



Agriculture Status and Women's Role in Agriculture Production and Rural Transformation in the Occupied Palestinian Territories

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Abstract

This paper focuses on the Occupied Palestinian Territories (OPT), comprised of the West Bank, including East Jerusalem, and the Gaza Strip, with respect to the status of agriculture and the role of Palestinian women in the agriculture sector, water management, and agricultural sustainability in rural areas in the OPT. Recent estimates indicate that 15.4% and 7.8% of the total employed are employed in the agriculture sector in the West Bank and the Gaza Strip, respectively. Despite the fact that the contribution of the agriculture sector to the GDP has decreased to 3% only, this sector is still hosting until recently 7.5%–10.5%, on average, of the employed in the OPT. Palestinian women only compose 18% of the labor force, and a little bit more than one fifth of them (22%, which is equivalent to around 4% of the women's labor force) contribute to the agricultural sector in the OPT. However, most of women's labor in the informal sector remains hidden and, thus, their contribution to the agriculture sector in the form of home-based activities is much higher than what is officially reported. Over 30% of informal agricultural work is performed by women as part of their domestic responsibilities. In addition, Palestinian women work at home as well as in the field, contributing effectively to the agriculture sector (plant and animal production) and, thus, to sustainable development in the OPT. With respect to water resources, women in rural areas play a considerable role in making water available for domestic and agricultural use, either by bringing water from far distances or getting water from springs and domestic harvesting wells (cisterns). Despite the fact that the status of agriculture in the OPT is really bad and getting even worse, and despite the presence of economic, financial, and political hardships and challenges, Palestinian women have obviously contributed to the agricultural sector towards achieving sustainable development in their communities in the OPT's rural areas.

Keywords: Palestinian women; Agriculture and status of agriculture; Water resources management; Challenges; Resilience; Sustainable development; Rural areas; Occupied Palestinian territories (West Bank; including Jerusalem; And Gaza strip).

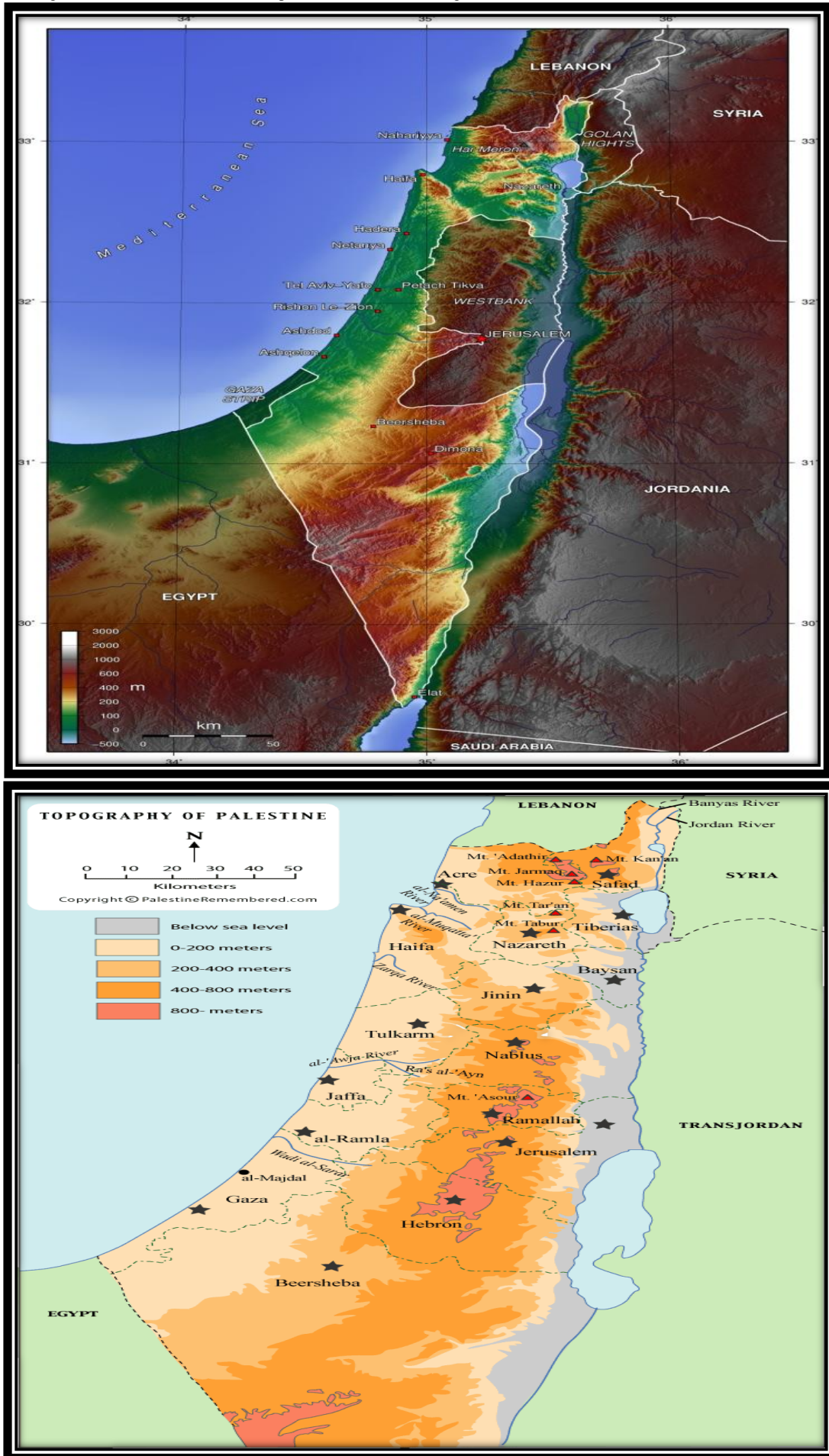


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1. Introduction

The focus in this study is directed to the Occupied Palestinian Territories (OPT), comprised of the West Bank, including East Jerusalem, and the Gaza Strip. The total area of the OPT is 6,020 km², whereby the West Bank (5,655 km²) forms 94% and the Gaza Strip (365 km²) forms 6% of the OPT's total area. The OPT forms 22.3% of the total area (27,000 km²) of Historical Palestine (Figure 1), whereby the West Bank forms around 20.9% and the Gaza Strip forms less than 1.4% of the total area of Historical Palestine. The OPT's population, as for October 2018, is around 5,100,000 [1], distributed as approximately 3.05 million in the West Bank and approximately 2.05 million in the Gaza Strip.

Figure-1. Maps of Historical Palestine, showing the topography and also the Occupied Palestinian Territories (OPT), which include the West Bank, including East Jerusalem, and the Gaza Strip (after [2]–left; and [3]–right).



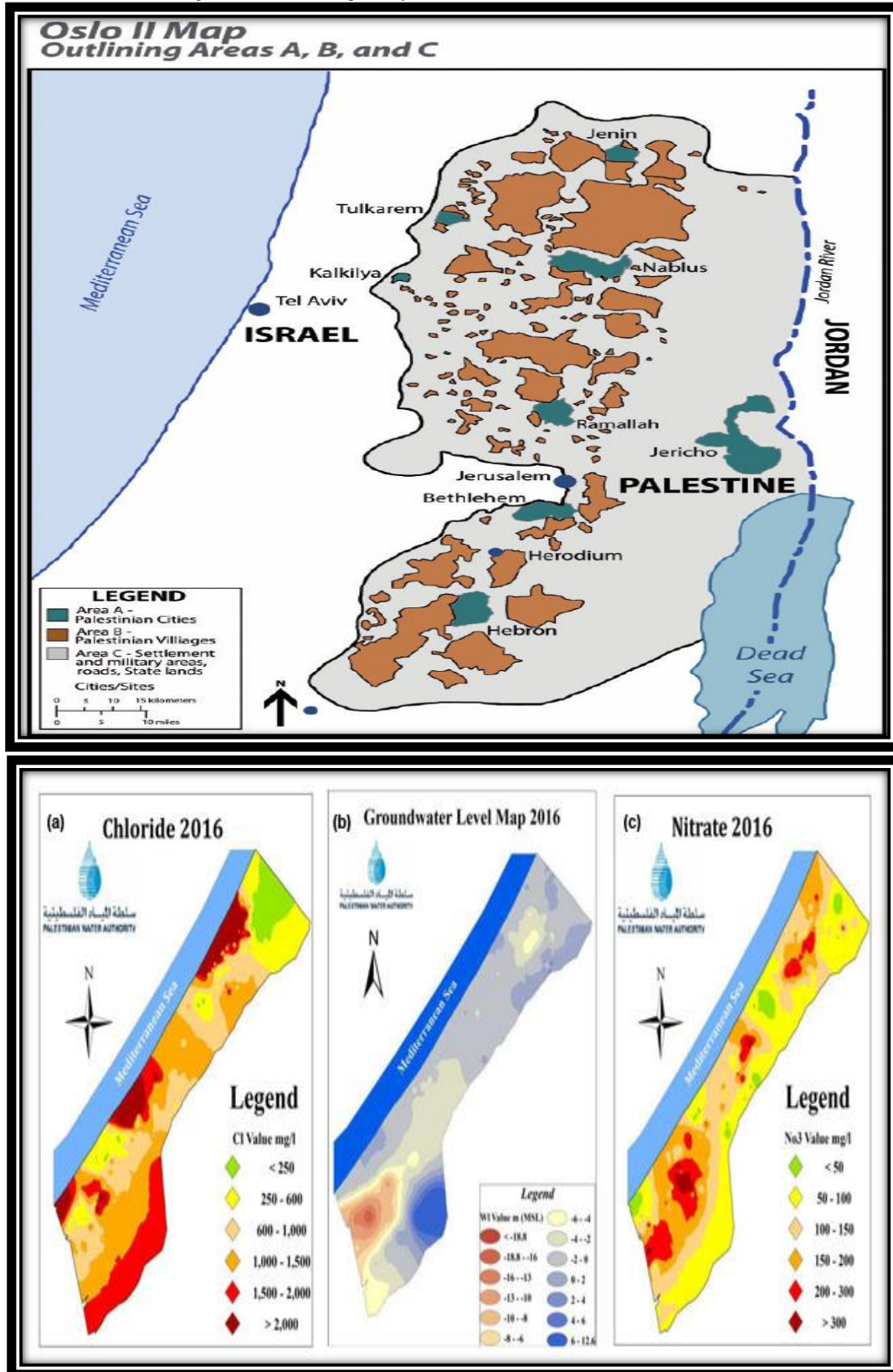
By the end of 2017, the number of females was around 49% of the OPT's total population, with approximately the same percentage (49%) in the West Bank and Gaza Strip [4]. At the same time, the unemployment's rate among women was 47.4% compared to 22.3% among males. Remarkably, approximately two-thirds (65.8%) of youth females, aged 15–29 years, are unemployed. On the other hand, the unemployment's rate among women with 12 school years and above (including primary and secondary school levels, as well as college and university levels) represents 53.8% of women in the OPT [5].

By the end of 2017, the percentage of employed people (aged 15 years and above) in the agriculture sector was only 6.7%, compared to 17.2% in construction, and 21.6% in commerce, hotels, and restaurants [4]. The World Bank provides data on the GDP's share of the agriculture sector in the OPT for the period 1994–2016, showing that the average value during that period was 7.49%, with a minimum value of 3.16% in 2016 and a maximum value of 13.26% in 1994 [6]. Some figures given by the Palestinian Ministry of Agriculture (MoA) showed that the labor force in the agriculture sector in 2006 constituted 16.7% of the total labor force (12.6% males and 35.1% females), falling to 10.4% in 2014, and to 8.7% in 2015 [7]. The TGE's figures indicate that the contribution of the agriculture sector to the Palestinian economy was in 1994 four times greater than that in 2016, suggesting considerable deterioration in the agriculture sector over the past 22 years (1994–2016). The MoA's figures indicate that the labor force in the agriculture sector dropped by more than 52% over a period of 9 years only (2006–2015).

The deterioration of the agriculture sector in the OPT can be attributed to several factors, including, among others:

1. The severe restrictions enforced by the Israeli occupation authorities on the Palestinian people in the OPT, especially farmers, so that many of them cannot reach their farms and lands.
2. The division of the Occupied West Bank, according to the Oslo Agreements signed in 1993/1995 between the Israeli and Palestinian leaderships, into three areas. These are *Area A* ($\approx 18\%$ of the total area of the West Bank), *Area B* ($\approx 22\%$ of the total area of the West Bank), and *Area C* ($\approx 60\%$ of the total area of the West Bank) (Figure 2–left). *Area A* is under the Palestinian control, security-wise and administration-wise; *Area B* is under the Palestinian control, administration-wise, and under the Israeli control, security-wise; and *Area C* is totally under the Israeli control, security-wise and administration-wise. It is noteworthy to mention that *Area C* is not only one and a half times greater than *Area A* and *Area B* combined, but it is also the best for agriculture, because it is the most fertile land and it has abundance of water resources, as well as much less population than the other areas *A* and *B*.
3. The almost total control of the Israeli occupation authorities on water resources in the OPT, as they control no less than 90% of the Palestinian water resources [8, 9], leaving only 10% to be used by the 5.1 million Palestinians (living in the OPT: West Bank and Gaza Strip) for the domestic, agricultural, and industrial purposes. Therefore, Palestinians are greatly suffering from water shortages, though they have their own water resources but they do not control them.
4. The water shortages and the extreme levels of water contamination in the Gaza Strip (Figure 2–right). With respect to quantity, the Coastal Aquifer System (CAS) in the Gaza Strip receives an annual average recharge of 55–60 million cubic meters per year (MCM/yr), mainly from rainfall, in addition to 30 MCM/yr from lateral groundwater flow and leakages, while the intensive abstraction rates from CAS is about 200 MCM/yr. As a result, it is estimated that there is an annual cumulative deficit of water of about 110–115 MCM/yr [10]. Regarding the water quality in CAS, it is badly and rapidly deteriorating, based on the World Health Organization's (WHO) standards for drinking water. In 2007, the chloride concentration in CAS was in the range of approximately 11–1,840 mg/l, and the nitrate concentration was in the range of 45–210 mg/l [11]. In the last few years, the chloride concentration has reached 2,000–10,000 mg/l and the nitrate concentration has reached 100–800 mg/l [10, 12–14]. Meanwhile, the recommended values for chloride and nitrate concentrations are 250 mg/l and 45 mg/l, respectively [15, 16]. These conditions of the water status in the Gaza Strip have made the Gaza Strip unlivable place. The UN's report "*Gaza In 2020, A Liveable Place?*" (Issued in August 2012) has highlighted that the Gaza's CAS will not be usable by 2016 and was irreversibly damaged since 2012 [17]. The main reasons for the high salinization and pollution of CAS are: 1) Over-extraction; 2) Penetration of untreated sewage; 3) Penetration of pesticides and fertilizers; 4) Intrusion of saline-water from deeper saline strata; 5) Intrusion of sea-water; 6) Return flows from very intensive irrigational activities in the Gaza Strip and the Negev [11, 18].

Figure-2. Left: Map of the Occupied Palestinian West Bank, showing its division into *Area A*, *Area B*, and *Area C*, according to the 1993/1995-Oslo Agreements (after [19]); Right: Map of the Gaza Strip, showing the groundwater level in m (middle) and water quality, in terms of chloride and nitrate concentrations (left and right) of the Coastal Aquifer System (CAS) (after [10].)



- The presence of almost one million Israeli settlers living in more than 200 Israeli settlements in the Occupied West Bank, in violation of International Law and the Fourth Geneva Convention. These settlements, creating an 'Apartheid System' within the occupied West Bank, form a real danger to Palestinians in the OPT, especially the farmers in *Area C*.
- Dumping the Palestinian markets with Israeli goods, especially fruits and vegetables that cannot be rivaled by Palestinian products, regarding prices, in particular.
- The climate change impacts, including temperature increase, rainfall decrease, drought, and changes in the arrival of the rainy season [20-26].

2. Methodology

To achieve the goals of this study, field work, including interviews with women living and working in the agriculture sector in rural areas, was conducted. Additionally, a great deal of previous works and statistical data on women's involvement in the agriculture sector in rural areas in the Occupied Palestinian Territories (OPT) were used, reviewed, and analyzed.

3. Agriculture Status in the OPT

Many Palestinian farmers (men and women) in the OPT believe that depending nowadays on farming only for family support is not enough, because working in agriculture has become problematic during the last few decades (particularly since the signing of the Oslo Agreements in 1993/1995). Hence, working in agriculture in the OPT can be describes as follows:

1. *Physically difficult*: This is because less family members are getting involved in agriculture.
2. *Non-rewarding*: This is because great areas of the Palestinian lands (especially those in *Area C*) are totally controlled by the Israeli occupation authorities. Some of these lands were seized by the Israeli authorities to be used for the construction of military bases, settlements, roads, and the 700-km long Segregation Wall, surrounding the West Bank. Thus, Palestinian farmers cannot reach their farms and lands.
3. *Unprofitable*: This is because Palestinian farmers cannot compete with the Israeli produce that are produced by large Israeli companies and are sold in the OPT. It is also because of the invasion of uncontrolled and cheap Israeli goods to local Palestinian markets.
4. *Unsafe*: This is because Palestinian farmers are constantly at risk from being shot or attacked by Israeli soldiers and settlers.
5. *Unaffordable*: This is because fertilizers, insecticides, pesticides, and other materials needed for agriculture are so expensive, so that Palestinian farmers cannot afford them.
6. *Shortage and high prices of water*: This is because Israel controls most of the Palestinian water resources, as discussed above, and the prices of water purchased from the Israeli company – Mekorot – are too high. Meanwhile, the Israeli settlers in the OPT obtain water from Palestinian water resources at very low prices and continually; i.e. 24 hours a day / 7days a week / 365 days a year. According to Corradin [27], “*Israel deliberately denies Palestinians control over their water sources and sets the ground for water domination.*” This action by Israeli ‘Mekorot’ represents ‘Water Apartheid’, according to Rabi [28].
7. *Being left alone*: This is because Palestinian farmers face serious challenges and, on the other hand, the Israeli occupation authorities implement well-prepared plans to do whatever it takes to destroy farming in Palestine.
8. *Lack of support*: This is because Palestinian farmers do not receive any support from the Palestinian Government, and because they have no insurance to cover their business’ losses resulting from the attacks of Israeli settlers and soldiers and from damages caused by natural hazards, such as climate change impacts, draughts, etc.
9. *Restricted*: This is because Palestinian farmers are unable to export their produce and other agricultural related-products to the West Bank from the Gaza Strip and vice versa, as well as to Israel and abroad, due to Israeli restrictions, such as closures, high costs, etc.

The following interviews, conducted in 2011 by *Gulf News* with five Palestinians working in the agriculture sector, clearly summarize the miserable and catastrophic situation of the Palestinian farmers and the agriculture sector in the OPT.

According to Nazzal [29], Ahmad Eid – Head of the Qalqilia Agricultural Department, Qalqilia Governorate, north West Bank – told *Gulf News* that the real problem that the Palestinian farmers facing is that they lose all the time. Eid said, “*At least 15% of the farmers [that was 8 years ago and in Qalqilia alone] have already abandoned farming, which is a serious strike to the agriculture sector.*” Eid stressed that, “*The core issue is marketing, and the Palestinian Authority and the Ministry of Agriculture are not capable of controlling marketing.*” Eid continued, “*We are not controlling the border checkpoints and borders. We are not controlling the markets. We are not controlling the agriculture sector.*” Eid continued, “*All around the year, the prices of the goods are so low. Even under those low prices, the Palestinian farmers cannot sell their products. Agricultural production requirements are so expensive that the majority of the farmers ended up in debts, being unable to settle them down for years.*” Eid continued, “*The [Occupied] Palestinian Territories have ended up markets for the Israeli goods. The market system is driving the Palestinian farmers out of competition, where much cheaper Israeli goods have flooded the local markets. Palestinian farmers do not get support in real term.*” Eid continued, “*We have tried to support farmers with fertilizers in collaboration with the Japanese. The Israelis consider fertilizers as a security issue. It is extremely difficult for the Palestinians to import any type of fertilizers. The Palestinian Authority has no hand in controlling the hiking prices of fertilizers and other production requirements.*” Eid continued, “*The Israelis have destroyed 10,000 donums [one donum = 1,000 m²] of citrus production in the area to spare the water needed to irrigate them. They destroy the agricultural seasons of the Palestinian farmers and force them to give up and walk away searching for another profession or job for living, but not farming*” [29].

Tayseer Basalat – Head of the Planning and Statistics Section at Qalqilia Agricultural Department – told *Gulf News*: “*A total of 3,700 donums [3,700 x 1,000 = 3.7 km²] of agricultural lands have been destroyed while building the [Israeli Segregation] Wall which seized 32,000 donums [3.2 km²] of agricultural lands behind it.*” Basalat stressed that, “*The lack of the agricultural lands has made the extremely bad situation even worse. Palestinian*

farmers suffer daily when they attempt to reach their lands and the Israeli authorities limit permits to land owners.” Basalat continued, “That has a negative effect on the agriculture sector all over the [Occupied] West Bank, and prevented the Palestinian farmers from even reaching their own lands to cultivate them” [29].

Medhat Abu Khader – a Palestinian farmer looking after 300 donums of land – told *Gulf News*: “The Palestinian farmer has become an orphan with no support of any kind. Palestinian farmers are waging a fierce agricultural and water war with the Israelis who use unfair and dishonest methods with a single goal of ending up farming in Palestine and making it a market for the Israeli goods.” Abu Khader continued, “The majority of the Palestinian farmers will abandon farming very shortly, despite the fact that the Palestinian farmers do not know any other profession other than farming. The Israelis humiliate the Palestinian farmers on their way to their farms and create obstacles to force them back home.” Abu Khader continued, “We are lost with this profession, and unless we get some protection and support, not even a single Palestinian farmer will be able to stand up for the [agricultural] war. The Palestinian farmers demand restrictions for the Israeli goods entering the Palestinian local markets.” Abu Khader continued, “We are fully aware of the agreements with the Israelis, but the extremely poor conditions of the Palestinian farmers force new and serious move to protect them from the Israeli goods, whose producers enjoy full support from their State which put minimum prices for those products and help the Israeli farmers sending their goods to the Palestinian markets to kill [destroy] the Palestinian farmers and make the Palestinian society fully dependent on Israel, agriculturally” [29].

Rezeq Abu Al Shaikh – a Palestinian farmer – told *Gulf News*: “All the Palestinian farmers are in debt and seriously considering abandoning farming. The Israeli goods should be banned at the Palestinian local markets with immediate effect if there was a real intention to save the agriculture sector.” Al Shaikh continued, “Some serious and bold measures should be taken and taken now to save the Palestinian farmers and bring an end to agricultural traders and brokers, who bring the Israeli goods to the Palestinian markets. Traders look for the large profits without paying any attention to the damage they cause for the agriculture sector in Palestine.” Al Shaikh continued, “Those people are destroying our business and families, when they bring the Israeli goods to the local markets, while the Palestinian Authority doing just nothing to stop them and protect the Palestinian farmers. The known and prevailing equation circulating among the Palestinian public is that farmers cannot support their families” [29].

Ali Al Sanam – a Palestinian agricultural materials’ trader – told *Gulf News*: “The current conditions may cause a total collapse of the agriculture sector. The conditions of the Palestinian farmers who do not enjoy any kind of official protection are extremely miserable.” Al Sanam continued, “The agriculture sector is moving from bad to worse, where this vital sector is in urgent need for protection, support and immediate review” [29].

In view of the above-described situation, many Palestinian farmers (especially those involved in family farming) have already, unfortunately, abandoned their farms, quit their work in agriculture, and, accordingly, moved to other professions, in order to support themselves and their families.

4. Agriculture Sector in the Occupied West Bank

Based on geographic attributes and geomorphologic and topographical characteristics, Historical Palestine (Figure 1) is recognized as being rich and diverse, composed of five climatic zones. These are: the coastal zone, the semi-coastal zone, the central highlands zone, the eastern slopes zone, and the Jordan-Valley zone (JVZ) [21, 26]. The last zone (JVZ, also known in Arabic as ‘Al-Aghwar’ or the ‘Ghor’ region) is located at approximately 400–200 m (1,300–660 ft) below mean sea level (MSL) (i.e. at negative altitude).

The average annual temperature in the five zones ranges between 15 °C and 25 °C (≈60–80 F), and the average annual rainfall ranges between less than 50 mm and 800 mm (2–32 in), with a few areas having a range of 900–1,400 mm (35–55 in), depending on altitude [8]. The annual rainfall of more than 685 mm (27 in) occurs in the most highly elevated areas in the northwest of the West Bank, and it declines to less than 100 mm (4 in) in the southwest and southeast, along the Dead Sea (see Figure 1–right). Almost 70% of the annual rainfall over Historical Palestine occurs, in general, between December and February [8]. The impacts of climate change on rainfall, storm intensity, and so forth have been considerably felt in Historical Palestine, especially in the OPT, which have already been suffering from severe shortages of natural resources, particularly water, because of the geopolitical conditions [20].

The West Bank, as being part of the OPT in Historical Palestine, is composed mostly of north-south-oriented limestone hills, extending from Nablus in the north; through Ramallah, Jerusalem, and Bethlehem in the middle; to Hebron in the south (Figure 2–left). The average height of these hills ranges from 700 m to 900 m (2,300–3,000 ft) (Figure 1–right). The hills descend eastwardly to the low-lying Great Rift Valley (also known as ‘Jordan Valley’) of the Jordan River and the Dead Sea. The West Bank does not lie entirely within the drainage system of the Jordan River, as elevated areas in the west give rise to the headwaters of streams flowing westward to the Mediterranean Sea (Figure 1–right).

The climate in the West Bank is mostly Mediterranean (Figure 1), slightly cooler at elevated areas compared with the shoreline, west to the West Bank. In the east, the West Bank includes much of the desert, including the western shoreline of the Dead Sea (Figure 1), characterized by dry and hot climate. Widely variable land-use patterns are dictated by the water availability. Relatively well-watered (rainfed through winter), non-irrigated terrain in the hills of the West Bank is used for the grazing of sheep and the cultivation of cereals, olives, and fruits. Irrigated lands in the hills and in the Jordan Valley region (Aghwar) are intensively cultivated for assorted fruits and vegetables.

The Jordan Valley region (Aghwar) is known as the ‘Palestinian Food Basket.’ It constitutes 55% of the total area of irrigated lands in the West Bank. It accounts for 60% of the vegetables that are produced in the West Bank and for 100% of the dates produced entirely in Historical Palestine [30]. However, because of the total control of the

Israeli occupation authorities on land and water resources, the agriculture sector, especially in the Jordan Valley, has fallen dramatically. This is due to the fact that almost 90% of the total irrigated agricultural lands in the West Bank are concentrated in the semi-coastal and Jordan Valley zones, which have been reduced to 12% only [31]. Accordingly, many Palestinian farmers have already abandoned their lands and moved to others sectors, such as construction, as indicated above.

What is left from the irrigated lands in the semi-coastal and Jordan Valley regions produce annually approximately 150,000 tons of vegetables, fruits, and field crops, forming 42.3% of the total plant production in the OPT [31]. Fruit trees occupy the largest area of the cultivated lands, growing 28 types that include olives, citrus, avocado, pomegranate, annona (custard apple), guava, etc. Field crops and forages also include 28 types, with wheat, barley, dry onion, chickpeas, alfalfa, potatoes, and herbs, such as cichorium (common chicory), anise, dill, sage, thyme, mint, chamomile, black cumin, cumin, etc. Next come vegetables, where farmers cultivate 27 types of crops that include cucumbers, tomatoes, squash, green and yellow beans, paprika, cauliflower, cabbage, fennel, etc. Great amounts of tomatoes, cucumbers, eggplants, and peppers (hot and sweet) are cultivated in greenhouses. During the last few decades, Palestinian farmers have introduced a number of new crops that include trees and other produce, such as dates, medicinal herbs, and baby cucumbers [30], as well as cherry tomatoes.

Nearly 63% of the agricultural land in the Occupied West Bank is located in *Area C*; most of which is in the Jordan Valley. As discussed above, *Area C* is a formal Israeli military zone, falling under the complete jurisdiction of the Israeli authorities. The inability of Palestinian farmers to consistently access their agricultural land in *Area C* has resulted in the loss of US\$ 480 million annually and around 110,000 jobs [32].

5. Agriculture Sector in the Besieged/Occupied Gaza Strip

The besieged/occupied Gaza Strip is located along the Mediterranean Sea, just northeast of the Sinai Peninsula of Egypt (Figure 1–left). So, it is located in the transitional zone between a temperate Mediterranean climate in the west and north, and the arid climate of the Sinai Peninsula on the east and south. The Gaza Strip, on average, is about 40 km (25 mi) long and 6–8 km (4–5 mi) wide, with a total area of 365 km² (≈141 mi²) and a population of more than two millions, as indicated above. The Gaza Strip is situated on a relatively flat coastal plain. Temperatures average in the mid- to upper 20s °C in summer and about 13 °C in the winter. The average monthly maximum temperature ranges between 17.6 °C for January and 29.4 °C for August. The average monthly minimum temperature for January is approximately 9.6 °C and 22.7 °C for August. The area receives, annually, an average of about 335 mm (≈13 in) of precipitation, or generally between 150 mm and 400 mm (≈6–16 in), while the average annual evaporation is 1,300 mm (≈51 in).

The topography of the Gaza Strip can be identified in terms of ridges (locally known as ‘Kurkar’), depressions, dry streambeds, and shifting sand dunes. The ridges and depressions generally extend in the NE-SW direction parallel to the coastline. The surface elevation ranges from mean sea level (MSL) to approximately 110 m (≈361 ft) above MSL. The depressions, which contain alluvial deposits, are approximately 20–40 m (≈66–131 ft) above MSL [33].

Historically, the agriculture sector has been the largest economic sector and is still playing an important role in the economy of the Gaza Strip. This role, however, has declined over time as the sector has suffered from a wide array of serious problems, including fluctuations of the political environment and the imposition of disruptive and restrictive rules and regulations by the Israeli occupation authorities. Between 1948 and 1967, the agriculture sector contributed more than 33% of Gaza’s GDP, 33%–40% of the employment, and 90% of all exports [34], with citrus and fruits as the main exported products. After 1967, the Israeli occupation authorities encouraged Gaza’s farmers to grow vegetables and strawberries, as they are more profitable, especially for export [35]. These crops required new costly inputs and technologies, such as greenhouses and irrigation systems with higher costs. The Israeli policies wiped out citrus production through preventing farmers from exporting to Israel, forbidding the planting of new trees or replacing old trees, and encouraging production of some specialized crops, such as strawberries flowers, and dates. As a result, the contribution of the agriculture sector to GDP declined from 37% at the end of the 1970s to 22% at the end of 1980s. The contribution to GDP continued declining after the Oslo Agreements (signed in 1993/1995 between the Israeli and Palestinian leaderships), reaching 10% in the 1990s. In the 1990s, the Israeli occupation authorities imposed movement restrictions which gradually intensified, as they institutionalized a general closure on the OPT, which affected the marketing and export of agricultural products in both the Gaza Strip and the West Bank. This caused further decline in the contribution of the agriculture sector to Gaza’s GDP to 7% in 2000, lowering total exports to around 23%, and constituting 14% of the employment.

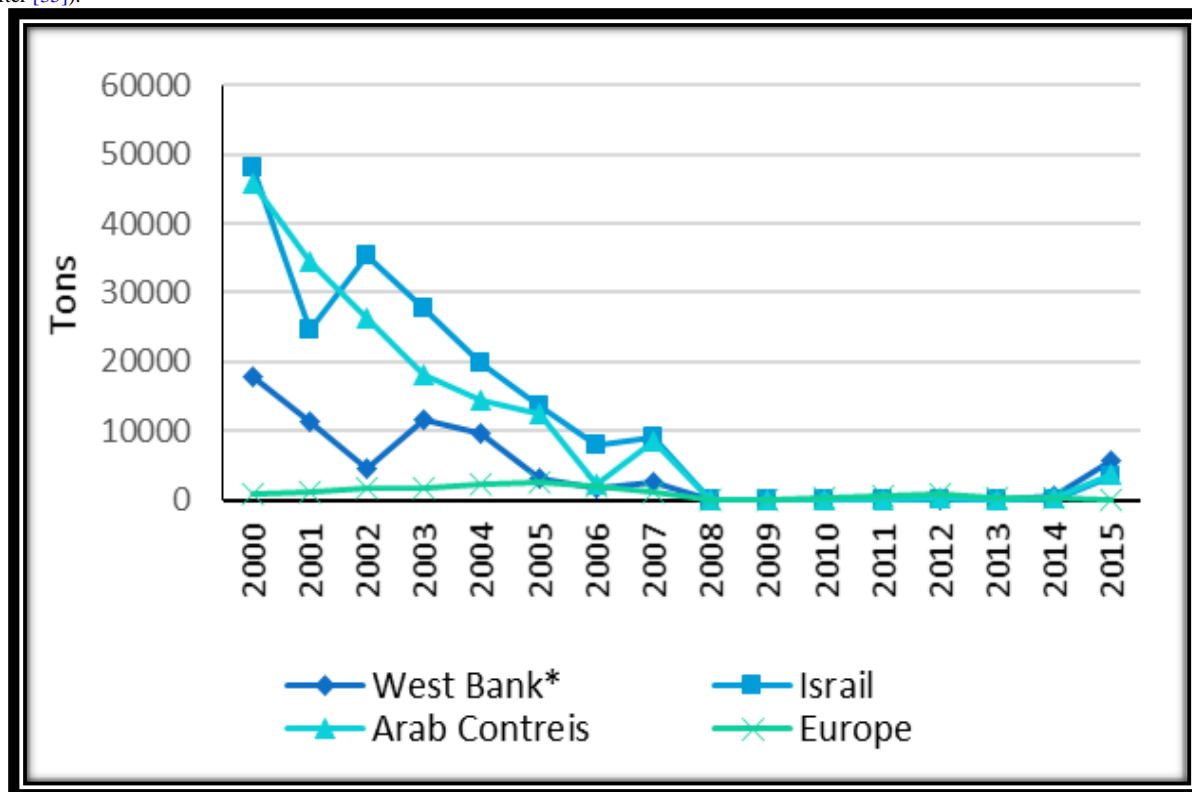
In 2005, Israel withdrew its forces and removed Israeli settlements from the Gaza Strip. In 2006, after the Palestinian elections, a decision was made to introduce a policy of separation between the West Bank and the Gaza Strip that turned into an imposed closure and blockade in June 2007. During the period between 2005 and 2015 the contribution of the agriculture sector to Gaza’s GDP fluctuated between 5.6% and 8.5%, reaching 5.7% in 2015 [35–40]. Between the years 2000 and 2007, Gaza’s farmers sold a monthly average of 2,000 metric tons (1 ton = 1,000 kg) of fruits and vegetables to Israel, and 680 tons a month to the West Bank. In contrast, from 2008 to 2014 (a 6-year period), only 2,898 tons of fruits and vegetables exited the Gaza Strip, or about 32 tons per month, almost exclusively to markets abroad [41]. Generally, farmers in the Gaza Strip cultivate citrus, dates, vegetables, wheat, and olives, as well as strawberries, and, to a less extent, flowers.

PCBS reports indicate that in the third quarter of 2016, only 4.5% of the total workers in the Gaza Strip worked in agriculture and fishing, and the agriculture sector recorded the lowest average daily wage at 22 NIS (≈6 US\$) (NIS is New Israeli Shekel; local currency) [42]. Figure 3 demonstrates the catastrophic situation of the agricultural

trade in the Gaza Strip for the period 2000–2015, which has led to a great financial loss to farmers, abandoning of the agriculture sector, and greater rates of unemployment. Accordingly, many stakeholders (farmers, traders, etc.) believe that the agriculture sector would never survive in the Gaza Strip without strengthening exports, and without facilitating better connections between the Gaza Strip and outer markets (West Bank, Israel, and Arab countries).

Adding salt to the injury, Israel launched on the Gaza Strip three wars in 2008/2009, 2012, and 2014, which badly destroyed the agricultural lands and crops in the Strip. In addition, the frequent use of poisonous herbicides and pesticides by the Israeli occupation authorities has greatly destroyed trees and vegetables in the Gaza Strip, causing extensive damage to crops and farmlands [43], taking into account that B'Tselem is an Israeli civil and human rights organization. According to Amira Hass (an Israeli female journalist), “*The purpose of herbicides is to enable farmers to grow produce, but Israel is quietly using them to do just the opposite in the [Gaza] Strip — in the name of security*” [44].

Figure-3. Agriculture exports from the Gaza Strip to the West Bank, Arab countries, Israel, and European countries for the period 2000–2015 (after [35]).



6. Role of Palestinian Women in Agriculture Sector

UNESCO considers gender equality one of its main pillars and a global priority, as reflected in the UNESCO’s Priority Gender Equality Action Plan (GEAP) 2014–2021 [45]. In the Occupied Palestinian Territories, UNESCO has worked over the last few years in partnership with the UN’s Food and Agriculture Organization [46], United Nations Development Programme (UNDP), and UN Women (UNW), as well as with the Palestinian ministries of culture, agriculture, women’s affairs, tourism and antiquities, and planning and administrative development, in order to safeguard and promote Palestinian cultural diversity and the importance of women’s role in Palestinian society, as a means of fostering social cohesion and inclusive economic growth.

The Palestinian women have always played a great role in all aspects of life in Palestinian society. “*This year, International Women’s Day, celebrated on 8 May 2018, carries the slogan ‘Time is now: Rural and urban activists transforming women’s lives.’ We happily celebrate the achievements of women achievers in academic, economic, and social fields, but we must also honor the contributions of the laborers who help feed our children and nation, the agricultural entrepreneurs, and the women who sell the fruits of their gardens on the sidewalks of our streets - they all contribute to our society and economy*” [47].

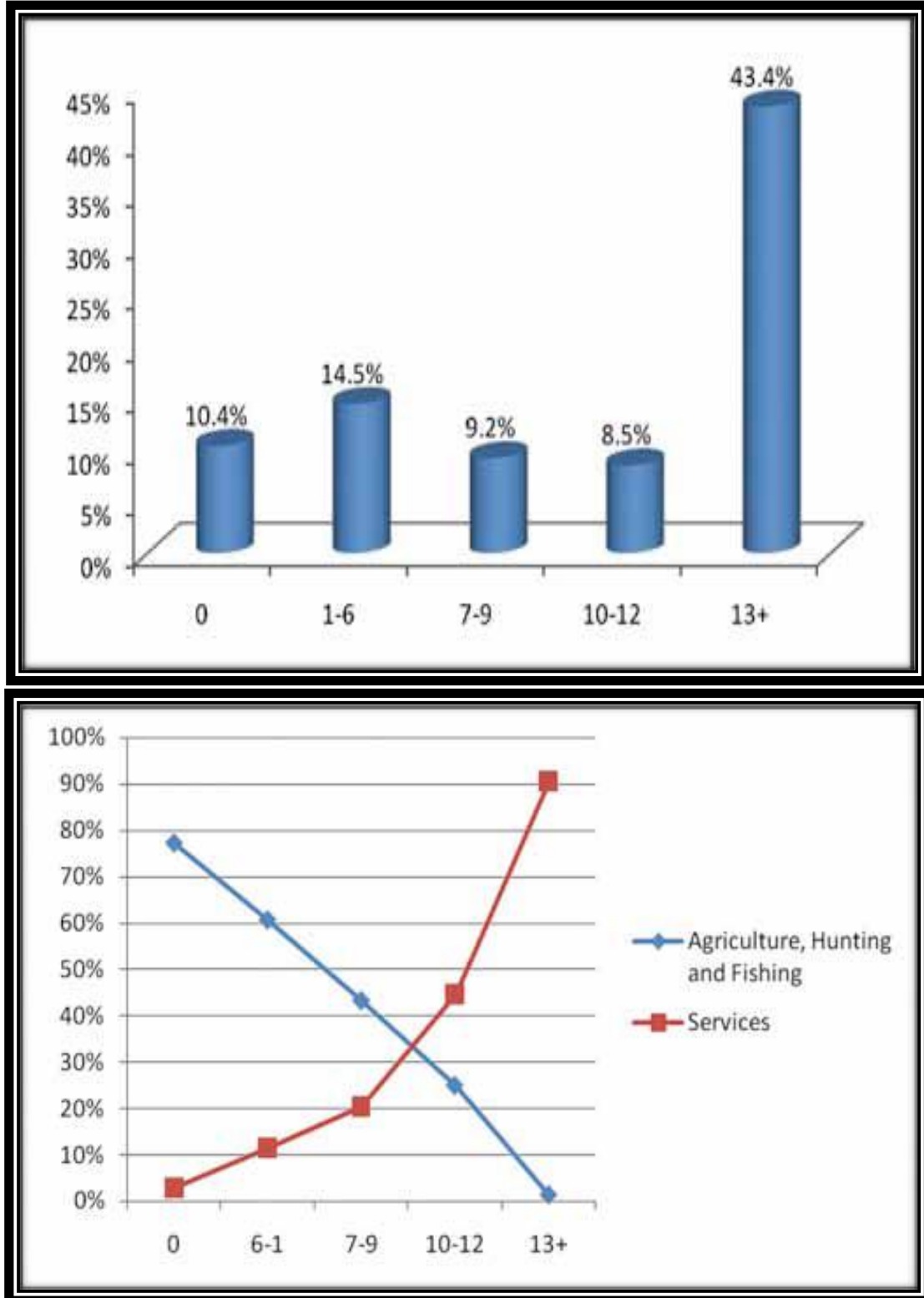
Women in rural areas make up over a quarter of the world’s population and constitute the majority of the 43% of women in the global agricultural labor force [48]. As related to the Palestinian women in rural areas, bridging the gender gap in rural life, particularly by increasing women’s access to and ownership of land, will not only empower them but also will contribute to national economic growth, healthier families, food security, and more resilient communities.

PCBS data indicates a wage gap in the Palestinian labor market between men and women, and in many cases women earn even less than the minimum wage specified by the Palestinian Government, which is NIS 1,450 (around US\$ 400). Though a large segment of the Palestinian women are engaged in the agriculture sector, there is no official data available on their wages. This could be attributed to two reasons: 1) Most women working in the agriculture sector are unpaid, because they work within their families. PCBS data for 2009/2010 indicates that 73.3%

of all agricultural employees are unpaid family members, 2.4% are permanent paid employees, and 24.3% are temporary paid employees [49]; and/or 2) They are still invisible to the national economy.

PCBS data indicates that the more years of education a Palestinian woman obtain, the more likely she will be actively participating in the labor force (Figure 4-left) [50]. Parallel to this, the lower the woman's level of education, the more likely she will engage in agriculture, which also provides indication to the locality of origin, namely rural areas (villages). This suggests that women who are working in the agriculture sector (farming, production, processing, etc.) have no education or low level of education (Figure 4-right) [50].

Figure-4. Left: Palestinian female labor force' participation rate per years of schooling; Right: Palestinian female's participation in agriculture and services, per years of schooling (after [51]).



While ownership, access, and use of land are not disaggregated by sex, women form the nucleus of agricultural production in Palestinian society. However, the cost of women's agricultural work in maintaining the land includes, in addition to unpaid care-taking of children and the elderly, the lack of ownership, which requires intervention from decision-makers.

As discussed below, the Palestinian women in the OPT have progressively contributed to the agricultural sector (see Figure 5), socially, economically, politically, policy-wise, education and awareness, technically, environmentally, heritage-wise, and culturally.

Figure-5. Examples of the Palestinian women's contributions to the agriculture sector in the West Bank and Gaza Strip [after [52] (upper left); [53] (upper middle); [54] (upper right); [55] (lower left); [56] (lower middle); [57] (lower right)]



6.1. Palestinian Women's Contributions to Agriculture Sector

Socially: The role of Palestinian women (mothers, wives, sisters, daughters; young, old; married, single; etc.) and their contributions to the agriculture sector is entrenched. By working in the agriculture sector, either in the field or at home, Palestinian women have strengthened the ties among family (nucleus) members, larger family, and with neighbors. Many Palestinian individuals, families, relatives, and neighbors help each other during, for instance, the olive picking (or harvesting) season, where women play the role of catalyst in this event. Recently, Palestinian women housekeepers got involved in what is called 'rooftop gardening' [58]. This is in addition to their involvement in the already-existing home agriculture, including cultivating vegetables, harvesting greens, raising chicken and sheep, etc. As a community activity, rooftop gardening has become a phenomenon even in refugee camps, though the roofs of homes in the refugee camps are very small in area. A new project, named 'RefuTrees' (Figure 6) has been successfully implemented, in the last few years, in three refugee camps (Dheisheh, Aida, and Al-Azza) in the Bethlehem Governorate, which seeks to help reverse a history of forced urbanization and revitalize connections to agriculture, and simultaneously to increase Palestinians' control over their food sources, especially organic vegetables [59]. These agricultural activities at Palestinian homes, not only strengthen the social ties among family members, neighbors, and communities, but also give them pleasure and happiness, enable them eat healthy food, and help them save money.

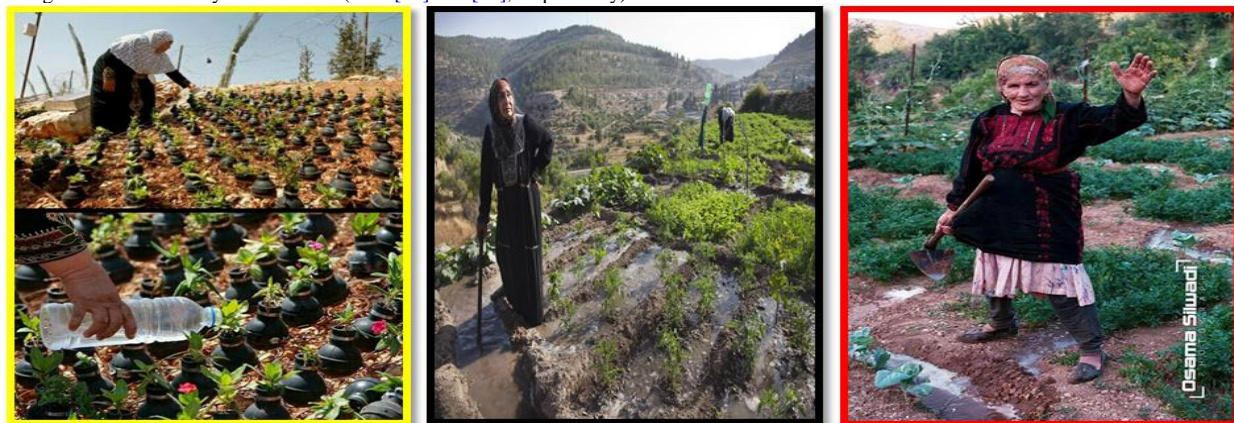
Figure-6. Examples of ‘roof gardening’ in three refugee camps (Dheisheh, Aida, and Al-Azza) in the Bethlehem Governorate, Occupied West Bank (after [59] (upper-three pictures); [60] (lower-left); [61] (lower-middle); [62] (lower-right))



Economically: The agricultural sector introduces the strongest foundation for developing the status and role of Palestinian women. Statistics indicate that almost 90% of the women in informal economy work in agriculture, and rural women form 30% of the Palestinian women’s power. Homestead agriculture is the traditional job of Palestinian women in rural areas. With the change of the socio-economic conditions, women are breaking through the traditional norms and coming forward to participate in development activities outside their homestead, such as carrying out agricultural field work, selling in markets their agricultural products (field crops and home-made), participating in agricultural exhibitions to market their products, etc. These activities, undertaken by Palestinian female farmers in rural areas, help in improving agriculture produce, quantitatively and qualitatively; in using water and land resources more wisely; and, thus, in making more financial profits, and, consequently, in contributing to agricultural economy and sustainable development in rural areas.

Politically: The Palestinian farmers have been facing a wide range of problems, hardships, restrictions, challenges, and even risks, as a result of the Israeli military occupation, which have badly affected Palestinian framers (women and men alike). These include land’s confiscations, restrictions on water use, movement’s restrictions, lack of external markets, and many others. All of these acts have been exacerbated even further by the Oslo Agreements signed in 1993/1995, resulting in sieges, invasions, curfews, internal closures, and extending old settlements and building new ones on Palestinian lands. For Palestinian women (young and old), the responses to these challenges have involved the search for coping strategies to help themselves support their households, and also to keep farming going on (Figure 7). Palestinian women working on agricultural lands in the West Bank and Gaza Strip are facing death every day, due to possible firing at them by Israeli soldiers and settlers.

Figure-7. Left: A Palestinian woman plants flowers in Israeli army tear-gas grenades (after [63]); Middle and Right: Palestinian elderly women taking care of their family-owned lands (after [64] and [65], respectively).



Policy-wise: On the policy side in relation to agriculture, it is noteworthy to mention that almost nothing has been done, legislation-wise, with respect to Palestinian women working in the agriculture sector, because the Palestinian Legislation Council (PLC) has been paralyzed since it was established in 2007. However, Palestinian women became involved in societies concerned with gender and agricultural activities, through women's organizations (NGOs), agricultural unions and, to a less extent, lobbying groups, as well as international organizations. Some of which help women getting involved in programs, projects, exhibitions, conferences, seminars, training, technical aid, and other activities related to agriculture. Some measures need to be addressed, in relation to policy-making with respect to Palestinian women and agriculture, which include: 1) Enhancing opportunities in rural areas, in terms of resources and infrastructure; 2) Developing programs to strengthen rural people's (particularly women's) role and their participation; 3) Supplying more gender-related data in agriculture, and in adaptive and appropriate research and technologies for women; 4) Providing qualified and professional females' extension agents, women's access to land, access to credit and other agricultural inputs; 5) Preparing learning and training programs for women to enable them understand technical information; and 6) Providing incentives to women to encourage greater agricultural productivity.

Education and Awareness: Palestinian women deserve much more programs, aiming at learning about how to deal with agricultural extension services. A major function of agricultural extension is to help farmers (especially women) make efficient, productive, and sustainable use of their land and other agricultural resources (water, soil, fertilizers, pesticides, herbicides, tools, machinery, different kinds of trees and vegetables, etc.) through the provision of information, advice, education, learning, and training. A key factor of the extension's approach is responsiveness to farmers' needs. This means that extension plans must ensure that the needs of female (and male) farmers, especially in rural areas, are addressed. In the last few years, a considerable number of Palestinian females (many of whom are from rural areas) attended colleges and universities to study agricultural sciences and engineering.

Technically: Technical advances in agriculture have created opportunities but also challenges. The greater use of technology in agriculture has reduced the burden of work on Palestinian women. However, technology is still not widely used in Palestinian rural areas because using it costs more money and needs knowledge and experience. Nevertheless, some new, not complicated techniques are used by farmers, including women, in planting, transplanting, weeding, harvesting, fruits and vegetables' drying, and products' packaging, as well as in water collection. For example, solar energy can be successfully used in water pumping from wells (cisterns). Photovoltaic (PV) solar-water pumping systems may be the most cost-effective water pumping option in locations where there is no existing power line. When properly sized and installed, PV water pumps are very reliable and require little maintenance. In addition, using the sun to dry crops and grains is one of the oldest and most widely used applications of solar energy. In addition, solar dryers protect grains, fruits, and vegetables, reduce losses, dry faster more efficiently and uniformly, and produce a better quality product than open-air methods. Another agricultural application of solar energy is greenhouse heating. Solar greenhouses are designed to utilize solar energy for both heating and lighting. A solar greenhouse has thermal mass to collect and store solar heat energy, and insulation to retain this heat for use during the night and on cloudy days. Solar greenhouses are used in some rural areas by Palestinian farmers (men and women). Furthermore, Palestinian women in rural areas have accepted the idea of dealing with treated wastewater, generated from micro- and small-wastewater treatment plants, to be used in irrigation of trees, because of water scarcity in rural areas. In recent years, women show high acceptance of reusing treated wastewater for agricultural purposes [66], which enhances women's responsibilities towards the environment and its well-being.

Environmentally: Increasing knowledge about the ways in which women in different groups and sectors of society participate in development has highlighted the interconnection between gender, the environment, and sustainability. In the transition towards the goals of sustainability, Palestinian women have emerged as a force, not only in support of proper environmental management, but also in demands for better quality of life and greater social equity. The triple model of 'Gender, Environment, and Sustainability' (GES) has been employed as the starting point for new approaches in the formulation of public policies aimed at sustainability in many countries around the world. In the Occupied Palestinian Territories, in particular, the GES model has been successfully applied without being studied at universities or being approved by policy-makers and legislators. This is due to the fact that such a model is deeply rooted in the culture and heritage of the Palestinian people. The Israeli occupation authorities have badly and severely destroyed the environment in the OPT. For example, since the Israeli army forces occupied the OPT in June 1967, close to 2.5 million trees (mainly olive trees) were uprooted, cut, burned, or died as being poisoned by the Israeli soldiers and settlers, resulting in 'ecocide' (Figure 8). A report published by the Ministry of Agriculture (MoA) showed that between 2011 and 2014, 73,000 trees were destroyed by Israeli settlers, causing the Palestinian farmers a loss of up to US\$ 91 million [67]. Attacks by settlers have increased by 315% from 2007–2011. These attacks usually increase during the olive harvest season (i.e. October–November of each year), during which Palestinian farmers become targets as they harvest their olives. On recent examples on such destructive acts against nature and the environment in the OPT, see UN [68], ARIJ [69], Hass [70], VP [71], MA'AN [72], Gross [73], MIFTAH [67], B'Tselem [74], MA'AN [75], MA'AN [76], Magid [77], and MEE [78]. Figure 8 shows examples of such acts undertaken by Israeli soldiers and settlers. In addition, millions of cubic meters (MCM) of sewage and wastewater are dumped yearly in the Palestinian lands by the Israeli settlers, who live illegally in the occupied West Bank, in violation of International Law. Ashly [79], reported that some 19 MCM of wastewater from Israeli settlements flows through the Occupied West Bank each year. Such acts of destruction to nature and the environment have put a great pressure on Palestinian people living in the OPT, especially farmers, in general, and female farmers, in particular.

Figure-8. Destruction of Palestinian olive trees (ecocide) by Israeli soldiers and settlers in different parts of the Occupied West Bank [80] (upper-left); [81] (upper-middle); [82] (upper-right); [73] (lower-left); [83] (lower-middle); [70] (lower-right)].



Heritage-wise: Agriculture has a direct relationship with Palestinian women, as well as with the heritage of Palestinian society, whereby a good triple model among ‘Agriculture, Heritage, and Women’ (AHW) has approved to be successful in Historical Palestine, including the OPT. This is with respect to historical means of agriculture, as well as to preserving seeds. Regarding historical means of agriculture in Palestine, some farmers are still using domestic harvesting cisterns for irrigation, because they are not connected to the water network and also because of water shortages. Some other farmers still use the old manners for agriculture and irrigation. For instance, in the village of Battir (located in the Governance of Bethlehem, 7 km (4.5 mi) southwest of Jerusalem, Occupied West Bank), the 4,000-year-old irrigated and rainfed terraces reflect an ancient route that ran from the coastal plains to the West Bank’s hills (Figure 9).

Figure-9. Picture of the village of Battir in the Bethlehem Governorate, southeast of the city of Jerusalem, showing irrigated terraces (after [84]).



The rural and agricultural setting is of great ecological and cultural significance. These terraces include olive trees, Roman grave-sites, and an ancient irrigation system formed by the continual layering of stones to form terraces on a prehistoric hilltop setting (Figure 9). The development of terraces' farming in such a mountainous region is supported by a network of irrigation channels fed by underground sources recharged by rainfall and discharged through springs. A traditional system of water distribution is still used in Battir village, so that the water collected through the network is shared among families of the village. Battir village, because of its natural beauty, was added to the World Heritage List on 20 June 2014. That was during the UNESCO Summit held in Doha, Qatar, 15–25 June 2014 [85]. Regarding seeds' preserving, in hills' regions of the Palestinian West Bank, farmers learned a long time ago how to adapt to extremes of climate that make spring the shortest season. A form of farming that informed both Palestinian culture and identity – seeping into the language, songs, and sayings – has increasingly come under threat from a combination of factors, including anthropogenic (man-made) climate change, the incursion onto Palestinian lands by Israeli settlements, and agricultural companies' marketing of hybrid varieties to farmers. Recently, an initiative is being launched to save Palestine's agricultural plant heritage, with a seeds' bank dedicated to preserving traditional varieties used by farmers for generations – before they vanish forever [86].

Culturally: The role of Palestinian women in the sector of agriculture has been manifested in the Palestinian culture, heritage, and folklore (Figure 10).

Figure-10. Art's reflections on the role of Palestinian women in agriculture (after [87]).



This is represented in the form of art, literature, music, costume, cuisine, drawing, painting, sculpture, printmaking, design, crafts, photography, videos, filmmaking, architecture, music, songs, poetry, writing of stories and novels, etc. These forms of culture express the Palestinian identity, despite the geographical and geopolitical separations between the Palestinian territories and Palestinian citizens in Historical Palestine itself, neighboring

countries, and Diaspora. As seen in Figure 10, the way of life of Palestinian women is strongly attached to agricultural activities, such as harvesting olive trees, collecting water from domestic wells (cisterns), using agricultural tools, grinding grains, raising chicken, etc. These examples are expressed through painting, drawing, embroidery, and other means of art.

Sumaya Farhat-Naser (a Palestinian female writer) authored, in 2014, a book of 219 pages, entitled, "*Daughter of the Olive Trees: A Palestinian Woman's Struggle for Peace (Arabische Welten)*." In her book, Farhat-Naser [88], gives an insider's account of the work for peace undertaken by Palestinian and Israeli women, discussing and analyzing conflict, and documenting ambitious dialogues. She has, thus, painted a unique picture of the every-day efforts to achieve peace and justice. These efforts create the tissue of relations upon which political and social communication and rapprochement will one day depend. She also discusses some agricultural and environmental issues related to the Palestinian-Israeli conflict, and addresses Palestinian women's roles with respect to these aspects.

7. Conclusions and Recommendations

The agriculture sector was and is still the backbone of the Palestinian economy in the Occupied Palestinian Territories (OPT), comprised of the West Bank, including East Jerusalem, and the Gaza Strip. In addition, the agriculture sector represents social, historical, and national intangibles that extend far beyond its economic importance. It represents a direct connection between Palestinians and their land; and it also represents independence, self sufficiency, and heritage [89]. In this paper, four main issues are analyzed and discussed: 1) The deteriorating situation of the agriculture sector in the OPT, and the adverse sequences and impacts on Palestinian farmers; 2) The agriculture sector in the West Bank; 3) The agriculture sector in the Gaza Strip; and 4) The role of Palestinian women with respect to the agriculture sector in the OPT (West Bank and Gaza Strip).

For the Palestinians in the OPT, the agriculture sector is very important as it absorbs 10% of the working force, and it is also a strong and effective means of food security. However, the situation surrounding the agriculture sector is problematic. Currently the agriculture sector accounts for approximately 5% of the Palestinian GDP, which has been considerably declining [90]. In 2016, the labor force participation's rate in the OPT was 45.7% in the West Bank and 46.7% in the Gaza Strip. The gap in the participation's rate between males and females in the OPT still very big, where it reached, in 2016, 72.3% for males compared to 19.2% for females [42].

The agriculture sector in the OPT is one of the major economic sectors and the only sector that can host the labor forces that have migrated from other sectors, especially during the periods of ongoing political instabilities between the Israelis and the Palestinians. Despite the fact that the contribution of this sector to the GDP has decreased to 3% in recent years, it is still hosting 7.5%–10.5% of the employed persons in the OPT. By 2016, the percentage of the workforce in the agriculture sector in the OPT was only 6.6%, of which 7.3% in the West Bank and 4.8% in the Gaza Strip [42]. For the same year (2016), the percentage of females working in agriculture was 11.0% in the West Bank and 2.3% in the Gaza Strip. This makes 8.8% in the West Bank and Gaza Strip together, compared to manufacturing (14.3%); construction (0.2%); commerce, restaurants, and hotels (14.6%); transportation and communication (1.4%); and services and other branches (60.7%) [42].

Since farming is a family business in the OPT, most of the female farmers work in their family farms. Palestinian women, who work at home and in the field, as well as in agricultural manufacturing, contribute well to the agriculture sector and the national GDP. However, the 'National Agriculture Sector Strategy 2014' [7] does not give strategic importance to gender mainstreaming/women's empowerment, based on the fact that the following points were not addressed in the Strategy: 1) Although the agriculture sector has been shrinking in the OPT, it is still significantly important with respect to women's employment; 2) Working in agriculture somehow empowers women, gives them self-confidence, and enables them to support their families, because that kind of work is the only source of income for some women and their families; 3) Women's contributions through their work in the agriculture sector is often underestimated, not only by others but also by women themselves, which might be attributed to the fact that women who work in family-run farms are, in most cases, unpaid; (4) While agricultural cooperatives are popular in the OPT, the proportion of women members and their contributions are still limited. Being members in such cooperatives enable female farmers to have their say in decisions and future plans; and 5) In women-only cooperatives, women tend to concentrate on 'feminine' work which is in line with traditional women's roles as mothers and care-takers.

Acknowledgements

The Author extends his sincere thanks to his friends and colleagues for their critical review of this paper.

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