

The most important source for water is water tanks, and the livestock watering is considered the highest water consumption all over the year, it costs 78 JD/season in average, drinking purpose costs 18 JD/season, using water for cooking costs between 17JD to 20 JD per season with an average of 19 JD/season, cleaning activities cost from 17JD to 22JD/season with an average of 20 JD/season,

**Table 42: Average cost spend on water per month for home and agriculture consumption according to season**

Season	Summer				Autumn				Winter				Spring				Average
Activity	N	Min	Max	mean	N	Min	Max	mean	N	Min	Max	mean	N	Min	Max	mean	
Drinking	49	1.5	80	18.8	49	1.5	105	19.35	49	1	105	17.45	49	1	80	17.23	18.2075
Cooking	49	3	80	20.41	49	3	80	18.66	49	3	80	16.56	49	3	80	18.64	18.5675
Cleaning	49	4	80	22.1	49	4	80	20.37	49	3	80	16.81	49	4	80	20.27	19.8875
Agri_activities	25	0	0	0	25	0	0	0	25	0	0	0	25	0	0	0	0
Livestock	32	0	720	96.8	32	0	720	80.3	32	0	360	58.6	32	0	720	76	77.925

Source: Research Sample

### 8.3 Labor:

Only 8% of farmers mentioned that they hired labor, but 92% mentioned that they didn't hire labor because there is at least one of the family members is working with his father in plant and livestock activities (Table 43).

**Table 43: Manpower**

Hired Labor	Frequency	Percent (%)
Yes	4	8
No	46	92
Total	50	100.0

Source: Research Sample

About 50% of farmers mentioned that they hired labor in Autumn season, 25% of them hire labor even in Summer or Winter season (Table 44).

**Table 44: Manpower Hiring Season**

Season	Frequency	Percent (%)
Summer	1	25
Autumn	2	50
Winter	1	25
Total	4	100

Source: Research Sample

## IX. Livestock:

It was found that there are sheep with percentage of 48%, there is 52% of farmers own goats, and only 2% mentioned that they own camel, 28% of farmers don't own livestock (Table 45).

**Table 45: Types of animals in the village**

Animals Type	Frequency	Percent (%)
Sheep	10	20
Goats	12	24
Sheep & Goats	13	26
No livestock	14	28
Sheep & Goats & Camel	1	2
Total	50	100

Source: Research Sample

### 1.9 Size of the Herd:

The size of the livestock herds varied from large (more than 500 heads) to small (less than 100 heads), but most households owned small livestock (e.g., sheep or goats).

Results show that 63% of total stockowners own less than 100 head of sheep. Only 17% own more than 500 heads while category (101-200) is about 21% of total stockowners (Table 46). 92% of them own less than 100 head of goat and 8% own between 100-200 heads.

**Table 46: Types of animals in the village**

Size	Sheep		Goats		Camel	
	N	%	N	%	N	%
Less than 100	15	62.5	24	92.3	1	100
between 101-200	5	20.8	2	7.7		
More than 500	4	16.7				
Total	24	100	26	100		

Source: Research Sample

### 2.9 Sheep and goat size change:

Sheep herd size changed over the last 5 years (2012-20107) from the point of view of farmers, results show that the herd size decreased by 50% or more as mentioned by 21% of farmers, 25% of farmers mentioned that there is a decrease between 10-25%. About 25% of farmers mentioned that the herd increased by a ratio 10-25% over the last 5 years. 25% of farmers said that the flock size is the same during these years (Table 47).

**Table 47: Sheep size change**

Size Change	Frequency	Percent (%)
increased by about 10- 20 %	3	12.5
increased by about 25 %	3	12.5
decreased by about 10- 20 %	2	8.3
decreased by about 25 %	4	16.7
decreased by about 50%	3	12.5
decreased by more than 50%	2	8.3
Raising livestock before five months	1	4.2
the same size	6	25
Total	24	100

Source: Research Sample

Regarding to the goat herd size, it changed over the last 5 years (2012-20107) from the point of view of farmers, results show that the herd size decreased by 50% or more as mentioned by 19% of farmers, 23% of farmers mentioned that there is a decrease between 10-25%. About 23% of farmers mentioned that the herd increased by a ratio 10-25% over the last 5 years. There are only 12% mentioned that there is an increase in the flock size either 50% or more. 23% of farmers said that the flock size is the same during these years (Table 48).

**Table 48: Goats' size change**

Size Change	Frequency	Percent (%)
increased by about 10- 20 %	5	19.2
increased by about 25 %	1	3.8
increased by about 50%	1	3.8
increased by more than 50%	2	7.7
decreased by about 10- 20 %	1	3.8
decreased by about 25 %	5	19.2
decreased by about 50%	3	11.5
decreased by more 50%	2	7.7
the same size	6	23.1
Total	26	100

Source: Research Sample

Referring to the Camel size, the farmer mentioned that it decreased by 50% (Table 49).

**Table 49: Camel size change**

Size changed	Frequency	Percent (%)
decreased by about 50%	1	100

Source: Research Sample

### **3.9 Animal Registration Program and Identification:**

Ministry of Agriculture applied plastic ear tag for each animal with a unique number, from this number the area (governorate and district) of where the animal tagged or come from is known, also the name of the owner of each animal is known (AIFR,2009). 40% of farmers mentioned that their livestock herds are registered under the animal registration program, but 60% of them mentioned that they are not registered (Table 50).

**Table 50: Animal Registration Program**

Registered	Frequency	Percent (%)
Yes	20	40
No	30	60
Total	50	100

Source: Research Sample

### **4.9 Veterinary services and animal health:**

They have mentioned that during the last year there were two visits in maximum to their herds by the governmental veterinary services (Table 51).

**Table 51: Animal Veterinarian Visits**

No of veterinarian visits	N	Minimum	Maximum	Mean
	20	0	2.00	0.35

Source: Research Sample

The veterinarian visit varies according to the season as mentioned by 40% of farmers (Table 52).

**Table 52: Visit vary according to the season**

Visit vary	Frequency	Percent (%)
Yes	8	40
No	12	60
Total	20	100

Source: Research Sample

If veterinarian visits vary seasonally its more likely in winter more other seasons as mentioned by 88% of farmers (Table 53).

**Table 53: Visit vary according to the season**

season	Frequency	Percent (%)
Summer	1	12.5
Winter	7	87.5
Total	8	100

Source: Research Sample

### **5.9 The average percentage contributions of the sources of feed for livestock:**

83% of farmers mentioned that they depend 10% on free grazing on communal land for feeding their sheep, and 15% depend on the barley that they grow in their fields, but 76% of farmers mentioned that they depend on purchasing barley.

Regarding to goat herds 83% of farmers mentioned that they depend 10% on free grazing on communal land for feeding their sheep, and 16% on the barley that they grow in their fields, but 74% of farmers mentioned that they depend on purchasing barley for feeding their herds (Table 54).

**Table 54: The average percentage contributions of the sources of feed for livestock**

Average Percentage	Free grazing				Barley grown on own field				Purchased barley			
	N	Min	Max	mean	N	Min	Max	mean	N	Min	Max	mean
Sheep	20	0	20	10	20	0	40	14.5	20	45	90	75.7
Goats	16	5	20	10.18	16	0	60	16.12	16	30	95	74.3

Source: Research Sample

Farmers bought barley for feeding livestock from Silos in Mouqqar and Sahab as 39% of farmers mentioned and 8% bought barely from Merchant in Sahab, the other 53% mentioned that they bought barely from the local market (Table 55).

**Table 55: Places where barley bought for livestock**

Market	Frequency	Percent (%)
Silos/ Mouqqar Center	12	33.3
Merchant / Sahab	3	8.3
Silos/ Sahab Center	2	5.6
Local market	19	52.8
Total	36	100

Source: Research Sample

Average quantity of barley bought by farmer was 39 ton/ year as mentioned by livestock holders, and it varied between 0.5 ton to 240 ton /year according to the herd size (Table 56).

**Table 56: Average quantity of barley bought by farmer (ton/ year)**

Quantity ton/ year	N	Min	Max	Mean
	36	0.50	240	38.793

Source: Research Sample

The average cost of purchasing is 190 JD/ton, and it varied between 120 JD to 210 JD/ ton of barley (JD) (Table 57).

**Table 57: Average quantity of barley bought by farmer (ton/ year)**

Price JD	N	Min	Max	Mean
Cost of 100 Kg of barley	36	12	21	18.68

Source: Research Sample

36% of farmers mentioned that they have noticed an increase in the price of barley in the past 5 -10 years, and only 6% mentioned that there was a decrease in the price of barley in the past 5 -10 years, but 58% thought that the prices are still the same over the same period (Table 58).

**Table 58: Changes in the price of barley in the past 5 -10 years**

Noticed change	Frequency	Percent (%)
Yes, increasing	13	36.1
Yes, decreasing	2	5.6
No	21	58.3
Total	36	100

Source: Research Sample

## **6.9 Description of grazing practices:**

Due to the continuous drought that affected the area, farmers depend only 10% on grazing for feeding the herd, the next table show that most of farmers depend on the grazing in the same villages, except in Winter and Spring they go far to near villages such as El Hraneh and Al Zeyarah (Table 59).



**Table 59: Animals' free-graze during the different seasons**

Village	Season		Frequency	Percent (%)
Muhareb	Summer	Muhareb	8	100
	Autumn	Muhareb	8	100
	Winter	Muhareb	8	100
	Spring	Muhareb	8	100
Al- Mjidiyah	Summer	Al- Mjidiyah	11	100
	Autumn	Al- Mjidiyah	11	100
	Winter	Al- Mjidiyah	10	90.9
		East of Al- Mjidiyah	1	9.1
		Total	11	100
	Spring	Al- Mjidiyah	9	81.8
		East of Al Majidhyah	1	9.1
		El Hraneh	1	9.1
		Total	11	100
	El Ektefah	Summer	El Ektefah	14
Autumn		El Ektefah	14	100
Winter		El Ektefah	11	78.6
		Al Zeyarah	1	7.1
		in the Desert	2	14.3
		Total	14	100
Spring		El Ektefah	13	92.9
		in the Desert	1	7.1
		Total	14	100

Source: Research Sample

Farmers move to neighbouring villages for animal grazing, the distance is varied from 0.5Km to 15 Km in winter (Table 60). Some livestock owners move for long distance to feed their animals.

**Table 60: Approximate distance from free-graze location to home (Km)**

Season	Distance during the season	N	Min	Max	Mean
Summer	Muhareb	8	0.1	1.5	0.095
	Al- Mjidiyah	11	0.5	2	1
	El Ektefah	14	1	25	3.375
Autumn	Muhareb	8	0.5	1.5	0.9375
	Al- Mjidiyah	11	0.5	1	0.90909
	El Ektefah	14	1	1.25	1.01786
Winter	Muhareb	8	0.1	1.5	0.725
	Al- Mjidiyah	11	0.5	40	4.45455
	El Ektefah	14	1	175	14.7857
Spring	Muhareb	8	0.25	1.5	1.03125
	Al- Mjidiyah	11	1	40	9.09091
	El Ektefah	14	1	100	9.73214

Source: Research Sample

Only 20% of farmers mentioned that there are some interventions in community to increase vegetation cover as shown in table 61.

**Table 61: Interventions in community**

Response	Frequency	Percent (%)
Yes	10	20
No	40	80
Total	50	100

Source: Research Sample

As shown in table 62 below, NCARE and ICARDA have a big role as mentioned by 30% of respondents in regulating the grazing in the community, and there was a governmental project which has also a great participation as mentioned by 60%, in addition to the Canadian project which built soil dam in Muhareb as mentioned by 10%.

**Table 62: Organizations that regulating grazing management in community**

Organization	Frequency	Percent (%)
Canadian Project ( built soil dam in Muhareb)	1	10
Government project	6	60
NCARE & ICARDA	3	30
Total	10	100

Source: Research Sample

There are more than ten kinds of crops/shrubs that animals normally feed on, they are shown in table 63 below, the most important crop is barley as mentioned by 16% of farmers, followed by Bran in summer and Tiben in autumn as mentioned by 8%, and 75% mentioned that they depend on shrubs and free grazing. The most important shrubs are Owdo, Qesoom and Alneton.

**Table 63: Kind of Crops/Shrubs that Animal normally Feed on**

Kind of shrubs	Responses		% of Cases
	N	%	
Barley	13	15.5	36.1
Bran ( summer) & Tiben ( autumn)	7	8.3	19.4
Owdo shrub ( winter)	9	10.7	25
Shrubs ( spring)	14	16.7	38.9
Qataf ( Summer)	3	3.6	8.3
Qesoom	9	10.7	25
Alneton	9	10.7	25
Homath	2	2.4	5.6
Akefeh & Sheeh	11	13.1	30.6
Ghozamah	1	1.2	2.8
Ghafoor (Al hethan)	1	1.2	2.8
Slehi	2	2.4	5.6
Rotam	1	1.2	2.8
Ghatha	1	1.2	2.8
There is no shrubs	1	1.2	2.8
Total	84	100	233.3

Source: Research Sample

There were no estimated changes in the variety (availability of different types of crops and shrubs found locally). Table 64 below shows the estimated quantity change of crops/shrubs that the herd

feed on over the past 5 years. It was found that barley decreased from 10-25% over the past 5 years as mentioned by 23% of farmers. Shrubs decreased from 10-25% as mentioned by 31%, and 40% of them mentioned that shrubs decreased 50% or more. Only 5% mentioned that it increased from 25-50%.

**Table 64: The estimated quantity change of crops/shrubs**

<b>Crops/Shrub</b>	<b>(Increase or Decrease) over the past 5 years</b>	<b>Frequency</b>	<b>Percent (%)</b>
Barley	decreased by about 10-20%	4	11.42857
	decreased by about 25%,	4	11.42857
All Shrubs	increased by about 25%	1	2.857143
	increased by about 50%	1	2.857143
	decreased by about 10-20%	6	17.14286
	decreased by about 25%,	5	14.28571
	decreased by about 50%	4	11.42857
	decreased by more than 50%	10	28.57143
Total		35	100

Source: Research Sample

Regarding to the change in sheep milk productivity of livestock over the last 10 years, it is shown in table 65 that it decreased from 10-25% over the past 5 years as mentioned by 44% of farmers, and 22% of them mentioned that it decreased 50% or more. Only 17% mentioned that it increased from 10-25%.

**Table 65: Change in Sheep milk productivity**

<b>Estimated change of Sheep Milk</b>	<b>Frequency</b>	<b>Percent (%)</b>
increased by about 10-20%	1	4.3
increased by about 25%	3	13
decreased by about 10-20%	6	26.1
decreased by about 25%,	4	17.4
decreased by about 50%	4	17.4
decreased by more than 50%	1	4.3
Oscillating (increase and decrease)	2	8.7
There is no change	2	8.7
Total	23	100

Source: Research Sample

Regarding to the change in goat milk productivity of livestock over the last 10 years, it is shown in table 66 that it decreased from 10-25% over the past 5 years as mentioned by 46% of farmers, and 18% of them mentioned that it decreased 50%. Only 18% mentioned that it increased from 10-50%.

**Table 66: Change in Goats milk productivity**

Estimated change of goat Milk	Frequency	Percent (%)
increased by about 10-20%	1	4.5
increased by about 25%	2	9.1
increased by about 50%	1	4.5
decreased by about 10-20%	6	27.3
decreased by about 25%,	4	18.2
decreased by about 50%	4	18.2
Oscillating ( increase and decrease)	1	4.5
There is no change	3	13.6
Total	22	100

Source: Research Sample

Table 67 show that 68% of farmers mentioned that there was a decrease in the milk productivity, there are many reasons, but the most important reason from the farmer point of view was the lack of pasture as mentioned by 73% of farmers, it was followed by lack of animal feed as mentioned by 42% of them. The drought is also considered a major cause for the reduction in the productivity as mentioned by 6% of farmers.

**Table 67: The Major Causes for the Change in Yield**

Major causes	Responses		% of Cases
	Frequency	Percent (%)	
Lack of pasture	24	52.2%	72.7
lack of animals feed	14	30.4	42.4
increasing in number of sheep	1	2.2	3
Feed bran early in the season	2	4.3	6.1
Drought	2	4.3	6.1
Cut trees and reduction in shrubs	1	2.2	3
According to quantity of the feed and fodder	1	2.2	3
Diseases	1	2.2	3
Total	46	100	139.4

Source: Research Sample

Regarding to market prices for sheep milk over the last 10 Years, table 68 below shows that 38% of farmers mentioned that there was a decrease from 10-25%, but 50% of them mentioned that there was an increase from 10-25% in the prices of goat milk. 47% of farmers mentioned that there was a decrease from 10-50%, but 47% of them mentioned that there was an increase from 10-20% in the prices of milk.

**Table 68: Change in Market Prices for Milk over the Last 10 Years**

<b>From Sheep</b>	<b>Estimated change</b>	<b>Frequency</b>	<b>Percent (%)</b>
	increased by about 10-20%	6	37.5
	increased by about 25%	2	12.5
	decreased by about 10-20%	3	18.8
	decreased by about 25%	3	18.8
	Don't sell	1	6.3
	No milk	1	6.3
	Total	16	100
<b>from Goats</b>	increased by about 10-20%	7	46.7
	decreased by about 10-20%	4	26.7
	decreased by about 25%	2	13.3
	decreased by about 50%	1	6.7
	Don't sell	1	6.7
	Total	15	100

Source: Research Sample

Table 69 below shows that the average price of sheep milk is 0.69 JD/kg before ten years and it is now 0.75 as an average. It varied between 0.33 to 1.00 JD/kg before ten years, and it varied between 0.4 to 0.9 JD/kg nowadays. Regarding to goat milk the average price is 0.43 JD/kg before ten years and it is now 0.52 as an average. It varied between 0.20 to 1.00 JD/kg before ten years, and it varied between 0.33 to 1 JD/kg nowadays.

**Table 69: Market Prices for Milk**

<b>Milk Price (JD/kg)</b>		<b>N</b>	<b>Min</b>	<b>Max</b>	<b>Mean</b>
From Sheep	Before 10 years	14	0.33	1.00	0.6971
	Recent price	14	0.40	0.90	0.7543
From Goats	Before 10 years	14	0.20	1.00	0.4271
	Recent price	14	0.33	1.00	0.5200

Source: Research Sample

Livestock owners mentioned that the major cause for the increase in milk price is the exploitation of the milkman due to lack of milkman number as mentioned by 73% of them, 15% of them mentioned that the available quantity of milk and the sold quantity to the milkman cause the increase in the price. Increasing in feed price also causes the increase in milk price as mentioned by 8% of them. 4% mentioned that increasing the costs of raising sheep cause this increase in milk price, another 4% mentioned the decrease in number of livestock as a reason. The livestock herds number has been decreased, so the demand for milk increased as mentioned by 4%.

The prices are fluctuating according to selling time (start and end of season) as mentioned by 27%, the quantity of fodder that provided to feed the herd as mentioned by 8% of them, to the number of customers as mentioned by 8%. The major cause for the decrease in milk price is the reduced demand for milk as mentioned by 15% of them. (Table 70)

**Table 70: Major Causes for Increase or Decrease in Milk Prices**

Major causes	Responses		% of Cases
	N	Percent %	
Increase in demand of buying milk because the number of animal is decreased	1	2.3	3.8
Exploitation of the milkman due to lack of others :Number of milkman	19	44.1	73.2
Quantity of fodder provided to livestock	2	4.7	7.7
The available quantity of milk and the sold quantity to the milkman	4	9.3	15.4
By selling time (start and end of season)	7	16.3	26.9
According to the number of customers	2	4.7	7.7
Increasing in feed price	2	4.7	7.7
Increasing in milk price due to decrease in number of livestock	1	2.3	3.8
Increasing the costs of raising sheep	1	2.3	3.8
Lack of demand for milk	4	9.3	15.4
Total	43	100	165.4

Source: Research Sample

The main produced dairy products at the household level was Jameed as 34% of them mentioned, 32% produces Ghee, 13% produces yogurt, 11% produces cheese, and 8% produces butter (Table 71).

**Table 71: Dairy Products that Produced at the Household Level**

Dairy product	Responses		% of Cases
	Frequency	Percent (%)	
Jameed	32	34.4	97.0
Ghee	30	32.3	90.9
Butter	9	9.7	27.3
cheese	10	10.8	30.3
Yogurt	12	12.9	36.4
Total	93	100.0	281.8

Source: Research Sample

And all house wife use machinery for processing dairy products, they used the agitate machine (Table 72).

**Table 72: Uses of any machinery (hand and /or power supported) to process the dairy products**

Answer	Frequency	Percent (%)
Yes	36	72
No livestock	14	28
Total	50	100

Source: Research Sample

Table 73 shows that 52% of them mentioned that they don't sell the produced dairy products, but they make it for the home consumption, and 20% of them mentioned that they sell the dairy products.

**Table 73: Selling Dairy Products**

Selling	Frequency	Percent (%)
No	26	52
Yes	10	20
No livestock	14	28
Total	50	100

Source: Research Sample

29% of them mentioned that they sell either Jameed, Gee, or milk. Only 6% mentioned that they sell either butter or Liquid Yogurt (Table 74).

**Table 74: Type of Marketing Dairy Product**



Type	Frequency	Percent (%)
Jameed	5	29.4
Ghee	5	29.4
Butter	1	5.9
Milk	5	29.4
Liquid Yogurt	1	5.9
Total	17	100

Source: Research Sample

59% of them sell their product in Sahab, 24% of them sell the milk to the milkman, 35% of them sell their product in Mowaqqar, 6% of them sell their product in Mowaqqar and Nqera (Table 75).

**Table 75: Market Place**

Place	Frequency	Percent (%)
Mowaqqar and Sahab	3	17.6
Milkman	4	23.5
Sahab	7	41.2
Mowaqqar / Nqera	1	5.9
Mowaqqar	2	11.8
Total	17	100

Source: Research Sample

The average selling price for Jameed was 7 JD/ kg, and 7.8 JD/kg for Ghee. Butter average price average was 5JD/kg. Milk price varied between 0.5 to 0.9 JD/Kg with an average of 0.69 JD/ kg (Table 76).

**Table 76: Average selling price according to type (JD/ kg)**

Price	N	Minimum	Maximum	Mean
Jameed	5	7	8	7.3
Ghee	5	6	10	7.8
Butter	1	5	5	5
Milk	5	0.50	0.90	0.69
liquid yogurt	1	0.50	0.50	0.5

Source: Research Sample

Results showed that the market selling price of sheep in the past 5 -10 years varied between 50 to 300 JD/head with an average of 177 JD/head in the last ten years and nowadays it varied between

80 to 220 JD/head with an average of 141 JD/head. Goat price also varied between 50-280 JD/head and the average was 157 JD/head, nowadays it varied between 70-200 JD/head, both have an average of 130 JD/head. Camels price was 300 in the last ten years and nowadays it decreased to 250 JD/head (Table 77).

**Table 77: Change in the market selling price of sheep and goats in the past 5 -10 years and nowadays (JD/head)**

Price JD/ head		N	Minimum	Maximum	Mean
Sheep	Before 10 years	24	50	300	176.9
	Now	24	80	220	140.6
Goats	Before 10 years	25	50	280	157
	Now	25	70	200	130.2
Camels	Before 10 years	1	300	300	300
	Now	1	250	250	250

Source: Research Sample

Results in table 78 below showed also that 67% of farmers mentioned that the sheep prices have decrease during the last ten years, even the goat prices have decreased according to 64% of them.

**Table 78: Estimated change in market price for livestock before 10 years**

Sheep	Estimated change	Frequency	Percent (%)
	No	1	4.2
	Yes , increased	7	29.2
	Yes, decreased	14	58.3
	Yes , decreased very much	2	8.3
	<b>Total</b>	<b>24</b>	<b>100</b>
Goats	No	1	4
	Yes , increased	8	32
	Yes, decreased	12	48
	Yes , decreased very much	4	16
	<b>Total</b>	<b>25</b>	<b>100</b>
Camels	Yes , decreased	1	100

Source: Research Sample

## X. Water Harvesting Techniques:

Water harvesting Vallerani system (Contour ridges), Marabs, cisterns, and water harvesting for rangeland shrub and barley growth, which have been studied over many years in the Jordanian Badia.

- 1- Vallerani mechanize system, a special tractor-pulled plow that automatically constructs water-harvesting catchments, ideally suited for large-scale reclamation work.
- 2- Runoff strips, where barley is planted in strips using a seed drill, with unplanted strips between catchment area. The catchment area will allow rainfall water to be harvested in the barley planted strip, which will maximize the available water for barley, and as a result, the barley crop will give reasonable straw and grain yield.
- 3- Marab is a natural formation found in the Badia. It is a water harvesting technology that is constructed at the lowest point of a watershed to collect and spread excess runoff water in order to maximize the size of land that can be brought under cultivation.

64% of respondents mentioned that they have used water harvesting techniques (WHT), but 36% mentioned that they don't (Table 79).

**Table 79: Water harvesting technologies**

WHT	Frequency	Percent (%)
Yes	32	64
No	18	36
Total	50	100

Source: Research Sample

### 10.1 Water Technology type:

60% of them adopted the soil dam, 34% of them made a well for collecting water, 3% of them applied either Marab, or hole (Table 80).

**Table 80: Water Technology Type**

Technology type	Frequency	Percent (%)
Soil dam	19	59.4
Well collection water	11	34.4
Marab	1	3.1
Hole	1	3.1
Total	32	100

Source: Research Sample

## 10.2 Establishment and Maintenance Cost:

The establishment and maintenance cost varied between 150 to 1700 JD, with an average cost of 380JD for the soil dam. The average establishment and maintenance cost was 850JD, but the average establishment and maintenance cost was 30JD for establishing the hole.

**Table 81: The establishment and maintenance cost for soil dam**

Soil Dam	Cost	N	Minimum	Maximum	Mean
	Establishment cost	15	0	1700	379.67
	Maintenance cost	2	150	200	175
Well Collection Water	Establishment cost	4	0	1700	850
	Maintenance cost	0			
Hole	Establishment cost	1	30	30	30
	Maintenance cost	0			

Source: Research Sample

82% of farmers thought that water harvesting techniques are very important to improve crop yield and farmers' income, even 18% of them mentioned that it is important (Table 82).

**Table 82: The Importance of water harvesting techniques**

Important	Frequency	Percent (%)
Very important	41	82
Important	9	18
Total	50	100

Source: Research Sample

## 10.3 Level of knowledge for water harvesting techniques:

It was found that 80% have knowledge about Marabs, 20% of them don't know it. Only 7% of them have knowledge about runoff strips, 93% have no idea about the Runoff strips. 47% of them have knowledge about Vallerani, 53% have no idea.

93% of them have knowledge about Haffira, and only 7% of them mentioned that they have no idea. Regarding to roof top water harvesting, it was found that only 40% of them have knowledge, but 60% of them have no idea. 95% of them have good knowledge about the soil dams (Table 83).

**Table 83: The Importance of water harvesting techniques**

	level of knowledge	Frequency	Percent (%)
Marabs	don't know it	9	19.6
	have minimal knowledge about it	5	10.9
	know it very well	32	69.6
	Total	46	100
Runoff strips	don't know it	28	93.3
	have minimal knowledge about it	1	3.3
	know it very well	1	3.3
	Total	30	100
Vallerani	don't know it	23	53.5
	have minimal knowledge about it	8	18.6
	know it very well	12	27.9
	Total	43	100
Haffira	don't know it	3	6.5
	have minimal knowledge about it	6	13
	know it very well	37	80.4
	Total	46	100
roof top water harvesting	don't know it	21	60
	have minimal knowledge about it	3	8.6
	know it very well	11	31.4
	Total	35	100
Soil Dams	don't know it	2	4.7
	have minimal knowledge about it	2	4.7
	know it very well	39	90.7
	Total	43	100

Source: Research Sample

### 10.4 The most suitable water harvesting techniques:

It is important to demonstrate to farmers that the technical and agronomic aspects are directly related to the management and economic ones and, therefore, any technical and agronomic improvement obtained by using the full package need to be quantified in monetary and economic terms.

According to the farmers, the soil dam is considered the most suitable water harvesting techniques for the agricultural activities needs as mentioned by 70% of respondents, followed by wells as well as hafiras (14%), 4% mentioned that the concrete dam is more suitable, and only 2% mentioned that vallerani is important (Table 84).

**Table 84: The most suitable water harvesting techniques**

Suitable WHT	Responses		% of Cases(50)
	N	%	
Soil Dams	35	60.3	70
Marab	6	10.3	12
wells	7	12.1	14
Hafira	7	12.1	14
Vallerani	1	1.7	2
Concrete Dam	2	3.4	4
Total	58	100	116

Source: Research Sample

The fifth scenario was the most appropriate for the farmers as mentioned by 54%, which is planting barley using Contour Strip, followed by 31% mentioned that the fourth scenario is the most important which is planting barley in traditional way. 7% of them mentioned that the sixth scenario is the most important scenario which is planting barely using Strip Narrow.

**Table 84: The most suitable water harvesting techniques**

Scenario	Scenario 1	Scenario2	Scenario 3	Scenario 4	Scenario 5	Scenario 6
Crop	Shrubs	Shrubs	Shrubs	Barley	Barley	Barley
WHT	Traditional way	Vallerani) bund structures(	ridges (VCR) Vallerani contour	Traditional way	Contour Strip	Strip Narrow
Cost (JD/Du)	48.258	49.425	49.345	15.06	28.05	25.05
Average Crop yield Kg/ du	75	-----	-----	75	75	75

Source: Research Sample

**Table 84: The most suitable water harvesting techniques**

Scenarios	Frequency	Percent (%)
Scenario 2	1	2.2
Scenario 3	2	4.3
Scenario 4	14	30.4
Scenario 5	25	54.3
Scenario 6	3	6.5
Scenario 3 +Scenario 5	1	2.2
Total	46	100

Source: Research Sample

## **XI. Conclusions and Recommendations:**

Farmers at the study area face many challenges relating to applying water harvesting it includes weather conditions, high prices of agricultural inputs in addition to high investment costs in using mechanized water harvesting.

The fifth scenario regarding to the most suitable water harvesting techniques was the most appropriate for the farmers as mentioned by 54%, which is planting barley using Contour Strip.

The benefits of water harvesting must be clearly perceived by farmers given their own socioeconomic conditions. In arid areas, increasing farmers' knowledge and perception of the merits of water harvesting through better access to technical information, extension, and training will help them develop a positive economic assessment of water harvesting technologies. In addition, it is suggested that policy support to encourage farmers to adopt this technology at their farms by providing loans with low interest rates, since the mechanized water harvesting is costly and not affordable by farmers, help would help promote water harvesting adoption.

Finally, the results also suggest the need for greater political and institutional input into water Harvesting projects. In particular, there is a need to design and develop alternative policy Instruments and institutions for extension, technical assistance, training, credit services that will facilitate adoption of the farmer- participatory practices to better fit the needs of farmers. A creation of a strong networking among different institutions related to applying water harvesting and involvement of civil societies subsidies more linking mechanisms between research and extension and extension education on water harvesting would further push the

### **Lessons Learned:**

- ▶ Involving the local communities during the planning and implementation processes of any technologies will have good effects on adoption.
- ▶ Women in Al Majidyya have different skills, some of them have skills in the manufacturing of pastries, sweets and others have skills in the manufacturing of ghee and Jameed, but they are suffering from lack of finance, marketing problems, lack of cooperation of men in the process of transportation and marketing, and lack of processing equipment.
- ▶ Al Majidyya cooperative was very important to the women as it serves as an opportunity for them to socialize and become empowered through manufacturing dairy products.
- ▶ Dairy production might be appropriate livelihood strategies for Majidyya women.
- ▶ Farmers are aware of the impact of climate change to their livelihoods like water scarcity, reduction in land productivity, and decrease incomes.
- ▶ The interested of women in the Majidyya community require attention to develop another training program on water issues and dairy product processing to provide opportunities to increase income and water conservation, thus improving the household's health and livelihoods. Women were interested in the Dairy training as a useful activity. There was significant interest and participation for Majidyya women in manufacturing Jameed with new process technology.
- ▶ Most Majidyya men rely on government employment to support their households. There are few people in the community relying on agriculture as a primary source of income.
- ▶ In case of use a new technology we should provide it to the community if it's price is expensive before the spreading and dissemination, because of the lack of usefulness of the dissemination of technology among farmers if they cannot buy it because of the high cost.
- ▶ Focusing on providing key sources of life in the region, such as providing a public water network.
- ▶ Establishment of an association to regulate grazing management in areas that suffers from lack of medicinal and rural plants, to preserve the remaining vegetation.
- ▶ We should focus on the technique of collection water through the surfaces in the water collection wells because of the presence of many collection wells beside homes in the area of Majidiyah, to be used in times of lack of water availability.
- ▶ Study the available market for the products and training the people about the products required in the market.



## **Annex: Questionnaire**

### **Household Survey**

The purpose of this survey is to solicit information on household livelihood strategies, natural resource use and management practices, and perception on climate variability. The household survey will be completed in the Muharab and Majdiyyae communities whose livelihood depends on the crop-livestock production system.

The data collected will be useful to understand the role of essential ecosystem services in supporting rural livelihoods and to promote the adoption of appropriate technologies that will ensure sustainable management and use of scarce natural resources, and increase household income.

NCARE will collect the data and submit the raw data as well as the analytical report as part of the WLI workplan for fiscal year 2017.



Survey code number: \_\_\_\_\_  
Name of enumerator: \_\_\_\_\_  
Date: \_\_\_\_\_

## I. Location Identification

1. Location (village, district, etc. as appropriate):

2. Governorate:

3. GPS Coordinate:

## II. Household Demographics

4. Name of interviewee (hh head):

5. Sex \_\_\_\_\_ (1= Male, 0= Female)

6. Female Headed Household \_\_\_\_\_ (No=0, Yes =1)

7. Age \_\_\_\_\_

8. Marital status \_\_\_\_\_ (1=married, 2=single,  
3=divorced, 4=widowed)

9. Educational status \_\_\_\_\_ (1= None, 2= Read and write,  
3= Elementary, 4= high school graduate, 5= vocational training, 6 = intermediate  
diploma, and 7 = B.S. and above)

10. Number of children \_\_\_\_\_

11. How long have you lived in this community \_\_\_\_\_ years or months  
(*circle appropriate unit*)

12. Where did you live before moving here?

13. How long did you live there before you moved here?

14. Do you agree with the statement that “There is a growing trend for the Bedouin  
community to become more sedentary as compared to your grandfathers?”  
\_\_\_\_\_ (No=0, Yes=1)

15. Number of people in the household

Please use the following codes/labels.

<i>Age Group</i>	<i>Sex</i>	<i>Relation</i>	<i>Educational status</i>	<i>Occupation</i>
1= <18 years' old 2 = 18-24 3= 25-34 4 = 35-44 5 = 45-54 6= >55 years' old	1 = Male 2 = Female	1= Spouse 2=Child 3= Relative 4= Hired help 5= Other	1=None 2=Read & write 3=Elementary 4=High school graduate 5=Vocational training 6= Intermediate diploma 7= B.S.	1= Farmer 2 = Gov't employee 3 = Private business 4 = Student 5 = Other (Specify)

No.	Age	Sex	Relation	Educational Status	Occupation
1					
2					
3					
4					
5					
6					
7					
8					
9					

### III. Agriculture and Livelihoods

16. What is your main source of income? \_\_\_\_\_  
**1**=Agriculture (specify crops), **2**= Livestock (specify types of animals), **3**= Employment (specify type of job), and **4**= Other-----

17. Net household income (category) \_\_\_\_\_  
**1**= < 1000, **2**= 1001 – 3000, **3**= 3001 – 5000, and **4**= > 5000

18. Do you have a secondary occupation? i.e. in addition to your main source of income?  
(0= No, 1= Yes) \_\_\_\_\_ If yes, please specify  
\_\_\_\_\_

19. Employment Status \_\_\_\_\_

**1= Full-time employment, 2= Part-time employment, 3= Unemployed, 4= Retired, 5= House work, and 6= Farm work**

20. Do you own any farm land? (0=No, 1= Yes) \_\_\_\_\_ If yes, where?  
\_\_\_\_\_ and what is the size of your farm land?  
\_\_\_\_\_

21. Do you rent any farm land? (0=No, 1= Yes) \_\_\_\_\_  
If yes, where? \_\_\_\_\_ and what is the size of  
your farm land? \_\_\_\_\_

22. What is the size of your cultivated land? \_\_\_\_\_ dunum

23. What types of crops and or plants do you grow on your land? And in what season?  
(Note: these crops could be grown in more than one season)

Crops 1= Barley, 2 = Olives, 3 = Other stone fruits, 4= do not grow anything	Season 1=Summer, 2=Autumn, 3=Winter, 4=Spring

24. Do you use hired help to work on your land? (0=No, 1=Yes) \_\_\_\_\_  
If yes, in which season? (1=Summer, 2=Autumn, 3=Winter, 4=Spring)  
\_\_\_\_\_

25. Do you have any water or soil conservation structures on your land? (0=No, 1=Yes)  
\_\_\_\_\_

If yes, please specify the type \_\_\_\_\_ and how long you have had it  
on your land\_\_\_\_\_.  
(Note: there could be more than one type)

26. Please indicate the current crop yield (kg/ha) from your farm.

crop 1 (name)-----yield----- kg/dunum  
crop 2 (name)-----yield----- kg/dunum  
crop 2 (name)-----yield----- kg/dunum

27. How would you categorize crop yield from your farm for the last four years (2009-2012)?  
(Please mark one category per year)

	Good=1	Medium=2	Bad=3
2009			
2010			
2011			
2012			

28. If you have answered **Yes** under question 25, do you think the conservation structures have made a difference in your crop yield? (**0=No, 1=Yes**) \_\_\_\_\_  
If yes, please specify the difference in percentage increase/decrease \_\_\_\_\_

29. Do you sell any of your agricultural produce? (**0=No, 1=Yes**) \_\_\_\_\_  
If yes, which crop? \_\_\_\_\_, in what season? \_\_\_\_\_ and where? \_\_\_\_\_  
*(Please note that they could sell different types of crops and in more than one season)*

#### IV. Water Use and Management

30. What is your **main** source of water for agricultural activities? \_\_\_\_\_  
**1=** rainfall    **2=** groundwater    **3=** harvested water    **4=** tanked water
31. What is your main source of water to meet the following needs? Do the sources vary seasonally?  
**1=** tap water, **2=** groundwater, **3=** harvested water, **4=** tanked water, **5=** bottled water

Main source of water for:	Summer	Autumn	Winter	Spring
Drinking				
Cooking				
Livestock				
Cleaning				

32. On average, how much do you spend on water per month for home consumption (in JOD)? Does it vary seasonally?

Source of water for:	Cost during Summer	Cost during Autumn	Cost during Winter	Cost during Spring
Drinking				
Cooking				
Livestock				
Cleaning				

## V. Livestock

33. What types of animals do you have? \_\_\_\_\_

(Note: the answer can be more than one type)

1=Sheep, 2= Goats, 3= Camels, 4= others

34. What is the size of your herd?

1= Less than 100, 2= between 101-200, 3=between 201-300, 4=between 3001-400, 5= more than 500

Sheep \_\_\_\_\_

Goats \_\_\_\_\_

Camel \_\_\_\_\_

Others \_\_\_\_\_

35. How has your herd size changed over the past 5 years? Can you tell us the estimated increase or decrease in size?

1= increased by about 10-20%, 2= increased by about 25%, 3= increased by about 50%, 5= increased by more than 50%, 6= decreased by about 10-20%, 7= decreased by about 25%,

8= decreased by about 50%, 9= decreased by more than 50%

(If more than 50% increase or decrease please ask them to specify)

Sheep \_\_\_\_\_

Goats \_\_\_\_\_

Camel \_\_\_\_\_

Others \_\_\_\_\_

36. Are your livestock registered under the *animal registration program*? (0=No, 1=Yes)

\_\_\_\_\_

37. How many times per year are your livestock visited by a veterinarian? \_\_\_\_\_

38. Does the veterinarian's visit vary seasonally? \_\_\_\_\_ (0=No, 1=Yes)

If yes, in what season is the visit more likely or frequent? \_\_\_\_\_

(1=Summer, 2=Autumn, 3=Winter, 4=Spring)

39. What are the average percentage contributions of the following sources of feed for your livestock?

	Free grazing	Barley grown on own field	Purchased barley	Others (Specify)
Sheep				
Goats				
Camels				
Others (Specify)				

40. From where do you buy barley for your animals?

\_\_\_\_\_

41. On average, how much barley do you buy per year? In Kg or ton?

\_\_\_\_\_

42. How much does it cost to purchase 100 Kg of barley? (in JOD)

\_\_\_\_\_

43. Have you noticed any changes in the price of barley in the past 5 -10 years? If yes, please *specify*.

\_\_\_\_\_

1=No, 2= Yes increasing, 3= Yes, decreasing, 4= Yes, decreasing a lot

44. Where do your animals free-graze during the different seasons? Please specify location and approximate distance from home. (*Note: these areas could be used throughout the seasons or in more than one season*)

Summer \_\_\_\_\_

Autumn \_\_\_\_\_

Winter \_\_\_\_\_

Spring \_\_\_\_\_

45. Are there any interventions in your community that aim to increase vegetation cover? (0=No, 1=Yes) \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

(*Note: these could be individual, community, project, or government based interventions. Please list all relevant interventions – name of the intervention and where it is implemented*).

46. Are there any community based organizations that regulate grazing management in your community? (0=No, 1=Yes) \_\_\_\_\_

If yes, please specify name and role

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

47. What kind of crops/shrubs do your animals normally feed on? And in what season? Please list in order of importance. (*Note: these sources could be used throughout the seasons or in more than one season*)

1. \_\_\_\_\_ 2. \_\_\_\_\_ 3.

\_\_\_\_\_

4. \_\_\_\_\_

48. How has the variety (availability of different types of crops and shrubs found locally) and quantity of crops/shrubs your herd feed on changed over the past 5 years? Can you tell us the estimated increase or decrease in size?

**1**= increased by about 10-20%, **2**= increased by about 25%, **3**= increased by about 50%, **5**= increased by more than 50%, **6**= decreased by about 10-20%, **7**= decreased by about 25%,

**8**= decreased by about 50%, **9**= decreased by more than 50%

*(If more than 50% increase or decrease please ask them to specify)*

Crops/shrub	Changes in variety	Changes in quality

49. Is there a change in milk productivity of livestock over the last 10 years?

**1**= increased by about 10-20%, **2**= increased by about 25%, **3**= increased by about 50%, **5**= increased by more than 50%, **6**= decreased by about 10-20%, **7**= decreased by about 25%,

**8**= decreased by about 50%, **9**= decreased by more than 50%

*(If more than 50% increase or decrease please ask them to specify)*

Sheep \_\_\_\_\_

Goats \_\_\_\_\_

Camel \_\_\_\_\_

50. What are the major causes for the increase or decrease in yield?

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51. Is there a change market prices for milk over the last 10 years?

**1**= increased by about 10-20%, **2**= increased by about 25%, **3**= increased by about 50%, **5**= increased by more than 50%, **6**= decreased by about 10-20%, **7**= decreased by about 25%,

**8**= decreased by about 50%, **9**= decreased by more than 50%

*(If more than 50% increase or decrease please ask them to specify)*

Sheep \_\_\_\_\_

Goats \_\_\_\_\_

Camel \_\_\_\_\_

52. What are the major causes for the increase or decrease in milk price?

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53. What other dairy products do you produce at the household level? *(List up to five in order of priority)*



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54. Do you use any machinery (hand and/or power supported) to process the dairy products?  
If so, please list the name of the technology and its purpose including type of dairy product produced.

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55. Do you sell any of the dairy products? \_\_\_\_\_ (0=No, 1=Yes)  
If yes, where do you sell them and at what price? (*List up to five in order of priority and specify the unit e.g. gram, kg, etc.*)

Type of dairy product	Market place	Average selling price/unit

56. Have you noticed any changes in the selling price of sheep and goats in the past 5 -10 years? If yes, please *specify*.

\_\_\_\_\_

1=No, 2= Yes increasing, 3= Yes, decreasing, 4= Yes, decreasing a lot

## VI. Climate Variability

57. Have you noticed any changes in water availability in the past years? If yes, please *specify*.

\_\_\_\_\_

1=No, 2= Yes increasing, 3= Yes, decreasing, 4= Yes, decreasing a lot

58. Have you noticed any changes in rainfall pattern in the past years? If yes, please *specify*.

\_\_\_\_\_

1=No, 2= Yes increasing, 3= Yes, decreasing, 4= Yes, decreasing a lot

59. Have you noticed any changes in fodder availability on communal lands in the past 5 - 10 years? If yes, please *specify*.

\_\_\_\_\_

1=No, 2= Yes increasing, 3= Yes, decreasing, 4= Yes, decreasing a lot

60. Have you noticed any changes in soil fertility in the past 5-10 years? If yes, please *specify*.

---

1=No, 2= Yes increasing, 3= Yes, decreasing, 4= Yes, decreasing a lot

61. Have you noticed any changes in the general landscape of your community in past 5-10 years? If yes, please *specify*.

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1=No, 2= Yes increasing, 3= Yes, decreasing, 4= Yes, decreasing a lot

## VII. Water harvesting technologies

62. Do you use any water harvesting technologies in your farm? (0=No, 1=Yes)

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If yes, please specify which type. \_\_\_\_\_

63. Please indicate the establishment and maintenance cost (per ha) for each of the current water harvesting technologies that you use in your farm

Technology type	Establishment cost	Maintenance cost

64. How important do you consider water harvesting technologies as a means to improving crop yield and farmers' income? \_\_\_\_\_

1= Very important, 2= Important, 3= Neither important nor unimportant, 4= Unimportant, and 5= Very unimportant

65. Please indicate your level of knowledge on the following water harvesting techniques.

1= don't know it, 2= have minimal knowledge about it, 3= know it very well

a. Vallerani \_\_\_\_\_ b. Runoff strips \_\_\_\_\_ c. Marabs

\_\_\_\_\_ d. Ponds \_\_\_\_\_ e. roof top water harvesting \_\_\_\_\_

66. Please specify which water harvesting technologies you consider more suitable for your farming needs
-

67. Which of the following scenario would you choose? If the status quo, please explain why?

	<b>Scenario 1</b>	<b>Scenario2</b>	<b>Scenario 3</b>	<b>Scenario 4</b>	<b>Scenario 5</b>	<b>Scenario 6</b>	<b>Status Que</b>
<b>Crop</b>	Shrubs	Shrubs	Shrubs	Barley	Barley	Barley	
<b>WHT</b>	Traditional way	)Vallerani bund (structures	ridges (VCR) Vallerani contour	Traditional way	Contour Strip	Strip Narrow	
<b>Annuity cost</b>	5848.2	49.425	49.345	15.06	28.05	25.05	
<b>Crop yield</b>	75	-----	-----	75	75	75	
<b>I would choose</b>							