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A Review: Selected Agricultural Issues and Practices in the Republic of Turkey, Israel and the West Bank

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Abstract **– Turkey's major agricultural production occurs on small farms. Turkish farmers want information about new crop varietals, equipment for all phases of production and new markets. Israeli production of agricultural products and related items occurs in kibbutzim and moshavim. The Agricultural Research Organization, Israel's major institution of agricultural research and development, conducts research with agriculturalists for improvements relative to gardening, plant crops, afforestation and livestock production. In the West Bank, Palestinian farmers and herders comprise the bulk of agriculture, the backbone of the economy. Water delivery is a major concern in the Republic of Turkey, Israel and the West Bank. Eventually, the $32 billon Southeastern Anatolia Project will deliver water to irrigable land in Turkey. Mekorot, Israel's national water company, has developed a water reclamation system that supplies water for drinking and irrigation even in the Negev Desert. In the West Bank, approximately 6% of the cultivated areas have irrigated agriculture.**

Keywords **– Agricultural Production, Israel, Turkey, Water, West Bank.**

INTRODUCTION

With population estimates ranging between 73 million to 78 million, Turkey is slightly larger than Texas with a land mass of 783,562 km2 (302,535 mi2), about 1.8% of which is covered by water (CIA, 2011a; US Embassy, 2011a). This is where east meets west with 95% of its land mass in Asia.

Presently, Israel, with a population of about 7, 473,000, is bordered by the Mediterranean Sea, Lebanon, Syria, Jordan, the West Bank, the Gaza Strip and Egypt. Of its 20,770 km^2, 20,330 km^2 comprise the land mass while 440 km^2 are covered by water.

The West Bank is comprised of 5,860 km^2 of land and water 220 km^2. It is bordered by Israel, the Middle East and Jordan (CIA, 2013). With an estimated population of 2,676,740, about 74.3% are urbanites (CIA, 2013).

Republic of Turkey

Agricultural production

As one of the nine priority markets for the U.S., exports of rice, live animals and wheat were part of the 40% increase of agricultural products to Turkey (Figure 1) in 2010 (Top Agricultural Exports, 2010). Also, increases in high-valued processed fruits and vegetables and organic products were reported (USDA, 2011a; US Embassy 2011a). There are now new credit guarantees for export sales to Turkey (USDA, 2013).

The overall decrease in tobacco products caused a downturn in Turkish exports to the U.S; however, there was an overall increase in processed fruits and vegetables (initially shipped to turkey as raw material), snack foods, and tree nuts (Karagöz, 2001; U.S. Embassy, 2011a; USDA, 2011a).

Fig.1. The Republic of Turkey and neighboring countries.
CIA (US Central Intelligence Agency) 2011c.

International Journal of Agriculture Innovations and Research
Volume 2, Issue 5, ISSN (Online) 2319-1473

Fig.2. Agrioecological zones (AZ) of Turkey; Karagöz, 2001.

AZ 1 - Central North:Continental climate with annual rainfall of 375 mm/yr. Rainfed cereals, food legumes and forage legume production. Extensive small ruminants, intensive dairy cattle.
AZ 2 - Aegean: Mediterranean climate with annual precipitation up to 800 mm/yr. Extensive small ruminant and beef cattle, intensive dairy cattle. Rainfed cereals, olives, figs, irrigated cotton.
AZ 3 - Marmara and Thrace:Cereals, sunflower, olives, vegetables. Important cattle region with many pure
and cross bred animals for milk and meat production. Proportion of pasture areas are only 9 percent of total land area. Precipitation 700 mm/yr.
AZ 4 - Mediterranean:Western coastal area. Annual average rainfall up to 700 mm/yr. Rainfed and irrigated cereals, olives, cotton, citrus, maize. Livestock less important. Significant goat meat production.
AZ 5 - North East:Hilly and mountainous high elevation area. Coldest part of the country with 100-180 days of frost/yr. Pastures occupy 75 percent of the total land area. Extensive livestock production. Subsistence cereal production.
AZ 6 -South East:Large fertile plains in the southern part. The biggest irrigation project (GAP Project) under process. Extensive sheep production. Rainfed cereals and food legumes, irrigated cotton. Increasing use of irrigation.
AZ 7 - Black Sea:Annual average rainfall of 1 500 mm. Rainfed hazelnuts, vegetables, maize, tea. Significant local cattle production and extensive sheep raising.
AZ 8 - Central East:Rainfed cereal, food legume production. Extensive small ruminant production. Local and cross-bred cattle for milk. Annual average precipitation 400 mm, days of frost 80-120. Pasture areas cover 54 percent of the total land area.
AZ 9 - Central South:Extensive small ruminants, intensive dairy cattle. Rainfed cereals, food legumes and forage production. Annual precipitation 350 mm/yr, days of frost 80-100.

Much of Turkey's workforce is engaged in agriculture where top production of cash crops includes cotton, citrus, tobacco, grain (wheat and barley), olives, sugar beet, tree nuts (especially hazelnuts) and tobacco (CIA, 2011a; OECD, 2008; Figure 2; Table 1). Agriculture (8.8 - 9.3% of GDP) provides about 26.5% of jobs and 3.5% of exports (CIA, 2011b; USDS, 2011). Many products are grown on farms with an average size of 15 acres as owners cannot sell parcels of less than 20 acres (U.S. Consulate, 2011; US Embassy, 2011a).

Table 1. Agriculture employment in Turkey and Gazientep, Ozbasaran, 2010.

ACTIVITY BRANCHES	TURKEY		GAZİANTEP	
	Employment	(%)	Employment	(%)
Agriculture and Animal Husbandry	12.576.827	49,71%	146.625	39,13%
Manufacture and Industry	3.276.173	12,95%	78.331	20,91%
Trade	2.512.777	9,93%	42.824	11,43%
Construction and Mining	142.111	0,56%	22.885	6,11%
Tourism and Transport	853.255	3,37%	12.887	3,44%
Services	5.806.690	22,96%	69.550	18,56%
Electricity, Gas and Water	98.152	0,39%	1.197	0,32%
Poorly Defined Activities	34.015	0,13%	378	0,10%
TOTAL	25.300.000		374.668	

Istanbul

Although Ankara became the political capital in 1923, Istanbul - with Greek, Roman and Ottoman roots - is Turkey's leading economic region (OECD, 2008). As a fast growing European city, Istanbul grew from a population of less than two million in 1945 to 12.5 million in 2009/2010 (EAA, 2010). In 2008, its GDP was 27% of the national GDP and generated 50 % of services and 40 % of Turkey's tax revenues (OECD, 2008). While Istanbul still preserves the old city center of small side streets with carpet shops, tiny workshops, bazaars, and various produce bins (Figures 3 a-f), new modern malls in other locales are moving into open spaces and becoming increasingly inviting to some shoppers.

International Journal of Agriculture Innovations and Research
Volume 2, Issue 5, ISSN (Online) 2319-1473

Fig.3a

Fig.3b

Fig.3c

Fig.3d

Fig.3e

Fig.3f

Fig.3. a. Turkish market – fruits, nuts and ginger roots. b. Dried vegetables. c. A variety of dried vegetables, fruits and candies. d. Plentiful walnuts and chestnuts. e. Spice market in Istanbul. f. Books and spices in a turkish street market.

The GAP Project

The Southeastern Anatolia Project (Turkish: Güneydoğu Anadolu Projesi, GAP, 2011), commonly known as the GAP Project, is one of the country's highest priorities and is one of the largest water projects of its kind in the world. The GAP is located in nine provinces covering about 10% of the land mass in the southeastern part of the country (GAP, 2011; Figures 4 a and b). Turkey anticipates spending $32 billion for this massive water project, a dream of the founder of modern Turkey, President Mustafa Kemal Atatürk (Figure 5).

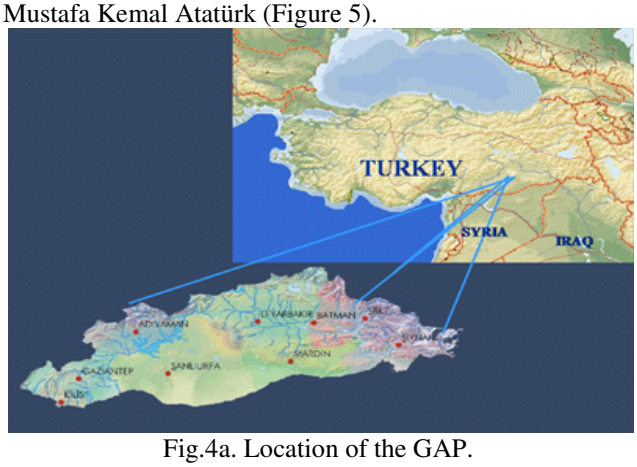

Fig.4a. Location of the GAP.

International Journal of Agriculture Innovations and Research
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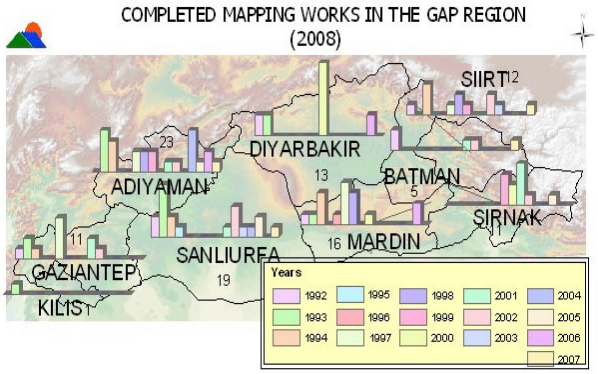

Fig.4b. Nine provinces of the GAP.

Official accounts note that the Gap Project began in 1980 and consists or 13 sub-project packages, 22 dams (19 of which are used for irrigation and generation of electricity) and 19 hydro-electrical power plants and irrigation facilities (GAP, 2011). Information from several sources (GAP, 2011; US Embassy, 2011a; Yucetepe, 2011) indicates that the movement of water will have many important effects. Presently, 19 of 22 major dams on the Tigris and Euphrates Rivers have been completed. The two rivers carry more than 52.94 billion m^3 of water and dams will control 28.5% of it. Moreover, the dams will deliver a specified amount of water to Syria, provide 22 - 24% of Turkey's energy needs and increase employment for 3.5 million out of 9-10 million people living in the region. This will decrease Turkey's unemployment rate, now standing at about 19%, increase the per capita income by 209% and ultimately deliver water to 22% of the total irrigable land. While the delivery system for irrigable land is only 15% complete, plans are underway to irrigate 1.3 million hectares of its rich black and red soils by 2016. Of the 78,058,000 hectares of land in Turkey, 42% could be farmed.

Fig.5. The Ataturk Dam, part of the GAP, a $32 billion water project and dream of the founder of modern Turkey, President Mustafa Kemal Atatürk.

Fig.6. Turkish farmers, beneficiaries of irrigation projects near Sanliurfa, seek more information about new crop varietals, equipment for all phases of production and new markets.

Fig.7. Small-scale family business (shelling pistachios) in Gazientep.

Sanliurfa and Gazientep

Sanliurfa and Gazientep are in the southeastern part of Turkey (Figure 1). GAP Headquarters are in Sanliurfa. Increasing migration to the city continues as the GAP Project promises economic prosperity through new building initiatives and social equity programs including female equality (Yucetepe 2011).

Farmers close to Sanliurfa are eager to benefit from irrigation and are seeking more information about new crop varietals, equipment for all phases of production and new markets. Additionally, they seek partnerships for capital investments (Figure 6).

Like Sanliurfa, Gazientep will benefit greatly from the GAP Project. The Province of Gazientep and its largest city, with the same name, are located on the historic Silk Way in the Southeastern and Southern Anatolia Region (GCC, 2011; SIS, 2011). The roads and railways connect the province to other Turkish cities, various cities to each other as well as Turkish cities to Iraq and Syria. Gazientep is often the place where semi-finished products are completely processed. Thus, leather, shoes, soap, textiles, cement, metal machinery, machined carpets and many other industries are striving in the five major organized industrial zones (GCC, 2011; World Bulletin, 2011). Additionally, family scale enterprises, for example dehulling/shelling of pistachios, for which Turkey is a major producer behind Iran and the US, abound (Figure 7).

Gazientep bakers produce world famous baklava while its farmers produce livestock (dairy and beef cattle, buffalo, sheep and goat), pistachios, wine grapes and olives (Figures 8 and 9). With demand for red meat outstripping traditional low yield and small scale production, the Turkish government targeted East and Southeast Anatolia for infusion of capital in order to increase establishments having more than 50 animals by 2012 (USDA, 2011b). Established protocols allow for importation of US breeding cattle and were slated to be signed for importation of sheep and goats by 2010 as well (USDA, 2011b).

Fig.8. Farmers in Gazientep produce livestock (dairy and beef cattle, buffalo, sheep and goat) at low yield. The Turkish government plans to increase production of small-scale producers.

Fig.9. Turkish sheep herders.

Fig.10. The World Wildlife Foundation's education for agricultural opportunities concentrates on the use of modern irrigation practices that can be adapted to small scale holdings.

Concerns and Controversy surrounding the GAP Project

Concerns from the World Wildlife Foundation (WWF), neighboring counties and sectors of the Turkish population are discussed below.

Educational Focus of the WWF

The main objective of the WWF in Turkey is to conserve natural resources including habitat and species. A major concern associated with the GAP Project is the 65+ dams constructed, under construction or planned and the consequent conversion of wild animal habitats to farm land. For instance, according to the WWF (2011), dams are planned near Lake Egĭrdir, where about 122,000 birds were observed in 2009. Additionally, pollution from agriculture is threatening bird habitats. WWF is providing education to farmers in the area so that stewardship for habitats becomes part of their farming practices.

According to the WWW, only 8% of Turkey's farmland is irrigated by newer methods of sprinkler and drip irrigation. In the remaining 92%, highly inefficient surface irrigation is practiced. WWF's education for agricultural opportunities concentrates on the use of modern irrigation practices that can be adapted to small scale holdings (Figure 10). Moreover, it provides information on sustainable agriculture and efficient land use, development of alternative crops, increased livestock and poultry production, issues of global warming and increased agricultural research at Turkish universities.

Environmental and Cultural Concerns

There are concerns about increased salinity for irrigated areas and increased humidity in the region of the GAP. While irrigation will increase the productivity for wheat, barley, cotton and tomatoes (by 556%) overall peanut and lentil production have decreased due to an increase in humidity (US Embassy, 2011a).

Because dams of the GAP will control water flow in and out of Turkey, ultimately, trans-boundary water issues between Turkey and its neighboring countries may occur (MEPC, 2011). Personal observations indicate that although the GAP Project has many economic benefits, local Kurds, not recognized as a legitimate minority in Turkey, are uncertain about their economic and political future as well as transportation and residential changes. Kurdish cultural artifacts have been damaged and they, along with archeological sites, have been submerged.

Göbekli Tepe

An interesting historical note is that archeologists have unearthed the settlement of Göbekli Tepe, thought to be about 11,000 years old, making it the oldest site for human habitation ever uncovered (Figure 11). Contrary to belief, this is not an agricultural site. According to Curry (2008 a and b) and Mann (2011), the hillside site, about 9.65 km outside of Sanliurfa, was most likely a place of worship. The people in the area would have been hunter-gathers rather than the first agriculturalists who settled in one place to tame the wild barley and oats or corral herds of wild animals.

Fig.11. Location of Göbekli Tepe, Turkey. b. At about 11,000 years old, it is oldest known site for human inhabitation, possibly a place of worship for hunter – gatherers. Chandler, 2009.

Israel

Agricultural Organizations

Reportedly, 15% of the land is arable and permanent crops are grown on about 4% (Agriculture of Israel, 2011; Fedler, 2011; IAS, 2011; ICBS, 2011, US Embassy, 2011b; Figure 12). Agriculture comprises approximately 2.4% of Israel's GDP and 2.0% of the labor force is involved in agriculture (Jewish Virtual Library, 2011a and b). Many fruits and vegetables are produced; animal agriculture consists of livestock, poultry and fish culture.

In Israeli agricultural production, the land and water resources supporting the nation are mostly state owned. Although changing, a great deal of agricultural production still relies upon cooperative communities of kibbutzim and moshavim. New to the landscape are isolated privately owned desert farms.

Kibbutzim

Israel has celebrated 100 years of kibbutzim (communal farms, Figure 13 a and b), which were instrumental in their national development (Abramitzky, 2011). The kibbutzim often served defense as well as agricultural purposes. In the original organization structure, everyone had equal expectations, voting power, income and benefits as young Jews from Eastern Europe participated in industrial adventures and farming, sometimes in remote areas. By the 1980s, generally mixed farming and an attached processing industry defined the organized community.

Over time, kibbutzim changed as the country evolved. Today, some capitalist ideas and other necessary changes have caused adaptation of new structures where in many of the 273 kibbutzim, labor intensive farm work has given way to innovative industries and premiere agricultural technologies (dairy farming and drip irrigation) sought

Fig.12. Currently, Israel is bordered by the Mediterranean Sea, Lebanon, Syria, Jordan, the West Bank, the Gaza Strip and Egypt. Israel Country Map, 2012


Fig.13a. Nearby the city of Be'er Sheva, the Mashabei-Sade Kibbutz, was settled in 1949.


Fig.13b. Landscaping at the kibbutzim.

around the world. S.A. E. Afikim, based in Kibbutz Afikim since 1977, is the world leader in innovative technology for modern dairy farm and herd management (ILDEX, 2010). Drip irrigation technology, shared with farmers in many arid countries, was developed by Netafim in 1965, reportedly following an idea from a California researcher at Kibbutz Hatzer. Netafim is a multimillion-dollar, multinational company providing drip-irrigation systems to many parts of the world (Jewish Virtual Library, 2011b).

Moshavim

Moshavim (plural of moshav or settlement), are government funded cooperatives where farmers receive the benefits of size without struggling with some of the ideology of the kibbutzim. Thai and Bedouin tribe members are often laborers for farms of the moshavim whose members are provided credit, marketing services, purchasing of seeds, fertilizer and pesticides (Moshav Noet Hakikal, 2011). Much of the Israeli export of vegetables, citrus fruits, melons, eggs and poultry are produced in the moshavim. At the Moshav Noet Hakikal, family farmers grow many staples in greenhouses. Staples include dates, herbs (especially sweet basil), melons and peppers which were cleaned, sized and packed in an efficiently organized packing house (Figures 14a-g).

The Agricultural Research Organization


Fig.14a. Israeli farmers and researchers focus particularly on farming in arid conditions

Fig.14b. Greenhouses.

Fig.14c. Greenhouse methods have increased the quantity of export-quality melons from 50% to 85%.

Fig.14d. At the Moshav Noet Hakikal, family farmers grow many staples in greenhouses.

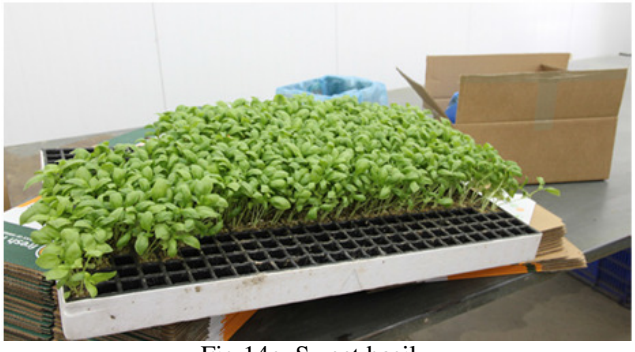

Fig.14e. Sweet basil.

Fig.14f. Peppers.

Fig.14g . Peppers are harvested, cleaned, sized and packed in an efficiently organized packing house.

The Agricultural Research Organization (ARO), first established as the Agricultural Station in Tel Aviv 1921, is Israel's major institution of agricultural research and development (Jewish Virtual Library, 2011a). As the research arm of the Ministry of Agriculture and Rural Development, it focuses on gardening, plant crops, aforestation and raising livestock, especially beef herds, at17% of agricultural output. Additionally, the ARO supports the production of products associated with livestock and works closely with the kibbutzim and the moshavim. Through enhancement of breeding and genetic testing by the Volcani Institute, the Minster of Agricultures' ARO has worked with dairymen and women to increase milk production from 6,330 l ~~liters~~ in 1970 to 10,000 l presently.

Personal observation revealed that the ARO works with farmers at Moshav Noet Hakikal who conduct hydroponic experiments on an unusual growing medium - shredded, recycled plastic bottles. Due to the salinity of the soil, some crops like basil are successfully grown by using fresh water to remove salts from the root zone during dry weather. When it rains the plants are irrigated to prevent salt from concentrating in the roots.

The Negev

Much of the agriculture products of Israel are grown in the Negev Desert, comprising approximately 62% (13,000 km^2) and home to only about 10% of the Israeli population or approximately 770,000 people (The Negev Foundation, 2011; ICBS, 2011). Agricultural production includes

beets, bulbs, cereals, cotton, fresh and dried fruits, flowers, fodder crops, honey, ground nuts, lettuce, olives, olive oil, peppers, peonies, potatoes, tea, tomatoes, greenhouse strawberries, wines, cattle, and eggs (Negev Nectars, 2011; The Negev, 2011; State of Israel, 2011; Noet Semadar, 2011).

Due to irrigation, rich soils and abundant sunshine, many crops (for example tomatoes for winter markets in the US and EU) are produced twice per year (Jewish Virtual Library, 2011b). Increased agricultural production has resulted in the continual discussion about inclusion/displacement of the nomadic Bedouin peoples (Noach, 2009; Ben–David, 2011; Figure 15a-c).

Northern Israel: Nazareth, the Jordan River and the Dead Sea Regions

Nazareth

Nazareth is the largest city in the North District. It is known as an Arab city because its population is about 52.5% Arab. A farming town, Nazareth is famous for the traditional markets that appeal to Israeli Arabs throughout the country in search of traditional Arabic foods. Nectarines from hoop houses, medicinal plants, cereals, tea, coffee, sugared almonds, lamb and spices in restaurants, along with specialties like fresh grape leaves, green almonds, and mallow (Malvaceae family) are available (Upson, 2010; Ministry of Tourism, 2011; Mahroum Oriental Sweets, 2011).

Fig.15a. Members (third and fifth from the left) of Bedouin communities and an advocate (fourth from left) discuss issues associated with the integration of Bedouins into Israeli society.

Fig.15b. Integration of Bedouins and their nomadic culture is difficult due to racism, Bedouin desire for open spaces and their association with extended families and communities. Government sponsored urban Bedouin communities have not prospered because nomadic animal agriculture cannot be well sustained in urban environments

Fig.15c. Many Bedouins live in "Unrecognized Villages" where governmental infrastructure (water, electricity, waste disposal road construction and other conveniences) may not be provided.

The Jordan River and the Dead Sea Regions

Low sea level, year round weather that produces a greenhouse atmosphere and availability of water and soil close to the Jordan River make ideal conditions for agricultural production of citrus, avocados, bananas, dates, forages, grapes, oranges, palm trees, tomatoes, wheat and zucchini/squash (Isaac et al., 2011; Figure 1). The Dead Sea is about 366 m below sea level, making it the lowest point on earth. It is ten times saltier than the ocean. Due to diversion for agriculture in Israel, Jordan and Syria, the Dead Sea River decreases in height by a rate of three feet each year (US Embassy, 2011b).

Water Reclamation

Like California and other parts of the United States as well as other parts of the world, Israel lacks sufficient water for everyone's use. In response to the water shortage, the government built Mekorot, Israel's national water company, in 1937 (Mekorot, 2009).

This water reclamation system supplies 80% of the country's drinking water and 80% of the total water supply through a system of 3,000 country-wide installations which include:

- Flagship installations containing plants for a central filtration and regional waste water treatment
- National water carrier system of aqueducts, pumping stations, reservoirs and tunnels to pump water from the north with heavy rainfall to the dry south and
- Water supply system that integrates several subsystems and combines water from several regions. Presently, Mekorot is responsible for 75% reuse of water with an ultimate goal of 90% reuse as a new system materializes. This system will allow water flow in all directions. Presumably, new and reused water sources,

improved irrigation methods and more water efficient crops will create long-term water security for Israel.

The West Bank

According to Isaac et al. (2011) agriculture is about 1/3 of the GNP of the West Bank (Figure 16). Crops produced around the Jordan Valley of the West Bank are the same as those delineated above. In the West Bank (and Gaza Strip), about 45% of the land is planted with olive trees having a potential production of approximately 34,000 metric tons yearly; however, the annual production of olives from 2001 - 2009 was 17,000 metric tons. About 100,000 farmers are employed in the cultivation of olives where 95% of production is for olive oil and the remainder is used for pickles, table fruit and soap. The olive sector periodically accounts for 15-19% of Palestinian export to East Asia, Europe, the Gulf countries and North America. For the West Bank, about 97.5% of irrigated land is in the semi coastal region and the Jordan Valley. About 65% of the total irrigated area in the West Bank is vegetable production while 28% and 7.4% of land is irrigated for fruit trees and field crops, respectively. Other produce is grown under plastic tunnels or houses (Isaac et al., 2011; Bureau of Consular Affairs, 2011).

Fig.16. Israel, the West Bank and Gaza, 2011.

Isaac et al. (2011) noted that around Jericho, all bananas are produced by drip whereas vegetables and citrus orchards are produced mostly in this manner. While drip is prevalent in the coastal region, it is not as prevalent as in the Jordan Valley. Across the West Bank, field crops are almost all drip. Agricultural ponds (for mixing of high salinity water from wells and fresh water from the springs) with plastic covers, cisterns and wells are still prevalent. As noted, the major concern relative to agricultural production is the shared use of water for the region.

CONCLUSION

With land mass, water and favorable environmental conditions, the Republic of Turkey has the ability to feed its entire population. Hopefully, completion of The Gap and lasting solutions for social and environmental issues will allow the country to do so. Israel continues to show the world how to use and move water. Its technology for high production of food in the Negev should continue to be transported to several extremely dry parts of the world. In the future, when political issues in the West Bank subside, it might be able to use the most modern irrigation technology to increase agricultural production.

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