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Palestine Economic Policy Research Institute

Water and Food Security in the Gaza Strip: Evaluation

Anan Jayyousi

2008

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This study was prepared by Palestine Economic Policy Research Institute (MAS), particularly by the following researchers:

Researcher: Dr. Anan Jayyousi, Ph.D in Civil and Environmental Engineering, (Water and Resources Management), State University, Utah.

Reviewers: Dr. Fathi Srouji, Senior Researcher, and Research Coordinator.

Editorial Assistant: Dr. Fathi Srouji (Arabic)
Jake Lomax (English)
Miranda Hurst

Layout: Lina Abdallah

Funding: This study was funded by **Asamblea de Cooperación Por la Paz (ACPP)** and **Junta de Comunidades de Castilla-La Mancha**

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Jerusalem and Ramallah

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Forward

Water is essential to human life. It is used in household consumption, industry, and more than anywhere else, in agriculture. Irrigated land is more productive than land that depends on rainfall. Water use in agriculture therefore raises the productivity of each dunum planted, increasing agricultural output and in turn decreasing food insecurity.

This study evaluates a water project implemented in the Gaza Strip by Asamblea de Cooperación por la Paz (ACPP). The project was particularly important in view of the complete closure of Gaza since 2006.

The study compares the project in the various targeted areas, before and after the interventions. This evaluation concentrates on needs, implementation, impact, replicability, sustainability, and how in general how the project contributed to meet food security principles.

I am grateful to ACPP and the Junta de Comunidades de Castilla la Mancha for commissioning and funding this study. I also acknowledge the importance of the implemented project for it has improved food security in the targeted regions and households in Gaza. I would like to thank Dr. Anan Jayyousi, the main researchers, the officials and employees of the Palestinian Hydrological Group, and main stakeholders (Farmers who participated in the project), whose dedication made this study possible.

Dr. Mohammad Nasr
Director General

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1. Background

In June 2006, ACPP (Asamblea de Cooperación Por la Paz) signed a cooperation agreement with Junta de Comunidades de Castilla-La Mancha to reduce food insecurity and poverty of the rural population of the Gaza Strip, focusing on families in villages to the East of Khan Younis and in the Al-Mawasi area. The 18-month intervention programme includes land and water well rehabilitation, rain and wastewater collection and processing, small farms and training. Primarily concerned with water, ACPP's main local partner in this enterprise is the Palestine Hydrology Group (PHG).

As part of the project, the Palestine Economic Policy Research Institute (MAS) will conduct a research study into the food security situation in the targeted part of the Gaza Strip. The study will add value to ACPP's programme – and potentially to many other similar projects – by focusing on how such an intervention can improve food security by maximising the benefit to the poor of the limited resources available. The research will examine the wider situation and issues involved through the lens of ACPP's programme, using it as an example to draw more general conclusions about the effectiveness of different types of project, the most pressing difficulties, and the factors whose presence – or absence – can make the difference between success and failure.

The study has two components, the first of which was a diagnostic study completed before implementing the interventions. The second component is this evaluation study, conducted after the interventions were executed.

Finally, it should be emphasised that due to the ongoing situation in the Gaza Strip and the lack of construction material, some proposed interventions were impossible to implement and were thus replaced by others. These are further explained below.

Objectives of Study

The overall objective of this research is to improve the usefulness of this particular ACPP project by providing information and analysis that is also useful to other water-focused food security interventions in the Gaza Strip. This will involve:

- ✧ Providing a diagnostic profile of the problems, needs, resources and capabilities of households in the target communities (phase 1),
- ✧ Assessing the effectiveness and impact of ACPP's interventions,
- ✧ Drawing up specific and more general conclusions about interventions that will benefit ACPP and other organisations.

In short, this research will use ACPP/PHG's project as a case study to provide lessons for all stakeholders working in the field.

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2. A Brief Description of the Project

This project aims to help alleviate the current situation of malnourishment and poverty affecting the rural population of the Gaza Strip. In order to achieve this, access to good quality food and natural resources, especially water, must be improved. Also, the productive capacity of 717 families must be strengthened.

The project will take place in the Gaza Strip, in the Occupied Palestinian Territory. It will be distributed among the districts of Bani Suhila and Khuza'a, both located east of the Khan Younis District, and the 18 km² Al Mawasi Strip, which includes the costal area from the Deir Al Balah to Rafah Districts.

The rural domestic context in which this project will work is often one without a constant paternal figure. It is also one with little freedom of movement for the mother of the family, who is too busy to seek work. Causes of this situation include the second *Intifada*, which gained the lives of many men and saw the arrest of many fathers and older brothers. Labour migration to urban centres has sharply risen due to poor work opportunities in the fields. It is also worth noting that in rural areas of Palestine it is not uncommon that physical and psychological disabilities are perceived as a family's divine punishment. Suffering this stigma, disabled children are often confined in order to minimise the effects of gossip and scorn of the community.

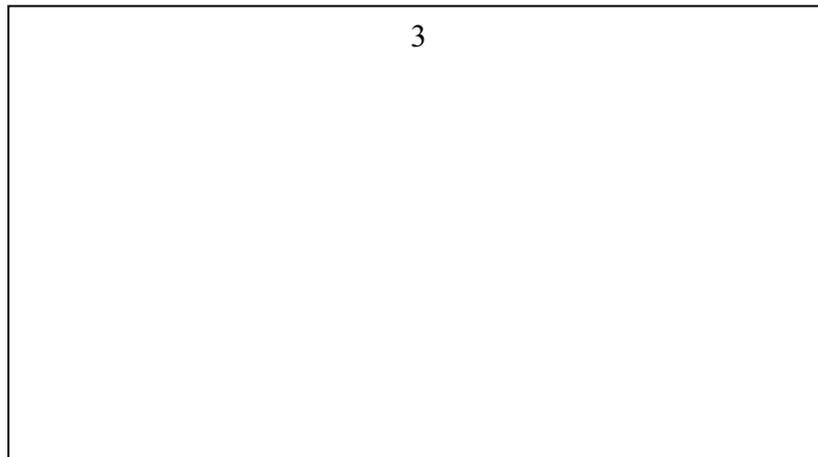
With all these points in mind, we have paid special attention to those families who are particularly strained, those with a disabled or sick member.

The intended improvements will include the following measures, taking into account the specific characteristics of the areas of intervention:

- ✧ Agricultural production will be increased through the reclamation of 320 dunums of land through the restoration of 8 agricultural and domestic wells, 1,100 m of 6" and 4" thermoplastic tubing for primary and secondary distribution systems and 3,500 ml of drip irrigation tubing.
- ✧ 25 cisterns with individual capacity of 200 m³ will be constructed to collect rainwater and 15 waste-water treatment plants will be installed

in order to protect the coastal aquifer from excessive extraction through use of illegal wells.

- ✧ 100 ¼ dunum plots and 200 family farms will be established for families headed by women. They will each receive: seeds, trees, plants, 100 groups of chickens each consisting of 9 hens and 1 rooster and 100 groups of rabbits each consisting of 3 females and 1 male.
- ✧ 10 greenhouses will be established for families with at least 1 dunum of arable land and an available irrigation system.

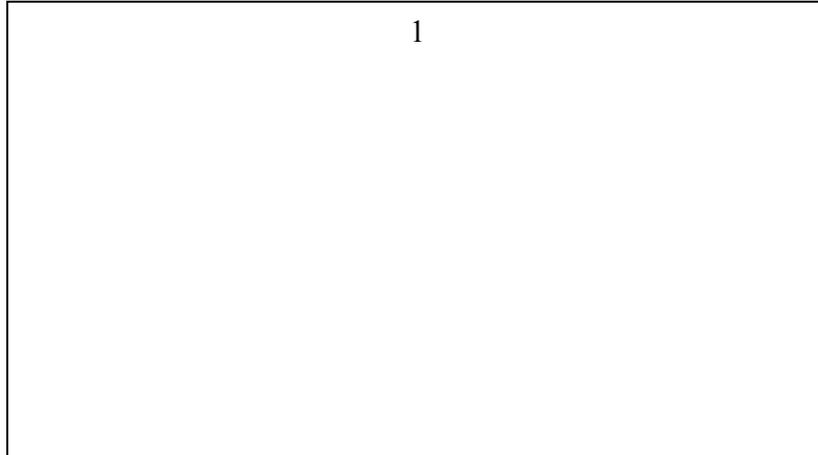


At the same time, 6 training courses will be held on the following topics: responsible and efficient water use for crops, use and maintenance of water collection systems, wastewater treatment, nutrition, hygiene and household economics.

Due to the ongoing situation in Gaza Strip, some of the aforementioned activities were replaced by other interventions. This is mainly due to the lack of materials needed to implement the activities such as steel and cement. The following list is what has actually been implemented:

- ✧ Restoration of 10 agricultural wells.
- ✧ 10 cisterns with individual capacity of 200 m³ constructed to collect rainwater.
- ✧ Construction of 100 home gardens.
- ✧ The establishment of 240 family farms for families headed by women.
- ✧ Distribution of 150 water tanks of size one cubic meter.
- ✧ Distribution of 46 irrigation networks 1 dunum each.

- ✧ Rehabilitation of 10 green houses.
- ✧ Rehabilitation of 48 sunroof tanks.
- ✧ Training courses of 120 training hours for 180 farmers both male and female.

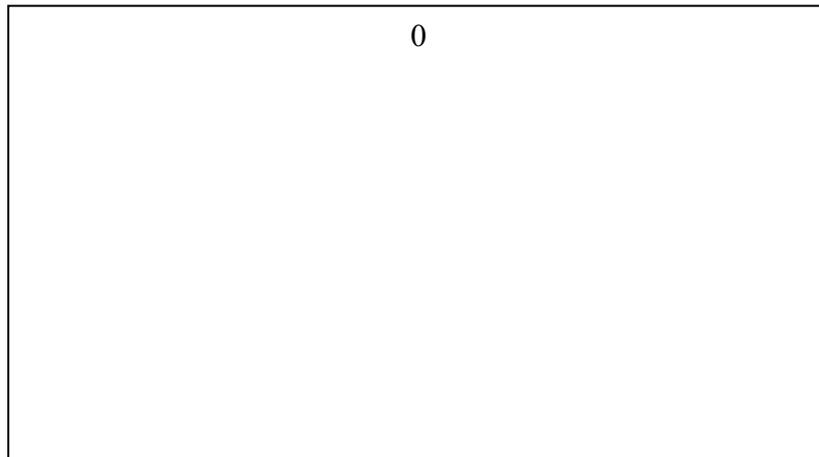


The project aims to re-establish the trade channels (in the areas of intervention) that will have a knock-on effect. There will be an improvement in access to quality foodstuffs not only for those families who will directly benefit but also for the inhabitants of selected municipalities who buy from the local markets.

In the medium to long-term, the measures of protection for the coastal aquifer will equally benefit all of the inhabitants in the following regions:

- ✧ 30,268 inhabitants of the Bani Suhila Municipality
- ✧ 8,926 inhabitants of the Khuza'a Municipality
- ✧ 9,500 inhabitants of Al Mawasi Strip
- ✧ To conduct this study, many reports have been collected and reviewed. A sample of these reports is listed below:
 1. The Agricultural Strategy and Policy (2004)
 2. The Comprehensive Planning Framework of the Water Sector (1997)
 3. Water Sector Strategic Planning Study (WSSPS) (2000)
 4. The Coastal Aquifer Management Plan (CAMP) (2001)
 5. The National Water Plan (2003)
 6. The Establishment of the Coastal Water Utility (2004)
 7. The food security strategy, PNA (2006)
 8. Pollution control in the Gaza Strip, PWA report (2004)
 9. Agricultural water demand, MOA report (2005)
 10. The data collected from the Palestinian Water Authority and Ministry of Agriculture regarding water supply, water demand, agricultural production and irrigable and irrigated lands.

The summary and main findings from this review are presented in the next sections.



3. Overview of the Water Sector in The Gaza Strip

The Gaza Strip is 40 km long and an average of 9 km wide. It is located between the Negev Desert and the Mediterranean Sea. On current projections, this narrow band of semi-arid land will have a population of over two million Palestinians by 2020 according to PCBS. The Strip is located on the western-most edge of the shallow coastal aquifer that is exploited for municipal and agricultural water supply for Gaza and southwest Israel.

3.1 General Hydro-Geological Setting

The coastal aquifer of the Gaza Strip is part of a regional groundwater system that stretches from the coastal areas of the Sinai (Egypt) in the south to Haifa (Israel) in the north. The coastal aquifer is generally 10-15 km wide, and its thickness ranges from 0 m in the east to about 200 m at the coastline. In recent studies, the Palestinian Water Authority (PWA) has warned that water salinity is reaching alarming levels due to water extraction from approximately 7000 illegal wells created over the past five years in order to counter domestic and agricultural water restrictions.

3.2 Groundwater Flow Regime

Under natural conditions, groundwater flow in the Gaza Strip is towards the Mediterranean Sea, where fresh groundwater discharges to the sea. However, natural flow patterns have been significantly disturbed by pumping and artificial sources of recharge over the past 40 years. Within the Gaza Strip, significant cones of depression have formed over large areas in the north and south. Water levels are presently below mean sea level in many places, including a hydraulic gradient from the Mediterranean Sea towards the major pumping centres and municipal supply wells.

Long-term records (> 20 years) of water levels are available for more than 100 wells in Gaza. Between 1970 and 1993, water levels dropped 1.6 m on average, mostly in the south. This is equivalent to 5 million cubic meters per year (Mcm/year) decline in overall aquifer storage on average, using a specific yield of 0.2. The water level declines are mostly apparent in the south, and are most likely a reflection of the lower recharge from rainfall in this area. In the north, most wells exhibit relatively slow declines with partial or complete recovery following the wetter than normal 1991/92 hydrological year.

3.3 Groundwater Quality

The major documented water quality problems in the Gaza Strip are elevated salinity and nitrate concentrations in the aquifer.

3.4 Chloride (salinity)

Salinity in the Gaza coastal aquifer is most often described by the concentration of chloride in groundwater. Salinity affects usability for irrigation and water supply.

Intensive exploitation of groundwater in the Gaza Strip in the past 30-40 years has disturbed the natural equilibrium between fresh and saline water, and has resulted in increased salinity in most areas. Depending on location, rates of salinisation may be gradual or sudden. In Gaza City and Jabalya, chloride values in several wells are increasing at rates up to 10 mg/L per year.

It is estimated from available data, (especially the Coastal Aquifer Management Plan) that less than 10 percent of the Gaza's aquifer resource contains groundwater that meets the World Health Organization's drinking water standard for chloride of 250 mg/L, primarily in the north and along the coastal dune sand areas of the Mawasi (southwest).

Based on the different previous studies including the Coastal Aquifer Management Plan study, the main sources of chloride that can be documented within the Gaza Strip are:

- ✧ Seawater intrusion. Several shallow agricultural and municipal wells, primarily in coastal areas, have been abandoned in the past 10 years due to "breakthrough" of seawater.
- ✧ Lateral inflow of brackish water from Israel in the middle and southern areas of the Gaza Strip. The source is believed to be groundwater from the Eocene age rocks that underlie the coastal aquifer in the east, and is therefore of natural origin.
- ✧ Presence of deep brines at the base of the coastal aquifer. Brines with chloride concentrations of 40,000 to 60,000 mg/L have been detected in sub-aquifer C between Rafah and the area formerly occupied by Netzarim settlement.

3.5 Nitrates

Most municipal wells in Gaza show nitrate levels in excess of the World Health Organisation (WHO) drinking water standard of 50 mg/L. In the

worst affected areas (urban centres), nitrate concentrations are increasing, in some cases rapidly, at rates of up to 10 mg/L per year.

The main sources of nitrates are fertilizers and domestic sewage effluent. The quantities of sewage that infiltrate to the water table on an annual basis through cesspits and septic tanks are significant, about 12 million cubic meters per year (Mcm/year). In contrast to salinity, groundwater flowing from the east has relatively low nitrate levels.

3.6 Water Balance of the Gaza Coastal Aquifer

A water balance of the Gaza coastal aquifer has been developed based on estimates of all water inputs and outputs to the regional aquifer system. The two largest components of the water balance are municipal and agricultural well abstraction. These exceed natural inflows (rainfall recharge and lateral inflow from Israel) by a factor of between 2 and 3.

The components of the current water balance of the Gaza Strip are:

Outflows:

Total abstraction + Lateral outflow (including natural discharge to the sea)

Inflows:

Effective recharge + Lateral inflow + Total return flows + Saltwater intrusion

The overall 'recent' net water balance of the Gaza Strip can be simplified as follows

Inflows (Mcm/year)			Outflows (Mcm/year)		
	MIN	MAX		MIN	MAX
Rainfall Recharge (1)	40.0	45.0	Municipal Abstraction	47.0	47.0
Lateral Inflow from Israel	18.0	30.0	Agricultural Abstraction	80.0	100.0
Lateral Inflow from Egypt	2.0	5.0	Mekorot Abstraction	5.0	8.0
Saltwater Intrusion - shallow	10.0	15.0	Discharge to the Sea	10.0	15.0
Water System Leaks	10.0	15.0			
Wastewater Return Flows	10.5	10.5			
Other Recharge (2)	3.5	3.5			
Irrigation Return Flows	20.0	25.0			
Loss of Aquifer Storage	2.1	3.2			
Total	116.1	152.2		142.0	170.0
Net Balance	-25.9	-17.8			

(1) This table does not include results of modelling – see section 2.5 for further water balance details.

(2) Includes recharge from WWTPs (i.e. Jabalia) and Wadi Gaza.

Lateral inflow is an important parameter in the overall water balance of the Gaza Strip. However, this is subject to considerable variation from one year to another depending on the hydraulic regime in Israel. Under natural aquifer conditions and hydraulic gradients, it is estimated that lateral inflow is about 15-20 Mcm/year. However, this quantity is presently higher due to the use of reclaimed water for irrigation and reduction of aquifer pumping. Presently, total lateral inflow from Israel is estimated to be about 30 Mcm/year from the north and east, but this is not a quantity of water that can be relied on as a water resource for the Gaza Strip. If production-pumping from the coastal aquifer in Israel increases, or irrigation return flows become less, then lateral inflow into Gaza will be reduced.

3.7 Net Groundwater Balance

The Gaza coastal aquifer is a dynamic system, with continuously changing inflows and outflows. The present net aquifer balance in the Gaza Strip is negative; that is, there is a water deficit. Under defined average climatic conditions and recent pumping and return flows, the net 'recent' deficit is about 25 Mcm/year. Implications of the net deficit include:

- ✧ Lowering of regional water levels (documented).
- ✧ Reduction in availability of fresh groundwater (documented).
- ✧ Seawater intrusion (documented), and potentially up-coning of deep brines (partly documented).

It is presently estimated that only about 10 percent of the aquifer volume may be considered 'fresh', meeting the WHO drinking water standard for chloride of 250 mg/L. This corresponds to a total volume of about 450-600 Mcm/year. The time frame for complete depletion of fresh groundwater will depend on continued abstraction volumes and patterns. Using a rate of aquifer depletion of about 25 Mcm/year, it can be calculated that depletion would occur in 20-25 years.

The net deficit has led to a lowering of the water table in the past 30-40 years and inland migration of seawater. Of these two factors, seawater intrusion accounts for a greater fraction of the volume loss, but it is less visible and thus tends to lessen the perception of the worsening aquifer evolution.

4. Overview of the Agricultural Sector in the Gaza Strip

4.1 Soils and Land Use

Near the Gaza Strip coast, the soils are sandy, characterised by high infiltration and low water retention. In some coastal areas, underlying clay layers may ultimately control the infiltration rate during prolonged winter rains. Rapid infiltration makes this area suitable for grapes, dates and other crops requiring well-drained soils. The underlying clay or loamy soils of lower infiltration do not pose a problem for agriculture. In fact, in some areas where the sand layer is thin, the sand is often removed to take advantage of the water retention characteristics of these soils. Wadi Gaza, the low point that serves as conduit for surface water drainage toward the Mediterranean, has transported finer soils. Thus this area has finer soils than are usually found close to the coast.

Silt and clay content generally increases with distance from the coast, increasing the soil's ability to retain water. The quantity of organic matter also generally increases with distance from the coast, making the soil suitable for a wide variety of crops including citrus, olives, and vegetables.

4.2 Crops

The wide variety of crops grown in the Gaza Strip includes vegetables, citrus, field crops, fruit trees and flowers. More land is devoted to vegetable production than to any other category and vegetable crops provide the greatest economic value. Table 1 below shows the vegetable crops grown in each area. Vegetables are generally cultivated in the east, where soils have a higher water holding capacity, but they also grow near the coast where sand has been removed or salty clays have been imported. Potatoes and tomatoes are the most widely cultivated vegetables, followed by watermelon, cucumber, squash, and eggplant. Vegetables are grown using efficient drip or less efficient sprinkler irrigation.

As part of the shift to intensive agriculture, many vegetables are grown in greenhouses, particularly tomatoes, cucumber, squash, mallow, and peppers. Through the use of different varieties and/or intensive agricultural practices, these crops can be harvested four times a year. Non-greenhouse crops, like cabbage and cauliflower, may still produce three harvests a year. Because strawberries are a high-value crop, they are becoming

increasingly important, although they spoil quickly and are therefore susceptible to the effects of delays experienced at border closings.

Table 1 Crop Production by Governorate for Agricultural Year 1996-1997

Governorate	Dunums			Crops by Percentage			
	Irrigated	Rainfed	Total	Vegetables	Fruit	Citrus	Field Crops
North Gaza	34,764	3,995	38,759	8.8	1.1	9.5	1.6
Gaza City	20,804	10,176	30,980	2.6	5.4	7.0	1.8
Deir Al Balah	22,631	10,376	33,007	5.4	4.3	4.7	3.5
Khan Younis	20,569	29,058	49,627	10.1	6.1	1.1	9.7
Rafah	17,866	13,883	31,749	7.5	4.8	1.6	3.3
Total	116,634	67,488	184,122	34.4	21.7	23.9	19.9

Source: MOA 1999.

Fruit trees, particularly olive, almond, guava, grape, and date, also contribute significantly to agricultural production. Olives are grown both for oil and food throughout Gaza Strip. They can be cultivated without irrigation but provide higher yields if irrigated. Almond cultivation is carried out primarily in the non-irrigated region in the south. Grapes, guavas, and dates grow on the sandy soils near the coast. Grapes are concentrated in north central Gaza, while dates are the dominant crop in south central Gaza near Deir-el-Balah.

Despite the overall decline in citrus production, due to low prices for citrus fruit and the fact that it does not tolerate high salinity, it is still significant, primarily in the north and central regions. Valencia oranges accounted for 65 percent of the citrus area cultivated in the 1997-1998 growing season. Heavy losses in grapefruit production have caused a rapid shift away from this crop.

The sophistication of irrigation for fruit and citrus trees generally lags behind that for other crops. Surface irrigation is still routinely employed for a significant portion of these crops, in part because it is very inexpensive, but it is much less efficient than either sprinkler or drip irrigation systems. The replacement of citrus with vegetables and other crops is accompanied by a conversion to more efficient methods of irrigation.

Field crops, wheat, barley, chickpeas and silage are low-value crops, increasingly being replaced by other crops. Flowers are a relatively new, increasingly important export crop in the Gaza Strip. Less than 1000 dunums (du), all irrigated, are devoted to flowers. Carnations are grown on 85 percent of this land, with half the remainder in an ornamental flower called sunflower (unrelated to larger traditional seed-harvested flowers of the same name). Most of the carnations are shipped to Holland for re-export. Due to the perishable nature of flowers, border closures have at times had devastating effects on this high value sector.

4.3 Irrigation Water Quality

Roughly two-thirds of the agricultural land in the Gaza strip is irrigated. Except for a small area near Wadi Gaza, all of the irrigation water comes from groundwater. With salinity levels increasing, the quality of the irrigation water is often the deciding factor in crop selection. The best quality water is found in the north. Here and in central Gaza, citrus and vegetables are grown. Some citrus groves in the central region clearly show the impact of salinity. In general, the water quality decreases from north to south. In the far south, east of Khan Younis and Rafah, an area with arable land has been irrigated in the past but is currently un-irrigated because the water from wells in this area has become excessively saline. This factor has contributed to the region's selection for the airport and for industrial and free trade zones.

4.4 Trends in the Agricultural Sector

During the last few years, the following trends can be noticed within the agricultural sector in the Gaza Strip:

4.4.1. Decline in Area and Percentage of GDP

If the demand for irrigation is calculated on the basis of what it would take to produce the food required by the growing population, it increases from the present usage of about 90 Mcm/year to more than 180 Mcm/year by the year 2020. However, the latter figure is not a realistic projection for the Gaza Strip, because neither the land nor the water will be available to support increased agricultural activity.

Available data from the Ministry of Affairs (MOA) shows a recent reduction in both irrigated and rain-fed agricultural land use in the Gaza Strip. The data also shows that although the agricultural contribution to the Gross Domestic Product (GDP) has shown a consistent increase over the

past 30 years, it is not growing nearly as fast as the total GDP for the Gaza Strip. This indicates that the relative economic importance of agriculture is decreasing; resulting in part from urban expansion onto land previously used for agriculture. Partially offsetting this trend is the greater demand for agricultural products to feed the growing population, which in turn, encourages farmers to bring more marginal land into production.

4.4.2. More Intensive Methods

The reduction in available land combined with the increased demand for agricultural products leads farmers to use greenhouses and other intensive methods requiring expensive inputs of fertiliser, soil modifiers, and/or pesticides.

4.4.3. Increased Irrigation Efficiency

The agricultural sector can be expected to continue to increase irrigation efficiency through improved irrigation management and the introduction of new technologies.

4.4.4. Changes in Cropping Patterns

Crops can also be expected to change to those that require less water or are tolerant of lower-quality water. The shift away from citrus toward vegetables can be expected to continue, driven by the increased salinity of the irrigation water (citrus as a salt sensitive crop), the decreasing prices for citrus fruit and the increasing value of land driven by the rapid population growth. Farmers have shifted to more intensive, higher value vegetable crops, which are generally somewhat more salt-tolerant.

5. Description of the Targeted Areas

The study area includes three main communities. Those are Bani Suhila and Khuza'a and Al Mawasi Strip.

Khuza'a

Khuza`a is located in the east part of Khan Younis Governorate. It is surrounded by the green line from the east and north, Abassan village from the West and Alfukharee area from the south. Agriculture is the main income resource for the people in the area with a total agricultural land of 6000 dunums. The crops are mainly vegetables and crops with about 300 green houses within the 6000 dunums. There is a growing scarcity of water in the area both in terms of quality and quantity. There are just five shallow wells within Khuza'a Municipality with high salinity values so people are forced to buy water from other areas within the Gaza Strip at a high cost.

Bani Suhila

Bani Suhila is located in the eastern part of Khan Younis Governorate forming the largest community of the eastern villages. Bani Suhila is bordered by Alqarara area from the north, Khan Younis City from the West and from the south there is Ma`an Area. Agriculture is the main income source for the people in this area in addition to common trades and governmental employees. The total area is about 60000 dunums of which 2235 dunums are agricultural land. The plantation in the area is mainly vegetables. The water sector suffers from big shortages with a problem of high salinity. For that, people are buying water from the Morag area.

Al-Mawasi Area

Al-Mawasi area is located in the south-west part of the Gaza Strip along the Gaza sea shore. The area extends over 12 Km with an average width of 1 km. The area is about 11000 dunums forming 3% of the Gaza Strip area.

Al-Mawasi area is considered one of the most important areas from an environmental point of view due to the agro-biodiversity that exists in the area in addition to the high sensitivity of the groundwater aquifers to pollution.

The area is also considered one of the best agricultural areas especially after the withdrawal of the Israelis and the taking over by Palestinians. New management over the 3000 dunums of plastic houses, previously under the control of the Israeli makes this area particularly favourable.

Geographically, the area is divided into two parts: Mawasi Khan-younis and Mawasi Rafah. Mawasi Khan-Younis has the largest area of about 8800 dunums and a total population of 6000 distributed between three communities. These communities are Al-Malahah, Genan and Tal Al-Abadleh. Agriculture is the main economic activity in the area. Guava, Potatoes, sweet potatoes, onions and dates are the main crops in addition to green vegetables in the plastic houses.

Mawasi Rafah is the other part of Al-Mawasi area. The area is about 2200 dunums with a total population of 6000 capita. The three main communities within the area are Al-Suweidieh village, Al-Shalalfeh and Al-Nada. Alike Mawasi Khan-Younis, the main economic activity in Mawasi Rafah is agriculture. Fishing is considered the second major economic income for people in the area.

6. Results of the Diagnostic Phase

Assessment of the existing conditions before implementing any project is an important issue in evaluating the outcome of the project in later stages. A questionnaire has therefore been developed to assess the different conditions of the beneficiaries in the three targeted areas. The questionnaire, in addition to its general information section, includes parts on water resources, wastewater services, agricultural activities and the socio-economic conditions. To assure a good representation of the different beneficiaries, a stratified sample according to location of 200 beneficiaries was selected. The 200 questionnaires were collected from the three project locations taking into consideration the number of recipients in each target area. After examining the questionnaire, results of the analysis are summarized under four headings: water, wastewater, agriculture and food security and socio-economic conditions.

6.1 Water Supply Services in the Project Area

The water supply section of the survey includes questions regarding: the water sources, quality of the water and levels of consumption and cost of each source. . These questions were repeated for both the domestic and agricultural sector and for the three targeted communities. The main results of the questionnaire analysis regarding water supply is summarised below.

1. The per capita water consumption for domestic use ranges from 53 l/c/day in Khuza'a and Al-Mawasi to some 137 l/c/day for some other families with an average daily consumption rate of 95 l/c/day. This is equivalent to some 35 m³/year. This range of water consumption is less than the recommended WHO standards of 150 l/c/day for small communities. The per capita consumption from sources that meet the drinking water standards, for example, is much less than the numbers indicated above; according to the questionnaire results, it is less than 10% of these figures in some cases.
2. 75% of the people who completed the questionnaire indicated that the water quality is 'not good' or even, 'bad'. Others describe it as salty. Only water coming from municipality wells and from desalinated sources can be considered of acceptable quality to international standards.

3. The water sources for domestic use are from groundwater wells, especially in the Al-Mawasi area, where 85% of people interviewed indicated that they use groundwater as their main water resource. This indicates the importance and suitability of activities rehabilitating the groundwater wells.
4. Other water sources for domestic use, in addition to wells, include some desalination and Mekorot water for the area of Bani Suhaila Municipality and water purchase for the Khuza'a area. The percentage of people living in these areas is some 15%.
5. The water prices for domestic use vary according to the source. On average, the unit water price, according to the questionnaire, is about 3 NIS per cubic meter.
6. Water for agriculture also comes from wells and small local springs for Al-Mawasi area and from wells for Khuza'a and Bani Suhaila. The agricultural demand is around 20 m³/month in Khuza'a area and ranges from 50 to 300m³/month per farmer in Bani Suhaila. This variation is explained with the fact that there is greater agricultural land per farmer in Bani Suhaila.
7. More than 87% of the people who filled-out the questionnaire indicated that water scarcity is the main constraint to growth in the agricultural sector. They indicated that water quality forms a major constraint in selecting which crops to sow, since some crops that have a high economic value need water of a higher quality which is not available.

Finally, it should be mentioned that 92% of the people who took the questionnaire are not happy about the water quality and believe that additional quantities are needed to fulfil their basic domestic needs. It therefore appears that the rehabilitation of ground water wells, proposed under this project, will have a positive impact on the targeted communities.

6.2 Wastewater Services in the Project Area

The wastewater section of the survey includes questions regarding the wastewater collection system, treatment, costs and facilities of wastewater. The main results of the questionnaire analysis indicate that:

1. No wastewater collection system exists in either Al-Mawasi or Bani-Suhila area. All the people who filled the questionnaire indicated that they use cesspit pools outside the house to dump their waste water or discharge it directly onto the street.
2. In Khuza'a, 64% of the people indicate that they do not have a wastewater collection system so they pour wastewater directly onto the streets. Only 36% wrote that they have a wastewater collection system which the municipality is responsible for collecting.
3. From the results of the questionnaire, it is evident that no-one is aware of any wastewater treatment or reuse facilities that exist in their areas. This is of course obvious, as they do not even have a collection system.

Based on these findings, it is expected that the proposed activity of constructing wastewater treatment plants will have a positive impact of people's health and livelihood in addition to protecting the Coastal Aquifer from further pollution.

6.3 Agricultural Activities in the Project Area

The agricultural activities section of the questionnaire includes questions regarding the type of crops, irrigation methods, agricultural return and size of cultivated area per crop. The main results of the questionnaire analysis can be summarised as follows:

- ✧ 60% of the people that filled-out the questionnaire indicate that they own agricultural land. The land size ranges from 0.5 dunum to 7.0 dunums with an average size of 3.3 dunums. This number is relatively small compared to land ownership in other areas of Palestine.
- ✧ Different irrigation methods are applied in the targeted areas. The main irrigation methods are drip irrigation, sprinklers and hoses. About 50% use drip irrigation, 25% hoses and the remaining 25% use sprinkler irrigation.
- ✧ Different crops are irrigated in the targeted areas. They include olive trees, guava, potatoes, sweet potatoes, onions, dates and wheat, in addition to green vegetables in the plastic houses. The average number of growing seasons per year is 3. This means that the land is often cultivated 3 times per year, but varies according to cropping patterns.

- ✧ The results of the questionnaire indicated that water quality is playing a major role in selecting the crops to be irrigated. More profitable crops such as strawberries need a better water quality which is not available to these farmers, as indicated above.

6.4 Socio-economic Conditions

The 200 questionnaires distributed to the 200 households show a total of 1597 family members. This gives an average number of 8 people per household. This number is relatively high compared to other areas in Palestine such as large cities in the West Bank where the number of family members is about 5. The main results of the questionnaire can be summarised in the following:

- ✧ According to questionnaire responses, the monthly income rate varies between 500 to 3000 NIS with an average of 1681 NIS (US\$ 420). This value is almost at the poverty line and indicates low income rates in the targeted communities.
- ✧ The number of workers per family varies between zero and three. Table 2 shows the percentages of number of workers per family.

Table 2: Number of Workers per Family

Number of Workers per Family	%
0	16
1	62
2	20
3	2

- ✧ Different income sources exist within the targeted areas. The main source of income is from agriculture but other employment represented in responses of the questionnaire includes: governmental jobs, building and construction business and other businesses such as driving. Table 3 below shows the different sources of income and their percentages relative to the questionnaire, taken in all three targeted areas.

Table 3: Types of Employment and their percentages

Employment Type	%
Agriculture	52
Governmental	22
Building and Construction	12
Other Businesses	14

- ✧ Table 3 illustrates that more than half of the population depends on agriculture, indicating a high priority to invest in the agricultural sector. It also shows that any development project in the agricultural sector will have a positive impact on the socio-economic conditions of the community.
- ✧ Only 14% of the people who filled-out the questionnaire indicated that receive support from NGO's and charitable organisations.
- ✧ Concerning the existence of agricultural unions, 60% of the people indicated that they belong to some kind of agricultural union. However, the majority of them are of the opinion that the unions most of the time are not helping to alleviate their livelihood difficulties.

7. Evaluation Questions

The evaluation had to assess the relevance of the project to identified problems and needs in the need assessment studies, the efficiency and performance of the implementation process, the effectiveness of the outcome in terms of planned results, the replicability of the project, and its impact and sustainability. This was achieved by brain-storming the following questions:

- ✧ Did the project achieve its goals as stated in the logical framework? What is the degree of achievement of the output within the project?
- ✧ How relevant were the project activities to the needs and demands in the target areas of the project? Did the project result in solving the identified problems in the targeted areas? If so, how was this achieved?
- ✧ Did the project improve the livelihood of people? How? How did the project help to support food security in the targeted areas?
- ✧ How effective was the project implementation process?
- ✧ How easy is it to replicate the different project activities?
- ✧ What are the lessons learned from implementing this project?
- ✧ What could ACPP change in future efforts of this type to increase its results in terms of relevancy, efficiency, effectiveness and the impact and sustainability of the project?

The methodology used to answer the above questions and to assess the different issues is presented in Section 8 below.

8. Evaluation Methodology

The methodology adopted in conducting the external evaluation is in keeping with the evaluation policies and procedures of MAS. Specific activities can be broken down as follows:

- ✧ Review of project documents
- ✧ Data collection that includes
 1. Interviews with the staff of Palestinian Agricultural Relief Committees (PARC)
 2. Survey of beneficiaries
 3. Evidential field data collection
 4. Focus groups with beneficiaries, community leaders and other stakeholders
- ✧ Data analysis
- ✧ Report writing

Based on the main evaluation activities above, implementation of the external evaluation went through the following key steps:

1. The work plan was developed, discussed and approved by a MAS team. This process was very helpful when conducting the remaining activities of the evaluation study. Also, the selected sites to be visited were selected and listed in the work plan. The selection of sites and beneficiaries to be interviewed was based on the following criteria:
 - ✧ More than 50% of the sites are to be selected for evaluation
 - ✧ The sites will have to cover all types of activities
 - ✧ Geographical distribution is to be considered.
2. The second step was a documentation review of all available materials prepared by ACPP for the project. The review included, among other documents, the project proposal, progress reports and the bill of quantities of the different activities.

The review allowed the evaluators to check if all activities proposed had actually been implemented. The review provided an overview of what was included in the different activities. Furthermore, the comprehensiveness of the reports were crosschecked with other documents and the evaluation team's experiences of a similar nature.

Based on the outcome of this review, the content of the meetings and interviews were defined and a questionnaire was prepared for the beneficiaries of the various activities.

3. The next step consisted of a series of interviews and focus group meetings.
 - ✧ Interviews with the project manager and ACPP project coordinator, as well as with ACPP and PHG's project members. The aim was to canvass their opinions on the project in terms of its implementation and impact. Also, the meetings with ACPP officials were to learn more about the selection process, the selection criteria of site and interviewees and the general impact of the project. These face-to-face meetings made it possible to detect and clarify any misunderstandings in relation to critical issues in the project and the reviewed documents.
 - ✧ Focus groups and interviews with beneficiaries, community leaders and other stakeholders including women representatives and project committees. Structured questions were prepared before the focus group meetings. These meetings were extremely beneficial in terms of getting a collective view of the different project activities and the various aspects under evaluation.
4. Survey of Beneficiaries. The direct beneficiaries of each project activity were surveyed. Random samples of families, stratified by the project activity they were supposed to have benefited from, were selected from the different locations visited. The questionnaire was designed by the evaluation team to elucidate general and specific information about the activities, seeking to ascertain their relevance, effectiveness, efficiency, replicability, impact and sustainability.
5. Evidential Field Data Collection and Interviews with Other Stakeholders. During the visits to the project's targeted locations, relevant data about each type of activity was collected and checked in person by the evaluation team. Photos were taken of the different activities. The evidence was compared with the objectives and verifiable indicators as set out in the project documents and the logic framework.
6. Data Analysis. While the data was being gathered, the evaluation team began to analyse it, building up a picture of the effectiveness of the project in meeting with the objectives stated in the terms of reference

(TOR). This was achieved by focusing on the relevance, efficiency, effectiveness, replicability, impact and sustainability of the different activities.

The analysis evaluated the project by both focussing on its different individual activities as well as approaching it as one. Evidence was drawn from the project documents, surveys and focus groups to evaluate the project. In addition to evaluating and assessing the project, the evaluation team came up with a number of constructive recommendations that would improve the design and implementation of a similar future project. These suggestions are included in the report.

9. Evaluation Findings

9.1 Project Documentation Review

The project documentation that was provided by ACPP and then reviewed included the following:

- ✧ Project proposal
- ✧ Description of intervention papers
- ✧ Progress reports
- ✧ Bill of quantities of the different activities
- ✧ Financial expenditure sheets
- ✧ Report of the baseline study
- ✧ Background documents regarding water and agriculture in the Gaza Strip

Major comments and conclusions reached after reviewing the documents and conducting the assessment are set out below:

1. In general, the material prepared for the project matched what was proposed in the application. The project proposal provided a clear detailed description of all project activities, the number of beneficiaries and the proposed locations. It should be mentioned that the way it was structured allowed the evaluation team to track the expected outcome and expected impact of each activity.
2. The proposal also included a very well-written chapter on sustainability that allowed the evaluation team to explore the issue of sustainability more thoroughly through the focus groups.
3. The selection of the different target groups was well documented and supported by the 'needs identification' study done before the starting of the project. When alterations were made due to unforeseen circumstances, the reasons behind changes were clearly mentioned, legitimate and approved by the donor.
4. The progress reports include details of the various interventions such as: cost, number of units, number of beneficiaries, location and the different components of the interventions.

5. The quality of the material in terms of formatting, reproduction material used, typing accuracy and language is excellent. Also, the scientific content of the documents is of a good quality and reflects the proficiency of the people preparing the reports.
6. The level of technical, administrative and financial details in the progress reports is sufficient and the information regarding job creation was well presented (although job creation is not a main objective in such kinds of development projects).
7. In general, the reviewed reports mentioned in clear terms any reasons for delay to implementing a project. The reasons were legitimate and acceptable. The progress reports also listed clearly the different points of strength and weakness in the implementation process, and tried to build recommendations for the next period to ease any constraints. Thus, the implementation process was also used as a learning process for ACPP employees, which will enrich their skill in implementing future projects of this kind.
8. The documents provided by ACPP and listed above did not include or recommend methods on how to follow up after the project is completed. An exit strategy would be very beneficial if included in future activities and would enrich project sustainability.
9. Finally, if other documentation is to be planned, an environmental evaluation report could be proposed. This report might include, in addition to environmental impact issues, mitigation and monitoring issues for both the construction activities and the operation and maintenance activities later on.

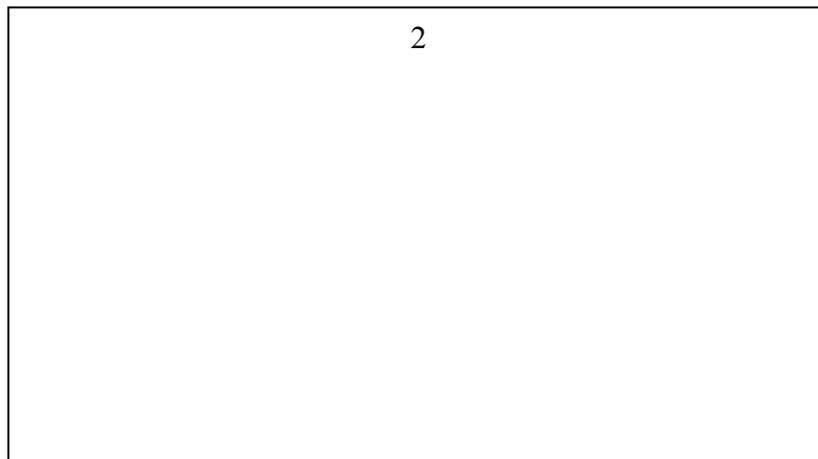
9.2 Project Relevance to Needs

A major issue in this evaluation is the appropriateness of the project design to the problems that need resolving. This, like other issues, was checked through both the survey of beneficiaries and the different focus group meetings with beneficiaries, stakeholders and community leaders.

The evaluators asked the different interviewees about the relevance of the implemented activities to their major problems and needs. They all agreed that the project in general was relevant and that it targeted a part of their major problems although the degree of relevance varied from one activity to another.

The interviewees also mentioned that some of the activities were of top priority to them, especially the rehabilitation of wells and pools. All the people interviewed concurred that the well rehabilitation was relevant to their needs and formed a priority for them. “We have a better source of water now because of the project”, said Naim from Al Mawasi.

In Al Mawasi, seven major activities, in addition to training, were implemented. Again, all the interviewees agreed that the activities were relevant to their general needs. Furthermore, when compared to other activities, most of them were of the same opinion that well rehabilitation and agricultural cisterns were more relevant to their needs and constituted a top priority to them than sunroof tanks.



In Bani Suhaila, all the people interviewed concurred that the project activities form a priority for them. They mentioned that home gardens and irrigation networks also covered part of their food needs, emphasising that the former provided them with self-sufficiency in many of the traditional crops. Um-Ahmad received a home garden from the project so that she was able to grow many vegetables no longer needs to buy them from the market. “The quality is even better, you know all the chemicals others are using” said Um-Ahmad.

The restoration of groundwater wells in Al Mawasi area is a success story particularly in terms of fulfilling needs of the community. The people interviewed in Al Mawasi mentioned that with the restoration of the

groundwater wells, many families went back to cultivating their own land that had not been cultivated due to lack of water or high water prices. Some plastic houses have already been constructed on the land and people are now waiting to start irrigating it.

In Khuza'a, all the people interviewed agreed that cement pool cisterns and home gardens were a priority for them. A woman from Khuza'a, who received a home cistern and garden from the project, mentioned that the water was not available for irrigation during certain months of the year which was a very big problem for the family. Now, after the execution of the project, this problem has disappeared.

This project is also relevant to Palestinian food security strategy principles. The activities included in the project targeted the four main principles of food security, (discussed below). It should also be mentioned that the activities implemented in this project are relevant to the findings and the proposed priority list of interventions that were raised by the donor orientations.

The above analysis is also confirmed by the beneficiary questionnaires. Table 4 shows the mean value of the answers related to the relevance of the different activities. From the table, it is clear that on average 89% of the respondents believed that the project is relevant to people's needs. This value ranges from 94% for the construction of cisterns to 84% for the rehabilitation of sunroof tanks.

Table 4: Mean Values of Responses for Project Relevance to Demand (%)

Project Activity	Mean Value of Responses (%)
Restoration of 10 agricultural wells	92
Construction of 10 cisterns	94
Construction of 100 home gardens	89
Establishment of 240 family farms	88
Distribution of 150 water tanks	91
Distribution of 46 irrigation networks	87
Rehabilitation of 10 green houses	88
Rehabilitation of 48 sunroof tanks	84
Overall Project Activities	89

9.3 Assessment of the Implementation Process

Another important task in this evaluation was to check if the materials, human resources and financial resources were efficiently allocated and used, and whether the implementation process itself contributed efficiently to the achievement of planned results.

The responses of the different interviewees on the efficiency of the implementation process were generally positive. It was stated by many interviewees that the steps of the process, from the announcement of the project and evaluation of the applicants to the actual implementation, were efficient and transparent. Several interviewees emphasised that the selection process was performed in the best way possible without the knowledge of applicants of the distribution of weights used in the criteria, as some of them may not have approved with the selection of weights. It was stated, not only by the project coordinators, but also by many beneficiaries including committee members and community leaders that the evaluation group actually reviewed all applications to double check the information.

Concerning unit prices for the different project activities, it is clear that they were all minimal compared to market prices, proving an efficient tendering process. This was stated by all the interviewees, especially those who implemented part of some activity and those who had experience with prices. This was also confirmed by the evaluation team from their previous experience of similar projects. Abu-Mohammed from Bani Suhila thought that this aspect of cost minimisation actually allowed more people to benefit.

Transparency was very good in the implementation process, demonstrated by the following main points:

- ✧ An announcement about the project in the targeted areas through loud speakers, written signs hung in public places and a workshop.
- ✧ The project manual that illustrated all necessary information for project implementation.
- ✧ The selection of beneficiaries through open workshops, a selection criteria and a transparent scoring system.
- ✧ Tendering and contracting that occurred in an open atmosphere and with the participation of local committee representatives.

The equitable geographical distribution of activities, according to the number of beneficiaries, is clear from the activities performed in the different locations and the amount of money allocated. This is true of the distribution between targeted areas in the Gaza Strip, but also true among the different beneficiaries. One can see the clustering approach in selecting the targeted communities. This will have helped to maximise the impact of the project activities, since integrity can be emphasised in this way between the different activities and the different communities in a certain district or cluster.

Another issue in the implementation process is adequate staffing. Although all the people interviewed mentioned the effective role of ACPP in implementing the project, it is the belief of the evaluation team that the project was understaffed. Additional staff in future activities may be needed to further assure a high quality of work on the field level and to avoid any delays in financial matters, especially payments.

Despite this understaffing, it is the belief of the evaluation team that all the implementation process phases - from the baseline survey, to recruitment, to selection of beneficiaries and to actual implementation - were performed successfully and in an optimal manner, again in many cases thanks to local committees. An insistence of the ACPP team on high standards and high quality of work in the implementation process was clear and mentioned by many interviewees.

An important point to note in the work concerning the implementation process is that despite the difficult political circumstances affecting freedom of movement, there were no vastly significant interruptions. This was explained by the fact that a large number of the workers were from surrounding villages or from the target village itself. A handful of interviewees did mention minimal delays that were due to some contractors not being able to source all the materials on time.

Continuous closures in the Gaza Strip did indeed hinder the availability of certain construction materials, in turn preventing full implementation of some of the proposed project activities. The largest example of this was the lack of cement that prevented the installation of a waste-water treatment plants and completion of all cement pools originally proposed in the project. Such obstacles were successfully solved by proposing viable activities to replace the previous ones. As the new activities were still a priority for the different targeted communities, they were approved by the

donor and implemented with an acceptable delay given the ongoing conditions in the Gaza Strip.

The changes that took place whilst executing the project were justified. All of these changes were due to the lack of construction material, mainly cement. The replacement activities were efficiently implemented, (despite restrictions on movement and closures due to the political situation) and reflected the needs and priorities of the local population. According to people interviewed, all the new activities are essential to them.

The above was also confirmed by the analysis of the questionnaires. Table 5 shows the mean value of the answers related to the efficiency of the implementation process. From the table, it is clear that according to the selected sample, people believed that the project was implemented in an efficient way. The overall average score for all project activities was 88%. This number ranges from 83% for sunroof tanks to 92% for the rehabilitation of greenhouse activity. No significant differences in the efficiency were found between the different locations for any given activity.

Table 5: Mean Values of Responses for the Efficiency of the Project Implementation Process

Project Activity	Mean Value of Responses (%)
Restoration of 10 agricultural wells	91
Construction of 10 cisterns	91
Construction of 100 home gardens	88
Establishment of 240 family farms	86
Distribution of 150 water tanks	85
Distribution of 46 irrigation networks	89
Rehabilitation of 10 green houses	92
Rehabilitation of 48 sunroof tanks	83
Overall Project Activities	88

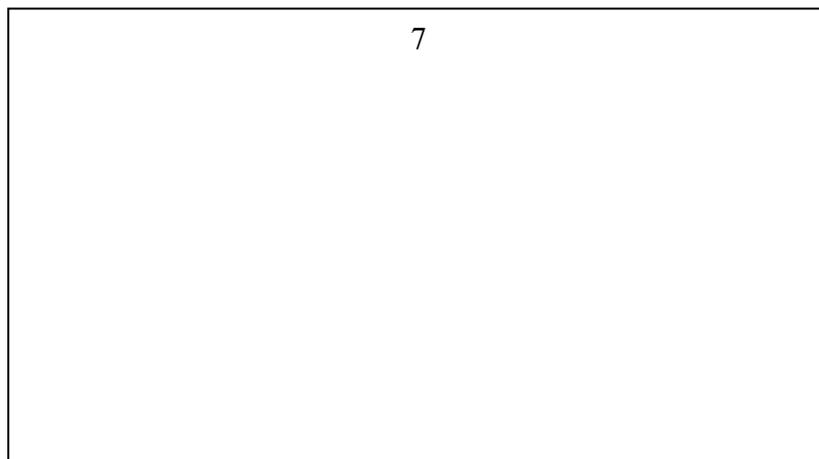
9.4 Project Effectiveness and Impact

Project impact is the most important aspect in evaluating development projects. The aim of this evaluation was to determine what difference the project made in practice and to what extent the principal objective of improving the food security conditions of families was achieved. The evaluators asked the interviewed beneficiaries and stakeholders about the

specific outcomes of the different project activities in order to discover what they believed the project helped them achieve. They all admitted that a lot remains to be done but that the project helped satisfy a good part of their needs. Most importantly, it was generally perceived that the project contributed to improving food security conditions.

Different success stories were cited as evidence of the enhanced food security conditions. Most interesting are the stories related to people who were able to generate their only income with the help of the project, as was the case with some home garden and family farms activities.

Ahmad from Khuza'a said that he had benefited from the irrigation networks provided by the project because they helped him increase the output from his land. His income consequently grew and affected all his life positively.



Many others benefited from home gardens and farms, finding like Ahmad, that the activities helped them increase their income and as a result, improve their livelihood and way of living. They also mentioned that the home gardens improved their nutrition conditions since they can produce some vegetables that they could not offer to buy from the market..

Many of the farmers interviewed highlighted how through the project, different family members were able to work in the constructed farms. This is true given the fact that most of the Gazan farmers depend on agriculture for their main income, and many of their children and younger members of their families also participate in the working activities in the various farms.

Therefore, the home gardens, family farms, irrigation networks and green houses did create additional jobs for the communities targeted. This will enhance the food security conditions in the area. The different project activities also created other supporting jobs, e.g. transport, packing of crops and marketing jobs.

Mahmoud from Gaza said that his family had thrived from the family farms activity. 'We can produce some food out of the farm now that we could not offer in the past' said Mahmoud. This shows the positive impact on the food security conditions and on the economic conditions of the beneficiaries and the surrounding community.

Another participant said that he benefited from the irrigation network activity. This project made irrigation easier and more flexible and helped to irrigate wider areas. He insisted on thanking PHG and ACPP for the project.

The project had a positive impact on improving access to water supplies. This is true in the case of the restoration of agricultural wells, the construction of cisterns and the distribution of irrigation networks. In Khuza'a, for example, interviewees were very content with the impact the project had had on their daily living. One beneficiary mentioned that the restoration of agricultural wells component of the project motivated him to cultivate his land that he had abandoned for so many years.

The construction of cisterns and cement pools helped people to reduce their water purchasing costs and allowed them to have more water for agricultural purposes. This allowed these people the possibility of cultivating more land and producing their own agricultural products. Participants were very happy, for instance, with the cement pools. "We saved money on water by having these cement pools", said different interviewees from Gaza.

The irrigation networks and cement pools also helped people to reduce the unit cost of water. Due to the new drip irrigation network in many areas, (including Bani Suhaila and Khuza'a) less water was needed for irrigation and the overall water cost reduced. In the case of cement pools, a reduction in cost also took place because farmers need to buy less water from tankers, which have a higher cost comparatively to other water sources.

The project made food more available in rural areas and in many cases at a family level also. This is true in the irrigation networks, home gardens and

family farms activities. Um Hassan from Bani Suhaila said that she no longer has to buy many products since cultivating her own home garden. She grows many food varieties and products.

The project had a positive impact on managing natural resources. This was achieved through training exercises, demonstrations and extension activities provided during the implementation of the different project activities. Although the level of appreciation of training activities was not as high as in other activities, people did mention that they benefited from such training and much of what they had learned they had already implemented in their agriculture and irrigation practices.

In various areas it was voiced that lands had not been cultivated for several years due to a lack of water but they had now resumed cultivation. Income generation was an issue that was mentioned frequently by beneficiaries. They reported that the different project activities succeeded in improving their income. The socio-economic impact resulting from this is valuable and very clear in many cases.

A great number of success stories from different locations and projects were reported to the evaluators. In Khuza'a, Mustafa mentioned that he was forced to buy tanks for irrigation and now after the cement pools construction he can save 2,000 NIS per season.

The evaluators heard a particularly large number of success stories in Bani Suhaila. Sana' mentioned that she benefited from the home gardens activity; she now plants her garden with various kinds of vegetables and provides part of her family's needs from its produce.

The impact of training was also maximised. Most of the training sessions took place during afternoons or late afternoons. This allowed people to participate who could not make it during morning hours and enriched the social life of the community. Gender issues were taken into consideration in all aspects of the project, including the training activities.

The program had an added effect of reducing the unemployment rate locally, especially during the period of implementation. During site visits and focus groups, narratives were frequently shared about the benefits of job creation on community life. As well as being a beneficiary, Mr. Abu Khaled from Al-Mawasi told the evaluators how working on the project had significantly helped him fund his daughter's academic studies .

In addition to improving food security conditions in the targeted communities, other positive impacts were reported by the interviewees including how:

- ✧ The different project components helped to motivate people to go back and cultivate their land. This is not only a local priority but also a national one, (considering all the external forces that sometimes make people leave their lands).
- ✧ To a certain extent, the project helped promote good relations between neighbours. “Water and land are now more efficiently used and people are cooperating”, said a farmer from Khuza'a. Social relations and solidarity were generally enriched and sharing products from home gardens now takes place.
- ✧ “The irrigation networks and cement pools activities helped people to work on their own land as they can afford water prices. I do not have to work in other areas and destroy the dignity of my family any more” said a resident of Bani Suhaila.
- ✧ In some of its targeted areas the project helped to attract the attention of other donors and was successful in motivating them to implement additional and much-needed infrastructure projects.
- ✧ The project also had a positive environmental impact, especially the water savings project and the restoration of ground water wells. These activities contributed directly into saving the surrounding environment and motivating people to increase the green area, reduce aquifer pollution and prevent soil erosion.

Based on the interviews, it is evident that the project had a positive impact on the livelihoods of people in the targeted areas. The size of this impact varied from one activity to another. The success stories mentioned in different locations and for the different activities were wonderful. No failure stories are reported here simply because none were detected by the evaluators. Everyone interviewed insisted that the project had a positive impact on the livelihoods of not only certain beneficiaries but on the targeted communities in general.

All the above is also confirmed by the analysis of the questionnaires. Table 6 shows the mean value of the answers related to the project's effectiveness and impact. The overall project effectiveness and impact is measured at 90%, reflecting the excellent result of the project in improving food security conditions in targeted areas. There are some variations in the level of impact between the different activities. The water supply activities, i.e. the cisterns, the agricultural wells and the irrigation

networks, had the highest effectiveness and impact, while the green houses and sunroof tanks had the lowest impact according to the outcome of survey. It should also be mentioned that statistical analysis shows no significant differences between the results of a certain activity in the different locations.

Table 6: Mean Values of Responses for Project Effectiveness and Impact (%)

Project Activity	Mean Value of Responses (%)
Restoration of 10 agricultural wells	92
Construction of 10 cisterns	93
Construction of 100 home gardens	93
Establishment of 240 family farms	93
Distribution of 150 water tanks	91
Distribution of 46 irrigation networks	89
Rehabilitation of 10 green houses	82
Rehabilitation of 48 sunroof tanks	88
Overall Project Activities	90

9.5 Project Replicability

Another important issue for evaluation in such a development project is replicability. When the evaluation team asked whether this project was competently conducted and worth repeating, respondents agreed that it was, although this varied from one activity to another.

Interviewees asserted that due to the success of the project, the positive impacts it had on livelihoods and the professionalism with which it was implemented, they wished it could be conducted again and that more people could benefit from it.

The evaluators were told that only 20% of the people who filled in the application in the cisterns activity actually received a cistern. This can be seen to highlight just how great the need is for such a project.

The restoration of agricultural wells was the main activity that all people interviewed insisted should be repeated, owing to great local needs in this field.

In Bani Suhaila, the people interviewed agreed that the home garden and the irrigation networks were the best development projects they had ever

had in their town. “This is the best project since it brought people back to cultivate their abandoned land and secure healthy food; we are very proud of it”, said a resident of Bani Suhaila.

The above is confirmed by the analysis of the questionnaires. Table 7 shows the mean value of the answers related to the project’s replicability, which was 89%. Minimal variations are noticed between the different locations that are on account of differing priority needs of the communities. However, the variation between the different locations, when statistically tested, shows no significant difference between the results of a certain activity in the various locations.

Table 7: Mean Values of Responses for Project Replicability (%)

Project Activity	Mean Value of Responses (%)
Restoration of 10 agricultural wells	92
Construction of 10 cisterns	93
Construction of 100 home gardens	94
Establishment of 240 family farms	94
Distribution of 150 water tanks	91
Distribution of 46 irrigation networks	83
Rehabilitation of 10 green houses	82
Rehabilitation of 48 sunroof tanks	85
Overall Project Activities	89

9.6 Project Sustainability

As a development project, assuring sustainability of the different implemented activities is extremely important. The evaluation team asked the interviewees about the sustainability of the project and whether the positive outcomes would or would not continue. They all believed that the positive impact on the community would continue as the project activities, they said, form essential components of their lives and are therefore also sustainable.

Most of the interviewees mentioned that the implemented activities helped develop their major source of income and is another good reason assuring sustainability. “Water is our lives, we could not cultivate our land without it, it saves my dignity because now I work in my land and I do not have to

go and work in another areas”, said a farmer from Gaza. These words from Salah were heard in many of the targeted areas.

Moreover, the project activities were implemented in a way to make their impact sustainable. The quality of material used and the methods of construction were of a high standard. These factors continue to enrich project sustainability and help maximise project benefits. For example, the irrigation networks are of the best quality available which will increase their lifetime.

Training is another important aspect of sustainability, especially training activities that consider how to organise different project components. Only by increasing participants’ awareness of project and activity management can there be some guarantee of sustainable outcomes. This was achieved in this project through training programmes that covered different relevant aspects of the implemented activities in each location.

Another issue that supports project sustainability is ensuring that none of the project activities contradict any of the prevailing socio-cultural attitudes and practices. On the contrary, the project activities discussed here enrich deep-rooted social practices such as rain-water harvesting and a love for the land.

The role of women in the project has been emphasised in various aspects including: home garden activities that were made exclusively for women, involvement of women in local committees and special training courses assigned for women. Such maximisation of the place of women in the project also enhances sustainability, as women in Palestine play the major role in food security.

Finally, the positive economic, environmental and social impacts of the different project components on the target communities form a major part in assuring project sustainability.

Based on all the above and the large number of interviews, it is fair to state that the project seems secure. This conclusion is supported by the analysis of the questionnaires. Table 8 shows the mean value of the answers related to the sustainability of the project. According to the tabulated results, the overall project sustainability is very good at about 94%. This value ranges from 84% for the irrigation network to 96% for the family farms activity. It should also be mentioned here that no significant differences were measured between the mean values of a certain activity for the different locations.

Table 8: Mean Values of Responses for Project Sustainability (%)

Project Activity	Mean Value of Responses (%)
Restoration of 10 agricultural wells	92
Construction of 10 cisterns	86
Construction of 100 home gardens	93
Establishment of 240 family farms	96
Distribution of 150 water tanks	95
Distribution of 46 irrigation networks	84
Rehabilitation of 10 green houses	91
Rehabilitation of 48 sunroof tanks	90
Overall Project Activities	91

9.7 Meeting Food Security Principles

Food security is defined as the access to sufficient, safe and nutritious food that meets dietary needs and food preferences for an active and healthy life according to FAO definition. Individuals are considered food and nutritionally secure if the following components of food security are present:

- ✧ Availability – sufficient quantities of food of appropriate quality are present, whether supplied through domestic production or imports (including food aid).
- ✧ Access – access by individuals to adequate resources (entitlements) to acquire appropriate foods for a nutritious diet. Entitlements are defined as the set of all those commodity bundles over which a person can establish command given the legal, political, economic and social arrangements of the community in which they live (including traditional rights, e.g., access to common resources).
- ✧ Utilisation – Consumption and utilisation of food through: adequate diet, clean water, sanitation and health care to reach a state of nutritional well-being for which all physiological needs are met. This highlights the importance of non-food inputs such as health for nutritional outcomes.

Stability is an important dimension of food security, based on the consideration that an individual, household, or population must have access to adequate food at all times and should not be at risk of losing access to food as a consequence of a shock, such as an economic or

climatic crisis, or, cyclically, perhaps during a particular period of the year (seasonal food insecurity).

Based on the above and following the four food security components according to Palestinian Food Security strategy, the project had improved the food security conditions in general through its targeted results. Thus, in terms of food security, the different projects increased and improved the following four major components:

- ❖ Accessibility (restoration of groundwater wells, construction of cement pools, home gardens, irrigation networks)
- ❖ Availability (restoration of groundwater wells, drinking water tanks, family farms, home gardens, plastic houses)
- ❖ Quality (home gardens, sunroof tanks, irrigation networks)
- ❖ Awareness (training program and extension services)

All the above is confirmed by analysis of the questionnaires. Table 9 illustrates the mean value of the answers related to the project's impact on enhancing food security in the targeted areas. The average response is estimated at 91%. This is a high number that reflects the effectiveness and relevancy of the implemented activities in enhancing the food security conditions in the targeted areas. The variation between the different locations, when statistically tested, shows no statistically significant differences between the results of a certain activity in the different locations.

Table 9: Mean Values of Responses for Project Enhancement of Food Security (%)

Project Activity	Mean Value of Responses (%)
Restoration of 10 agricultural wells	92
Construction of 10 cisterns	93
Construction of 100 home gardens	93
Establishment of 240 family farms	92
Distribution of 150 water tanks	88
Distribution of 46 irrigation networks	91
Rehabilitation of 10 green houses	90
Rehabilitation of 48 sunroof tanks	82
Overall Project Activities	91

10. Evaluation Conclusions

The overall objective of the project under evaluation was to improve the nutritional and economic conditions of targeted communities. As a direct evaluation of this objective, it can be stated that all mentioned project activities have been implemented. In addition, the estimated number of beneficiaries to the project has been achieved or slightly increased in the activities due to good unit prices from different contractors despite the changes that took place on the activities due to lack of construction material.

Based on the reviewed documents, interviews with beneficiaries and stakeholders and the results of the questionnaires distributed, the following points can be stated:

- ✧ In general, the implemented activities were relevant to people's needs and demands. Analysis of the questionnaires shows that on average 89% of the beneficiaries considered the project relevant to their needs. The degree of relevance ranged from 84% for the sunroof tanks activity to 94% for the construction of cisterns activity.
- ✧ Participants believe that the project was efficiently implemented. The average score for the implementation process of all project activities was 88%. This number ranged from 83% for the sunroof tanks activity to 92% for the green houses activity.
- ✧ The different project components show a high level of replicability. This was entirely due to the positive impact the project had on the communities and the high needs in the targeted area for such kinds of activities.
- ✧ The various project components impacted differently on the targeted beneficiaries. The overall project effectiveness and impact is measured at 95%, demonstrating a positive impact of the project in terms of improving food security conditions. Additional impacts were recorded, including: improvement of standards of living, furthering good relations between neighbours, a positive environmental impact of the different activities and finally, the project helped people resume cultivation of land that had been neglected for many years.
- ✧ The project improved food security conditions in the targeted communities by enhancing and integrating the four major components

of food security listed in the Palestinian Food Security Strategy. These are accessibility, availability, quality and awareness.

- ✧ According to our evaluative results, the overall project sustainability is very good at about 91%. This value ranged from 84% for irrigation networks activity to 96% for the family farms activity. Supplementing the questionnaire results were personal statements from certain beneficiaries on a variety of topics that reflected positively on the sustainability of the project.
- ✧ The project had different positive environmental and socio-economic impacts, including income generation due to different project activities, improving health and improving the beneficiaries' access to clean drinking water and sufficient good-quality food. Some of these impacts target core principles of human rights.
- ✧ Finally, a large number of success stories were collected for the different project activities, especially for the water supply components and the wells rehabilitation. At the same time, not a single failure story was reported during the interviews or in the survey.

Based on the above, the evaluation team documented evidence of exemplary efforts and progress towards meeting the main goal of the project. The evaluators were not able to collect any evidence of deficiencies or failure stories in implementing the project. Nevertheless, some recommendations can be drawn from the interviews and the team's previous experiences. These specific recommendations to ACPP include the following:

- ✧ ACPP is encouraged to continue implementing such kinds of projects due to the high needs of many communities and strong replicability of the activities. This is especially true for land reclamation and collective irrigation network activities.
- ✧ ACPP is also urged to continue communication with the local communities in towns and villages where this project was implemented. The evaluation team believe that this will help secure project sustainability, especially since a large percentage of committee members are involved in other civil society organisations and/or are community leaders.

11. General Recommendations and Lessons Learned

Many interventions similar to those implemented in this project have been implemented by the Palestinian Hydrology Group (PHG) and other NGO's. A small sample of these previous activities is shown below in Table 10.

**Table 10: A sample of Similar Interventions
in the Gaza Strip**

NGO	Activities Performed
Palestinian Agricultural Relief Committees (PARC)	Upgrading irrigation networks; Replanting damaged lands; Rehabilitation of livestock farms.
Union of Agricultural Work Committees (UAWC)	Rehabilitation of Citrus and Olive farms, using Copper Sulphate and Inactive Calcium Hydroxide (Bordeaux Mixture); Rehabilitation of greenhouses; Rehabilitation of agricultural roads.
Arab Center for Agricultural Development (ACAD)	Construction of concrete rainwater harvesting ponds.
Palestinian Hydrology Group (PHG)	Upgrading irrigation networks; Rehabilitation of groundwater wells Construction of cisterns Construction of family farms with livestock Construction of home gardens; Rehabilitation of agricultural roads.

Based on the evaluation above, meetings with different NGO representatives dealing with food security interventions, one can reach to the following recommendations:

- ✧ The level of positive impact of a certain activity is not only a function of the type of activity but also a function of the type of beneficiaries (farmers or other, men or women) and their priority needs. Table 11 below summarises some of the activities and listed the type of beneficiaries who profited most from these activities:

Activity	Type of Community that Benefited the most	Comments
Construction of Cisterns	Rural areas with no water supply system and/or insufficient water resources	Families with agricultural land benefited more than others
Construction of green houses	Families depend on agriculture	More beneficial in areas with sufficient water supply
Home gardens	Families with the women being the head of the family	Families with no other income
Irrigation networks	Agricultural areas with no water supply system	Collective irrigation networks are usually better than on farm irrigation networks
Rehabilitation of domestic water networks	Areas with a water resource but lack a water supply system	Families with low income would benefit more than others since such projects will increase the affordability of having sufficient, clean water
Rehabilitation of water sources such as springs and wells	Areas with insufficient water resources	Agricultural communities benefit more since they can use any additional quantities for irrigation
Rehabilitation of agricultural roads	Rural areas	Farmers who own large pieces of land benefit more
Food aid projects	Urban areas especially refugee camps	People with low income and those with disabilities would benefit more
Cash aid projects	Urban areas especially refugee camps	Women and the disabled who cannot work certain jobs have the greatest benefit

- ✧ In terms of job creation, distinct activities have different job potentials. In agricultural communities, most of the farmers depend on agriculture for their main income, and many of their children and younger family members also participate in the working duties of the various farms. Therefore, it is expected that the employment ratio will increase due to the agricultural components. This means that projects which enhance agricultural production work better in terms of job creation in rural areas and for families earning their income from agricultural activities. Also, agricultural projects usually create many other supporting jobs. These include: transportation, packing of products, crushing of olives and marketing jobs. In addition to this, indirect employment

opportunities for suppliers of raw materials are generally created by projects such as these. This is most clear in construction projects such as irrigation networks, green house rehabilitation and water network extension and rehabilitation. When compared to cash for food or food aid activities, development projects such as the ones mentioned above are more successful in regards to job creation. Furthermore, sustainability is higher than in other food security projects.

- ✧ Some food security projects have positive environmental impacts, these include irrigation projects, home gardens, cisterns and programmes which rehabilitate water supply networks. Other food security projects have a less direct and less favourable environmental impact, as is often the case with food aid, cash aid and family farms with live stock projects. Examples of positive environmental impacts include:
 1. Reducing pollution levels to some degree. This includes the following: rehabilitation of a water supply network, rehabilitation of springs, land reclamation and terracing and irrigation network projects.
 2. Strengthening the environment and water management of the agricultural sector and irrigation process.
 3. Rainwater harvesting projects which generally contribute to reduce the over-usage of water pumped from wells.
 4. A positive impact on the soil characteristics, especially with drip irrigation projects. Using harvested rain water will first leach the accumulated salts out of the root zone of plants and therefore help the plants to absorb sufficient water and grow healthily.
- ✧ Living conditions are harsh in the target areas, especially in places where trees have been uprooted, lands raised and greenhouses destroyed. These living conditions have had a negative impact on the standard of living and general psychological well-being. Selecting the most appropriate interventions for this context is not an easy task under such a high needs atmosphere. It is without surprise that the depth of the impact is expected to vary from one farmer to another, depending on the kind of service provided and the time span required to yield the required results. Under these conditions, the priority ought to be with basic life needs such as food security than any other thing. For that, projects related to accessibility and availability of basic needs will have the most impact on the targeted communities. These projects include initiatives to increase accessibility with road rehabilitation projects and land reclamation projects as well as increasing availability

of resources, through for example, rainwater harvesting projects and the rehabilitation of water sources.

- ✧ Considering gender issues, agricultural projects in general usually help to provide jobs for women in their lands since some 70% of activities in agriculture, such as weed control and the collection of produce are tasks usually performed by women. This helps reduce costs incurred by farmers. Although women are not usually paid to perform agricultural work, they did not report feeling negatively about it, most probably as the activities take place in their lands, and benefit their families.
- ✧ Implementation procedures differ according to food security projects in aspects such as type of community participation, technical issues and methods of implementation. In general, effective community participation is an essential component in the success of any food security project. It not only assures that the implemented project becomes a priority to the community but also enhances the sustainability of any positive impact.
- ✧ The level of technical issues needed for a certain food security project varies from one project kind to another. While projects of food aid and cash aid need almost no technical details, others such as rehabilitation projects and construction projects require more. Accuracy in technical details leads to a greater sustainability and effectiveness of any project.
- ✧ Between the different actors, (local and international NGOs, public-sector bodies, communities and the private sector) cooperation in the food security area is a necessity. Although cooperation in all activities and efforts maximises positive impact, some activities in food security demand more cooperation than others. Projects that have more than one funding agency, or projects that require the approval of a number of authorities typically have a more cooperative atmosphere than smaller projects. A lack of cooperation and communication about what the others were doing typically produced a duplication of effort for the same target group. This is very common in cash aid and food aid projects. The evaluation team were told about different cases concerning lack of proper coordination. Many of the donors now realise that in the future, a database or a central source of information regarding all food security activities per location is vital.
- ✧ In some food security projects that include components regarding infrastructure, there is a need to identify and approach the training needs of the targeted community. For example, in agricultural projects there is a general demand to train farmers on new agricultural techniques, marketing methods, cropping patterns and diversification.

This does not only increase community awareness but enriches project sustainability and effectiveness.

- ✧ Finally, increasing sustainability and maintaining the positive impact of any activity is important. There are different aspects to achieving sustainability, the most important of which, (according to the interviews) is instilling both the community and individuals with a sense of ownership towards the project. The durability of infrastructure and the selection of projects therefore becomes a priority to the targeted community. Wherever possible, the community should have a share of the project in order to enrich feelings of ownership.

12. References and Acknowledgements

This evaluation would not have been possible without the help of more than 200 people, including ACPP and PHG officials, PHG employees, beneficiaries in the different villages and others who attended the FGD. The evaluation team would therefore like to express its profound gratitude and appreciation to each of these individuals for their help and support.

Special thanks go to Engineer Nahed Abu-Shbak from PHG and Ursula Urdillo and Enrique from ACPP for providing the evaluators with all the references needed to conduct this assessment. Their valuable assessment and suggestions were enormously helpful.

We would also like to extend our appreciation to Miss Naimah Mohammed and her team for their support in distributing the questionnaire. They were extremely helpful, also arranging for the evaluators to meet the beneficiaries and stakeholders involved in the project.

Finally, we would like to express many thanks to the people of all the targeted villages and in particular to well owners who were always ready to meet with the evaluation team to discuss different issues.

References

- PNA (1997), Palestinian Water Authority, The Comprehensive Planning Framework of the Water Sector (Final Report, Volume 2).
- PNA (2000), Palestinian Water Authority, Water Sector Strategic Planning Study (WSSPS).
- PNA (2001), Palestinian Water Authority, The Coastal Aquifer Management Plan (CAMP).
- PNA (2003), Palestinian Water Authority, The National Water Plan.
- PNA (2004), Ministry of Agriculture, The Agricultural Strategy and Policy.
- PNA (2005), Ministry of Agriculture, Agricultural water demand, report (2005).
- PNA (2006), Ministry of Planning, The food security strategy, PNA.