ISSN: 3029-0724

Research Article

Journal of Environmental Science and Agricultural Research

The Role of Supplementary Irrigation As a tool for Drought Management in a Semi-Arid Country Palestine

Mohammed Yousef Sbeih

Irrigation Project Coordinator PARC Ramallah, West Bank Palestine

Corresponding author
Mohammed Yousef Sbeih, Irrigation Project Coordinator PARC Ramallah, West Bank Palestine.

Received: December 17, 2025; **Accepted:** December 30, 2025; **Published:** January 07, 2026

ABSTRACT
Palestine consists of the West Bank and the Gaza Strip. The proclaimed state of Palestine has a land area of 6,657km³.

Keywords: Palestine, Irrigation, Economics, Supplementary, Irrigation, Food Production, Drought

Introduction

Water is always considered as an essential factor of life and development in arid and semi-arid countries.

Water Scarcity and the Need for Additional Water Supplies

The crisis of water scarcity looming on the horizon threatens the stability and security of the Middle East in general and the Israeli-Arab relations in particular. The Palestinian population and economy grow against finite freshwater resources, the annual per capita availability, which was about 2,000 CM in 1980, has fallen to less than 500 CM in 2000; it is predicted to fall to less than 200 CM by 2025; far below the benchmark level of 1,000 CM used as an indicator of severe water stress.

Much of the water crisis is caused by the way water is used. More than 75% of Palestinian withdrawn freshwater is allocated to agriculture and only 25% to municipal and industrial uses, compared with worldwide 69% and 31%, respectively. This implies reallocation of freshwater from agricultural to domestic and industrial uses. It is estimated that a reduction in agricultural water use by 15% would double the water available to households and industry in the region. This would reduce irrigated agriculture in a country that aims to expand it due to social and food security reasons. Moreover, the Palestinian policy-makers avoid inter-sector water transfer, mainly due to internal and external political considerations represented by the fact that Israel dominates the management of the entire water resources. The Palestinian Territories (PT) will increasingly suffer from water scarcity and consequent food insecurity, unless feasible and viable alternatives are provided. This fact has converged national, regional, and international efforts in search for additional and alternative sources of water.

The Need for Supplementary Irrigation in Palestine

As it was mentioned before, Palestine is a semi-arid country, where the average rainfall is 450mm. The availability of water is questionable. Furthermore, the availability of water for agriculture is reducing in a tangible way due to the followings:

- The normal increase in growth rate, the population of the country is increasing, so the demand for domestic water is also increasing. This will affect the availability of water for agriculture.
- 2- Since rainwater is the only source of water, the quantity of rainwater (rainfall) has been decreasing in the recent years. As well as the population has been increasing tremendously and drought will be spread and the agricultural area will become a desert by long run. The percentage of the irrigated are in the west bank is only 6% of the total cultivated area. The total irrigated area is 125,000 dunum where the total

Citation: Mohammed Yousef Sbeih. The Role of Supplementary Irrigation As a tool for Drought Management in a Semi-Arid Country Palestine. J Envi Sci Agri Res. 2026. 4(1): 1-3. DOI: doi.org/10.61440/JESAR.2026.v4.132

area that can be irrigated is more than 600.000 dunums. And it seems that the available water is decreasing and the demand for water is increasing. since rainfall is the only source of water in west bank and the rainfall quantities is decreasing so supplementary irrigation could play major role in decreasing the effect of drought

- There is a huge conflict on water issues at this stage between the Palestinians and the Israelis since Israel occupied Palestine. It should be mentioned here that during early negotiations in the peace process, four main issues have been delayed since 1992; they are Jerusalem, refugees, water and borders. Still after 8 years of negotiations, there hasn't been any significant movement on these issues. So the quantity of water that can be available for the Palestinians will probably not be increased.
- The quality of ground water wells especially in Gaza and Jericho becomes saline and shortly it cannot be safely available for agriculture.
- Due to the increase in population, water for domestic purposes will in the first option of distributing water. The best example of this is Ein Alsultan Spring in Jericho which is responsible for supplying water for both domestic and agriculture in the area, where population is increasing and the demand of water for domestic purposes is increasing as will which implies that there will be water for agriculture in the coming few years.

From the above, it seems that extra availability of water for additional irrigated area or even to sustain the irrigated area is not an easy task.

Supplementary Irrigation

Supplementary irrigation could be used for all crops in all Palestinian areas. It should be stated that 94% of the crops are rain fed crops where supplementary irrigation could be applied by different means such as

- Rainwater harvesting during winter and this water can be used for irrigation in summer. Farmers can use small pumps to pump the water to the plant or even in small plots of land farmers can irrigated by buckets from the collected water.
- Treated wastewater can be used to as supplementary irrigation to irrigate the rain fed crops. this is highly needed since rain fed crops are distributed everywhere in the west bank especially in the south ,this is applicable especially where the rain fed crops are dominant and new areas cant be planted to be irrigated by treated wastewater.
- Rain fed crops can be irrigated as supplementary irrigation. different type of crops can be irrigated as supplementary irrigation such as olive trees, almond trees where these crops are dominant in Palestine.

Cereal can be irrigated as supplementary irrigation especially in the south and middle area of Palestine where the average rainfall is less than 450 mm and adding water (irrigation during growing season) will increase the production of the crops per unit area.

The predictable benefits from using supplementary irrigation is tremendous. this can be summarized as: increasing the production per unit area where as example the production of cereals' irrigated by supplementary irrigation was 3 times of rain fed cereals without supplementary irrigation of an experiment done at ALBIREH city.

Adopting supplementary irrigation will save water that can be used for irrigated areas. since there is high demand for water for domestic purposes and it is clear that domestic purposes have the priority, so adopting supplementary irrigation can increase the production.

In addition, there are more than 300 springs are distributed in the west bank and this water is not used since the surrounding areas are already planted with olive trees or almond trees, simply supplementary irrigation can be applied by using the spring water either in summer or in winter season. Using supplementary irrigation can help in securing the fresh water used for irrigation to be use for domestic purposes.

Supplemental Irrigation

Definition

ICARDA defines supplemental irrigation (SI) as; the addition of essentially rain fed crops of small amounts of water during times when rainfall fails to provide sufficient moisture for normal plant growth, in order to improve and stabilize yields. Accordingly, the concept of SI in areas having limited water resources is built on three bases:

First: Water is applied to rain fed crops, that would normally produce some yield without irrigation.

Second: Since precipitation is the principal source of moisture for rain fed crops, SI is only applied when precipitation fails to provide essential moisture for improved and stabilized production.

Available Area That is Ready for Irrigation

Where in Gaza Strip the irrigated area could be doubled or tripled in terms of topographical situation but due to the limitation of the water both quality and quantity it is very difficult to increase the irrigated area while in the West Bank the area that could be irrigated in terms of topographical conditions estimated to be 535 thousand dunums (Awartani 1991) as in table 3.

Table 1: Distribution of area that could be irrigated in the West Bank

Location	Dunum
Plains in Jenin and Tulkarem	99,600
High land	277,40
Eastern slopes	64.6
Jordan Valley	93.5
Total	535.1

Source (Awartani 1991)

It is well known in Hebron, that the quality of grape of that man is the best in Hebron, since Hebron is of the biggest producing city (country) in Palestine.

Since the municipality constructed a pilot treatment plant, it thought of planting crops using the treated effluent. This was

funded byUSAID Three crops were selected by the Agriculture Department to be planted for the first time in Palestine using treated wastewater: clear.

Table 2: Results of El Bireh wastewater treatment pilot plant using treated wastewater

Treatment	Production of wheat (anber variety), all the plants, kg/dunum
Irrigation with treated wastewater with Fertilizer	2520
Irrigation with treated wastewater without Fertilizer	20036
Without irrigation, with fertilizer	1600
Without irrigation, without fertilizer	572

Methodology of Practicing Supplementary Irrigation in Palestine

Since the ownership of land is very small in size i.e. from 5-10 dunums, supplementary irrigation can be easily implemented for vegetables, trees and to cereals to some extent constructing of small ponds of 40-50 m^3 capacity, i.e. this pond can be located on a 14–18-meter square area. This pond can be located on the lowest point in elevation of the individual land. This land serves two farmers if agreed upon where it can be sited on the border of each farmer land.

Distributing of water to the plant can be done manually by lifting the water and distributing it to the plants by a bucket. Another way of distributing this water that this water can be lifted manually from the pond and poured into a barrel that can be located on the dip of the pond with ½ meter rose over the surface so water can be distributed to the plant by gravity through pipe line. The farmer can distribute the water pipe from the plant to another. These methods can be implemented easily with zero operation cost. Since only the farmer himself can conduct this job easily, another method of distributing water is by using small pumped electricity is available since the head required is very small.