



Flood-Based Livelihoods
Network Foundation

The War Impact on Food Security in the Tihama Region

Case Study: Wadi Zabid and Wadi Siham



Assessment Report
November 2017



“Food security is defined as a situation during which “all people, at all times, have physical, social, and economic access to sufficient, safe, and nutritious food to meet their dietary needs and food preferences for an active and healthy life” (FAO 2009a, 1).



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Chapter 1: Introduction

1. In brief

The current war in Yemen has severely contributed to the degradation and impairment of the livelihoods of the people, most tragically by affecting and jeopardizing the food security situation in all war-torn regions generally; and in the Tihama region in particular. The food insecurity and malnutrition are witnessed to have passed into severer conditions since the eruption of war in March 2015, leaving the country on the brink of famine. The war in the already-fragile country has been a key driver and a major contributing factor to the drastically aggravating livelihood situation, rapidly deteriorated food and nutrition situation, and elevated complexity of the humanitarian crisis in the country.

The household level of food insecurity is about 32.1% of the population in Yemen, 37.3% rural and 17.7% urban households indicating high inequality. Almost one-third of Yemenis (7.5 million) do not have enough food to satisfy their needs. Children being underweight and stunting is also much more pronounced in rural areas (62.1%) than in urban areas (45.4%). The average rural nutrition is poorly balanced, and the risk of micronutrient deficiencies is especially high. Food insecurity is highest among rural, nonfarm households, and livestock farmers.

Over 70% of population is living in rural areas in Yemen and about 50% of the labor depends on agriculture and its related activities for their living. Agricultural production is estimated to cover about 25% of the crop-based food needs.

The June 2015, June 2016, and March – July 2017 IPC analyses classified Al-Hodeidah , where more than 80% of Tihama is located, in IPC phase 4 (*Emergency level*), i.e. Al-Hodeidah is considered the most affected area by the ongoing war in Yemen (FSIS July 2017 IPC analysis). Between July and September 2016, WFP's MVAM surveys found that the average of 18% of respondents in Al-Hodeidah reported large numbers of poor food consumption, with an additional 19% in the consumption borderline. During the same period, 45% of respondents reported a reduced coping strategies index (RCSI) of over 20%.

Agriculture in the Tihama region, being the main sustainment of the population, has been majorly influenced by the serious disruptions the agricultural sector is experiencing. The current war has negatively affected the productivity and investment capacity of the country. The supply and distribution of agricultural inputs and farm products to the markets have also been adversely affected. Affected people's coping mechanisms and safety nets are stretched to the limit as families adopt insufficient and negative coping strategies in order to survive (IPC Yemen August 2015).

WEC in collaboration with the Flood-Based Livelihoods Network (FBLN), NICHE-Yem027 and MetaMeta Research conducted an operational research to assess the impact of the current war on food security, as well as understand the manifestation and causes of the famine and food insecurity in the Tihama plain, historically known as the food granary of the country. The selection of the study areas in the southern and central parts of the region of the Tihama Plain came to determine the impacts of war on household's food security and agricultural production in these regions. This study focused on Wadi Zabid (as southern wadi of the plain) and Wadi Siham (central wadi of the plain), where agricultural patterns show a main dependency on spate irrigation.

The main objective of this assessment study was to quantify the impact of the ongoing war on food security to support the efforts of the international community to pursue their assistance for the affected poor and vulnerable population in Tihama, as well as best understand how to respond. It evaluates the food insecurity situation from two perspectives, the farmer's and the consumers', by understanding the challenges posed to establishing food security. The study also explored the direct and indirect impacts of war on food security and agricultural activities, while evaluating how those activities are in relation with food security and production. It eventually looked into coping strategies adapted by farmers and other water users, and any possible innovated simple solutions that they may be adopted to relief negative consequences on food security and thus ultimately on the livelihoods of the people.

2. Materials and methods: The study approach

An overview of the assessment framework

In this study, relevant secondary data were collected to identify gaps of food security in both Wadi Zabid and Wadi Siham. Collection of field primary data was then obtained by conducting a field survey in the study area to fill in the identified gaps. The collection of primary and secondary data was conducted over a period of three months.

For the aim of assessing and evaluating the impact of the development of food insecurity situation in the area, qualitative and quantitative approaches were applied to collect field data on the impressions and experiences of different categories of respondents. The data were designed to provide the situation by asking for quantities, physical condition and magnitude of damage. Types of damages have been reported and classified for various elements of agricultural facilities and infrastructures affected during the war. It has been agreed that hard data would likely be unavailable for all

indicators in all locations covered by the survey of food insecurity aspects carried out by WEC in June 2017.

The approach included covering a detailed account of the current situation to identify food insecurity problems resulted from the war. The major portion of the assessment was devoted to damage assessment of the food security infrastructure. The quality of the data and supporting evidence had huge variances in completeness and quality. Hence, the survey and questionnaire forms were designed to provide a picture of the situation by asking for quantities were they applicable.

The assessment framework conducted searching methods based on the field survey of spate irrigation areas affected by the ongoing war, where the study included households, farmers and local communities affected by the ongoing war. This method was applied to measure the impact of war on the livelihoods and food security. In addition, the study included evaluating the situation of the markets of agricultural products such as vegetables, fruit, grains, legumes, meat and poultry as well as livestock markets.

In both wadis, interviews were conducted with the targeted households and local community leaders. The survey questionnaire forms were distributed to them while including questions related to the research process in terms of the impacts of war within the social and economic aspects affecting the lives of those households resulting in food insecurity.

Data collection and analysis

The field survey was conducted during the period 11-18 June 2017, and carried out at the household and local community levels for up, mid and downstream areas of each Wadi. The stratified sample was used to select the households studied. In this field survey, rural and community leaders were employed to conduct the surveys.

In both wadis, there were two components to the field survey. The first component was the statistical survey of 177 households in two Wadis in Al Hodeidah governorate. The second component was the community/district level survey, where 79 community leaders and local councils were asked for their views on the food security situation and its determinants. Cross analysis of the data aimed to ensure coherence between what was described at the household level and how communities/officials understood the food security situation.

The survey carried out differentiated between three parts (reaches) of each wadi: upper,

middle and downstream areas. The importance of this approach is to identify the food security situation in each area of the wadi, where each part is commonly dominant by a different agricultural system and the effect of war differs. This discrimination allows more accurate and appropriate interventions to be proposed without negatively affecting the other parts of the wadi. In other words, solutions/measures proposed for the upper part of the wadi should not negatively affect the downstream areas.

In Wadi Zabid, the total number of targeted households surveyed was 94 households in 14 villages, distributed over the upstream (37 households / 5 villages), midstream (49 households / 4 villages) and downstream (8 households / 5 villages). The small number of downstream households surveyed was due to the several constraints the field survey team encountered in this area, including the security situation and restrictions. The questionnaire at the local community level included 31 questionnaires conducted by local leaders in each of the villages of upstream (15 questionnaires), midstream (11 questionnaires) and downstream (5 questionnaires).

In Wadi Siham, the total number of targeted households surveyed was 83 households / 12 villages, distributed over the upstream (27 households / 4 villages), midstream (29 households / 4 villages) and downstream (27 households / 4 villages). Local leaders conducted the questionnaire at the local community level, where 48 questionnaires were conducted in all villages of upstream (12 questionnaires), midstream (19 questionnaires) and downstream (17 questionnaires).

The collected data was subject to statistical analysis using the SPSS program. Analyzed data and findings were summarized together with appropriate conclusion and recommendations.

3. Structure of the report

This assessment report consists of four chapters, where the findings and results from the survey of the impact of the war in Yemen on food security is discussed. Chapter 1 introduces and addresses food insecurity and materials and approaches employed in the study, as well as discusses the background of the study area while giving an outlook on war-related issues in there.

The report aims to highlight and shed light to the situation and various aspects concerning the food security situation, focusing on two perspectives. The first perspective is the consumer', which includes hunger rates, food consumption, food insecurity complications, and the adopted measures to cope with the difficulties

detering the affected population from obtaining a well-being and adequate livelihood. Chapter 2 discusses the various issues under this category.

Finally, Chapter 3 is dedicated to the second focus of this assessment study on the war impact on food security, the farmer's perspective. It provides details on the food production and the difficulties imposed on this process under the current war circumstances in the study area. It also evaluates irrigation and its affected infrastructure and systems and thus hindering agriculture; marketing and the challenges farmers find when endeavoring to sell their products; and finally the adaptation strategies employed by farmers to cope with the alterations and socio-economic deterioration in the country.



The Tihama

4. Background of the study area

4.1. Spatial coverage

Al-Hodeidah is the second largest governorate in Yemen in terms of population size. It has a population of about 3.19 million inhabitants, accounting for a percentage of 11.5% of the total Yemeni population. Al-Hodeidah is the main governorate in the Tihama region, representing more than 80% of Tihama's region area.

Wadi Zabid is one of Tihama's main wadis located in its southern part (Figure1). It is the second largest wadi in the spate spate-flowed Tihama, with an area of 4639 km², while the catchment of Wadi Siham is located in the central part of Tihama (Figure 1), with an area of 5586 km².

4.2. Climatic and Hydrological Characteristics

Wadi Zabid

The average annual rainfall in Wadi Zabid's watershed is typically 550 mm/year but with peaks in some areas of upper catchment to 1000 mm/year. The average volume of its spate flow is 118.1 MCM to irrigate an area of about 15,215 hectares. The length of the main channel of the wadi is about 25.2 km with a cultivable area of 18,691 hectares by spate irrigation. According to the wells survey for the years 2005-2010, the number of working wells with pumps in Wadi Zabid/Rama basin reached 6,510 wells, pumping an estimated quantity of water 526 MCM to irrigate an agricultural area of 28,827 hectares. This represents 97% of the total water extracted from groundwater aquifers.

Wadi Siham

The length of Wadi Siham's main canal is 187 km. The number of operational wells in Wadi Siham basin is 2,715 wells pumping an estimated amount of 221.7 MCM of water to irrigate an area of about 16,828 hectares, representing 86% of total water extracted from groundwater.

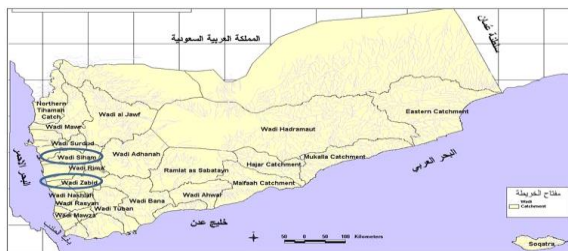


Figure 1: Location of Wadi Zabid and Wadi Siham

4.3. Agricultural production and irrigation systems

There are two agricultural seasons in both Wadi Zabid and Wadi Siham: the autumn season (July – October), and the summer season (March –June). The main crops grown in Wadi Siham during autumn are sesame and sorghum. Sorghum is grown for the purpose of producing grain and fodder. In the summer season, sorghum and millet are grown and irrigated using rainwater, whereas, tobacco and vegetable crops are grown and irrigated using groundwater.

In concern with the cropping pattern in Wadi Zabid, the Agricultural Research and Extension Authority's results of the field survey for 2012 mentioned that farmers in the upper and middle areas in the wadi are planting sorghum and sesame depending on spate irrigation, while farmers in downstream areas cultivate other crops depending on supplementary irrigation. In addition, Wadi Zabid's farmers cultivate mangoes and bananas depending on groundwater.

4.4. War-related issues in the study area

Al Hodeidah's agriculture, fishery and livestock sectors play leading roles in the national food production. As a part of the vast Tihama plains, with fertile soils and a favorable climate, the governorate offers good potential for food and livestock production activities, in addition to its vast coastline for fish and seafood productions.

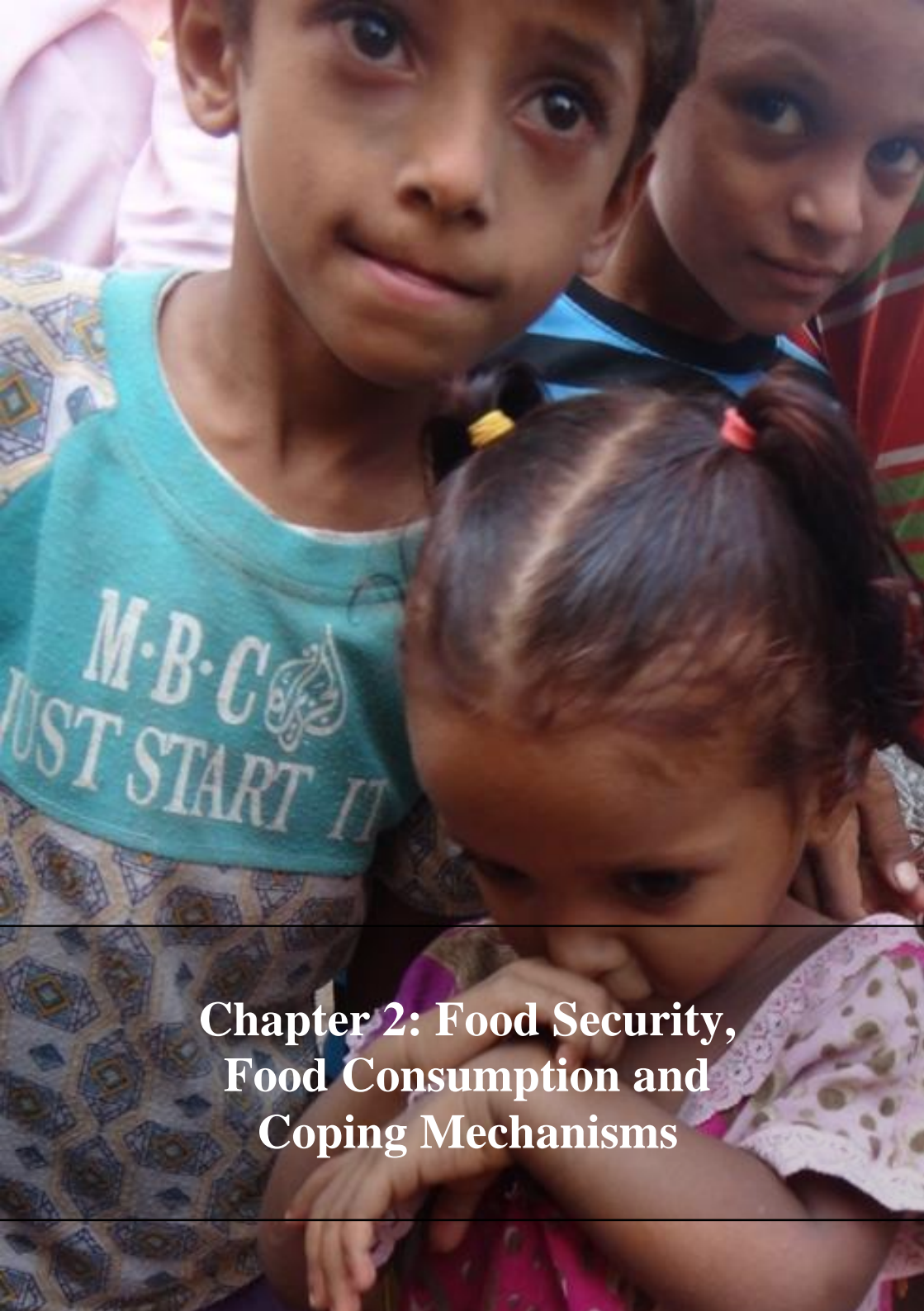
Comparing cultivated areas of 2013 and 2014 with the 2015 agricultural statistics, the results disclosed an estimated 12% decline in cultivated areas, e.g. cotton cultivation area in Wadi Zabid fell from 1310.5 Maad (477 hectare) in 2012 to 622.4 Maad (227 Hectare), representing a 48% decline in 2015 alone. Recent estimation results of agricultural statistics and agricultural extension reports revealed an average of 20% decline in agricultural production per unit area in 2015 and 2016 compared to 2013 and 2014. This decline is due the following reasons:

- High prices of fuels and agricultural inputs required for production, which led to an increase in production costs. The production costs increased by 63 - 83% per hectare for most crops, compared to the production costs of 2014;
- Large numbers of banana and mango trees dried out due to irrigation water not being provided; and
- The Tihama Development Authority (TDA), which is the responsible government organization in the region, established neither maintenance

nor operation.

In Wadi Zabid alone, results confirm that there was a rise in the cost of crop cultivation during 2015, with an average increase of 29% compared to 2014. The high costs of agricultural production and its inputs, and the high prices of fuel derivatives have all led to a decrease in farmers' income, and a reduction in cultivated areas. As for farmer's income in 2015 and 2016, net income decreased by more than 50% compared to the results in 2013.

Agricultural marketing has also been significantly affected by the war. Cold storages are no longer in operation, and roads and transportation means have been damaged or destroyed. The higher fuel prices have led to higher costs of agricultural marketing posing a serious struggle for farmers to cope with.



**Chapter 2: Food Security,
Food Consumption and
Coping Mechanisms**

Food Security, Food Consumption and Coping Mechanisms (Consumer perspective)

A massive number of households are disturbed by the life-changing alterations the war has resulted in, including the diminution of income and value of assets, hunger rates, food scarcity, and food consumption reduction for survival at the household level.

The analysis of the assessment study –for the 'during-the-war' period from March 2015 until June 2017, and the 'pre-war' period – covered the war impact on food security and its implications reflected on the people. This chapter will focus on assessing the food insecurity situation giving its various aspects, key contributing factors and consequences from a consumer perspective. All evaluations and observations in this chapter focus on the targeted people as (food consumers).

A highlight of observations and survey values on the socio economic situation in the study area is firstly explored. The overview of the socio economic situation provides an evaluation on the sources of income, water, and fuel at the household level. Income impairments deterring the people from meeting their dire need for food is also evaluated.

Additionally, this chapter will further discuss the food insecurity the households are undergoing, where rates of hunger, food consumption and food availability, as well as the anxiety and concern levels among households are analyzed.

An evaluation of a number of complications in concern with the food insecurity development in the area is also provided, where rates of malnutrition and other health problems are studied. This part also looks at and studies the different strategies and coping mechanisms the people have adopted, as food consumers, to cope with the difficult deteriorated food situation they found themselves in.

1. Evaluating the socio-economic situation and characteristics

1.1. Sources of income for households

Families in both wadis have several sources for their income, which could be classified into main sources and secondary sources. The main sources of income are crop

agriculture and livestock production. The remittances from family members, seasonal employment and exchange trade are considered secondary sources for income of the households. The targeted families in Wadi Zabid and Wadi Siham had no households benefiting from social assistance nor simple trading Table (2.1).

The assessment revealed that income sources in Wadi Zabid's villages vary based on their location within the wadi. The main source of income of 65% of families in upstream and downstream areas was crop agriculture. Upstream areas' second source of income was disclosed to be livestock production for about 80% of families. Houses benefiting from remittances as a 3rd source of income constituted 71% of households in Zabid. Whereas, 27% of households in the wadi's upstream benefited from seasonal labor work as a 2nd source of income, and 14% of households at the wadi's downstream considered it as a 2nd and 3rd source of income.

In Wadi Siham, a similar trend was observed, where crop agriculture was considered as a main source of income in midstream areas (40%) and downstream areas (29%). The exact same percentages apply to the livestock production as a 2nd source of income in the same areas. In the wadi's upstream and midstream areas, 50% of households benefited from remittances as a 3rd source of income. As a 3rd source of income, 28% and 50% of households in the wadi midstream and upstream benefited from working as seasonal labor, while 62.5% of households at the wadi's downstream benefited from social assistances, and 50% in the wadi's upstream and downstream considered the simple trading their 3rd source of income.

Table (2.1) Sources of income for household in Wadi Zabid and Wadi Siham

Type of income source	Name wadi		Wadi Zabid	Wade Siham
	Source of income/ rank		Average	
Main income source	Crop product	1 st Source	28.7%	28.5%
		2 nd Source	5.2%	4.9%
		3 rd Source	1.1%	0.0%
	Livestock Products	1 st Source	0.0%	7.3%
		2 nd Source	26.7%	28.5%
		3 rd Source	6.7%	0.0%
Secondary income source	Seasonal labor	1 st Source	4.4%	0.0%
		2 nd Source	22.2%	0.0%
		3 rd Source	6.7%	33.3%
	Remittances	1 st Source	0.0%	0.0%
		2 nd Source	4.8%	0.0%
		3 rd Source	28.6%	33.3%
	Social assistance	3 rd Source	0.0%	33.3%
	Simple trading	3 rd Source	0.0%	33.3%

1.2. Household's domestic water sources

There are four main sources of water for domestic uses in both wadis: public water projects, public water taps, open wells, and covered wells. The evaluation on domestic water sources revealed that more than 80% of the households use protected covered wells as their main source of domestic water in downstream areas of both wadis; about 50% of the households use public water taps; and 27-48% of the households use public water projects. The domestic water sources in both Wadi Zabid and Wadi Siham are illustrated in (Figure 2), and the following gives detailed numbers for specific domestic water sources within the different areas in the wadis:

Wadi Zabid:

50% of Wadi Zaabid's upstream households use public water taps or public water projects as their main source of domestic water, and 50% of households use other sources. On the other hand, in midstream areas, 31% of households use public water projects and a water supply network, while the rest use the other water sources for their domestic water needs. And finally 27% of downstream areas' households use public water supply projects, 50% use public water taps, and all other households use wells as their main source of water.

Wadi Siham:

In Wadi Siham, 73% of households use private wells as the main source of water, while 15% to 48% of households use public water supply projects through all wadi's villages. In up and midstream areas, 50% of households use public water, while 83% of downstream households use covered wells as a source for domestic water use.

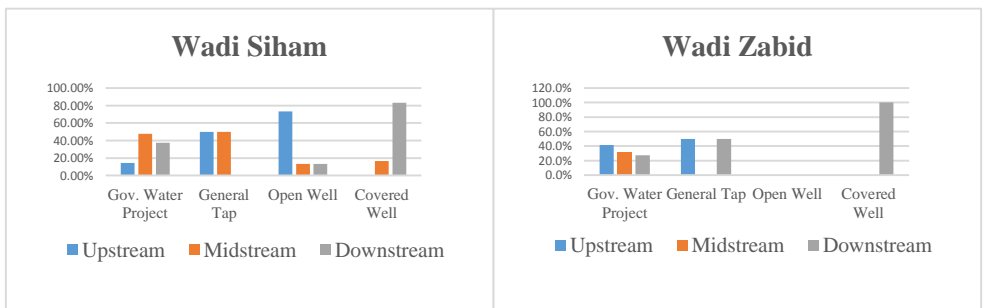


Figure 2: Sources of domestic water in Wadi Zabid and Wadi Siham

1.3. Sources of household cooking fuel

The two main sources of domestic cooking fuel identified are gas and firewood (Table 2.2). Prior to war, 50 - 51% of households depended on firewood as their main source of cooking fuel for domestic use in both wadis. During the war, however, 75% of households use firewood, while 10% of households still depend on gas as their main source of cooking fuel, while they use firewood combined with gas as a supplementary source of cooking fuel in both wadis.

The statistics show that there is a 20 - 32% increase in the rate of firewood use during the war. This was mainly due to the increase of gas prices as a result of its unavailability in the market. It was concluded that the use of firewood by households increased in the upstream and midstream villages compared to downstream households.

Table (2.2) Source of the fuel used in the cook before and during the war

Mean	Wadi Zabid			Wadi Siham		
	Wood	Gas and wood	Gas	wood	Gas and wood	Gas
Before the war	51%	16%	33%	50%	18%	32%
During the war	68%	20%	12%	82%	8%	10%

1.4. Households' financial and income inauspicious circumstances

The indirect consequences of the war have majorly contributed to the elevated deterioration of the socio-economic situation in the two wadis, and thus the aggravating food security situation. Two types of socio-economic impairments were identified: agricultural (discussed in *Chapter 3*) and non-agricultural impairments (Table 2.3).

Household's main non-agricultural impairments include public salaries interruption and suspension; increasing unemployment rates and decreasing job opportunities; and disease outbreaks due to poor primary health care and lack of proper WASH services.

In both wadis, the monthly household income decline ranged from 30 - 100%; meaning that some households have lost their income completely. The average of the war-resulted income decline will be discussed in both Wadi Zabid and Wadi Siham. Such indirect impacts, as well as the inflation and insanely increasing prices in the food market have been amongst the key drivers in the food insecurity developments. Results disclosed that food insecurity rates are higher amongst those who are poor, lost their sources of income, or rely mainly on the unsustainable food aids.

On the other hand, the targeted households revealed that the least damages were the destruction and direct damage on properties by air strikes, where there was no damage recorded in all areas of Wadi Zabid and downstream area of Wadi Siham. On the contrary, the second highest rate of the overall non-agricultural damages was the destruction of properties by airstrikes, preceded by the suspension of public salaries.

Table 2.3: Recorded non-agricultural damages resulted by the war

No	Types of Damage	The war impacts	Wadi Zabid	Wadi Siham
			Average of all wadi areas	Average of all wadi areas
1	Non-Agricultural damages	Stopping the payment of salaries of government employees	12.8%	34.9%
2		Increased unemployment and limited opportunities	85.1%	49.4%
3		Spreading the diseases and deteriorating the health care	62.8%	77.1%
4		Destruction or direct damage caused by air strikes (properties..., etc.)	0%	8.4%
5		Others: (Food shortage, Stop the electricity, Inequality in distribution of food aid and Deterioration of the situation in general)	96.8%	86.7%

2. Impact of war on food security

2.1. Food deprivation and hunger

A striking number of households reaching more than third of the targeted population in the two wadis were recorded to be food insecure. The evaluation concluded that about 10-30% of households sleep hungry almost all days of the month. This striking result is

explained: by the lack of financial resources resulting in households with no food stocks to survive another day; and the unavailability of food in the market, or that the available food's increasing prices are non-affordable. Thus, this hidden hunger state the poor and unfortunate are compelled to go through was also revealed to be one of the coping strategies they adapt in order to survive with limited opportunities and resources.

In the different villages in both wadis, percentages of households going to bed hungry due to various reasons (no funds, no food available..., etc.) are depicted in Figure 3. It was evaluated that about 4-21% of households in the different villages go to sleep hungry at least 11-20 times a month. About 3-26% of households in different villages went to sleep hungry at least 1-10 times a month, and about 10-33% of households in different villages went to sleep hungry 30 times a month because they had no food at home.

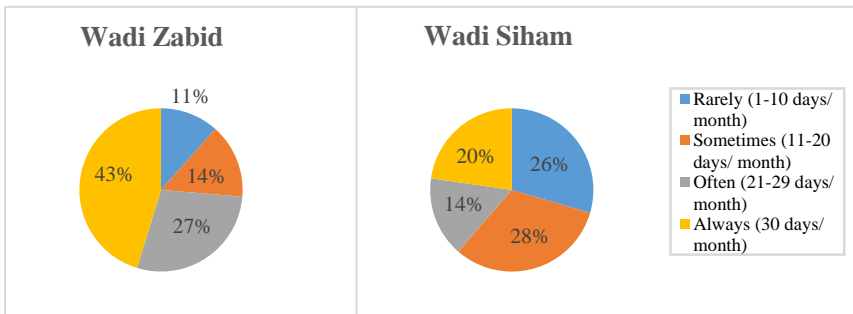


Figure 3: Number of times and percentage of households sleeping hungry in both wadis due to the lack of food in their home

2.2. Food availability

Results explaining the food insecurity within the households in terms of its availability over a week in both wadis indicate that more than 60% of all families do not have enough food stored for a forthcoming week. As shown in (Figure 4), 97% of families in the downstream and 78% of midstream of Wadi Zabid do not have enough food for a week, mainly due to lack of money. This poor availability of food at the household level was also observed in the midstream (98%) and downstream (92.5%) parts of Wadi Siham.

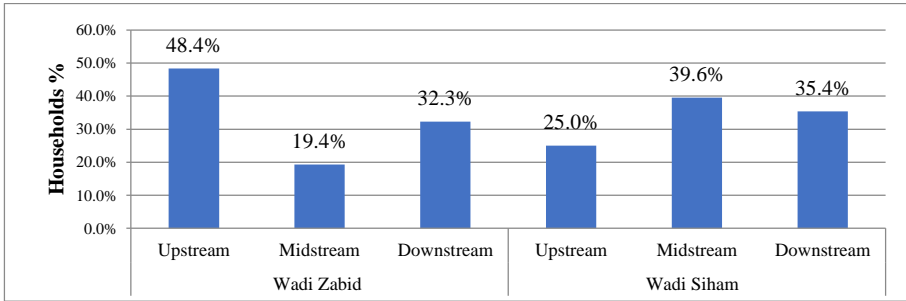


Figure 4: Percentages of families in the wadis' villages who said to have enough food stocks to meet the minimum household needs within a week during the war

2.3. Food accessibility

Results add that the households are experiencing obstacles accessing the food market, where only 33% of households have access to markets to purchase the food they need during the war. In addition, 75-80% of households suffer from obstacles that limit their access to food and markets, especially in the downstream villages of Wadi Zabid and Wadi Siham villages where the security situation is less stable.

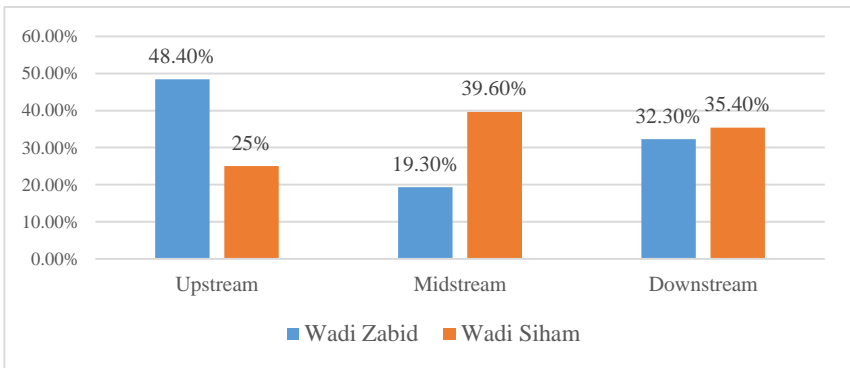


Figure 5: Percentages of families with full or some access to food markets in Wadi Zabid and Wadi Siham

3. Food consumption

Households' massive concern is the insufficiency of the available food to which they have access. There is a growing anxiety amongst families, which results in depression and thus more confined and insufficient solutions practiced by the families to adapt. They go to further limit their food consumption and decrease the amount and diversity of nutritious food.

In both wadis, the households' anxiety of not having enough food at home is intense. The percentage of anxiety within the households goes as high as 100% for families in Wadi Zabid, and 86% in Wadi Siham. In correspondence to their anxiety of not having enough food for the entire family and the insufficient funds, the survey's results for both wadis revealed that more than half of population ate low-cost food and food they did not like. For the reason of lacking the sufficient means, 92% of respondents in Wadi Zabid and 77% in Wadi Siham had limited food stored in their houses. Consequently, 49% of households in Wadi Zabid and 62% in Wadi Siham reported they went to sleep hungry (Figure 3) to minimize their food consumption with the insufficient financial resources they possess. The food insecurity situation has shown that the affected poor population with lack of financial resources have gone for reducing their monthly expenditure as unlikable coping strategy (*Chapter 3: 6.2*). Thus, they were pushed to reduce their food consumption or go for a cheaper unlikable food options (*Chapter 2: 4*) to put up with the alterations in the socio-economic situation and the food security and availability within the household (Table 2.4).

Table (2.4) Percentages of households (HHs %) and their food availability situation

Name of Wadi	HHs eating selected food due to the lack of money	HHs eating food they don't like	HHS eating limited food due to money shortage	HHs going to bed hungry most of the time	No food at home because no money
Wadi Zabid	94.7%	91.5%	91.5%	47.9%	66%
Wadi Siham	74.7%	78.3%	71.1%	53%	44.6%

4. Coping mechanisms and strategies adopted to alleviate hunger and uncertainty of food availability

The study explored the various adaptation measures and coping strategies the households in the two wadis have adopted to cope with the deteriorated food situation during the current war. A wide range of measures to deal with food insecurity was reported to have been adopted by the affected households, where every household usually adopts an approximation of 3-5 measures. There is no single prominent measure that is uniformly followed by all households, i.e. the adopted strategy is related to the socio-economic position of the particular household. The common measures and strategies identified by the study showed a spatial relationship with the households adopting them. In other words, the adopted strategies depend on the different locations of the households. The measures adopted included: displacement of the family to another location; renting another land, immigrating abroad, selling some assets (land, livestock, furniture, or others); head of family looking for another job, consuming savings to buy food (selling jewelry, e.g.); and/or using the food stored for emergencies. All adaptation strategies are summarized in Table (2.5) and depicted in (Figure 6a and 6b), where the following significant distinctive patterns were concluded:

Wadi Zabid:

- 40 to 64 % of households in all wadi areas used/adopted one or more of the following :
 - Prioritizing food for family members;
 - Moving the family out to another place if the situation continues;
 - Renting the land(s) they own;
 - Selling some property, land or livestock;
 - Immigrating abroad; and
 - Stopping their children's education and get them to work to help in financing the family, while some send family member to seek help from rich (begging).

- 40 to 63% of households in upstream areas used/adopted the one or more of the following:
 - Sending family members to live with relatives;
 - Reducing adult's consumption of food for the children;
 - Consuming savings to buy food (e.g. selling jewelry), and using the stored up for emergency (reserved);
 - Searching for another job by the head of family to earn more money;
 - Requesting assistance from humanitarian organizations; and
 - Sending some family members to seek help from the rich (begging).

- 30 to 35% of households in midstream areas used/adopted one or more of the following:
 - Marrying off their young girls to reduce family expenditure;
 - Reducing health care and education budgets; and
 - Consumption of low quality food.

Wadi Siham:

- 40 to 75% of households in downstream areas adopted measures such as:
 - Moving the family to live elsewhere (more affordable);
 - Sending some family members to live with relatives, and/or emigrating abroad;
 - Seeking help from the rich, and requesting assistance from humanitarian organizations;
 - Giving family workers priority in food; and
 - Reducing health care budget.
- 43 to 75% of households in wadi's midstream villages, adopted measures such as:
 - Leasing land or selling assets such as land and livestock.
- 40 to 44% of upstream households adopted measures such as:
 - Reducing adult's consumption of food for children; and
 - Reducing the education budget or stopping their children from going to school.

Table 2.5: Adaptation strategies to the current food situation in Wadi Zabid and Wadi Siham

	The strategies	Wadi Zabid	Wadi Siham
1	Reduce the nutrition budget	94.7%	81.9%
2	Consumption of low quality foodstuffs	87.2%	56.6%
3	Reduce the budget for the purchase of clothes and household appliances	79.8%	81.9%
4	Consumption of savings to buy food (selling jewelry ..)	67.0%	66.3%
5	Use the stored up for emergency (reserved)	51.1%	49.4%
6	Renting land they own	5.3%	4.8%
7	Borrow to provide food	86.2%	57.8%
8	Selling some property from land or livestock	41.5%	61.4%
9	Request for assistance from humanitarian organizations	63.8%	55.4%
10	Sending some family members to seek help from rich (begging)	23.4%	21.7%

11	Reduce adult consumption of food to allow saved food for children	29.8%	41.0%
12	Prioritizing food for family members	11.7%	19.3%
13	Stopping children from education to work and making a living	60.6%	62.7%
14	Reducing health care budget	36.2%	61.4%
15	Sending family members to live with relatives	7.4%	8.4%
16	Stopping education of children for the purpose of getting a job and making a living	39.4%	33.7%
17	Marrying a young girls (under the age of 18)	21.3%	15.7%
18	Moving of the family to another place if the situation continues	8.5%	4.8%
19	The head of family searched for additional jobs to earn more money	58.5%	55.4%
20	Immigrating abroad	27.7%	19.3%

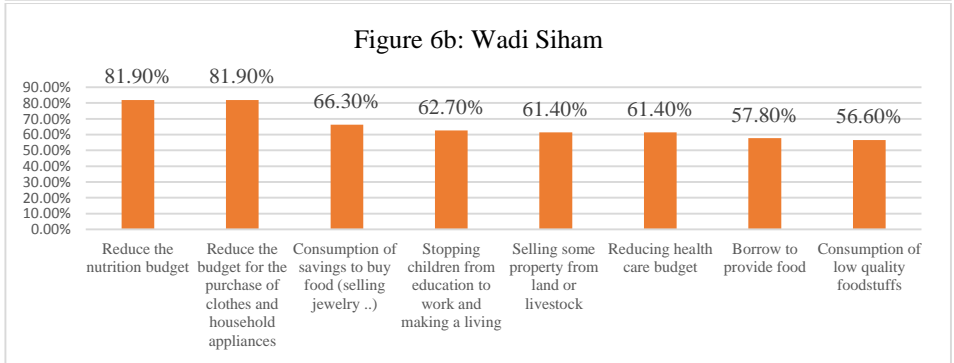
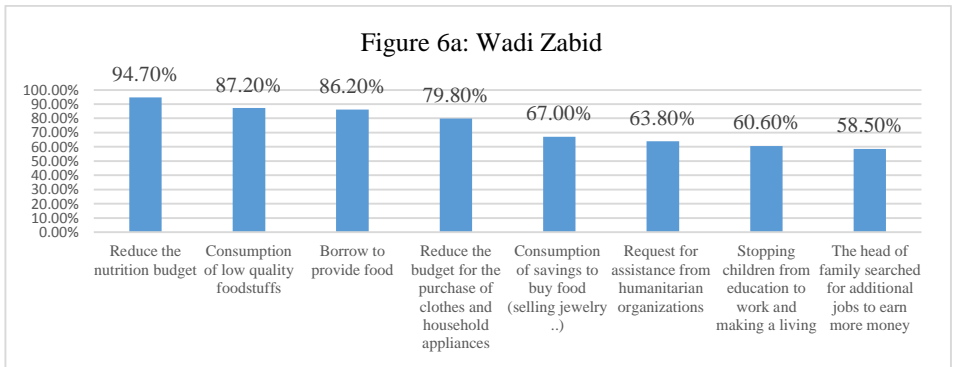


Figure 6a and 6b: The most adapted strategies to cope with the food insecurity situation in both Wadis

4.1. Aid and relief measures

In addition to the coping measures at the household level, several types of relief measures were provided to households at a community level. Those measures included the following (in a respective ordinal prioritization): the distribution of food baskets; provision of health care services; distribution of financial aids; and provision of agricultural production requirements (e.g. water and some agricultural and industrial inputs). It is important to note that the distribution of these aids was not uniform in all wadis' areas (Table 2.6).

The distribution of food baskets in the villages of Wadi Zabid and Wadi Siham was reported to have covered 74 - 77% of the households. The distribution of health relief, ranked third in priority, reached 64% and 86% of households in Wadi Zabid and Wadi Siham respectively. The financial assistance scale was recorded the largest (Figure 7) while covering most of the households, in Wadi Siham in particular. Assurances, such as agricultural and industrial production inputs, women handicraft supplies and training did not reach either of the wadis.

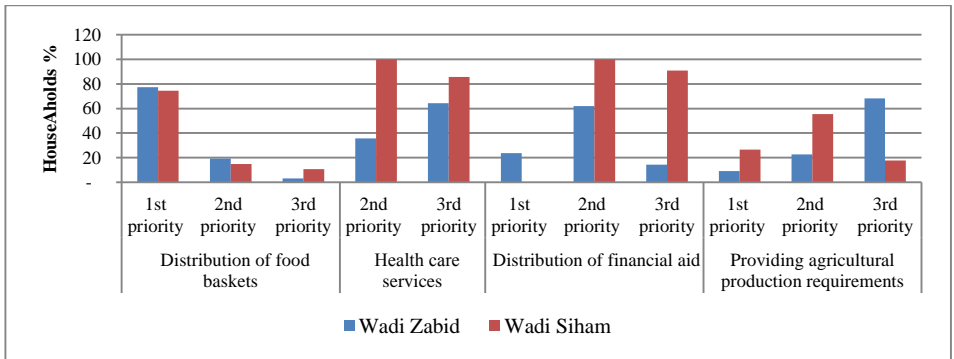
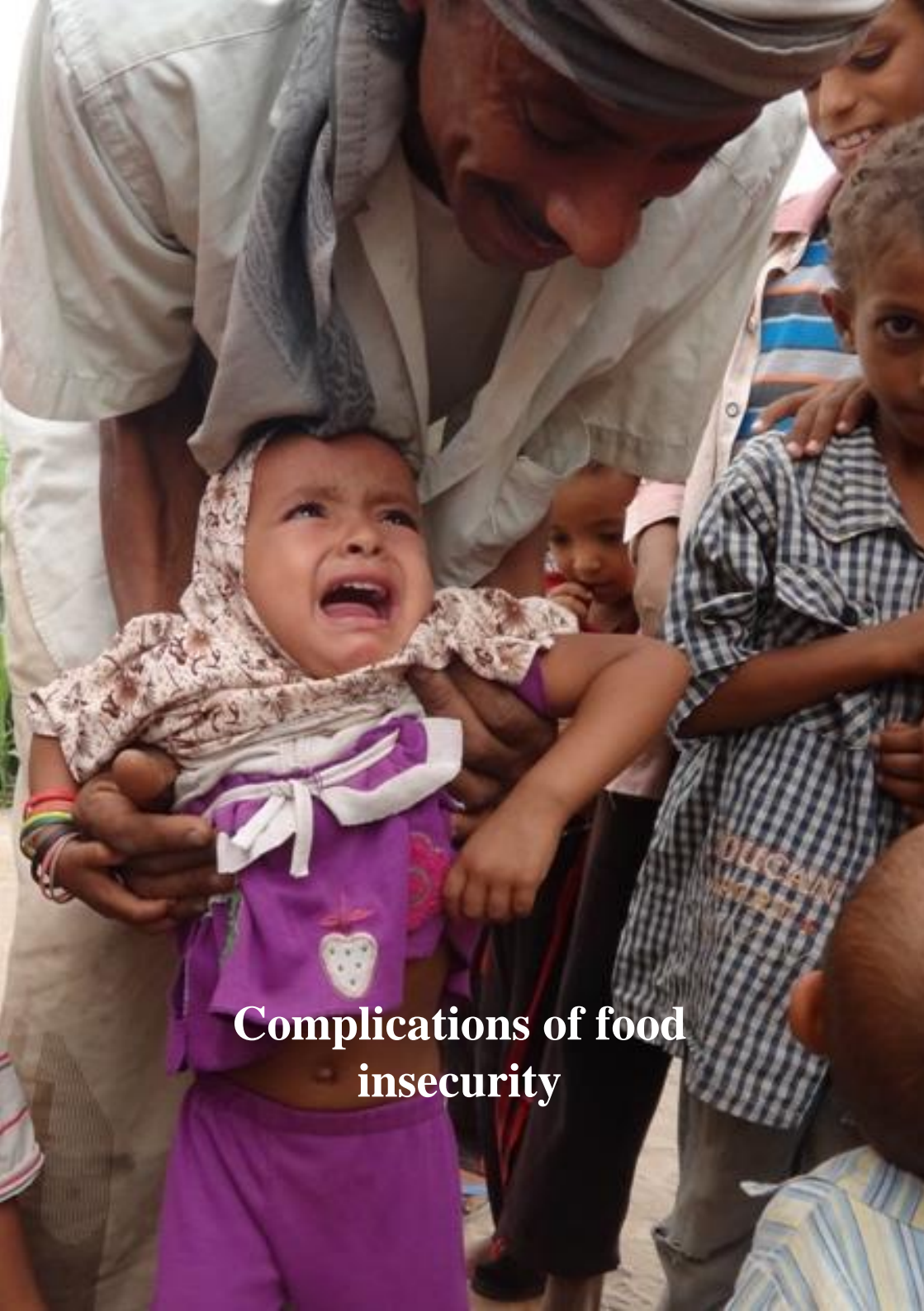


Figure 7: Significant types of relief measures provided to family and society in Wadi Zabid and Siham

Table 2.6: The three most prioritized relief measured in Wadi Zabid and Wadi Siham

Name of Wadi	First priority relief measure	Second priority relief measure	Third priority relief measure
Wadi Zabid	Distribution of food baskets	Financial aid	Provision of agriculture production input
Wadi Siham		Health care services	Financial aid



**Complications of food
insecurity**

5. Complications of food insecurity and inefficient coping strategies

5.1. Malnutrition among children

Issues of malnutrition, especially amongst children, and severe health problems go in line with the deteriorated livelihood situation and the increasing rates of food insecurity. The outcome of the field study revealed high rates of malnutrition among children (Table 2.7a). Measurements of height, weight and circumferences were obtained and analyzed. The analysis also considered the given household's food security status, as well as the strategy adopted, primarily the deduction of nutritious food. Established results of undernourishment for both wadis reported 14 to 60%, and 30 to 100% of children suffering from both acute and moderate high malnutrition respectively, regardless the age group. Consequently, the numbers represent 14% and 30% being the lowest rates, and 60% and 100% being the highest rates of acute and moderate high malnutrition respectively.

Acute malnutrition

There is an increase in acute malnutrition rates (circumference of the forearm is less than 12.5cm) among children in both wadis. The highest rate of acute malnutrition was recorded in both upstream and midstream areas of Wadi Siham among children of two- to four-year age group, with a percentage of 50% to 60%. Only 17% showed acute malnutrition in upstream and downstream areas of Wadi Zabid.

33-50% of children aged two years and less (3-26 months) in downstream villages of Wadi Zabid and Wadi Siham suffered from acute malnutrition, while 30 to 50% of children aged 4 years or less were affected during the war with high rates of acute malnutrition in villages of both wadis.

Examination of the severity of children malnutrition revealed that children aged 4-6 recorded the least affected by war, with a percentage of 14% to 20% being at risk of acute malnutrition, while the majority were not severely malnourished.

Moderate-high malnutrition

- The rates in this category are also in an increase among children. A circumference of the forearm between (11.5-12.5 cm) characterizes moderate-high malnutrition affected children (Table 2.7b). Percentages ranging from 30 to 100% of children (3-26 months) suffering from moderate-high malnutrition was recorded by the study in all villages of Wadi Zabid (out of the surveyed sample). In this age group, 30 to 38% of children in Wadi Siham's up and downstream villages were diagnosed to suffer from moderate-high

malnutrition. In addition, children from the same age group in the up, mid and downstream villages of Wadi Siham suffered from high malnutrition (20 to 25%). The study also revealed that 40% of children aged 2-4 years in Wadi Zabid's upstream and in Wadi Siham's midstream villages were affected by moderate-high malnutrition.

Table (2.7.a): Scale of malnutrition for children by measuring the circumference of the forearm in cm (Malnutrition: forearm < 12.5 cm; Subjected to malnutrition: 12.5cm < forearm < 13.5cm)

	Zabid		
	Upstream	Midstream	Downstream
Children with Malnutrition	34.4%	10.5%	50%
Children Subjected to malnutrition	20.7%	26.4%	8.3%
	Siham		
	Upstream	Midstream	Downstream
Children with Malnutrition	80%	83.3%	85.7%
Children Subjected to malnutrition	20%	8.3%	14.3%

Table (2.7.b) Scale of high malnutrition for children (Acute Malnutrition: forearm < 11.5 cm; Moderate High Malnutrition: forearm = 11.5 – 12.5 cm)

	Zabid		
	Upstream	Midstream	Downstream
Children with High Malnutrition	20%	0%	16.7%
Children with Moderate High Malnutrition	80%	100%	83.3%
	Siham		
	Upstream	Midstream	Downstream
Children with High Malnutrition	62.5%	40%	41.7%
Children with Moderate High Malnutrition	37.5%	60%	58.3%

5.2. Health problems (infectious and non-contagious diseases)

The spread of diseases and the deteriorating health care system amongst households have been identified as indirect impacts of the war. Many families were reported suffering from many infectious, non-communicable and malnutrition diseases (Table 2.8). The most common diseases in both wadis are: malaria, typhoid, cholera, diarrhea (gastrointestinal disease), and kidney and liver infections. The results of the survey also indicate a spread of non-infectious diseases in the villages of both wadis,

Table 2.8: The highest health problems in the wadis' villages

Wadis	Wadi Zabid			Wadi Siham		
	Upstream	Midstream	Downstream	Upstream	Midstream	Downstream
Type of diseases/ Area						
Infectious diseases	83%	17%	0%	17%	31%	52%
Non - communicable diseases	50%	19%	31%	29%	51%	20%
Malnutrition	45%	21%	34%	27%	42%	31%

Childhood/ motherhood and newborn problems:

Many health problems related to motherhood, newborn and child health care emerged in both wadis as a result of the war. The survey results indicated a high proportion of families with health issues (Table2.9), where 38 - 50% of households reported their children suffering from health problems; and 41 - 100% of households reported their females suffering from motherhood and newborn problems during the current war in both wadis.

Table (2.9) Child and motherhood, and newborn health problems in Wadi Zabid and Siham

Wadis	Wadi Zabid			Wadi Siham		
	Upstream	Midstream	Downstream	Upstream	Midstream	Downstream
Type of diseases/ Area						
Problems of motherhood and newborn	100%	0%	0%	47%	12%	41%
Child Health	42%	21%	38%	25%	25%	50%



**Chapter 3: Food Production,
Irrigation, Marketing, and
Agricultural Coping
Mechanisms**

Food Production, Irrigation, Marketing, and Agricultural Coping Mechanisms (Farmer perspective)

The survey considered the overall agricultural sector's components: crop production, livestock, fishing, and household access to agricultural land. Food production, availability, accessibility, and security are interrelated components in an integrative process of food stability or vice versa. National food availability is achieved when sufficient quantities of food are consistently available for all individuals in a given country. The major determinants of the availability of food are national food production, imports into Yemen, and stocks availability. The survey provides a number of striking observations with regard to food production and availability in the study areas that will be further discussed throughout this chapter. There is a high importance of understanding the socio-economic situation of the area to further discuss food production, irrigation and marketing. The study assessed the situation while studying the income of households involved in the agricultural sectors, damages to the sector and damages to other utilities. Access is defined as “the status of the household in owning, renting or sharing agricultural land”. Therefore, the descriptive statistics may refer to households accessing agricultural land in line with this definition. Households are defined as farming households. ‘Farmers’ refers to households with access to agricultural land, while either growing crops or raising livestock on that land. The assessment of cropping systems was for 2017 for those households who had access to agricultural land (owned, rented or shared), and conducted agricultural activities, along with those who grew fruit from trees.

In this chapter, the analysis is based on the food security framework developed by the current study, and includes households' food security main determinants, constraints and threats. The chapter focuses on looking at the food insecurity situation in both Wadi Zabid and Wadi Siham from the farmer perspective. The focus here is on exploring the current socioeconomic situation of the farmers; measuring the food productivity; recording irrigation and marketing constraints; and recording agricultural coping mechanisms and adaptation suggestions by farmers.

1. The socio-economic situation

The agricultural sector constitutes an important identifying the socioeconomic status of a given society. The current turmoils encountered by the sector in Yemen is constraining its capabilities and limiting its beneficiaries. A summary of the impact of the current war on the agricultural sector includes: poor institutional performance and low operating and investment budgets; suspension of all types of supports provided to farmers; declination of agricultural product exports and imports; and reduction in the availability of water for agricultural uses due to the huge damage in water structures and facilities, restriction of water tankers movement and high prices of diesel required to pump groundwater for agricultural irrigation.

The destruction and damage of cold storages and the means of transportation, in addition to the shortage of diesel and the blockage of roads have made exportation almost impossible. Imports on the other hand are limitedly in the market, and the hindrance posed to making them available has caused their prices to sporadically increase.

1.1. Household monthly income

Households working in livestock production were disclosed to commonly have the highest monthly rate of income in both wadis during the pre-war period. This is still the case in both wadis' mid and downstream areas. In general, Wadi Zabid recorded a monthly family income of 148 USD as the highest in the wadi during the war period. Comparing the results of the two wadis, Wadi Zabid reported with the current lowest household monthly income, not exceeding 59.42 USD. Wadi Siham, on the other hand, was disclosed to have the highest monthly income, 59.42 USD (family size is between 8-12 members).

The following is a number of drawn observations and evaluations concerning the alterations in the average monthly income in the two wadis during the war, where (Figure 8a) and (Figure 8b) reveal the average monthly reduction in income in USD when compared to the pre-war period, and the average shortage percentage in income.

Wadi Zabid:

- A 41% to 80% decline in monthly household income was observed, with some households who have almost lost their income completely.
- The highest drop in income was observed in the downstream area of the wadi for some animal breeders.

- There is a 47 to 73% reduction in the monthly household income in all wadi's areas for families depending on remittances coming from family members.

Wadi Siham:

- There is a 47.5 to 66% decline in the monthly household income in all wadi's areas.
- The highest drop in income was observed in the downstream area of the wadi for some animal breeders and crop cultivators, as well as the other work.
- There is a 61% reduction in the monthly household income (other work) in the downstream area. There was no change observed in income from other works including remittances in the upstream and midstream parts.

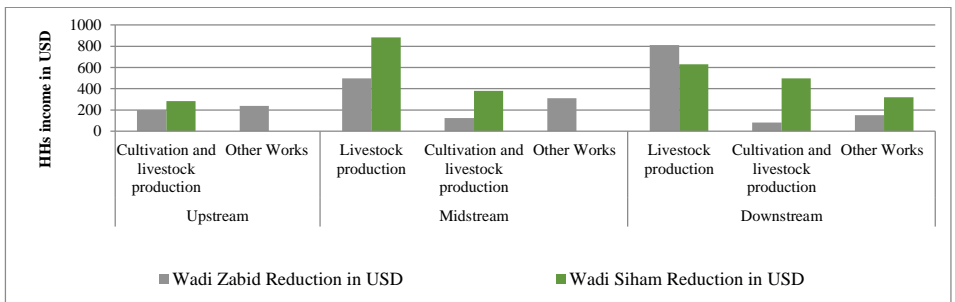


Figure 8a: The reduction in monthly average of the household income (USD) in Wadi Zabid and Wadi Siham

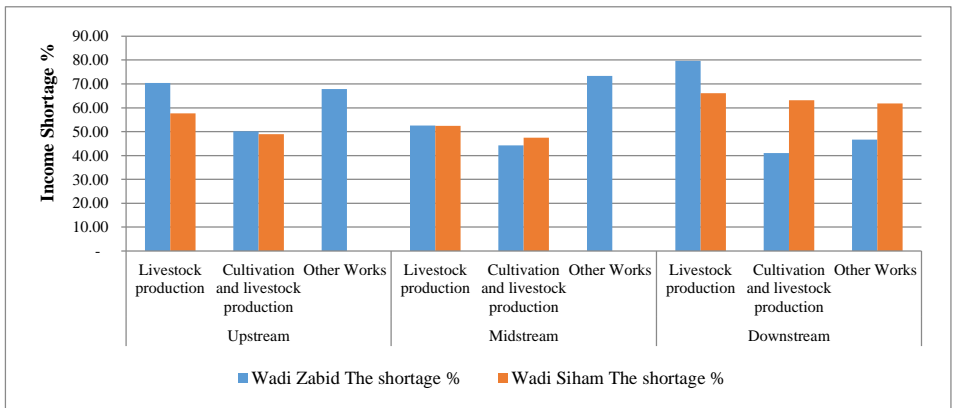


Figure 8b: Monthly average percentage of the household income shortage during the war in Wadi Zabid and Wadi Siham

1.2. Agricultural land Accessibility

Evaluating the socioeconomic situation in the two wadis, one must point to the farmers' accessibility to agricultural lands. Access to agricultural land can be categorized into three main classes: owing, renting and sharing. Table (3.1) shows this classification in both wadis under this study in both pre- and during-war periods.

Generally, for owners and land holders in both wadis there is hardly any change in the percentage of their access to agricultural lands. The rented lands, however, have been affected and their percentage decreased in both wadis due to the war. The sharing rent class shows no change in Wadi Zabid during the war; however, almost all sharing rent lands in Wadi Siham were abandoned. Reduction of access to agricultural lands was assessed to mainly be due to the unaffordability of paying the rent of land due to economic impairments.

Table (3.1) Percentages of land holding's areas (ha) in both Wadis (Zabid and Siham) before and during war

Name Wadi		Wadi Zabid			Wadi Siham			
Area		Upstream	Midstream	Downstream	Upstream	Midstream	Downstream	
Before War	Owner holder	< 2 hectare	71.4%	14.3%	14.3%	36.4%	63.6	
		2 -4 hectare	50.0%	50.0%		55.6	44.4%	40.0%
		4- 8 hectare	14.3%	-	85.7%	38.9%	27.8%	7.7%
During War	Owner holder	< 2 hectare	66.7%	16.7%	16.7%	50.0%	25.0%	
		2 -4 hectare	50.0%	-	50.0%	27.3%	45.5%	27.3%
		4- 8 hectare	14.3%	-	85.7%	70.0%	30.0%	-
Before War	Rent	< 2 hectare	-	-	-	100%	60.00	-
		2 -4 hectare	100.0%	-	-	-	69.20	0.40
		4- 8 hectare	-	-	100.0%	23%	-	0.08
During War	Rent	< 2 hectare	66.7%	16.7%	-	100	-	0.50
		2 -4 hectare	50		50.0%	45%	-	0.33
		4- 8 hectare	14.3%		35.7%	50%	-	0.67
Before War	Sharing rent	< 2 hectare	50.0%	50.0%	0.0%	60.0%	20.0%	20.0%
		2 -4 hectare	14.3%	57.1%	28.6%	60.0%	20.0%	20.0%
		4- 8 hectare	41.7%	16.7%	41.7%	0.0%	100.0%	0.0%
During War	Sharing rent	< 2 hectare	50.0%	50.0%	0.0%	0.0%	0.0%	0.0%
		2 -4 hectare	13.2	50.0%	50.0%	0.0%	0.0%	0.0%
		4- 8 hectare	42.9%	21.4%	35.7%	0.0%	0.0%	0.0%

2. An outlook of the agricultural sector's damages

A number of damages were identified in the two wadis. It was clear that most of the agricultural damages were observed in the upstream areas and downstream areas of Wadi Zabid and Wadi Siham respectfully. The observation by the study has categorized those damages into four main groups: 1) direct damages to water infrastructure; 2) Collapse of agricultural service support; 3) constrained marketing; and 4) other

community services and utilities damages. Recorded damages are given in Table (3.2), and the following are the drawn results of the four categories therein:

2.1. Water infrastructure damages

The most notable agricultural damages for most households was the destruction of water structures as a direct impact of the war. Damages in water infrastructure included damages on water networks, diversion dams and irrigation systems..., etc. That has led to water shortage and unavailability for irrigation, and thus to a decline in the agricultural area and crop productivity. The shortage in water for irrigation was significantly observed in downstream villages of both Wadis, by a range of about 60% of households.

Wadi Siham's mid and downstream villages were the most affected due to the direct destruction of irrigation systems (*Chapter 3: 4.2*), roads and bridges by airstrikes. Whereas, upstream and downstream villages were the most affected in Wadi Zabid, where 43% and 60% of households suffered from agricultural damages respectively. Those damages have created a massive impact on the upstream area which rely on floodwater irrigation, and led to water scarcity in downstream areas due to the destruction of irrigation water structures (dams - wells - reservoirs). The damaged irrigation systems and diversion dams affected 26-74% of households in both wadis. The damages were resulted by the lack of maintenance of water barriers and canals (removal of sediments and trees). In Wadi Siham, 50% of households suffered from agricultural damages in upstream areas due to inefficient performance of water diversion structures resulting from the lack of maintenance,

2.2. Collapse of agricultural service support

Damages under this category include: interruption of government subsidies (diesel, agricultural inputs, pesticides, and agricultural extensions) used to be allocated to support farmers; high prices of agricultural inputs as well as fuel and diesel; and constraints of marketing and promoting the agricultural products. These damages have led to a decrease in agricultural area, crop and livestock productivity, and thus to a severed food insecurity phenomenon.

The survey responses assembled and analyzed from the two wadis, which were used in the initial evaluation and assessment revealed that 45% of Wadi Zabid's households suffered from agricultural damages of suspending the support for farmer (financial -

extension). They also suffered from 43% and 40% reduction in agricultural yields, due to the increase in fuel prices and costs of agricultural inputs/investments respectively.

In Wadi Siham on the other hand, 68% of households suffered from agricultural damages in midstream areas due to suspending the support for farmer (financial - extension), and 46% due to reducing the agricultural yields due to the increase in fuel prices.

2.3. Constrained marketing

Airstrikes destroyed commercial and marketing sites in both Wadi Zabid and Wadi Siham. Results indicate that 43% of households in Wadi Zabid suffered from agricultural damages due to the difficulty of marketing their agricultural and craft products, and 40% due to the deterioration in livestock production. Whereas in Wadi Siham, 40% suffered from agricultural damages due to the difficulty of marketing their agricultural and hand craft products (*Chapter 3: 5*).

2.4. Other community service and utility damages

Most community services and other service facilities were exposed to either direct (airstrike) or indirect (operational, no fuel, lack of staff..., etc.) damages by the current war. In addition to the water infrastructure damages, the most affected public facilities and services were roads, bridges, communication and internet, and electricity in both wadis. The number of affected beneficiaries within the villages commonly related to the extent of damage on the structures and/or to the continuation of their operation. The following observations summarize the most important findings:

- 46-69% and 22-44% of households have been affected in Wadi Siham and Wadi Zabid respectively by the damages on community facilities and utilities. Wadi Siham's mid and downstream villages were the most affected due to the direct destruction of roads and bridges by airstrikes. Whereas, upstream and downstream villages are the most affected in Wadi Zabid.
- 60% of households in Wadi Siham's downstream areas were affected by the damage on communication and internet services due to lack of electricity. Airstrikes also destroyed some schools, health facilities, as well as transportation and commercial sites in both wadis.

Table 3.2: The war impacts on agriculture and farmers in Wadi Zabid and Wadi Siham (percentage of agricultural damages in Wadi Zabid and Wadi Siham)

	War Impacts (Agricultural Damages)	Wadi Zabid	Wadi Siham
1	Water scarcity caused by destruction of water structures (dams, wells, reservoirs)	5.3%	34.9%
2	Inefficient performance of water installations due to lack of maintenance	31.9%	36.1%
3	Reducing the agricultural yields as a result of increasing the fuel prices for irrigation water pumps	50%	57.8%
4	Stop support the farmers (financial-extension)	38%	37.3%
5	Increased prices of agricultural inputs due to the economic blockade	40.4%	68.7%
6	Difficult marketing for agricultural and craft products	22.3%	30.1%
7	Deterioration in livestock production	47.9%	74.7%

3. Food production

3.1. Family self-sufficiency and agricultural production

The self-sufficiency of the food produced by the households on a weekly basis indicated a significant decrease in food production during the war compared to the pre-war period as shown in (Figure 9a) and (Figure 9b). The assessment of food production by households for the two wadis introduced the following findings:

Wadi Zabid:

- A 28-37% decline in fruit and vegetable production in downstream areas compared to pre-war period. In the same area, a decline of 44% and 40% in the production of cereals and flours, and animal products respectively.
- The causes of the production decline in downstream areas were not identified due to restriction from entering the most affected locations (Al-Tuhyta and nearby villages), being military locations.
- In general, it was observed that there is a simple correlation between the increase in the number of family members and the increase in food production (a positive relationship). For instance, for downstream households with higher average number of members (8-12 members per family), higher rates of production were noticed compared to mid and upstream households that had smaller family size.

Wadi Siham:

- A reduction of 100% in vegetable production, i.e. production of vegetables in upstream and downstream areas was completely stopped due to the current war. Lower rates of fruit production were also recorded with a 37% reduction in the

upstream area compared to the pre-war period. Similarly, animal production reduction was evaluated at about 8%.

- The highest cereal production reduction/ shortage reached 44.54% in midstream areas of Wadi Zabid, recording the highest shortage in both wadis.

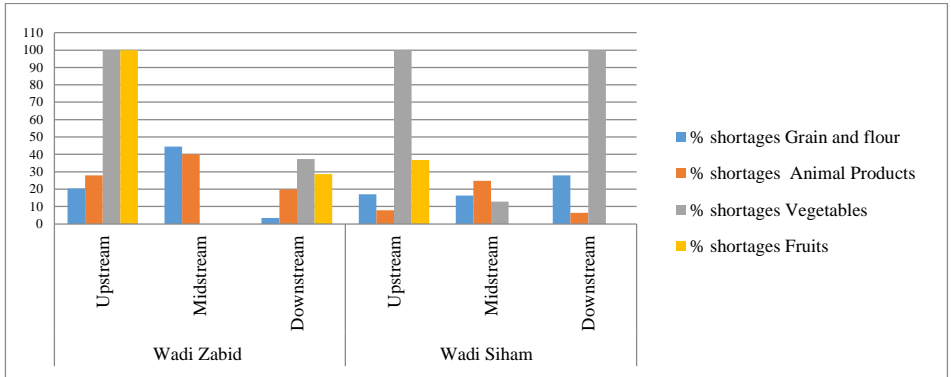


Figure 9a: Percentage of family food production shortage during the war in Wadi Zabid and Siham

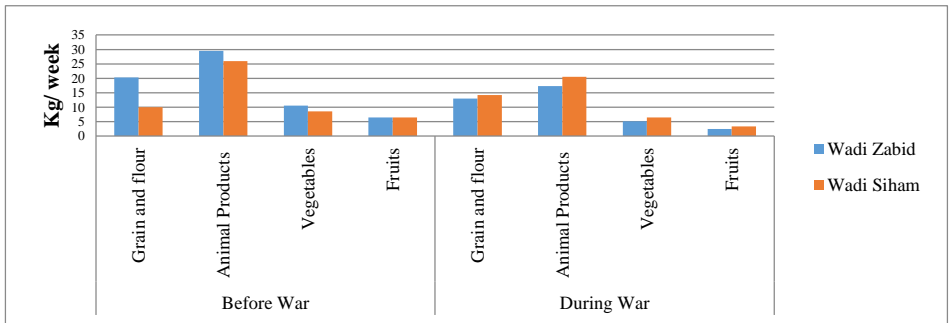


Figure 9b: Average of food produced by households before and during the war in Wadi Zabid and Siham (kg/week) for (8-12 members/family)

3.2. Types of agricultural production and crops grown

The study revealed that the war was a key driver to the production reduction of different crops by households in both wadis, including the production of fruits, vegetables and fodders. This effect was observed most strongly on the cultivation of cereals, legumes/beans, vegetables, fruits, fodders and tobacco, in addition to others crops such as sesame, cotton..., etc.

The cultivation of vegetables was assessed to be significantly affected, especially in mid and upstream areas of the wadis. This impact was due to the scarcity of water for irrigation, which was due to the destruction or lack of maintenance of water facilities, and the high fuel prices (Figure 10a) (Figure 10b).

In both wadis, almost half of households (50%) were engaged in mixed agricultural activities (subsistence agriculture, in addition to the sale of surplus products). No change was recorded for this type of production. 23% of upstream families and 69% in the downstream part are engaged in mixed agricultural activities. Cereals, fruits, vegetables, and fodder crops evaluation revealed they were not dominant crops in the midstream areas.

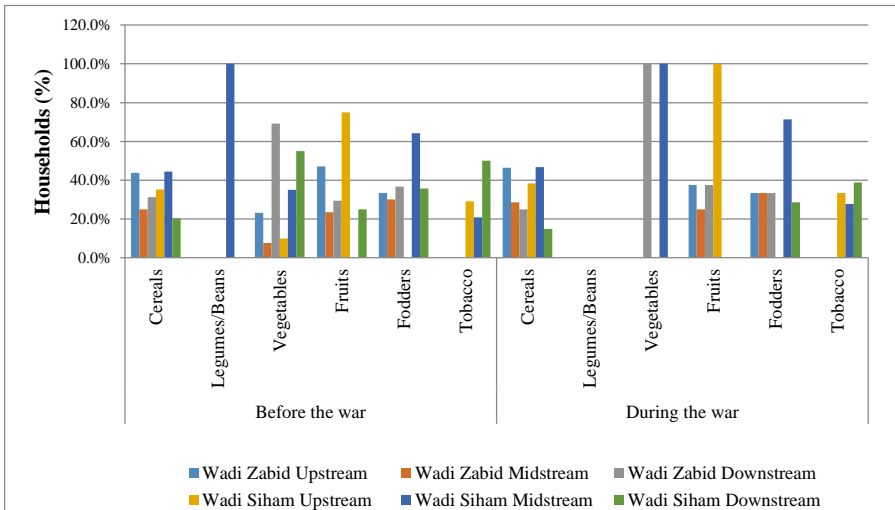


Figure 10a: Types of crops grown by the family before and during the war in Wadi Zabid and wadi Siham

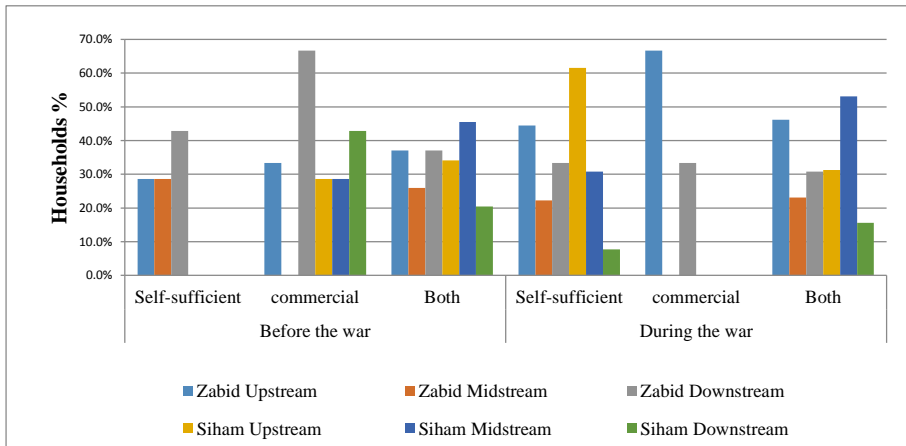


Figure 10b: Agricultural production pattern before and during the war in Wadi Zabid and wadi Siham

3.3. Crop area and agricultural productivity

Cultivated areas have gone down dramatically as a result of the war. The average total area reduction in Wadi Zabid is 395ha (from 792.5 ha before war to 397.4 ha during war), while the average total area reduction in Wadi Siham is 557 ha (from 986.6 ha before war to 428.9 ha during war). The average cultivated area reduction for both wadis is 476.4 ha. The reduction in crop areas in Wadi Zabid was most severe in cereals with a 108 ha reduction followed by vegetables and fodders with a reduction of 95 ha for both corps. In Wadi Siham, however, the reduction of crop area was far more severe in vegetables with a 216 ha reduction followed by cereals with a reduction of 111.6 ha. For other crops, such as sesame, cotton, and tobacco, there is a reduction of 96 ha (Figures (2.6a), and (2.6b)).

The reduction in cultivated area included all crops, with some serious crop cultivation collapse. In addition, the yield per hectare shows reduction in both wadis, where the decline was most obvious in fruit production with about 6.6 ton/ha. A severe decline was also observed in vegetable area in Wadi Siham with 216 ha (Table 3.3). The combined effect of the reduction areas under cultivation, concluded that the lower yield per ha was a reduction of 42% and 46% in Wadi Zabid and Wadi Siham respectively.

It can be briefly summarized in average percentages that the main agricultural production in the Tihama region witnessed a crop area reduction, where in Wadi Zabid

(Table 3.3) there was 59% less yield of crops like sesame, cotton and tobacco. Whereas, a 53 % less yield of vegetables, and 44% less yield of fruits were also recorded in the same area. In Wadi Siham, there was 77% less yield of crops such as sesame, cotton and tobacco, 16% less yield of fruits, and 14% less yield of vegetables.

Table (3.3): Percentages of shortages in crop area (ha) and in productivity and yield (ton/ha) compared to the pre-war period in Wadi Zabid and Wadi Siham

Name wadi	Region	Cereals		Vegetables		Fruits		Fodder		Other		Average	
		Area	Yield	Area	Yield	Area	Yield	Area	Yield	Area	Yield	Area	Yield
Wadi Zabid	Upstream	27.51	10.43	-	-	27.52	23.33	25.22	4.72	54.55	81.97	28.20	25.19
	Midstream	46.29	23.81	-	-	18.81	10.00	46.29	-	51.52	47.37	45.74	31.74
	Downstream	65.97	60.00	64.71	53.15	11.19	100.00	59.39	39.16	66.84	48.45	43.71	68.76
	Mean	46.59	31.41	64.71	53.15	19.17	44.44	43.63	21.94	57.63	59.26	39.21	41.90
Wadi Siham	Upstream	27.72	3.35	80.00	11.11	20.50	16.43	8.44	6.67	13.51	-	20.91	17.47
	Midstream	31.81	13.46	57.30	19.27	46.09	16.13	31.61	17.72	-	-	28.50	58.22
	Downstream	53.06	14.77	64.72	10.51	69.49		65.71	16.96	97.02	76.98	71.59	61.69
	Mean	37.53	10.53	67.34	13.63	45.36	16.28	35.25	13.78	55.27	76.98	40.33	45.80



Irrigation

4. Irrigation

The war in Yemen has resulted in a shortage in water for irrigation compiled with a lack of production inputs (e.g. fertilizers, pesticides and improved varieties). The study had evaluated irrigation in the two wadis by studying two main aspects, the current sources of irrigation water and the systems used to cultivate lands. The recorded findings are as follows:

4.1. Irrigation water

The use of groundwater for irrigation has decreased, and farmers rely more largely on the use of floodwater (spate irrigation). However, in the tail areas, spate irrigation has become less reliable, and farmers mostly depend on the well systems. In many cases, however, farmers have simply reduced the area they cultivated (Table 3.3).

Wadi Zabid:

The study revealed that there was an increase of 15% of households using floodwater during the war in the upstream areas, compared to 48% before the war. This increase showed to be due to the increase in pumping costs following the rise in diesel prices. It was at the expense of the downstream households, resulting in a reduction of 17% of spate water because of the unequal distribution of spate water. Whereas, upstream areas witnessed a 15% increase in rain-fed areas due to the lack of maintenance for irrigation systems and thus less available irrigation water, while 26% of upstream households depended on spate irrigation and 14% depended on rain fed irrigation during the pre-war period.

Wadi Siham:

Pre-war assessment disclosed a percentage of 64% of households in upstream areas who relied on spate irrigation systems, while the middle and downstream households were more dependent on groundwater. In addition, 40% and 48% of households in upstream and midstream areas respectively used rain-fed agriculture. The study revealed a 36% during-war increase of households using spate irrigation system, mainly due to the increase of diesel prices. This has affected other areas in the wadi (lower areas), as farmers were forced to decrease their cultivated areas.

4.2. Irrigation systems

The agricultural irrigated lands in both wadis were significantly affected by the war. The total pre-war cultivated areas of 3896 ha in Wadi Zabid was reduced to 1908ha, with reduction of about 51%. In Wadi Siham, the total cultivated area was 4688ha and was reduced to 2222 ha with about 52% reduction. The following area-specific results are provided therein:

Wadi Zabid

The pre-war evaluation in Wadi Zabid (Figure 11) revealed that 40% of upstream households used spate and well irrigation systems, and 43% used rainfall irrigation. Regardless the primary irrigation system used, households employed supplementary irrigation for all irrigated areas. In midstream areas, 32% of households used spate irrigation and 43% used rain-fed agriculture. Downstream households used well water for over 60% of irrigated crops.

During the war (Figure 11), however, the study showed that 63% of upstream households used spate irrigation, and 30% used well irrigation along with complementary irrigation for all irrigated crop areas. In midstream areas, 32% of households used spate irrigation, and 54% used rain-fed agriculture, while well irrigation covered 70% of irrigated crops in downstream areas.

Wadi Siham

The pre-war assessment disclosed that 64% of upstream households used wells for irrigation. In midstream areas, 53% used groundwater as a source for irrigation and 48% used rain-fed agriculture. Finally, well water was used for over 30% of irrigated crops in downstream areas.

The assessment also studied the during-war irrigation systems used to cultivate crop areas. Results revealed that 100% of upstream households used wells for irrigation along with complementary irrigation for all irrigated areas. Well water was used for irrigation for about 54% of irrigated crops in midstream areas, while in downstream areas, well water was used for over 42% of irrigated crops. Pre- and during-war assessment of the surveyed households in Wadi Siham is depicted in (Figure 11) and (Table 3.4).

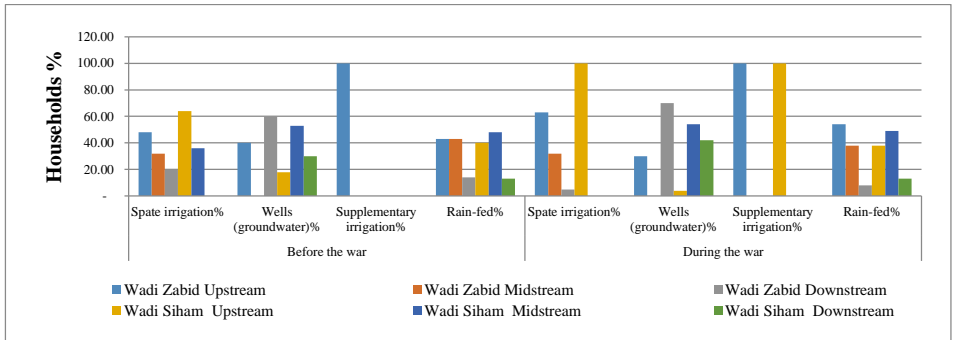


Figure 11: Water resources for the irrigation before and during the war in Wadi Zabid and Wadi Siham

Table (3.4) Types of irrigation systems used in village during the war in Wadi Zabid and Wadi Siham

Crop	Wadi	Wadi Zabid			Wadi Siham		
	Type of irrigation / region	Upstream	Midstream	Downstream	Upstream	Midstream	Downstream
Vegetables	Spate or wells irrigation			100.0%			
	Complementary irrigation			13.6%	4.5%	22.7%	59.1%
Cereals	rain-fed				44.4%	51.9%	3.7%
	Spate or wells irrigation			38.1%		19.0%	42.9%
	Complementary irrigation	57.7%	23.1%	19.2%			
	rain-fed				34.4%	56.3%	9.4%
Fodder	Spate or wells irrigation			100.0%			
	Complementary irrigation	19.6%	13.0%	10.9%	8.7%	34.8%	13.0%
Sesame	Spate or wells irrigation			42.9%			57.1%
	Complementary irrigation	33.3%	33.3%	33.3%			
Cotton	Spate or wells irrigation			43.8%			56.3%
	Complementary irrigation	25.0%		75.0%			
Fruits	rain-fed			100.0%			
	Spate or wells irrigation			50.0%	50.0%		
	Complementary			15.4%	84.6%		
Banana	Complementary irrigation	100.0%					
	Spate or wells irrigation					91.7%	8.3%
Mango	Complementary irrigation	55.6%	44.4%				
	rain-fed					91.7%	8.3%
Qat	Complementary irrigation					91.7%	8.3%

5. Marketing

Obstacles farmers encounter when marketing their products (lack of access):

The war has not only affected the agricultural production, it also affected the marketing of those products. The study identified several obstacles and risks the households and farmers encountered while marketing their agricultural products. Airstrikes, including the direct targeting of transportation means and on ground clashes were on top of the list. 100% and 59% of households in Wadi Zabid's upstream and Wadi Siham's downstream area respectively mentioned that airstrikes were the most significant constraint that obstructed them from marketing their products.

Apart from the direct war impacts, there were other restrictions that hindered families and farmers from marketing their products during the war. 46% of households complained about the high cost of transportation and poor purchasing power of consumers. This has forced many families to sell their products locally only at cheaper prices (Figure 12a) and (Figure 12b).

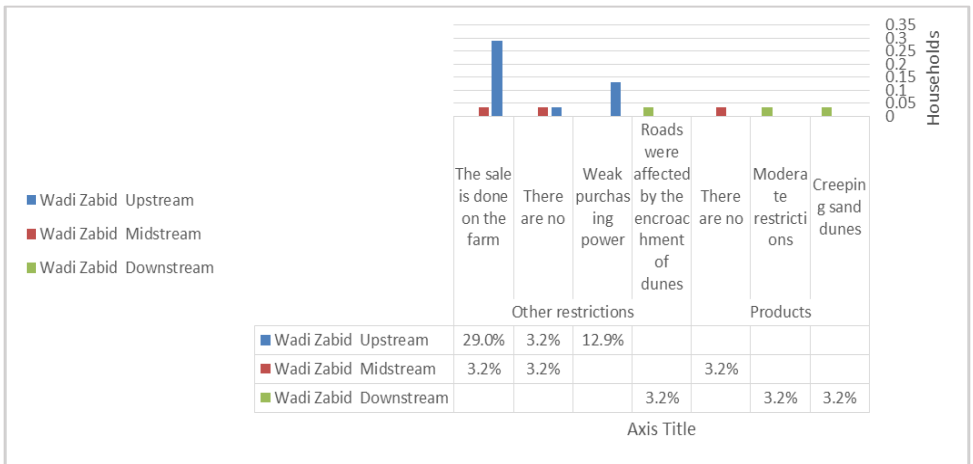


Figure 12a: Constraints that limit farmers from marketing their products (Wadi Zabid)

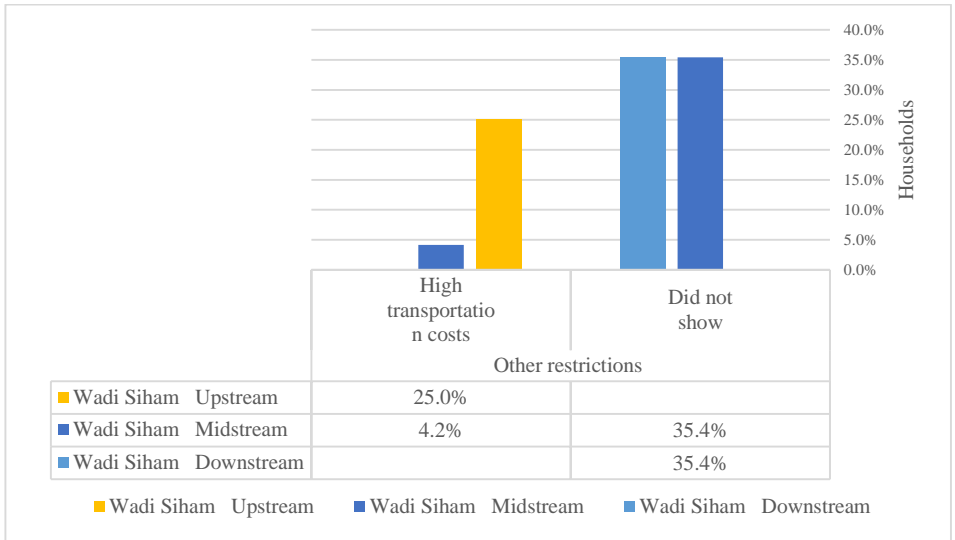


Figure 12b: Constraints that limit farmers from marketing their products (Wadi Siham)

6. Agricultural coping mechanisms and adaptation strategies

6.1. Actions to tackle water shortage

The war has created two types of water shortages. The first is due to the lack of maintenance for the spate irrigation infrastructure, leading to a reduction in the availability of floodwater for beneficial use. The second type was influenced by the significant increase in fuel prices – forcing farmers to pump less groundwater. Groundwater-based cultivation of mangos, bananas and tobacco in the upstream areas suffered from a reduction of pumping hours. In some cases, mangos were abandoned all together, and standing trees were left to dry out. Similarly, fodder and vegetable production were abandoned in the lower areas with a reduction in areas under staple crops.

For farmers to adapt with the alterations and water shortages resulted by the war, the assessment disclosed three main strategies applied in both wadis (Table 3.5); those are reducing irrigation hours; reducing the crop area; and excluding some crops. The strategies recorded in both wadis are summarized as follows:

Wadi Zabid:

- Minimizing irrigation hours and crop areas (44 to 100% for all crops) in all wadi's areas, while crop exclusion was only recorded in the downstream areas.
- Renting the farm recorded a percentage of 100% in upstream areas, while farms' cultivation suspension in upstream and downstream areas was 46% and 40% respectively.
- In downstream areas, several methods were adopted to deal with the lack of water supply. The majority of households adopted multiple strategies, such as reducing irrigation hours, reducing cultivated areas and eliminating the plantation of some crops if necessary. Most households abandoned cereals and fodders crops.
- In upstream areas, farmers adopted a reduction in irrigation hours for banana.

Wadi Siham:

- Minimizing irrigation hours (50% and 80% for cereals and vegetable respectively) was recorded in wadi's midstream areas, and (50%, 67%, and 100% for cereals, fodders and fruits respectively) in upstream areas. Excluding crops was only recorded in the downstream areas, where households abandoned cereals, sesame and cotton cultivation.
- Animal Husbandry and poultry strategies were recorded in upstream areas (100%), and in midstream areas (40%).
- Renting the farm strategy constituted 79% in downstream areas, while suspending the farm cultivation in mid and downstream areas recorded percentages of 44% and 56% respectively. Shifting to rain-fed agriculture strategy in upstream and midstream parts represented 40% and 56% respectively.
- In upper and middle areas, most farmers reduced irrigation hours for banana, mango and tobacco crops.
- On extreme circumstances, shortage of water led some farmer to not only rent their farms but also sell it, or abandon agriculture all together.

Table (3.4) Actions and strategies by farmers and households to cope with the shortage of water supplies during the war.

Strategy	Wadi	Wadi Zabid			Wadi Siham		
		Upstream	Midstream	Downstream	Upstream	Midstream	Downstream
Reducing irrigation hours	Vegetables			100.0%		80.0%	20.0%
	Cereals		19.4%	32.3%	50.0%	50.0%	
	Fodders		27.3%	31.8%	66.7%	33.3%	
	Sesame	25.0%	25.0%	50.0%			
	Cotton	12.5%		87.5%			
	Mango Banana	55.6% 100.0%	44.4%		100.0% 100.0%		
Reducing crop area	Vegetables			100.0%	5.3%	26.3%	68.4%
	Cereals	48.4%	19.4%	32.3%	28.2%	46.2%	25.6%
	Fodders	40.9%	27.3%	31.8%	16.3%	44.2%	39.5%
	Sesame			25.0%	50.0%	100.0%	100.0%
	Cotton	12.5%		87.5%			100.0%
	Tobacco					91.7%	8.3%
	Mango Banana	55.6% 100.0%	44.4%		100.0% 100.0%		
Excluding the crop	Vegetables			100.0%	14.3%		85.7%
	Cereals			100.0%			100.0%
	Fodders			100.0%			
	Sesame	16.7%		83.3%			100.0%
	Cotton	20.0%		80.0%			100.0%
	Mango Banana	100.0% 100.0%			100.0% 100.0%		
Animals breeding	Animal Husbandry				23.40%	40.40%	36.20%
Poultry and birds	Poultry Husbandry				100.00%		
Other actions	Farm Rental	100.00%				22.20%	77.80%
	Sale of farm				12.50%	37.50%	50.00%
	Rain-fed agriculture				40.00%	56.70%	3.30%
	The farm stopped	45.50%	13.60%	40.90%		44.00%	56.00%

6.2. Reducing the monthly expenditure as an adaptation strategy

Households had to reduce their monthly expenditure in order to cope with the alterations and challenges the war has caused, (Figure 13) and (Table 3.6). The assessment disclosed that 32 to 47% of household's expenditure reduction in Wadi Zabid, and 54% to 69% in Wadi Siham.

Livestock-dependent households recorded the highest level of expenditures in both wadis for the pre-war assessment. During the war, a significant drop in families' expenditure was observed, depending on both cultivation and livestock production as an income source. The study recorded both before- and during-war monthly expenses. Thus, the assessment revealed the reduction and drop in households' monthly expenditure had to be implemented as an adaptation strategy to the lack of funds, reduction of agricultural production and increasing food insecurity rates. Table (3.6) and Figure 13 show the monthly expenditure reduction amount in USD, as well as the shortage percentage recorded when comparing both pre and during-war households' monthly spending and expenses.

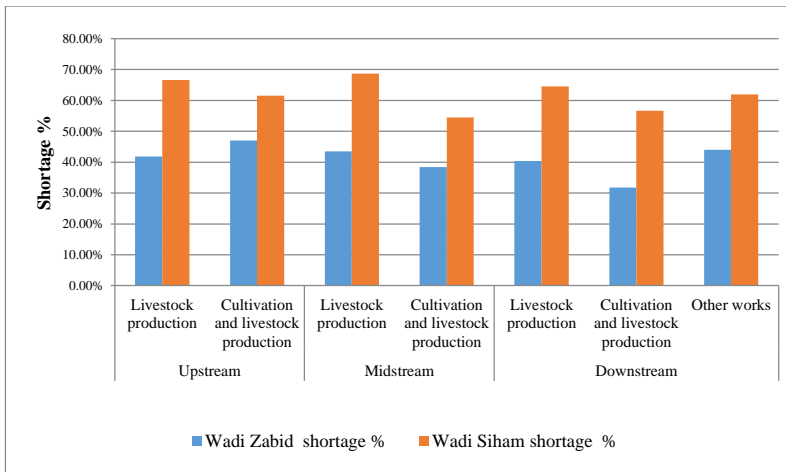


Figure 13: Percentage of the shortage in the monthly average of the household expenses during the war compared to the pre-war period in Wadi Zabid and wadi Siham

Table (3.6) Monthly average of the household expenses before and during the war in Wadi Zabid and Wadi Siham in (USD)

The area	Type of Work	Wadi Zabid		Wadi Siham	
		Reduction USD	shortage %	Reduction USD	shortage %
Upstream	Livestock production	336.34	41.80%	225.45	67%
	Cultivation and livestock production	253.79	46.96%	194.94	62%
Midstream	Livestock production	315.26	43.52%	585.73	69%
	Cultivation and livestock production	76.65	38.45%	215.86	54%
Downstream	Livestock production	269.58	40.35%	358.97	65%
	Cultivation and livestock production	88.54	31.76%	257.45	57%
	Other Works	55.99	44%	120.01	62%

6.3. Restoring agricultural production (farmer's proposed recovery strategies and solutions)

The conducted interviews by the study included questions for households and farmers on their proposed solutions and interventions required for restoring the war-affected agricultural production to a prior-war situation. The interviews also included questions on how to increase the income of families and farmers. Recorded proposals are summarized in (Figure 14), and the following are the most highlighted proposals for agricultural production recovery:

- The most significant strategy/ solution suggested by households was the expansion of supplementary irrigation systems in Wadi Zabid's upstream areas (71%), and 50% and 40% in Wadi Siham's mid and downstream areas respectively. Where on the other hand, 50-70% of families in both wadis identified the most important solutions to be: maintenance of irrigation systems, and expansion of complementary irrigation systems by providing solar energy systems.
- The agricultural rural systems were complementary in the villages of up and middle stream areas of the two wadis.
- 43% of downstream households' interest in both wadis lied in the strategy of expanding modern irrigation systems.
- 54% of midstream households in Wadi Siham were interested in changing the crop pattern and crop diversity, and 40% preferred the provision of agricultural inputs (seeds, fertilizers, pesticides).
- Other proposed solutions in both wadis included the restoration of agricultural production through the support of solar water-pumping systems and/or subsidizing diesel prices for farmers, along with the provision of required training to farmers in agricultural production recovery strategies.

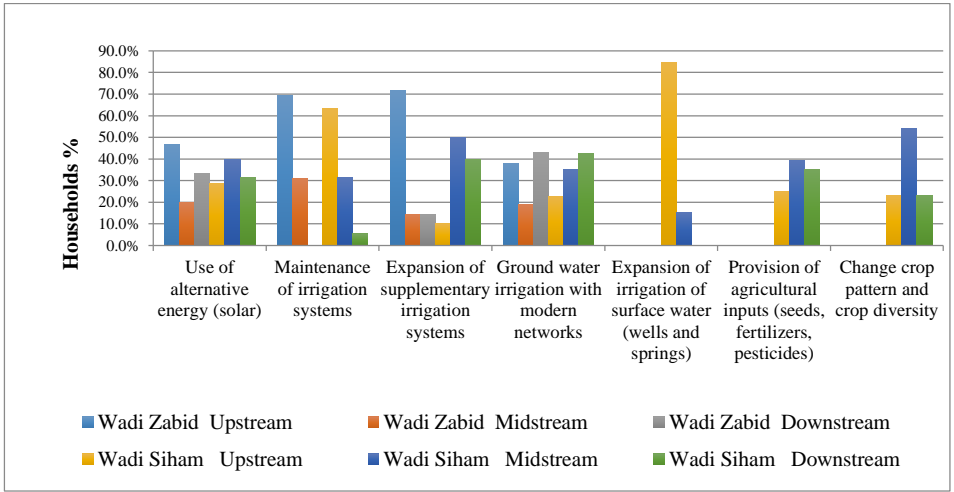
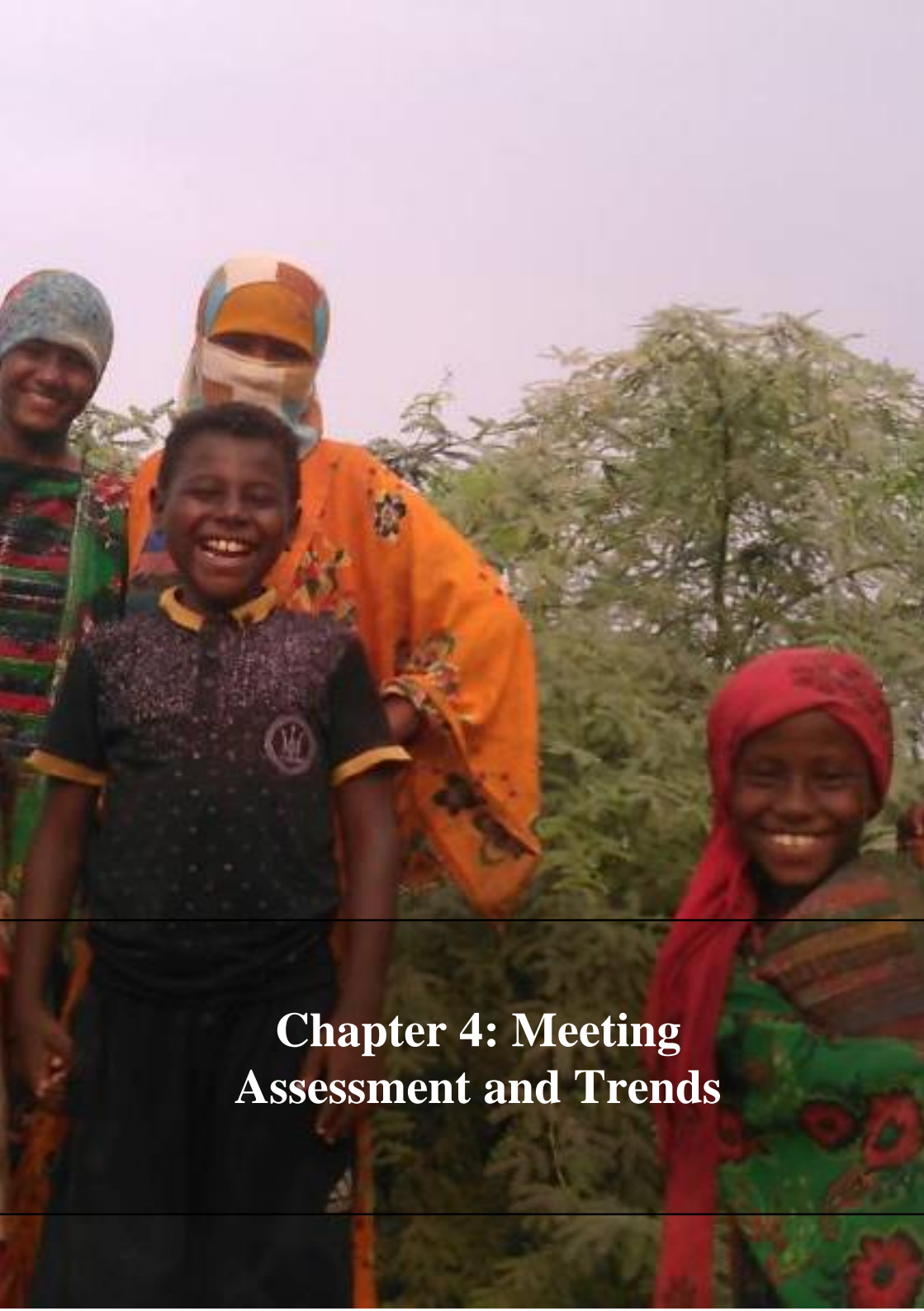


Figure 14: Strategies and solutions proposed by farmers to restore the war-affected agricultural production and increase income



**Chapter 4: Meeting
Assessment and Trends**

Meeting Assessment and Trends (The way forward)

1. Conclusion

Results of this assessment report clearly indicate the negative impact of war on the population in the study area concerning the food security. The outputs and evaluation of the recorded data concluded a number of findings that could be summarized as follows:

1.1. Impact of war on the food security for the food consumers:

- While 42 - 75% of households in both wadi's areas have no food at home because they do not have money, 80 - 82% of households in both wadis worry about the unavailability of enough food in their houses. Their concerns last almost all days of the month.
- 62 - 83% of households eat low cost food, and 80% eat food that they do not like due to the lack of financial resources. Regrettably, 46 - 54% of households go to sleep hungry.
- Most households' incomes do not exceed \$300 per month for families of 8-12 members. Humanitarian crisis is getting worse in different villages due to little and weak relief support provided that it does not fully cover people's urgent needs. Priorities for relief are concluded to cover the distribution of food baskets, and health relief services, followed by the distribution of financial assistance, providing water and providing some agricultural and industrial inputs. The distribution of these relief aids was found to be not uniform in all wadi areas.
- There are many negative indicators confirming the increase in acute malnutrition rates amongst children, and the spread of infectious and non-infectious diseases in both wadis due to the war. Water borne diseases spreading is mainly due to the shortage in providing sufficient safe water for domestic use.
- 30-50% of the children in the both wadis' villages are in 4-year age group and are the most affected during the war; they are suffering from high rates of acute malnutrition.
- There are four main sources of water for domestic uses: public water projects, public water taps, open wells, and protected wells in both wadis.

More than 80% of the households use protected wells in downstream areas of both wadis, and 50% of the households use public water taps in both wadis.

- The most common infectious diseases are cholera, malaria and typhoid, while the health situation is worsening by non-communicable diseases such as kidney diseases and liver infections.
- 75 - 80% of the households suffer from obstacles that limit their access to food and markets, especially in the downstream villages of both wadis as they have been considered as military areas.
- There is an increase in the family members who eat food they do not prefer due to the lack of money in the downstream villages of both Wadis compared to villages in upstream and midstream areas of the wadis.
- 50 -70% of households depend on firewood as the main source of fuel for domestic cooking, and 14% depend on firewood and gas as supplementary sources of cooking fuel in both wadis.
- There is an increase of 40 - 60% in the use of firewood during the war, mainly due to the increase in gas price.
- Most community services and facilities were exposed to damage; direct damage (airstrike) or indirect damage (operational, no fuel, etc.). The most affected public facilities and services in both wadis are water networks, roads, bridges, diversion dams, irrigation systems, communications, internet and electricity.

1.2. Impact of war on the food security for the food producers:

- The most important sources of income for households are agriculture, crop and livestock productions. Remittances, seasonal employment, simple trading, exchange trading, and social assistance were considered as secondary income sources for households in the study area's villages.
- The most important factors contributing to the food security situation for local people were identified to be: the type of agricultural holdings; cropping areas used by households; sources of irrigation water; and type and quantity of crops production.
- The majority of households were found to be owning small farms (less than 2 hectares). War has made many families stop renting agricultural lands due to the witnessed decrease in agricultural production. In addition, the shortage in irrigation water due to the increase of water pumping costs has led to the decline of cultivated lands and productivity of crops per unit area. That has adversely affected the income sources; increasing poverty

amongst households, affecting food availability, increasing the prices of agricultural food products, and reducing the ability of the vast majority of households to meet their daily food requirements, thus increasing hunger among inhabitants.

- Reduction in rent land holdings was found to be 50 - 60% in all Wadi Zabid areas, and 65 - 100% in Wadi Siham areas, especially in the downstream where the production is almost stopped. This reduction in the agricultural production is due to economic reasons including farmers' non-affordability to pay for land rent, provide production inputs or provide fuel for pumping water for irrigation.
- The average food production by family in the study area was observed to have been significantly decreased during the war due to the shortage in irrigation water compiled with the lack of production inputs, i.e. fertilizers, pesticides and improved varieties.
- Crop yield per area (ton/ha) show a decline of various degrees. The most severe was noted in fruit production in both wadis with about 6.6 ton/ha reduction. On the other hand, reduction in cultivated area for vegetables in Wadi Siham was observed to amount 216 ha.
- The agricultural irrigated areas in both wadis are significantly affected by the war. In Wadi Zabid, the total cultivated area was 3896, and has been reduced to 1908ha (51%) during the war. In Wadi Siham, the total cultivated area was 4688ha and has been reduced to 2222 ha (52%).
- Two types of damages were distinguished in the study area; the agricultural damages and non-agricultural damages. Important factors affecting the food security of households in both wadis have been identified as: the destruction of water infrastructures; cessation of government subsidy to farmers; high prices of agricultural inputs; and the difficulty in marketing agricultural products. The most important agricultural damages for most households were the destruction of water structures, and consequently the decrease in agricultural areas and in crop productivity. In addition, another factor was the suspension of government salaries, which was considered as a non-agricultural damage in the assessment. All these factors had a significant impact on the decline in the average monthly income of families during the war, and consequently the availability of food and their accessibility to it.
- Shortage in irrigation water was significantly observed in downstream villages of both Wadis, in range of 60% and 58.6% of households for

Wadi Zabid and Wadi Siham respectively. This shortage came as a result of the destruction of irrigation water structures (dams - wells - reservoirs) in downstream areas.

- 45% of households suffered from agricultural damages due to the suspension of farmer's support (financial - extension), while 43% and 40% were affected by the reduction in the agricultural yields due to the increase in fuel prices and prices of agricultural production inputs.
- 32% to 47% of households' expenditure has decreased in Wadi Zabid and 54% to 69% in Wadi Siham to cope with the lack of financial resources and the intense food insecurity situation in the country.
- A decrease of 41% to 80% in average monthly households show that some families almost lost their income completely. The highest drop in income was observed in both Wadis' downstream areas to animal breeders, crop cultivation and other works.
- In Wadi Zabid's upstream area, 63% of households depend on spate irrigation and 30% depend on wells irrigation together with complementary irrigation for all irrigated crop areas. In midstream, 32% of households depend on spate irrigation, and 54% depend on rain-fed agriculture, while downstream areas depend on well irrigation for 70% of irrigated crops.
- In Wadi Siham's upstream areas, 100% of households depend on wells for irrigation with complementary irrigation for all irrigated areas. In midstream and downstream, well water is used over 54% and 42% of irrigated crops, respectively.
- The war created two types of water shortages: the first is due to the lack of maintenance of surface spate irrigation infrastructure, hence less flood water is available. The second type is due to the significant increase of fuel prices forcing farmers to pump less groundwater for cultivation.
- In the upstream areas of both wadis, where groundwater-based cultivation of mangos, bananas and tobacco was affected by the reduced pumping hours, in some cases mango were abandoned all together and tree stands were drying out. Similarly, fodders production and vegetables were abandoned in the lower areas and the area under staple crops was reduced.
- In downstream areas of both wadis, several methods were adopted to deal with the lack of water supply. The majority of households adopted multiple strategies, such as reducing irrigation hours; reducing cultivated areas and eliminating planting of some crops if necessary. Most of households abandoned cereals and fodders crops, sesame and cotton, in the upper and middle areas. Shortage of water has led some farmers to

- rent or even sell their farmlands or abandon all agricultural activities.
- The common adaptation measures, which apparently related to the location of households within the wadi, included: moving the family to another place; rental of land; immigrating abroad; selling of some assets (land or livestock and others); head of family searching for an additional job; consuming the savings to buy food (e.g. selling jewelry); and using the stored reserve for emergency.
- 43% of the households in both wadis agreed on their great interest in expanding the modern irrigation systems, especially in downstream areas.

2. Recommendations

The result of this research will be both a good basis for recovery (reconstruction) and will draw attention of donors/outside to the situation of the Tihama population and similar areas in Yemen. The recommendations will take into account the intervention challenges that are currently present in Yemen (i.e. in each site). In addition, the significance of the study is the provision of a basis and an overview dataset that will help understand how to best respond to recover Tihama into the granary of the country it used to be, and assist its people toward better livelihoods and wellbeing. The recommendations cover measures and interventions that should be undertaken to alleviate the food insecurity among the population in Wadi Zabid and Wadi Siham. They emphasize that the production systems and the restoration of agricultural activities to the pre-war period must be supported and strengthened, which will enhance the sources of income and provide more employment opportunities and livelihoods for the population by doing the following:

- The maintenance of irrigation systems and the expansion of irrigation systems with modern facilities;
- Supporting farmers in purchasing solar water pumping systems;
- Modern irrigation techniques should be used in irrigated agricultural lands;
- The provision of training to farmers in strategies to restore the agricultural production.
- Supporting and providing agricultural inputs at cheap prices, e.g. seeds, improved seedlings, fertilizers, pesticides..., etc.
- Supporting and encouraging families in the possession and breeding of livestock, as one of the major and important sources of income to households through the provision of cheap feed sources, vaccines,


veterinary health care, and else.

- Supporting the fishing communities in purchasing fishing boats and accessories while enhancing their capacities for production and marketing of their products.
- Supporting apiarists in the purchase of hives and production requirements while enhancing their marketing capabilities for both internal and external markets.
- More attention should be paid toward restoring and rehabilitating many war-affected facilities and public services used by households in the different villages of both wadis, such as water supply networks, roads and bridges, diversion dams, irrigation systems, communications, internet, and electricity.
- Strengthening the current relief measures during the war period, especially in the poorest villages, where acute food insecurity is concentrated among the population. The most important relief measures urgently required are the distribution of food baskets and health relief services, followed by the distribution of the financial assistance to return to a prior-war agricultural and industrial production status.
- Improving livelihood solutions by alleviating food insecurity and implementing water resources management. The capacity and skills of vulnerable rural households need to be built on applications of low-cost techniques and innovations. This will allow households to set up and sustain a small income, and increase production.
- Creating more livelihood opportunities for women, in which they build their own asset base. This particularly relates to the home garden, drip-irrigated greenhouses, and livestock breeding activities.
- Improving the natural resources base and strengthening sustainable agricultural practices to improve livelihood opportunities and increase the ability to manage shocks and meet necessary food needs for the most vulnerable, women-headed households in particular. Households with a low-income status should be specifically targeted for training to build their skills and receipt of agricultural inputs for the different activities.
- Developing women-led home gardens, through the application of live fencing, horticulture, fruit trees, composting, and forage grass for small ruminants to improve their livelihood opportunities. That will result in a positive impact on the food security of households by meeting their daily needs.
- Introducing low-cost household-level greenhouses in combination with drip irrigation systems that can increase the nutritional and economic status of households. It allows for the cultivation of nutritious crops such

as vegetables.

- Further studies and field research on the state of food insecurity should be conducted in the other parts and wadis of the Tihama region, with a focus on war-affected areas not covered by the present study. The study should be inclusive of all areas of the Tihama plain in its southern, central, and northern parts.

Finally, there are several gaps that need to be investigated, especially in the downstream areas of both wadis. There is a need to investigate the remaining wadis' areas in Tihama in order to evaluate the damages on the agricultural facilities toward improving the livelihoods of the households by improving their production and income.



Amal from Alalwaia (25 years old) – Zabid city

On May 12th 2015, Amal lost her husband at a young age when the Saudi-led coalition bombed a restaurant in the town of Zabid (Shajea Restaurant). Amal, whose family suffer from serious food insecurity, says:

"After two years of my husband's death, we [her son, daughter and herself] live only on our relatives' and neighbors' aids in addition to my work in making homemade bread (Lohoh, kuban), which does not afford enough". She continues, "I will do whatever I can to see a bright future for my children".

Najeeba from AlZarebah Village (40 years old) – Zabid

Najeeba confirms that she and her family were in a better condition before the war compared to now. They now cannot afford the simple needs, even the very basic one, food.

"I and my five kids feel the absence of my husband. I have three kids with special needs, two boys and a girl. Their medications cost a lot. Lately, because of my husband's death in the war, I stopped buying their medications, as I cannot afford them. Because of the war, everybody is suffering from economic and financial issues," she says sadly.