Cooperation Through Education: How Southern West Bank, Palestine, Can Be Developed Through Agricultural Engineering

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I. Abstract

Development in the third world is greatly dependant on assistance and cooperation with developed counties. Agricultural engineering can play an important role in the educational, economical and social development of under developed countries in the world due to the nature of work that requires interaction with local people. In this paper, background information is presented about Palestine and Southern West Bank. In addition, many on-going long-term development projects in Southern West Bank are presented as examples of cooperation.
Regional and international cooperation in the field of agricultural engineering are shown to be important tools that would lead to the training of Palestinians and to the transferring of knowledge and technology. It is suggested here that this cooperation would lead to interaction and building of tolerance between nations that in turn would be one of the factors that would lead to sustainable just peace in the Middle East.

II. Background

In this section, a very brief introduction is given about Historic Palestine and Palestine. Geography of the area, agricultural crops and water resources are presented as background information for the reader. Many other resources are available for detailed information about the different topics presented. These resources are listed in the additional references for readers who want to further pursue the different topics.

A. Geography

In this paper, the term Historic Palestine is used to indicate the pre 1948 British mandated Palestine that includes today's Palestinian Territories and Israel. In addition, the term Palestinian Territories is used to indicate the land occupied by Israel in June of 1967, which include the West Bank and Gaza Strip. The name Palestine is used here to indicate the Palestinian territories: West Bank and Gaza Strip.

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1. Location

Historic Palestine lies on the western edge of the Asian continent and the eastern extremity of the Mediterranean Sea as shown in figure 1. The West Bank geographic coordinates are 32 degrees North and 35 degrees East, while the Gaza Strip geographic coordinates are 31.45 degrees North and 34.33 degrees East.

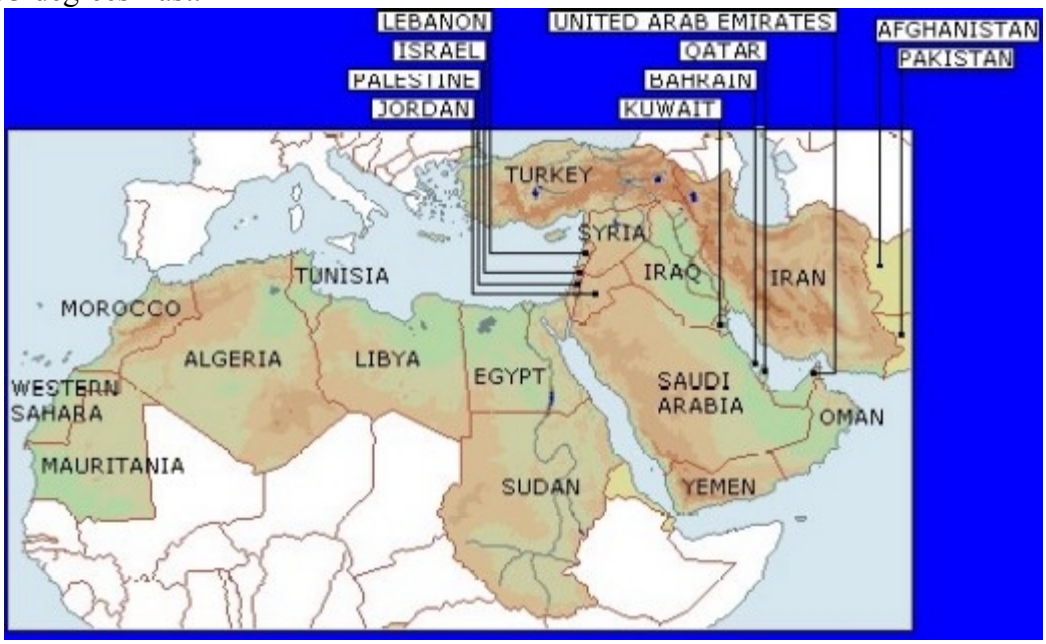

Figure 1: Map of the Middle East

2. Area

Historic Palestine has an approximated area of 26,323 km^2. Palestine's total area is approximated at 6,170 km^2 of which the West Bank is 5,805 km^2 and Gaza Strip is 365 km^2. The maps for Historic Palestine and for Palestine are shown in figure 2.

3. Population

The population of Palestinians living in Palestine is 3.2 millions. There are 1.1 million Palestinians who live in the Gaza Strip and there are 2.2 million Palestinians who live in the West Bank.

4. Climate and Topographical Areas

The climate of Palestine exhibits large changes in small distances. There are four topographical Zones in Palestine that has different distinctive climates: coastal, semi-costal, mountain and semi-arid zones.

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The coastal zone consists of the Gaza Strip that extends along the Mediterranean Sea. Gaza Strip is a coastal plain with sand dunes up to 40 meters high. Rainfall in the Gaza Strip area averages around 300 mm per year.

The semi-coastal zone extends in the northwest region of the West Bank with an average annual rainfall of 700 mm. This area has an elevation that ranges between 100 and 300 meters above sea level.

The third climatic topographic area in Palestine is the Mountain Zone located in the center of the West Bank. The area of the Mountainous Zone is about 70% of the West Bank total area. This zone has hot dry summers and cold wet winters with elevations ranging between 850 and 1100 meters above sea level. Annual rainfall including snow ranges between 450 and 700 mm. The Mountain Zone watershed is the main source that recharges the mountain aquifers.

The Semi-arid Zone consists of the Jordan Valley and the Easter Slopes of the West Bank. The Jordan Valley is a fertile plain along the Jordan River with an annual average rainfall of 150 mm. The Jordan Valley has warm winters and hot dry summers and an elevation of 250 to 300 meter below sea level. The Eastern Slopes of the West Bank run from the eastern mountains of the West Bank down to the Dead the Sea. The annual rainfall average for the Easter Slope Zone is less than 250 mm and has an elevation that varies from 750 meter above sea level to 400 meter below sea levels.

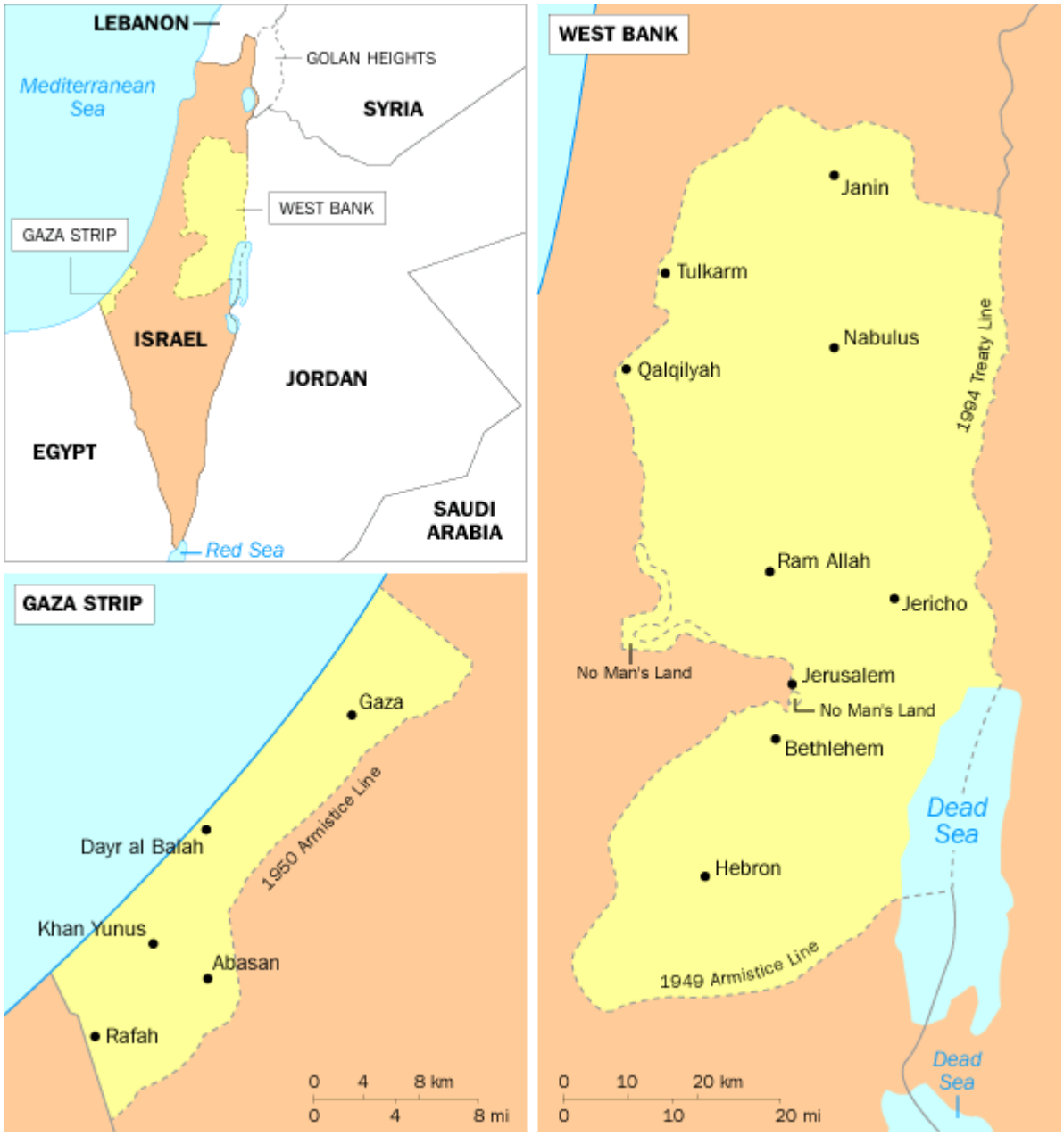

Figure 2: Historic Palestine, West Bank and Gaza Strip

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B. Agricultural Crops

As shown in the previous section, Palestine has different climates that allow for different crops to be grown year round. In the winter, the Jordan Valley provides all types of vegetables, citrus and flowers for the local markets and for the European markets. During the spring and the summer the Coastal and Semi-Coastal zones provide citrus and all kinds of vegetables and fruits to the Palestinian market. The mountains of the West Bank provide rain-fed and irrigated agriculture with crops that include cereals, olive trees, fruit trees, grape vines, stone fruits, figs, vegetables, food legumes and forages

C. Water Resources

Renewal of water resources depends on the overall amount of precipitation in Palestine. Between 5 and 25% of precipitation runoff recharges ground and surface water depending on location and topography. Most of the ground water in Palestine is controlled by the Israeli Authorities and always there is a shortage in water supply on the side of Palestinians. About 50% of Palestinians construct cisterns to collect rainfall in the winter to be used later during the dry season.

1. Ground Water

Ground water supplied in the forms of springs and wells is the main source of water in Palestine. The West Bank is the watershed that recharges the Eastern and most of the Western mountain aquifers. The coastal and semi costal zones are the recharging watersheds for the coastal aquifers. Ground water is the main water supply for Palestinians in all the different zones in Palestine. Palestinians living in the Jordan Valley use water that comes from springs and from Al-Ojah wadi. The Israeli Authority utilizes most of the water of the Jordan Valley to meet the needs of the Israeli settlements in the Jordan Valley.

2. Recycled Wastewater

Recycled wastewater has been identified as an important resource to solve the water deficit crisis in the Middle East and in the countries of the Southern Mediterranean Basin. In Palestine, recycled wastewater can provide an alternative to groundwater for the use in irrigation and recharging underground aquifers. The Palestinian Water Authority estimated that at least 92 million cubic meters of recycled wastewater would be available for reuse in agriculture in the year 2020 as shown in Table 1 (Al-Dadah, 2001).

Table 1: Potential Recycled Wastewater Quantities Available for Agricultural Purposes in Gaza Strip and West Bank

	Million Cubic Meter		
Year	Gaza Strip	West Bank	Total

2000	6.0	0.0	6.0
2005	19.0	1.6	20.6
2010	28.0	8.2	36.2
2020	53.0	39.0	92.0

III. Agricultural Education in Southern West Bank

In this section a background about Southern West Bank and an introduction to the existing agricultural educational institutions in Southern West Bank are presented.

A. Southern West Bank (Hebron Governorate)

The major Governorate in Southern West Bank is Hebron. Hebron District or Governorate comprises of Hebron City and more than 95 small and medium size villages surrounding the city. Hebron is located approximately 36 *Kilometers* south-southwest of Jerusalem, is a mountainous area with an elevation of about 1000 meters above sea level and with an annual rainfall average of 550 *mm*.

Hebron Governorate is the largest in Palestine with a population exceeding 460,000 inhabitants (PCBS, 2001). Approximately, 160,000 live in the City of Hebron itself. Figure 3 shows the rapid increase of population in Hebron Governorate and the expected numbers until the year 2006.

In addition, total fertility rate is the highest in Palestine after Gaza. In 1997, total fertility for Hebron was estimated at 7.1 compared to 5.6 for West Bank and 6.1 for Palestine (PCBS, 2000). The fertility rate has not changed for the year 2001 and is still at 7.1 for Hebron. The social structure of the Hebron people is family oriented, with a high rate of early marriages.

There are two academic training institutions in Southern West Bank that provide training in the area of Agriculture: Arub Agricultural High School and the College of Agriculture at Hebron University.

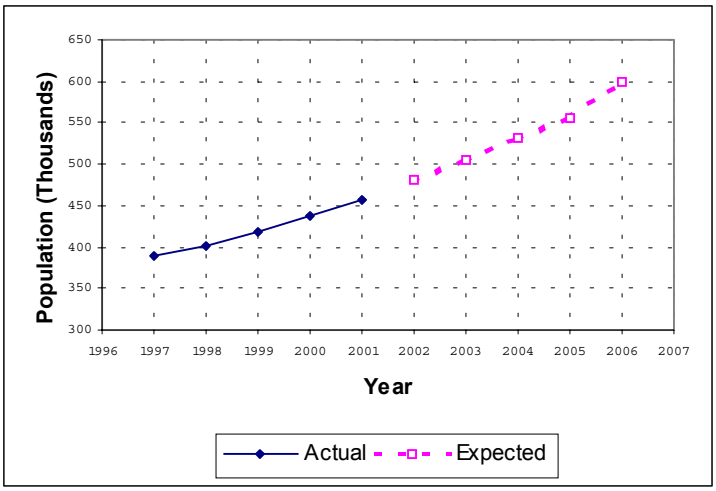

Figure 3: Population of Hebron District

B. Arub Agricultural High School

Arub Agricultural High School is a two-year agronomy and animal husbandry school. It has basic courses that prepare the student to become a more skilled farmer.

C. College of Agriculture at Hebron University

Hebron University was established in 1971 pioneering higher education in Palestine.
This co-educational institution has so far graduated 4407 students and has a current enrollment of 4500 students.
The College of Agriculture was established in 1987 with 5 departments that offer B.Sc. degrees in the following majors: Plant Production and Protection, Animal Production and Protection, Soil and Irrigation, Agricultural Economics and Extension and Food Technology. The enrollment of the College of Agriculture for the Spring 2002 has been 206 students.
Starting the Fall 2002, the College of Agriculture will be offering Master degrees in two specializations: Horticulture and Management of Sustainable Natural Resources.

1. Students

Most of the students attending the College of Agriculture at Hebron University are from the Hebron Governorate. In the past and before the closures and isolation policies of the Israeli occupation, students from all over Palestine used to attend Hebron University, but this trend had stopped due to the lack of freedom of movement.

2. Faculty

About 45% of the Faculty at the College of Agriculture attained their graduate training from American Universities through a faculty development program launched from 1980 until 1994 by United States Agency for International Development, USAID. The rest of the faculty in the College of Agriculture received their graduate training from different European, Russian and Arab Universities. Some of the faculty kept in touch with schools from which they graduated and most have lost contact.

3. Research and Development

Scientific research that leads to solving local problems and yields economical and social development is very rare in most Palestinian Universities. The tough economic situation, the Israeli restrictions on freedom of movement for Palestinians and the lack of research resources and infrastructure are some of the factors that hinder such research.

IV. Environmental Conditions in Southern West Bank

The legislative body in Palestine has passed the environmental law in 1999. The law tries to organize the use of natural resources in a sustainable way. However, the enforcement of the law has been less than successful.

Manmade pollution is on the increase in Palestine in general and in Southern West Bank in particular. Unlawful use of untreated wastewater in irrigating crops consumed by human and animals is still practiced on regular basis. Dumping of biological and chemical hazardous materials in landfills and in the sewage networks is still practiced. Also, the unregulated use of pesticides on agricultural crops is another of the many agricultural and environmental problems facing Palestinians.

It should be mentioned here that most of these problems are caused due to the bad economical situation and due to the lack of understanding of the long-term risks involved in such practices.

To give a picture of the bad the economic situation for Palestinians nowadays, some statistics are given. For the year 2000, the average net income per capita was $1500, while aid per capita for the same year was $214. For the first 2 quarters of 2002 the World Bank indicated that 70% of Palestinians living in West Bank and Gaza Strip earned less than $2 per day (World Bank, 2002). This shows that the situation was very bad and is deteriorating.

V. Recent Major Water and Agriculture Related Projects in Southern West Bank

Between 1996 and 1999, USAID provided more than $78 million to build reservoirs, drill four production wells, install transmission lines, and put booster pumps into place. As a result, the amount of available water has been doubled for some 460,000 residents of Southern West Bank. Prior to USAID assistance, residents of Southern West Bank had infrequent access to running water, especially in the summer.

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In addition, USAID is planning to construct the first wastewater treatment facility for the Hebron City, where more than 160,000 Palestinians live. Currently, Hebron City relies on pipes that take the sewage and deposit it untreated in a valley while the surrounding villages and towns rely on septic tanks or just let the untreated sewage flow in the streets.
The wastewater treatment facility project has three phases. The first was conducted in 1999 through which the flow characteristics were obtained to form a basis for design. The design of the facility has been completed. The second phase is the reuse of the recycled water for agricultural purposes. The third phase will be the actual construction of the facility that is estimated to be completed in 2005.

VI. Proposed Involvement

For the sake of peace and stability in the Middle East, sustainable development must be achieved. Agricultural engineering that pertains to water, recycled water, sustainable use of natural resources and improving production are some of the tools that can be used to achieve development. In addition, capacity building of institutions and human resource development can be used as the vehicles to deliver such development. One of the conditions for sustainable peace is sustainable development on the regional and local scales.
There are two major factors that are necessary to achieve development. The first is the material side and the other is the human factor. A call to the donor countries and international development bodies is made here to fully participate and support meaningful development in Palestine.

Cooperation and exchange of skills and knowledge are essential for the development of Palestine and Southern West Bank. Joint research projects and transferring of skills and technology can be the means that will lead to development. It is essential to have such cooperation and exchanges be on a regional and international levels. Also, such cooperation should be sensitive to cultural differences and provide equal opportunities to the different bodies that would be involved in the development.

VII. Cooperation in Southern West Bank

There are many agricultural - environmental related projects that are going on in Southern West Bank.
The Middle East Regional Cooperation Program (MERC) has approved the Palestinian – Jordanian - Israeli project: “Wastewater Treatment and Reuse in Agricultural Production”. Three Palestinian, one Jordanian and three Israeli academic and research centers are involved in the project. A portion of the project will be conducted by Hebron University in Southern West Bank.

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The College of Agriculture at Hebron University, the Department of Agricultural and Biosystems Engineering at The University of Arizona and the Environmental Research Center at Ben Gurion University in Sedi Boker, Israel were awarded a two-year project to study the effects of irrigating lettuce with recycled water. The project is in its second year now and is funded by the International Arid Land Consortium.

A sustainable land use initiative in Southern West Bank was launched by the US Department of Energy. Initiated by the Cooperative Monitoring Center, CMC, Albuquerque, New Mexico, a network of metrological station was established to monitor and share long term ecological research data between Israelis and Palestinians. The partners in the project are: Hebron University, the Palestinian Environmental Authority, the Volcani Agricultural Research Center in Rohovot, Israel and the Mitirani Center for Desert research at Ben Gurion University.

For more information about these project please visit the project web sites listed below.

VIII. Conclusion

After the disaster of September 11 the view of Americans to people of the Middle East has changed dramatically. The unfortunate stereotyping of Arabs and Moslems in the Western Media is cutting all opportunities for understanding and tolerance. The statement of "you either with us or you are an evil" will not get the world any closer to peace or prosperity. Communication and exchange of culture must be the tools to attain peace in a troubled world.

Agricultural Engineering can help in closing the gap between cultures. Meaningful and comprehensive agricultural development projects that concentrate on the human and material aspects are ways to foster understanding between cultures.

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International Arid Land Consortium: http://ag.arizona.edu/cgi-bin/haseltin/
Cooperative Monitoring Center Project: http://www.cmc.sandia.gov/ILTER/

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