Political and Socio-Economic Dimensions of Rainwater Catchment on the West Bank - Palestine

Samar Michael Husary, Abedul Rahman Tamimi, Salam Rihan, Ahmad Allan
Palestinian Hydrology Group
Email: samar.husary@excite.com

Abstract

The major components in the Palestinian-Israeli political conflict since 1948 are the land and water resources; i.e., control and management of water. Because of the limited water resources and the land confiscated by the Israelis, many national and international Non-Governmental-Organizations are working together with the Palestinians to take care of their water needs. Within the political context, rainwater catchment is the only water source for the rural areas suffering from water shortage. In fact, 37% of the population of the West Bank live in areas without sustainable water supply systems, and 49% of the communities have no water supply systems.

The Palestinian Hydrology Group, together with other agricultural organizations developed a program to help people in rural areas to collect rainwater for both domestic and irrigation purposes. The program involves construction of concrete ponds and cisterns. Concrete ponds (with a capacity up to 2200 m^3) are used to collect rainwater from roofs of greenhouses and direct runoff. The water is used to irrigate the surrounding land and the green houses. Cisterns (with a capacity up to 200 m^3) are used to collect rainwater from the roofs of the houses. The program provides beneficiaries with technical and financial support. The beneficiaries from the program used to buy one cubic meter of water for about US$5. Cisterns with a capacity of 150 m^3 can fulfill the domestic needs for an average of more than six months and save about 50% of the money allocated for water purchasing. Concrete ponds, used to irrigate uncultivated land or the greenhouses, help in providing families with extra income. Besides, the socio-economic dimensions of the program, rainwater collection helps to prevent confiscation of Palestinian land by the Israeli authorities.

I. Introduction

The basic principle of Islamic water law is that water should be available to all members of the Moslem community. Islamic water law recognizes two important water rights:

The right of thirst: the right to take water to quench one's thirst or to water one's animal, and
The right of irrigation: the right to employ water to cultivate land.

These two major rights formed the basic for the water laws put into effect by everyone who controlled the Palestinian Territories starting from the Ottoman Empire, to the British Mandate and the Jordanian Rule over the West Bank.
Before 1967, all water resources in the Palestinian Territories were considered private property. There were no restrictions on well drilling, pumping to utilize the water from the aquifer or establishing any water or water related project. The total water consumption in the West Bank was estimated at 81.5 MCM/ year, of which the total quantity of water used for domestic purposes was 6.5 MCM.

After 1967, the Israeli occupation authorities issued a series of military orders that put water

resources under the authority of the military commander of the Palestinian districts. Over the last 27 years, military occupation has had a major impact on the management and sustainable development of Palestinian water resources, and has had particularly serious effects on the water resources and the political geography of the West Bank and the Gaza Strip. The Israeli military orders stipulated rules and regulations, taking into consideration all water issues; water transfer, water extraction, sale and distribution, control of water use, water sharing, rationing of water, consumption, construction of water installation and drilling of water wells. They also considered granting of permits for all matters of water resources, i.e., groundwater and surface water, including springs, ponds, streams and rivers. They considered the setting of prices and quantities allowable for use by indigenous Palestinian inhabitants and the farmers in Palestinian Territories. These orders have amended all other water laws made prior to 1967 and made it easier for the Israeli authority and the Jewish settlers to seize and utilize water in the Palestinian Territories.

In the Palestinian Territories, water is the most precious natural resources and its relative scarcity is a major constraint on economic development. Furthermore, the control and allocation of water resources are crucial issues in the multilateral peace negotiation. Both the Palestinians and the Israelis claim to have property rights on all or even on parts of the annual flow of the so-called „water under dispute." From a Palestinian point of view, the scarcity of water in the Palestinian Territories requires that the Palestinians be given property rights on all their water resources and future investments in water projects to maximize the capacity of the available water resources.

Water resources in the Palestinian Territories (PT's) are insufficient for many reasons. First of all, Israel uses most underground water resources situated under the West Bank for their population in Israel, as well as for the Jewish settlers in the PT's. Secondly, Palestinians have not been allowed to obtain their legitimate share of the waters of the Jordan River. Thirdly, Palestinians were neither allowed to promulgate their own water laws, or to develop a competent water management system. The Palestinians suffer from lack of water provided to their communities for both domestic and irrigation purposes. There are about 49% of the rural communities in the West Bank with no sustainable water supply, they fulfil their needs by purchasing the water from the closest municipal facilities or from tankers. In terms of population, 37% of the population have no access to water supply. On the other hand, in the southern part of the West Bank, Hebron and Bethlehem Governorates, the two Governorates suffers from shortage of water supply. The cities and towns connected to water supply do not have water year round, because there is no enough water to supply their network, for more than six months a year. During the summer months, they get water only once a month.

II. Palestinian Hydrology Group Program

Rainwater harvesting and storage do not constitute a new technology. The ancient Romans became masters in rainwater harvesting and the construction of reservoirs. It was this new techniques of building closed cisterns, and at the same time the urbanization within the Roman Empire around the Mediterranean, which resulted in the development of rainwater catchment culture at all those places where water resources were limited. Rainwater harvesting is gaining importance again, for example in rural areas and especially so in many developing countries due to the present water crisis in these countries, demanding the utilization and development of all possible sources to ensure the supply of water.

Through its work in the field of water and environment, PHG recognized that the main

problems of the Palestinian people and particularly the farmers are the problem of water availability. Through the involvement of some of its member in the peace negotiations, PHG conceived that the Israeli-Palestinian negotiation concerning the final settlement and in particular the water issues, is facing many difficulties. The mentioned two reasons reveal the development of the Rainfall Harvesting program by PHG.

The program developed by PHG in co-ordination with some human and agricultural committees is oriented towards marginal water resources whose development will not create any conflict with the Israelis and in the same time highly benefit the Palestinians in overcoming their water problems. The program is highly supported by international organizations and encouraged by the Israelis.

The main objectives of the program are:

. Developing water resources for domestic use in the margined communities.
. Increase amount of water available for agricultural purposes.
. Raising environmental awareness for water saving practices for both domestic and agricultural purposes.
. Keeping the land from being confiscated.

In its program, PHG is targeting the rural areas without water supply networks suffering from the water shortage, and the farmers who do not have water or access to water for irrigation

The Program has the following specific objectives:

Social Objectives
Political Objectives
Economical Objectives
Environmental Objectives

Social Objectives

Supporting the neglected rural areas and marginalized people in the Palestinian communities by helping them in constructing cisterns to get their own water supply.
Supporting Farmers in the agricultural sector by helping them to construct cisterns and pools to provide their own irrigation water supply.
Achieving community participation by implementing low cost, small-scale projects; i.e., cisterns, pools, etc. This helps communities to be independent.
Helping communities, such as the Bedouins, to settle down. When Bedouins are encouraged to settle by establishing a fixed water supply, it will help other social and human institute to provide them with facilities such as schools, clinics, etc.
Supporting women in rural areas, as they are responsible for the issue of water in the rural communities. The program supports them by raising their awareness in terms of water conservation and environmental issues.

Political Objectives

Protecting the land from being confiscated by Israelis.
Using all the available water resources that are not considered in the negotiation with the Israelis over water. This will help to overcome the water crisis (on a small scale) without

rushing the Palestinian into accepting any compromised solution suggested by the Israelis, since this might affect the Palestinian water rights.

Environmental Objectives

Enhancing environmental friendly practices by keeping clean drinking water supply and raising public awareness
Introducing basics of public awareness by giving lectures and holding workshops.

Economic Objectives

Providing drinking water for families, thus reducing expenses allocated for water to 54%.
Using rainwater increases the cultivated land and thus increases the income of poor families.

III. Criteria for Beneficiary Selection

PHG defined two major areas for the activities of its program, the rural areas at the southern Governorates, Hebron and Bethlehem, and the northern Governorates, Nablus, Jenin and Tulkarem, due to the crucial water situation in these areas. The program also defined two sectors of work, water for domestic use and water for irrigation purposes.

Selection criteria for beneficiaries of the water for domestic use:

Families or communities that have no water supply network and who are not included in the water supply master plan for the coming ten years.
Poor families or poor communities who can not afford purchasing water.
Families and communities who can participate in the construction costs by covering the labor costs, since one family member usually does the work.
Small communities that are settling in remote areas such as Bedouins.

Selection Criteria for beneficiaries of the water for irrigation:

Landlords who own lands near the settlements and who are threatened by settler to confiscate their uncultivated land.
Poor farmers owning land but can not afford construction of ponds for rainfall harvesting.
Big families who can work in the reclaimed land they own.
Farmers who are ready to participate in the process of construction supplying labor.
Farmers who are members of the farmers' unions, to encourage and improve the co-operation among organization working in the same field and help farmers to get benefit from there own unions.

As the Palestinian Hydrology Group is a non-governmental non-profit organization, most of its funding depends on donations from other countries providing money for both human and water based projects. The PHG main fund for rainfall harvesting programs comes from the international and governmental organizations as SODEPAZ/ Spain, Save the Children Foundation/USA, Catholic Relief Services/USA, and many other institutes. PHG in water harvesting project provides technical support through helping beneficiaries to locate the site for the cisterns or the pond, also in designing the structure and in defining the desired quantities and any other support needed during the construction. Also, and as a financial support, PHG provides the beneficiaries with the money to cover the material cost and

digging. The percentage of the financial support for the beneficiaries goes up to 80% for some people, while labor cost is always supplied by the beneficiaries as a community contribution to the project.

Projects Components

The Program started 5 years ago, in the northern Part of the West Bank and in the last three years it has expanded to the southern areas of the West Bank. The activities implemented in the last three years are:

Concrete Ponds

The Concrete ponds are used to harvest water for irrigation purposes. They are used to store water harvested from the roofs of the greenhouses or from direct runoff from the surrounding mountains. The water coming into these pools is filtered through a fine screen. The water stored is used to irrigate the plants in the greenhouses themselves and the surrounding cultivated area. The stored water is sufficient to a period of time that depends on the type of the plants and the time of the year. During droughts and in summer time, the ponds are used to store purchased water.

Cisterns

The cisterns are constructed underground in two shapes. Depending on the type of the soil, the shapes are rectangular and pear shape. When the cistern is constructed on a rocky area, the pear shape is used and texturing of the inner side of the hole is needed. If the cistern is constructed in area with soft soil, the rectangular shape is used and reinforced concrete is needed. Table 1 presents a summary of the work implemented in the Last three years.

Table 1: Summary Table for the Work implemented in the Last three Years

Location	**Item**	**No. of Item**	**Capacity (m^3)**
Hebron	Cisterns for Public Institutes	22	80-200
	Cisterns for Domestic Use	313	80-150
	Cisterns at Agricultural areas	78	80-200
	Concrete ponds for Irrigation Purposes	6	400-2200
Nablus	Cisterns for Domestic Use	198	80-150
	Cisterns at Agricultural areas	12	80-150
Tulkarem	Cisterns for Domestic Use	97	80-150
	Cisterns at Agricultural areas	-	
Jenin	Cisterns for Domestic Use	31	80-150
	Cisterns at Agricultural areas	40	80-150

V. Political and Social Impact of Rainfall Harvesting Program

The ponds constructed in the Hebron area are of great political importance, since these areas

are threatened by Israeli settlers and soldiers. Many pieces of land are threatened to be confiscated as they are very close to settlements or military areas. For each constructed pond, Table 2 mentions the threat, as well as the number of reclaimed pieces of land resulting from these of such ponds for rainwater harvesting.

The construction of ponds besides their political importances increased the number of jobs created in the agricultural sector. The cisterns constructed for both domestic and agricultural practices have benefited a huge number of communities. There was and still is a concentration of work in the Governorate of Hebron as the rural areas in this Governorate have been classified as the poorest area in the West Bank. Table 3 summarizes the number of the constructed cisterns and the beneficiaries of these items.

Table 2: Summary of the Location of the Ponds and the threats in the area to confiscate the land

Location	**No. Of Ponds**	**Capacity (M^3)**	**Cost/M 3 (US$)**	**Political Threat**	**Reclaimed land (Donums)**
Baq'a	2	2000	12.5	Kiryat Arba' Settlement	12
Dora	1	2200	8	Military Camp	10 +2 green houses
Sa'ir	1	1800	10.5	Bypass Road	8+5 green houses
Idna	1	400	19		4
Dora	1	800	19	Military camp	15+20 with potential to be cultivated
Totals	**6**	**7200**			**76**

Table 3: Number of cisterns and Beneficiaries using Rainfall Harvesting in the Last Three Years

Location	**Item**	**No.**	**Beneficiaries**	**Uses**
Hebron	Cisterns for Public Institutes	22	8000	Domestic use in schools, clinics, mosques and other institutions
	Cisterns for Domestic Use	313	2100	Individual domestic use
	Cisterns at Agricultural areas	78	420	Agricultural practices in the agricultural areas
Nablus	Cisterns for Domestic Use	198	1650	Individual domestic use

	Cisterns at Agricultural areas	12	80	Agricultural practices in the agricultural areas
Tulkarem	Cisterns for Domestic Use	97	680	Individual domestic use
Jenin	Cisterns for Domestic Use	31	217	Individual domestic use
	Cisterns at Agricultural areas	40	320	Agricultural practices in the agricultural areas
Total		**791**	**12855**	

VI. Cost of Construction

The type of cisterns constructed in Hebron area vary from place to place due to different types of rocks and soil in the area, the site surrounding construction and the volume. Two types of construction are adopted, rectangular shape and pear shape cisterns. The pear shape cisterns are used to reduce the need for concrete and reinforcement, the drilling is done with very simple equipment and consequently reduces costs. But this type of cistern is not suitable for all types of soils and rocks. On the other hand, rectangular shape cisterns are drilled using heavy equipment and require reinforced concrete. The costs of the two shapes of cisterns are listed below taking into consideration the volume and drilling equipment materials and labor. Details of the construction costs are presented in Table 4.

Table 4: Costing of Construction in US$.

Item	**Drilling cost Per m^3 (US$)**	**Material Cost per M3 (US$)**				**Labor Cost (US$)**	**Total Cost Per m^3 (US$)**
		Steel per m^3	**concrete (B250)**	**cement (texturing) per m^3**	**Aggregates (texturing)**		
Rectangular Shape Cistern	7.5	5	21.5	3	0.5	12.5	50
Pear Shape cisterns	25	1.5	-	3.5	2	4.5	36.5
Concrete Ponds	7.5	5	21.5	3.5	0.5	12.5	8-19*

**Depending on the areas, in some areas digging and texturing is needed others need only minimum reinforcement with cement.*

VII. Economic Analysis

Tables 5 and 6 summarize the financial benefits from the use of rainfall harvesting for both

the cistern and pond system with the program of rainfall harvesting.

Table 5: Cost Benefit of the program: Cisterns

Item	**Capacity (m^3)**	**Usage Period (Month)**	**Monthly Consumption (m^3)**	**Total Amount of Money Paid for Water per Year (US$)**	**Water Cost Saved (US$)**	**Saved Money (%)**
Cistern	80	6.5*	80/6.5=12.3	12.3m^3/month*12months *4.8*US$=708.5	386.7	54.5
Cistern	200	6.5*	200/6.5=30.8	30.8m^3/month*12months *4.8US$=1774	966.6	54.5

*The cistern serves for 5 months if the family has sanitation system and electrical machines that require water for functioning i.e., washing machines, otherwise the cistern serves for 8 months.

Table 6: Cost Benefit of the program: Pools

Item	**Capacity**	**Donums irrigated**	**Annual Profit from Irrigated Donums**	**Total**
Ponds	400	4	4 donums*500US$/donum=US$2000	2000
	800	15	15 donums*500US$/donum=7500	7500
	1800	5 green-houses 8	5 donums*3000US$/donum=US$15000 8 donums*500US$/donum=US$4000	19000
	2200	2 green-houses 10	2donums*3000US$/donum=US$6000 10donums*500US$/donum=US$5000	11000

Rainfall harvesting reduces the expenses allocated for water for domestic use by more than 50%, and the construction of ponds increases the income by about US$ 500 per donum if traditional agriculture is practices and with about US$ 2000/donum/year if green-housing system agriculture is used.

VIII. Conclusion

The Rainfall Harvesting program implemented by the Palestinian Hydrology Group has many dimensions and it has a political, social and economic impact on the rural areas of the West Bank. The construction of ponds prevents land from being confiscated, it creates new jobs in the agricultural sector and it brings economical gains to the farmers. The construction of cisterns helps to reduce expenses paid by the poor families for purchasing water, it helps to upgrade the hygienic standards of the rural families. It also helps women in their daily lives, as the women in rural areas are responsible for providing water to the family. It also enhances the living standards of the rural families and helps to overcome the water shortage in the Palestinian areas.

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