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**Palestine Economic Policy Research Institute**

# **PALESTINIAN INNOVATION SYSTEM AND DIGITAL ECONOMY: CHALLENGES AND OPPORTUNITIES**

## **ANNEXES**

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**Swiss Development Cooperation (SDC)**

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**OVERVIEW OF THE DIGITAL AND INNOVATION  
ECOSYSTEM IN PALESTINE**

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## 1. CURRENT STATUS OF THE PALESTINIAN DIGITAL ECONOMY AND INNOVATION SYSTEM

There is no single agreed definition for digital economy, which itself is an evolving economic sector. Narrowly, it is defined as online platforms and all activities that related or presence to these platforms, but the broad definition includes all activities that employ digitalized data (IMF, 2018). The European Commission (2013) narrowly defined the digital economy as internet economy that based on digital technologies. G20 DETF (2016) introduced a broader definition for digital economy to include the range of economic activities that use digitalized information and knowledge. There is a growing awareness among researchers and policy makers that the digital economy, in any of its definitions, is becoming a major driver of economic growth and social change. The digital transformation of economic operations can boost innovation and improve productivity across many economic sectors, transform public services, and improve wellbeing (OECD, 2017). For most countries, the competitiveness and the ability to survive and compete globally based mainly on the ability to innovate and to adapt and introduce innovation successfully.

### a. The reality of innovation in Palestine

In Palestine, the last twenty years have seen a high growth of higher education, availability of thousands of Ph.D. and Masters degree holders in all disciplines, increased focus on entrepreneurial and innovative universities, and fast growth in entrepreneurship and start-ups sector (World Bank, 2018a; Morrar, 2018). This is also reflected in some promising figures and statistics such as the high rate of education among Palestinian youth, fast growth of graduates in ICTs, entrepreneurial behavior and start-ups, high rate of women entrepreneurship (World Bank, 2018a; Palestinian Ministry of Education and Higher Education, 2017). As for digital infrastructure, more than 48% of households in Palestine were connected to the internet in 2014 (PCBS, 2014), up from 1% in 2000.<sup>1</sup> Internet World Statistics estimated that there were around three million internet users in Palestine in December 2017 with 60.5% penetration rate.<sup>2</sup> In addition, more than 63% of households have a personal computer in 2014, and around 98% of them has a mobile line. The Third Generation (3G) feature has been available in Palestine only as of 2018 (West Bank only) due to restrictions imposed by the Israeli occupation authorities, while it has been available in the world markets since the early 2000s.

In the last decades, Palestinians have invested heavily in human capital through education and career professionalism, which has contributed to knowledge creation, technological development and promotion of innovation (Judeh, 2016). However, statistics are still inadequate regarding innovation input (R&D expenditure, patents, prototypes, inventions, etc.) and output (product innovation, process innovation, ad-hoc innovation, etc.) in the Palestinian economy.

### b. Main beneficiaries from the digital economy

The transformation from a traditional economy into a digital economy is expected to affect all aspects of the society. Palestine, like any other country, expects positive outcomes from investing in digital economy and innovation. It is expected that some sectors and segments will be more affected in the first stage of digitalization. For example:

- Youth are expected to be the main beneficiaries of digital economy growth in Palestine. Digital infrastructure can prompt and stimulate entrepreneurial behaviour and creation of start-ups among youth, especially university graduates who suffer from high unemployment.
- Women are among the most vulnerable groups in Palestine despite attaining high education levels. Through digitalization, women will have better opportunities to exploit their skills and knowledge to find a job outside formal sectors and traditional jobs that are dominated by men.

<sup>1</sup> <http://www.internetlivestats.com/internet-users/state-of-palestine/>

<sup>2</sup> <https://www.internetworldstats.com/middle.htm#ps>

Owing to the limited job opportunities in the formal sectors, women in Palestine own close to 62,000 mainly micro, but also small, and medium enterprises (MSMEs)—approximately a quarter of all enterprises—in West Bank and Gaza in 2018 (World Bank, 2018).

- People living below poverty lines and those who live in area C: The digitalization process has the potential to reduce information asymmetries for poor or rural workers, and enable them to enter the labor market (Gonzalez, 2016). Expanded digital applications in Area C (e-banking, e-government, e-business, etc.) will increase the accessibility of public and private services, mitigate Israeli constraints on movement, raise awareness about investment opportunities, and increase residents' understanding of their social and economic rights. There is a great potential for Palestinian ICT firms (e.g. telecommunication and internet providers, software developers) to invest in area C and replace dependency on Israeli ICT services.
- ICT sector and knowledge-intensive business services (financial services, R&D, consultation, engineering, etc.) will benefit from investments in digitalization as they are the private sector partners capable of providing the expertise and the technology needed in a digital economy.

#### **c. The possible economic and social implications of the digital economy in Palestine**

However, not all these positive outcomes can be taken for granted, as the digitalization of the Palestinian economy poses immense challenges. For example, promotion of digitally-enabled start-ups in Palestine is expected to be the cornerstone in building young high-impact companies, which have the capacity to create jobs mainly for university graduates (who form the main bulk of unemployment in Palestine), boost economic growth and competitiveness of the Palestinian economic in the region and worldwide, and stimulate innovation. The transition to digital economy might lead local companies (mainly SMEs) to create new investment opportunities through new digital applications adapted to local conditions in education, knowledge services, agriculture, and tourism or open new business models in entrepreneurship and innovation. It also enables local firms to connect with global value chains and makes foreign markets more accessible for domestic exports.

The high degree of global digital economy interconnection and the absence of any policy on Palestinian trade in services, entails downside risks. An uncharted and market-driven expansion of the digital economy could create new channels of Palestinian economic dependency on Israeli IT large scale IT capital and corporations, like the sub-contracting links that Palestinian light manufacturing (eg. textiles and footwear) maintained over several decades with Israeli industry linked to global markets. Once such industries became downgraded as Israeli manufacturing entered hi-tech and related domains, whole Palestinian sub-contracting branches at the bottom of the value chain were wiped out. If digital economic growth does not accelerate overall Palestinian economic “catching-up” with trade partners (as economic theory suggests it should), then it might deliver only limited development dividends, and prolong dependency on Israel.

Palestinian society has long experienced socio-economic challenges, such as high rates of unemployment and poverty (influencing youth and women especially), and deterioration of the health system and infrastructure. Digitalization may be a remedy that can develop viable, effective digital-based new services. For example, digital technologies can facilitate the development of e-health services in Palestine like electronic health record, e-prescribing, telemedicine, m-health, and health information system. In the education system, digitalization facilitates remote teaching, online IT training services, web-based learning, web-based training services, computer-mediated learning, blended-learning, and e-learning. The government adoption of digital economy practices (digitalization of public services) would likely foster government transparency and effectiveness, knowledge sharing, and support anti-corruption efforts by using e-government modalities (e.g. e-regulations and e-registrations systems), through which the Palestinian official departments can better understand and respond to societal trends and developments.

#### **d. Conclusions**

Palestine has made worthy strides toward digitalization and innovation economy. There are numerous promising indicators in Palestine that show the steps toward the digitalization of the

Palestinian economy. These include heavy investment in human capital through education and career professionalism, fast growth in entrepreneurial and start-ups activities, wide dissemination of ICTs usages for both individuals and organizations, increasing discussion about innovation and creativity, and the growth of R&D and knowledge creation in the academic institutions. However, the innovation system is disorganized, disjoint and fragmented, i.e. too many players, too much competition coupled with weak coordination, replication of ideas, weak connections between the private sector, public sector, and academia, etc. Despite the high growth of ICT services, this has yet to encourage policymakers, investors and economic sectors to exploit ICTs in digitalization of the local economy or create new value chains through innovation.

Three main challenges must be addressed to enhance the feasibility of ICT technologies creating a digital economy in Palestine. First, developing standard performance indicators to measure the extent to which ICT is being assimilated by individuals and organizations. The second challenge concerns developing reliable tools to measure the role and impact of ICT diffusion on the digitalization of economy and society. Thirdly, efficient and coordinated policies are needed to accelerate the digitization or the use of digital applications by government, individuals and organizations, and realize its accompanying benefits.

## **2. ECOSYSTEM MAP OF THE PALESTINIAN DIGITAL ECONOMY AND ACTORS**

The ecosystem map of the Palestinian digital ecosystem describes the relationship between the various organizations and innovation-related entities that have an influence on or can support the digital transformation of the Palestinian economy. Figure 1 below depicts an interactive mapping of coordination mechanisms across five clusters (government, education system, domestic and international finance sources and entrepreneurial sector) required to achieve effective interaction between the elements of the innovation system, digitalization enabling organizations and policymakers. It provides a short description of each of the main involved actors, their role in promoting an ecosystem that stimulates, facilitates and supports the digitalization of the Palestinian economy, leading to new start-ups, ventures and entrepreneurial firms, new jobs in creative sectors, attracting investment, creating wealth and improving the social welfare.

### **a) Government**

The Palestinian government has the lead responsibility in defining the road map towards a digital economy. It should play a key role in designing policy programs to support digital economy, driving and adopting emerging technologies, knowledge creation, digitalization of public services, and development of the digital ecosystem. Governments must play a critical role in spurring innovation, creating the legal framework for protecting innovation and knowledge production, and actively creating new markets for digital products. This task cannot be left to the market, external financial interests or even the national higher education system, all of which require that government bring stakeholders together and provide a framework for collaboration. It also can assist digital entrepreneurs in issues related to intellectual property, infrastructure, investment climate, and procurement of digital products and services produced by entrepreneurs.

### **b) The legal framework for the digital economy**

For most of the stakeholders and investors in the digital and entrepreneurship endeavor in Palestine the legal structure is one of the main impediments to innovation, R&D and knowledge creation. Little work has been done in terms of renovating laws and regulations, some of which originate in the 1950's. Intellectual property laws in Palestine date back to the Jordanian period in the West Bank, such as the Trademark Law No. (33) of 1952 and the Patent Law No. (22) of 1953 (Morrar, 2017). An expert in IT and digital economy confirms, "The legal structure in Palestine is not investor-friendly, and hence start-ups will incorporate outside of Palestine to cater to investor requirements, leading to more complexities and expenses" (Daily Telegraph, 2014). The Ministry of National Economy (MNE) and Ministry of Telecom and Information Technology (MTIT) are the main public bodies responsible for the institutional framework for innovation and digital



1. Palestine Academy for Science and Technology (PALST). It is an autonomous public, not-for-profit organization established in 1997 and reconfirmed in 2004 by Presidential decree. The focus of PALST is to define the Palestinian science priorities, fostering scientific and technological research through cooperation with national and international agencies, and promoting innovation and knowledge creation to face the challenges of digital economy<sup>3</sup>. Recently PALST developed two science bridges with Germany and Quebec in Canada. These two programs are crucial to enhancing R&D in science and technology in Palestine, the transition toward innovation economy, and the transfer of know-how, innovation, and technologies from economies with highly developed innovation systems, to Palestine.
2. The Higher Council for Innovation & Excellence (HCIE):<sup>4</sup> The PNA recently established this Council, which is supposed to regulate innovation in the Palestinian territory and provide technical and financial support for creative and innovative ideas. Its activity has been limited mainly to advocacy so far.
3. The Scientific Research Council: In 2013, the Ministry of Higher Education (MOHE) established the scientific research council chaired by the Minister and the membership of scientific research deans from four Palestinian universities and five members from the private sector and NGOs. The council allocated an around USD 5 million in 2013 for supporting scientific research in Palestine, but outcomes have not been announced.<sup>5</sup>

The innovation ecosystem in Palestine still suffers from some weaknesses, especially the weak public policy leadership. For example, it is still not open to the international innovation and research environment. Collaboration with international research institutions and innovation centres is crucial for building the innovation and digital system in Palestine. Public subsidy for scientific research is still very limited, fragmented and has very limited contribution to innovation and economic development in Palestine (Morrar, 2017). This might be embedded in the economic and political instability in the Palestinian territories, and the focus of donors' funding for the Palestinian government on non-R&D and low knowledge creation projects.

#### e) The education system in Palestine

The higher education sector in Palestine has grown and developed steadily in the last 20 years (see Table 1). Many universities that offer both bachelor and master programs originated in the mid-1970s and early 1980s. Technology incubators, accelerators, and center of excellence may be found today in most of the universities (e.g. Najad Za'ni in Bir Zeit University, Medical and Health Research Center of Excellence in Al-Quds University, Technology in Polytechnic University of Hebron, Business Innovation & Partnership Center at An-Najah University). Many projects have been implemented in these centers in the last years. For example, "My Project Starts with an Idea" funded by the Palestinian Investment Fund, and "Empowering Future Technology Entrepreneurs" funded by Spark.

**Table 1: Weaknesses and strengths in the Palestinian education system**

| Elements that support the digital economy                                                                                                                                                                                                                                                                                                                                                                                                              | Elements that hamper the digital economy                                                                                                                                                                                                                                                                                                                                                                                                                    |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>• The educational system is one of the main pillars for digital economy.</li> <li>• Only 3% illiteracy rate in Palestine among persons 15 years and above: 3.2% in the West Bank and 2.8% in Gaza Strip (PCBS, 2017).</li> <li>• The number of higher education institutions in Palestine was 49 in the 2017 (Palestinian Ministry of Education and Higher Education, 2017)<sup>6</sup>, distributed</li> </ul> | <ul style="list-style-type: none"> <li>• Traditional education system (lecture-based education, textbook-based education, etc.)</li> <li>• Weak connections with the private sector</li> <li>• Huge gap between labour market demand and educational system outcomes.</li> <li>• Scientific research is still a nascent sector with only 32 active enterprises and hiring only 230 employees (PCBS, 2017). So, R&amp;D-related activities in the</li> </ul> |

<sup>3</sup> <http://www.palestineacademy.org>

<sup>4</sup> <http://www.hcie.ps/>

<sup>5</sup> <http://www.mohe.pna.ps/Councils-and-Commissions/Scientific-Research-Council>

<sup>6</sup> <https://www.mohe.pna.ps/mohe/factsandfigures>



| Elements that support the digital economy                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Elements that hamper the digital economy                                                                                                                                                                                                                                                                                                                                  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>into 14 classical universities, 16 university colleges, 18 community colleges, and one open university.</p> <ul style="list-style-type: none"> <li>• Around 218,415 students were enrolled in the higher education institutions in 2017: 133,032 females and 85,383 males (Palestinian Ministry of Education and Higher Education, 2017).</li> <li>• Many universities now focus on ICTs-related fields, every year new branches (Bachelor and Master) in ICTs disciplines.</li> <li>• Around 8,146 of faculty members in different disciplines, amongst 3,239 Ph.D. holders (Palestinian Ministry of Education and Higher Education, 2017).</li> <li>• Increasing focus on R&amp;D, despite the financial crises in most of the universities, but most allocate an annual budget for R&amp;D. For example, An-Najah University allocates USD 100,000 for R&amp;D in science and technology.</li> <li>• Serious attempts to develop the educational system and adopt new models like entrepreneurial universities, project-based learning and research-based learning.</li> <li>• Palestinian universities now offer a range of entrepreneurship-related services: technology transfer, graduate self-employment and industry linkages (Sultan, 2017).</li> <li>• Palestinian universities are moving towards the international context. Many research opportunities were created through the international collaboration agreements like Erasmus, Erasmus +, Horizon 2020.</li> </ul> | <p>digital sector is expected to be very low, consistent with weak performance of R&amp;D sector overall.</p> <ul style="list-style-type: none"> <li>• R&amp;D through universities still basic and not connected with the real needs of the society, i.e. There is a kind of disconnection between research outcomes, innovation, and reality (Morrar, 2017).</li> </ul> |

#### f) Private sector

In most countries, the role of the private sector is crucial in the transmission to digital economy. It plays an important role in diffusion of digital technology, development of ICTs sector, boosting R&D and innovation, and stimulation of entrepreneurship initiatives and startups. In Palestine, it is not easy to determine the role of the private sector in the digitalization of the Palestinian economy and the promotion of innovation and knowledge creation. But here we suggest a profile of the ICT sector as is the corner stone in the digitalization of any society.

##### i. ICTs sector

The emergence of the digital economy is only part of the more general changing structure of an economy brought on by the dramatic changes in information and communication technology (ICT) that occurred worldwide over the last three decades. In Palestine, the proliferation of ICTs has been substantial over the last two decades, marking rapid rates of adoption of new technologies at both micro and macro levels (see Table 2). Palestinian ICT products are becoming more competitive in international markets, therefore we see an increase in the outsourcing of ICT products to Israel and other countries. For example, in 2008, the Israeli subsidiary of Cisco, a Silicon Valley networking giant, was one of the first firms to outsource work from Palestinian firms, such as Asal Technologies and Exalt Technologies (Schumpeter, 2014). Cisco has since been followed by the Israeli subsidiaries of Microsoft, HP, and Intel. The Palestine Information Technology Association of Companies (PITA) estimates that IT outsourcing accounts for around 10% of the West Bank's ICT sector GDP and employs around 3,000 Palestinians (Schumpeter, 2014).

**Table 2: ICTs in Palestine: infrastucture, diffusion, and structure**

| ICT support System                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | ICT diffusion                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | ICTs firms                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>• Broadband internet is widely available now in both West Bank and Gaza and with very good quality.</li> <li>• The Third Generation (3G) feature is now available in Palestine (West Bank only) after it was banned by GoI while it was available in the world markets already in the early 2000s.</li> <li>• In 1999 Palestinian Information Technology Association of Companies (PITA) was established as organizational body to ICTs sector.</li> <li>• Logistics services available for e-commerce.</li> <li>• There were 7792 students enrolled in ICTs in 2017 (Palestinian Ministry of Education and Higher Education, 2017).</li> <li>• There are 44446 graduates from higher education institution in 2017, including 1843 ICTs students (Palestinian Ministry of Education and Higher Education, 2017).</li> </ul> | <ul style="list-style-type: none"> <li>• More than 48% of the households in the Palestinian territories are connected to the internet in 2014 (PCBS, 2014), up from 1% in 2000.<sup>7</sup></li> <li>• Mobile and wireless internet technology is now available in Palestine, more than 375 thousands ADSL subscribers (PCBS, 2018a).</li> <li>• The total number of fixed telephone lines was 472,292 in 2016, and the number of mobile subscribers for the same year was 4 million using both bill and card system (PCBS, 2018a).</li> <li>• Internet World Statistics estimated that there are around three million internet users in Palestine in 2017 with 60.5% penetration rate.<sup>8</sup> Penetration rate is approaching 50% across developing countries according to the International Telecommunication Union in 2017<sup>9</sup>.</li> <li>• Around 47.0% of the total number of firms in Palestine used computers, 39% used internet, and 11% used electronic transactions in 2011.</li> <li>• More than 63% of households have a personal computer in 2014, and around 98% of them have a mobile line.</li> </ul> | <ul style="list-style-type: none"> <li>• The Palestinian ICT sector has experienced increasing growth in the last 20 years.</li> <li>• It is the fastest growing sector in Palestine. In the last two decades, the ICTs sector grew more than 300% (Morrar, 2016).</li> <li>• ICTs sector in 2016 included 633 firms hiring 8833 workers (PCBS, 2017b).</li> <li>• The ICTs is very productive in Palestine with USD 92,189 labor productivity in 2016 (PCBS, 2017b). The labor productivity of the industrial sector is USD 42,437, in trade USD 21309, and in services USD 14532.8.</li> <li>• ICTs companies diverse to cover most ICT services<sup>10</sup>: <ol style="list-style-type: none"> <li>1. Telecommunication companies</li> <li>2. Application Software Companies.</li> <li>3. Professional IT Consulting Service Providers.</li> <li>4. Professional Network Service Suppliers.</li> <li>5. Software and Solution Development Companies.</li> <li>6. Internet Service Providers.</li> <li>7. Professional and Technical Training Providers.</li> <li>8. Suppliers of Computing &amp; Telecom equipment.</li> </ol> </li> </ul> |

## ii. Finance System

The banking system in Palestine is well developed, including the financial services (current and deposits accounts, overdrafts, consumer loans, commercial loans, money transfer, e-banking, etc.), and the regulatory infrastructure. It consists of 15 banks distributed as 12 commercial banks and 3 Islamic banks. The banking sector in Palestine is organized by the The Palestine Monetary Authority (PMA) which responsible for the formulation and implementation of monetary and banking policies.

However, funding for entrepreneurship, start-ups and creativity mainly does not come through private capital or banking facilities, but rather through non-financial institutions (NGOs/NPOs play the prominent role). Indebtedness to financial institutions is not an option for many entrepreneurs, and banks impose high-interest rates on debt financing and high equity stake requirement on early-stage investments knowing that most of the new digital-based projects are start-ups and entrepreneurial projects with high risk and low guarantees (World Bank, 2018). Bank loans are mainly consumption-oriented rather than development-oriented or investment loans. GIZ has estimated that the bank loans represented only 2.1% of total investment in SMEs in Palestine in

<sup>7</sup> <http://www.internetlivestats.com/internet-users/state-of-palestine/>

<sup>8</sup> <https://www.internetworldstats.com/middle.htm#ps>

<sup>9</sup> ITU, World Telecommunication/ICT Indicators database, released January 2017.

<sup>10</sup> <http://www.pipa.ps/page.php?id=1b870fy1804047Y1b870f>

2016. In 2017, private consumption loans accounted for around 17% of overall facilities, and consumer services around 11%, whereas loans for mining and manufacturing less than 5% and loans for agriculture and food processing around 1.5% (PMA, 2017).

In Palestine, the microfinance institutions (MFIs) have grown very fast, with an outstanding portfolio of around USD170 million and 87,000<sup>11</sup> borrowers late 2016 compared with USD92 million portfolio and 54,201 borrowers in 2013 (Sharakah, 2016).<sup>12</sup> The original MFIs who established the new MFI Sharakeh were ASALA, ACAD, FATEN, UNRWAMMD, ANERA, PARC, CHF, PDF & YMCA, in addition to Al Ameen Company in the Gaza Strip. Despite relatively high interest charged, MFIs are supposed to contribute to financial inclusion among marginalized groups who have low accessibility to finance. For example, in 2016, 38% of borrowers from MFIs were women. MFIs are getting ready to play a prominent role in bridging the USD600 million credit provision gap for micro, small and medium enterprises (MSMEs) in Palestine and stimulate the entrepreneurship and start-ups sector.<sup>13</sup> But they still face limited growth opportunities due to some regulatory efforts which aim to better regulate, ensure consumer protection and provide more stability to this emerging MFIs sector.<sup>14</sup> More efforts are expected from the PMA to strengthen the legal framework and supervisory capacities for the MFIs as well as consumer protection

Venture capital (VC) firms are the major new financiers of entrepreneurship and digital ecosystem in West Bank and Gaza. Foreign aid and local angels and investors mostly support them (World Bank, 2018). The most notable VC firms are Sadara Ventures (one of the first –if not the first– venture capital firm working with the Palestinian ICTs sector) Ibtikar Fund, Oasis500 from Jordan, and Raed Ventures, a Saudi corporate venture capital firm, and 500 Startups. VCs reported investments of almost USD150 million in over 40 companies over the past six years (World Bank, 2018), a significant indicator of the potential viability of this new form of financing.

### *iii. FinTech*

Financial technology (Fintech) is a modern concept in the Palestinian digital ecosystem. In the last couple of years, PMA has started substantial steps to develop the Palestinian banking system in order to respond for the increasing needs from customers for e-banking (ICT-based banking services), and to cope with the global trend and international banking standards, as part of the Palestinian financial inclusion strategy. Recently, the PMA has placed the electronic payments as a priority in its agendas. In 2014 a cooperation memorandum signed by Riksbank (the central bank of Sweden) and PMA to exchange banking experience especially in Fintech, which followed by an introductory workshop by Riksbank to transfer the Swedish experience in developing electronic payment methods (PMA annual report, 2017). In June 2018, the Swiss State Secretary for International Finance, Mr. Julien Thöni visited the Palestinian monetary Authority and met with Riyadh Abu Shehadah, the Deputy Governor of the PMA. This visit was very important to the dissemination of Swiss experience in Fintech to the Palestinian financial market and to evaluate the possible role for Swiss in the development of Fintech environment in Palestine<sup>15</sup>.

At the micro level, we can find an increasing investment in Fintech applications by financial institutions in Palestine. For example, Bank of Palestine one of the fastest growing bank in the Middle East has been invested in Fintech dramatically.<sup>16</sup> The bank owns PalPay, a Fintech company providing e-payment solutions serving 50% of the population that are still unbanked, and through consumers can make a broad variety of payments, including utility bills, school fees etc., using their cards. In addition, many banks in Palestine like the National Bank (TNB) and SAFA

<sup>11</sup> <http://microfinance-mena.org/category/countries/palestine/>

<sup>12</sup> <http://www.palmfi.ps/site/>

<sup>13</sup> <http://microfinance-mena.org/category/countries/palestine/>

<sup>14</sup> Same reference

<sup>15</sup> <http://www.pma.ps/Default.aspx?tabid=205&ArtMID=793&ArticleID=2306&language=en-US>

<sup>16</sup> <https://www.bankingtech.com/2016/09/people-centric-palestine-bank-debuts/>

Bank adopted Temenos' T24 core banking system to order to help them digitally transform<sup>17</sup>. Palestine Techno Park allocated a space for FinTech Innovation Lab as a focal point of access to Fintech technologies for leading international financial players, tech giants and VC's, as a place to trade Fintech ideas, and platform for our partners & members to engage, collaborate and grow. There focus mainly in digital banking, Big Data Analytic, Blockchain, Insurance-Tech, Digital Payments, Artificial Intelligence, and IoT Solutions for banking<sup>18</sup>.

The growth of Fintech industry in Palestine might bring new investment opportunities in the Fintech ecosystem (businesses supporting the sector). For example, supporting companies focused on internet security, networking, data mining, and other services that are integral to the entire technology sector. Fintech is expected to tackle financial inclusion head on in Palestine and create new links Palestine between citizens, financial institutions, venture capital funds, startups, and others looking to invest in new technologies or innovative strategies. This Fintech ecosystem could be yet another driving force in Palestinian digital economy by creating new businesses, boosting entrepreneurship and innovation in the ICTs sector, and generate new ICTs and digital-related jobs.

#### *iv. Entrepreneurship*

Entrepreneurs and start-ups in Palestine are not working in a vacuum. There is an increasing number of institutions in West Bank and Gaza that have incubated/accelerated the ideas come through entrepreneurs and innovative people either locally or abroad (World Bank has estimated them at 20 institutions).<sup>19</sup> The entrepreneurship ecosystem is developing and evolving in Palestine, and there are more youth founding their own start-ups or becoming team members of start-up businesses, outside formal jobs in the public and private sector. The most important statistics in the entrepreneurial sector are related to female entrepreneurship, which suffers from an alarming employment gap with men, as in most developing countries. With very limited job opportunities in the public and private sectors, many women in Palestine turn toward entrepreneurship (as mentioned above).

The obstacles to entrepreneurship and start-ups in Palestine cannot be separated from those facing innovation system and the digital ecosystem, for example lack of government support, weakness in legal frameworks, fragmented and separated efforts in the entrepreneurship system, political situation, etc. Entrepreneurs also lack business knowledge and experience upon entry which impedes them from making informed decisions about market demand, sources of finance, or business models for early-stage enterprises (World Bank, 2018b). Moreover, private investors suffer from information asymmetry which inhibits or discourage them to fund early stage ventures. The start-ups ecosystem in Palestine is still young but is growing steadily. Since 2009, each year saw on average 19 more startup launches than the year before. By comparison, women are more active in Palestine with 23 per cent of startups in Gaza and the West Bank led by women, higher than Beirut (19 per cent) and New York (12 per cent). However, the growth of start-ups and entrepreneurship is not met with development in the public policy and legal framework.

#### **g) Donors and support organizations**

It is well acknowledged in Palestine that most activities under the entrepreneurship, start-up, and innovation rubric remain a donor-driven activity, which means that the attempts to change the Palestinian economy into a digital and knowledge-based economy are often developed with the active participation of bilateral and multilateral agencies. The wide community of donors driving digital economy, start-ups and entrepreneurship in Palestine includes international development agencies (eg. USAID, World Bank GIZ, AusAID, IDB, SDG, EUROMED), international NGO's (eg. Spark, MercyCorps, Care, MEPI, WE EFFECT), who fund through local NGOs (LEADERS,

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<sup>17</sup> <https://www.bankingtech.com/tag/palestine/>

<sup>18</sup> <http://www.technopark.ps/en/article/214/FinTech-Innovation-Lab>

<sup>19</sup> World Bank (2018b). Innovative private sector development report, West Bank, and Gaza.

Welfare Association, Ibtikar Fund, Palestine for a new beginning “ PNB”, Sharek Youth Forum, Injaz organization, Pioneers of Palestine- Synergos). The European Palestinian Credit Guarantee Fund (EPCGF) is a good example for collaborative initiative between banks in Palestine and international fund agencies to stimulate SMEs and start-ups in Palestine. EPCGF is a partial credit guarantee scheme with the purpose of improving credit access for SMEs in the Palestine. It offers partial credit guarantees for SME loans to partner banks and has so far guaranteed loans of USD 97.5 million (Brown and Gietzen, 2015).

Most of the incubators and accelerators are supported by donor funding, with the presence of many international accelerators in the start-up's ecosystem. The main eight incubators in West Bank and Gaza are: Arabreneur, Business & Technology Incubator in the Islamic university of Gaza, Business development, Gaza Sky Geeks, Leaders, Mobaderoon, Palestinian ICT Incubator – PICTI, and UCAS Technology Incubator (Abushaban, 2015).<sup>20</sup> The digital and innovation infrastructure also includes support centers (e.g. Sharek, Paltrade, UN Women), associations (e.g. PITA, Business Women Forum), and policy research centers (e.g. MAS and Portland Trust).

### 3. SWISS DIGITAL ECOSYSTEM AND POSSIBLE COLLABORATION WITH THE PALESTINIAN DIGITAL ECOSYSTEM

#### a. Cooperation between Swiss and Palestinian universities, scientific institutes and start-ups

Since the establishment of the PNA, Switzerland (government and Swiss-based organizations) has continued its support of diverse bi-lateral and multilateral funded programs with government and non-government institutions in Palestine. Swiss organisations funded many projects in Palestine related to digital economy; under different themes such as entrepreneurship, start-ups, R&D, social innovation, etc. For example, between 2010-2012, the Swiss Agency for Development and Cooperation (SDC) funded a project about “Palestinian Women Economic Empowerment Initiative”, which targeted Palestinian women refugees in Lebanon. The main objective for this project was to protect low-income entrepreneurs from risk through creating sustainable income streams<sup>21</sup>. CEWAS Middle East (Swiss NGO supported) is one of the very active NGOs in Palestine which support entrepreneurship and start-ups, mainly in the environment and water-related issues. Here in the table 4 below a list of some of the CEWAS project in Palestine in the last 5 years<sup>22</sup>.

**Table 4: List of some of the CEWAS project in Palestine in the last 5 years**

| Year | Project                                 | Description                                                                                                                                                                                                                                                                      |
|------|-----------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2014 |                                         | CEWAS (Swiss NGO) through local NGO partner Leaders began in 2015 providing professional training, mentorship and consulting services to start-ups in Palestine aiming to begin a business in sustainable water, sanitation and resource management (Spark annual report, 2015). |
| 2016 | Smart Start-Up Competition              | A partnership programme with SDC and the Bethlehem Business Incubator to help participants understand sustainability challenges in Palestine and develop business ideas and solutions                                                                                            |
| 2017 | Water Innovation Lab                    | A 4-days training course and part of the second round of the CEWAS Start-Up Programme in Palestine. It guides participants through a creative idea development and innovation process to find a sustainable solution for a specific challenge.                                   |
| 2017 | CEWAS Roadshow in Palestine – Towards a | A Roadshow event at Work Factory Manara for CEWAS environmental start-ups in Palestine to discuss with donor and                                                                                                                                                                 |

<sup>20</sup> <https://www.wamda.com/2015/09/palestine-s-top-8-incubators>

<sup>21</sup> [https://www.ilo.org/beirut/projects/WCMS\\_213580/lang--en/index.htm](https://www.ilo.org/beirut/projects/WCMS_213580/lang--en/index.htm)

<sup>22</sup> <https://cewasmiddleeast.org/events/>

| Year | Project                            | Description                                                                                                                                                                                                 |
|------|------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|      | Greener Future                     | investment community about green innovations flourish in Palestine.                                                                                                                                         |
| 2017 | Round Start-up Programme           | The 2nd round of the Palestine start-up programme kicked off with new innovative start-ups in sustainable water, sanitation and resource management.                                                        |
| 2018 | The Social Entrepreneurship Series | A monthly series on various topics of relevance to social entrepreneurship in Palestine. It aims to build a structure to support social enterprises in Palestine in cooperation with all community members. |

The scientific collaboration between Switzerland and Palestine is still on a small-scale in comparison to the collaboration between the Palestinian universities and other EU and USA universities. In the last few years, the Swiss government represented by the Secretary for Education, Research, and Innovation (SERI) started to pay more attention to academic and research collaboration with Palestine. For example, in 2014, Mr. Mauro Dell'Ambrogio, the Swiss State Secretary for Education, Research and Innovation visited the occupied Palestinian territory to discuss with the official representatives in Palestine possibility of cooperation at researcher, university and private partner level, and to find out about start-ups and support structures. In 2017, SERI has commissioned the HES-SO to develop the scientific collaboration between Switzerland and the Middle East and North Africa (MENA) region. The beginning was with "Young Scientists Mobility Grant" which situates Palestine as a priority country. Every year SERI allocates a group of scholarships for Palestinian post-graduate researchers (Ph.D. and Post-PhD) to follow their study in one of the Swiss universities and federal institutes of technology.

#### **b. The comparative advantage of Switzerland and niches**

It is apparent that Switzerland is one of the most competitive economies in the world and a leader in science and innovation. It is among the most attractive countries for scientists, such that it attracted 8000 more scientific authors than the number who left in the last 15 years. In 2015, Switzerland was among the OECD countries with the largest propensity to collaborate internationally (OECD, 2017).

In the last 10 years, Switzerland has initiated crucial improvements in its innovation ecosystems, such as quality of scientific institutions, R&D spending at the micro and macro level and firms' capacity for innovation. Since 2011, Switzerland has earned the number 1 position in the Global Innovation Index "GII" (eight consecutive years), number 1 position in the Knowledge and technology outputs pillar since 2012, and number 2 in innovation quality in 2018 (GII, 2018). To attain such a ranking in the GII and GCI requires also radical changes and improvements in the digital and innovation ecosystem. Digitalization is exploited by Switzerland to drive development and renewal, realize flexible labor market, achieve excellence in education and research and high-quality infrastructure and to maintain them in the long-term (Federal Office of Communications OFCOM, 2016).

"Digital Switzerland" strategy replaced the 2012 Federal Council's Strategy for an information Society in Switzerland. It became a measure within the legislative planning 2015 – 2019, which "provides the guidelines for government action and indicates where and how authorities, academia, the private sector, civil society, and politics must work together in order to shape the transformation process for the benefit of everyone in Switzerland" (Federal Office of Communications OFCOM., 2016). The plan has several action areas like data and digital content, e-government, and e-health, development of a knowledge-based society, innovation and growth in the digital world.

In terms of digital readiness, Switzerland experienced significant improvements and still room for growth by increasing the overall digital literacy of its population coupled with effective data security laws. Digital Index Switzerland is an annual assessment of the digital transformation

maturity of 100 top companies, 42 business activities, 130 industry benchmarks, and 10 industries (Digital Index Switzerland, 2017). The 2017 report found that the majority of Swiss companies enhanced their innovation processes focusing heavily on digital products and services.

Swiss industries are not absent from the discussion about industry 4.0 and internet of things (IoT). It has the best environment to play a prominent role in the industry 4.0, which is evident from the associated indicators. There is a fast change from Swiss industries toward digitalization, and 6% of Swiss workers work in technology and knowledge-intensive sectors, which is the highest percentage in Europe (Angelstorf, 2016)<sup>23</sup>.

### **c. Agriculture sector in the digital economy**

The agriculture sector in Switzerland, as in other areas of economic life, is in at the cutting edge of digital transformation. This includes all areas of farming: water, crop and herd management, plant protection, animal health, mechanisation.<sup>24</sup> Here we highlight some important applications for the employment of digital applications and ICTs in order to increase the competitiveness and the productivity of the agriculture sector that could be considered in the Palestinian strategic context:

- **Smart farms**<sup>25</sup>

Is one of its kind in Europe which has been applied in the Swiss farm to become demo for smart-farming technologies. It was firstly operated in the canton of Thurgau on 81 hectares farm.

- **Agriculture 4.0**<sup>26</sup>

Agriculture 4.0, like Industry 4.0, is the Swiss smart-farming revolution that the center of competence of the Swiss Confederation for Agriculture research (Agroscope) is studying with the aim of making farms more efficient, competitive, productive, optimizing processes and minimizing the negative impact on the environment.

- **InnoFarm project**<sup>27</sup>

It is a collaborative project between a three World Food System Center (WFSC) member groups, funded by the Swiss National Science Foundation. It aims to reconcile innovative farming, new technologies, and new data streams that can enable sustainable development of smart Swiss systems. It also examines how sensor technology, mobile, high-resolution measurement equipment can be used in order to influence greenhouse gas and nitrate emissions.

- **Digital innovations for sustainable agriculture**<sup>28</sup>

An interdisciplinary team located in the ETH Zurich, which studies the enabling factors (technical, agricultural and socio-economic) for using modern ICTs applications for a sustainable Swiss agriculture.

### **d. Swiss digital ecosystem contribution to the development of a Palestinian digital economy**

In the last years, networking and collaboration relationships between Palestinian universities and international universities have led to the growth of R&D and knowledge production in the Palestinian society. Here, we recall the important role of Erasmus and Erasmus<sup>+</sup> projects, Palestine-Quebec Science Bridge, and Palestinian-German Science Bridge PGSB, which have played an important role and opened the doors for Palestinian universities to access and learn from the experience and knowledge of the EU and Canada. Also, Korea International Cooperation

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<sup>23</sup> <https://www.s-ge.com/en/article/news/industry-40-digital-transformation-swiss-smes>

<sup>24</sup> <https://houseofswitzerland.org/swissstories/economics/agriculture-4-0-swiss-smart-farming-revolution>

<sup>25</sup> <https://www.futurefarming.com/Smart-farmers/Articles/2018/2/Swiss-farm-to-become-demo-for-smart-farming-technologies-250077E/>

<sup>26</sup> <https://houseofswitzerland.org/swissstories/economics/agriculture-4-0-swiss-smart-farming-revolution>

<sup>27</sup> <http://www.worldfoodsystem.ethz.ch/news/wfsc-media/2018/05/innofarm-project-kicks-off-in-solothurn.html>

<sup>28</sup> <http://www.nfp73.ch/en/projects/agriculture-and-nutrition/digital-innovations-for-sustainable-agriculture>

Agency (KOICA) is one of the international cooperation agencies that supports digitalization of Palestinian economy and builds strong ties with universities and entrepreneurial institutions.

Considering the situation of Switzerland in the world map of R&D, education, and innovation, there is a compelling and timely need for SDC to consider how its overall programs in the Occupied Palestinian Territories (OPT) can better recognize the promotion of innovation and digitalization of Palestinian economy as a funding priority. The following policy framework and possible interactions and collaborations are recommended to link the digital ecosystems of Switzerland and Palestine:

1. Palestine could take further steps to unlock the full potential of its digital economy and open it to the Swiss expertise, especially in economic sectors in Palestine with very low employment of digital applications (e.g. agriculture and food industries, transportation, public services). A starting point might be through support for adapting the strategy of “Digital Switzerland” into a similar one in Palestine. This will provide the policymakers with a document or guidelines which indicates the optimal way for authorities, academia, the private sector, civil society and politics for working together in order to support national digital development or transformation, boosting innovation, growth and prosperity in the digital world, providing equal opportunities and the participation for all citizens, and positively affecting the well-being of citizens. Swiss leadership in this area would be widely welcomed.
2. The Palestinian educational sector is a corner stone in any plan for digital economy. The successful attempts to access into the international experiences reaffirmed that it is important to open the Palestinian research, innovation and educational system to the international ecosystem. SERI and the Swiss Federal Institute of Technology (ETH) might play a prominent role in this endeavour through linking the Swiss academic and research institutions with their counterparts in Palestine, open/support research labs in the Palestinian universities in science and technologies which also linked directly with the private sector in Palestine, hosting Palestinian researchers in Swiss academic institutions and research centres through well-defined research programs which serve specific economic sectors in Palestine (e.g. agriculture and food industries, ICTs, science and technology) and targeting the most vulnerable groups (e.g. youth graduates, women, people in area C).
3. As mentioned earlier, the entrepreneurship sector in Palestine is very promising despite the huge challenges. Swiss private and public experiences are very important and be called upon to leverage this sector. Here we confirm the importance of collaboration between Swiss digital organisations (e.g. Digital Switzerland, InnoVaud, Polytech Ventures, BIO-Technopark® Schlieren-Zürich, Swissparks.ch, Swiss ICT investor Club, Swiss Biotech Association, Redstone Digital GmbH) and their counterparts in Palestine (PITA, Leaders, HCIE, ICTs firms, NaBIC),<sup>29</sup> all which work with start-ups and entrepreneurs and focus on the ideas of the graduates from local academic institutions.
4. It is important to link Swiss associations and private funding agencies and the start-ups and innovation ecosystem in Palestine in a win-win relationship. For example, the Swiss Entrepreneurs Foundation was established in 2017 in a collaborative initiative from 15 banks, insurance firms and organizations including UBS and Credit Suisse to raise a fund worth CHF 500 million to support young Swiss start-ups.<sup>30</sup> Here, the ideas of Palestinian entrepreneurs might be a good investment opportunity for Swiss incubators and accelerators.
5. Area C includes 61% of West Bank, and investment there is essential for sustainability of the Palestinian economy. The World Bank estimated the annual additional output from investment in Area C would amount to at least USD 3.4 billion per annum in valued added terms – a sum equivalent to 23 percent of 2011 Palestinian GDP, mainly from investment in agriculture and Dead Sea minerals exploitation. Regarding the telecommunication sector, the report estimated an annual revenues loss of USD 18 million to Palestinian mobile operators

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<sup>29</sup> An-Najah Business Innovation & Partnership Centre

<sup>30</sup> <http://fintechnews.ch/fintech/switzerland-welcomes-new-startup-fund-support-entrepreneurship/11253/>



due to the inability to serve customers in Area C, and a yearly revenue loss of around USD 7 million for the only landline provider (Paltel) (World Bank, 2013). Therefore, direct Swiss public funding to support investment in digital and innovative projects in area C, especially in the agriculture sector, will be crucial to realise a sustainable growth in GDP in Palestine. It would also ensure that digital economy development also touches the poorest, most marginalised and at-risk elements of the Palestinian people.

**ASSESSMENT OF INNOVATIVE APPROACHES IN FOOD  
SECURITY AND AGRO-ECONOMIC DEVELOPMENT IN  
PALESTINE:  
PLANT PRODUCTION**

**Submitted to:  
Swiss Development Cooperation (SDC)**

**By:  
Palestine Economic Policy Research Institute (MAS)**

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## **1. SECTORAL BACKGROUND: PRODUCTION, WATER, GEOGRAPHY AND ECOLOGY**

In an area witnessing long history of political instability, agriculture in the occupied Palestinian territories has a strong significance for national identity due to its affiliation to land, cultural heritage and social life. In terms of its potential in trade and employment, agriculture's impact on the overall Palestinian economy is decreasing. In a country of very limited resources, it is fundamental for Palestinian policy-makers and international donors to enhance the positive effects that agricultural production could have on Palestinian society. This report will shed light on the contemporary situation of the plant agriculture sector in the oPt, with focus on the status of innovation in plant production and the real needs in different regions and crops in the West Bank and Gaza Strip

Agriculture in Palestine is a major contributor to protecting land from confiscation and settlements. Furthermore, it contributes directly to the preservation of the environment, and it plays an important role as a supplier of inputs to various industries and as a consumer of inputs and services from other sectors (MoA, 2014). Despite its importance, agriculture's contribution to GDP in the oPt has declined from 14% in the mid-1990s to as low as 4.5% by 2014 (UNCTAD, 2015:9) and even lower since. Agriculture is at the heart of food security, provides employment for 7.3% of the labor force and accounts for around 20% of exports, with olives, olive oil, vegetables and cut flowers as the main products exported from the West Bank and Gaza Strip (WBGS) (World Bank, 2013).

In Palestine, the occupation has multiple and profound consequences on rural livelihoods. In the West Bank the fragmentation of land due to the division in areas A, B and C, the Separation Wall as well as movement restrictions including those regulated by the permit regime and closure policies all combine to limit the population's access to land and water, with clear impact on farming and livestock rearing. Mobility restrictions are estimated to render 50% of cultivable land inaccessible, hindering household and commercial production and decreasing jobs in this sector. The areas surrounding settlements which is not accessible is approximated at 5000 dunums, half of which is agricultural land privately owned by Palestinians who need a special permit to access their lands. Israel's closure policies also harm farmers in more subtle ways: for example, Israelis open gates close to the wall letting landowners, but no other family members, in to harvest olive trees. In Gaza Strip, besides the effects of the recurrent conflicts and the land-restricted areas detailed above, other obstacles to a viable agriculture include the fact that certain fertilizers are part of a list of "dual use items" and their import in Gaza Strip and the West Bank is not allowed.

The cultivated area in Palestine is estimated at 1.854 million dunums (or 31% of the total area of the WBGS), of which 91% is in the West Bank and 9% in the Gaza Strip. The rain-fed area constitutes 86% while the irrigated area constitutes 14% of the total cultivated land, the rangeland amounts to 2 million dunums. However, the area available for grazing is only 621000 dunums. In addition, forests stretch over an area of 94000 dunums. Palestine houses 48 natural reserves, of which only 17 were transferred to the PNA, concentrated in the Eastern Slopes and the Jordan Valley area. About 63% of the arable land is located in Area (C); 19% in Area (B); and 18% in Area (A) (MoA, 2013:7). The distribution of agricultural properties in oPt is listed in (Table 1).

Land holdings in Palestine tend to be small, and land-holding size per farmer has decreased significantly since 1967 mostly because of population growth and traditional tenure arrangements. More than 50% of the holdings in the West Bank are 1.0 hectare or less. Less than a quarter of the Palestinian farms are more than 2.0 hectares and less than 10% are more than 5.0 hectares (ARIJ, 1994). Studies have also shown that while traditional farming techniques are still widely used, mechanized farming increasingly implemented, especially in land preparation (where more than 50% of farmers cultivating field crops, 80% in greenhouse vegetables and 40% in horticultural crops use this technique). Animal traction is generally used where mechanization is not in this activity of for small agricultural holding. Seeding and harvesting is still largely done manually.

**Table 1. Distribution of agricultural properties across the West Bank and Gaza Strip (PBCS, 2013).**

| <b>West Bank</b>   |       |
|--------------------|-------|
| Private ownership  | 54.6% |
| Family sharing     | 21.2% |
| Sharing            | 10.9% |
| Fixed rent         | 4.8%  |
| Rent               | 4.5%  |
| Hired labor        | 4.0%  |
| <b>Gaza Strip:</b> |       |
| Private ownership  | 77.0% |
| Sharing            | 14.0% |
| Rent               | 5.5%  |
| Family labor       | 2.2%  |
| Hired labor        | 1.3%  |

The rate of women's participation in the labor force in the West Bank and Gaza Strip (WBGS) is just 15.2%, one of the lowest in the Middle East and the world. Sixty-two percent of women outside the labor market are young women between the ages of 15 and 34, and most of them are married and have no children. This represents a good opportunity for intervention to encourage these women to look for jobs. It must be noted that 45 percent of the women who have given up looking for work have suffered from frustration for not finding jobs and were regarded as unemployed or outside the labor market (FAO, 2011)

Despite the significant contribution of women in Palestinian agriculture, this is still invisible and rarely recognized. Palestinian rural women contribute largely to extensive chores, factory work and farm work. They carry out many responsibilities and activities like preparing the land, planting, daily crop management and, as well as harvesting equally with men. Despite this major contribution, an estimated 40 percent (FAO, 2011, p11) of rural Palestinian women of working age carry out unpaid work. This means that their production is not comprehensively covered in the Gross Domestic Product (GDP). Moreover, they do not control agricultural revenues. This marginalizes their role in the production process.

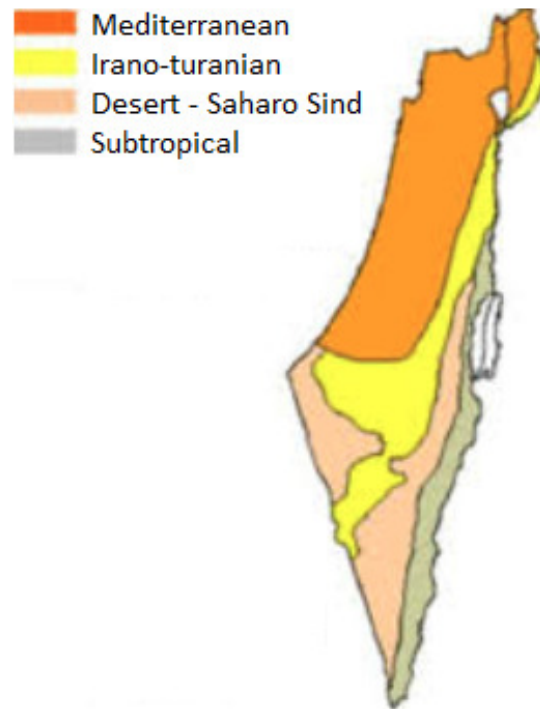
Further to this, according to a study conducted by MAS for the United Nations Food and Agriculture Organization (2018), women are less likely to hold positions of authority and are less likely to own agricultural holdings. It appears that women's activities are limited to only certain aspects of the food supply chain, such as picking and packaging. Women face greater limitations in marketing products, and do not have the same type of access to markets, due to it being a male dominated sector with certain sociocultural limitations for women's involvement. Hence, even when women are fully in charge of holdings through different phases of the food supply chain, their negotiating power is even more limited. Furthermore, conditions of employment in the sector are precarious, with very little protection of farmers and laborers. Workers mostly do not have work contracts or agreements and are employed seasonally. For women, the infrastructure of farms means also that they have little access to amenities in order to take breaks or attend to personal needs, especially given cultural expectations about women's conduct in public settings. Furthermore, aside from fully family-run and operated farms, day or seasonal agricultural workers appear to find work through informal networks, and there seems to be a growing presence of women in these types of arrangements. Largely because of Israeli restrictions on water usage, over 90% of Palestinian agricultural land is rain-fed, mostly in the West Bank. Gaza, Qalqilya, Tulkarm, Jenin, Jordan Valley and Jericho are more dependent on irrigation in their agriculture largely using ground wells or spring water. By contrast, about 70% of agriculture in Israeli settlements in the West Bank is irrigated (ARIJ, 2011).

Before the Israeli occupation in 1967 and at the time of British mandate and Jordanian administration, agricultural practices in animal and plant production were entirely seasonal,

conventional and traditional, and to a large extent rain-fed dependent. Immediately following its occupation of the West Bank and Gaza Strip Israel took over control of almost all the shared trans-boundary water resources in the oPt including the underground mountain aquifer – comprising the Eastern, North-Eastern and Western basins in addition to the Jordan River. The Oslo Accords maintained Israeli domination of management of all Palestinian water resources, and most of ground water aquifers and resources and large agricultural areas known as “Area C” are controlled by the Israeli water company Mekorot.

Palestine, as part of the eastern Mediterranean region is characterized by pronounced diversity in the geography and climate which is reflected in different agricultural activities and variability in crops as well. Palestine generally has a Mediterranean climate characterized by hot and long dry summers and short, cool, rainy winters. Precipitation ranges from 100 to 700mm annually concentrated between the months November and March. Besides the coastal plain which is humid-hot in summer and mild cold and rainy in winter, there are other three climatic zones: Irano-turanian, desert (Saharo-Sind) and subtropical zone. The geographical distribution of the four climatic zones are illustrated in (Figure 1).

**Figure 1. Map of the Eastern Mediterranean region including Palestine illustrating the major eco-climatic geographic zones.**



Climatic diversity allows for certain types of crops in different regions of Palestine. For example, in coastal and semi-coastal regions to the west high temperature in summer make it suitable to grow citrus and tropical crops like guava, avocado, mango, litchi, while in the Jordan Valley which is hot but less humid in summer, it is suitable to grow date-palm, citrus and banana. Transitional areas and eastern slopes in general are planted with rainfed field crops in addition to irrigated vegetables and potatoes. The mountainous areas are in general planted with olives, stone fruits, grapes and other minor fruit crops like figs, pomegranate and walnut. Olives are distributed across Mediterranean climate areas and concentrated more at the northern region of the WB. Grapes dominate more in the southern region of WB, particularly in Bethlehem and Hebron districts. Recently, grapes were introduced to the northern districts (Nablus, Tubas and northern Jordan Valley) in addition to Gaza Strip. The common vegetables crops planted in the West Bank except

Jericho are: beans, broad beans, cabbage, carrot, cauliflower, cowpeas, cucumber, eggplant, Jews mellow (Mloukheyyeh), lettuce, musk melon, okra, onion, pepper, potatoes, pumpkins, radish, spinach, squash, sugar beets, thyme, tomatoes, turnip, water melon. They differ from each other in the season they are planted and irrigation method used.

Most of the modern agricultural practices, technologies and techniques have reached the oPt from Israel. After 1967, Palestinian agricultural production structure was almost identical to Israel's: tomatoes, cucumbers and melons were roughly half of Israel's crop; plums and grape production were equal to Israel's; and Palestinian production of olives, dates and almonds was higher. At that time, the West Bank exported 80% of the entire vegetable crop it produced, and 45% of total fruit production (Hazboun, 1986). In 1981, the Israeli government inaugurated what is called "the Civil Administration" (CA) and the Israeli Ministry of Agriculture through CA was responsible for extension services and demonstrating and introducing new varieties and modern agricultural practices to Palestinian society and farmers. For example, the introduction of protected or covered (greenhouse) agriculture, the use of drip irrigation and the use of synthetic fertilizers and pesticides, introducing new vegetable and fruit crops and varieties were all transferred from the Israeli agriculture by CA, in addition to the knowledge that came from employees or workers in Israel.

After the Oslo accords, the Palestinian National Authority Ministry of Agriculture (MoA) assumed responsibility for extension services in addition to running research (as relevant experiments) in the agricultural experiments stations which are located at the northern and southern West Bank and in Gaza Strip as well. Currently the Palestinian MoA is the main provider of agricultural extension services in the country. It serves a significant number of farmers all over the West Bank and Gaza Strip districts. In 2013, there were 17 agricultural directorates located in the main cities of the WBGS as well as 38 extension units scattered at different cluster villages. Approximately 270 extension officers are involved in the extension services provision (MoA, 2013). These extension officers attempt to respond to farmers' needs on daily and regular basis and to provide up-to-date information on modern farming techniques, diseases control, in addition to wide ranges of technical advice. Extension services are provided for free and mainly funded by the government, it is considered as one of the most important agricultural services provided to farmers. However, very limited budget resources are allocated for these extension services in Palestine (General Directorate of Extension and Rural Development, 2018).

In summary, the agriculture sector in Palestine has a unique structure involving several players that can be summarized as follows:

- The Ministry of Agriculture (MoA): it is the official-formal system represents the PNA and involved in writing and implementing policies, monitoring and organizing different agricultural activities and responsible for extension services.
- The Israeli authorities that play a critical role especially in monitoring and controlling agricultural activities mainly in Area "C". Furthermore, they have the control on imports of different agricultural inputs like seeds, fertilizers and pest control materials.
- Non-Governmental Organizations (NGOs): they are engaged in land development, water resources and environment, poverty reduction and women empowerment, marketing (internal and external) of several agriculture products like olive oil, dried herbs and dates, as well as other crucial rural development programs. Among the leading NGOs are the Agricultural Development Association (ADA), Palestinian Agricultural Relief Committees (PARC) and the Union of Agricultural Work Committees (UAWC).
- Agribusiness or private companies: they are responsible for importing, distributing and marketing all agriculture inputs like seeds, fertilizers, irrigation equipment and pest control materials. They are also involved in introducing new technologies like modern irrigation system, Integrated Pest Management (IPM) and organic farming materials.
- Private Sector: there are several investors who revealed good opportunities in agriculture. Their investment goes not only to satisfy the Palestinian internal markets, but also focus on

exporting fresh or processed products to international markets. Examples are olive products, dried herbs, grape products and dates.

- Farmers: include very small (household) holdings less than 1000 m<sup>2</sup>, medium size (less than a hectare) or large (more than hectare) agriculture holdings.

## 2. INNOVATION IN THE FOOD SECURITY AND AGRICULTURE SECTOR

### a) Current status of innovation in the plant agricultural sector

Research in agriculture in Palestine is carried out mainly by three main sets of actors:

- Universities: 9 out of 13 universities in the West Bank, as well as 2 out of 11 universities in Gaza Strip (The Islamic University of Gaza and Al-Azhar University), are teaching and running research related to agriculture in Palestine (listed in Table 2). Most of the research addresses topics of local interest related to plant production and protection, animal production, veterinary science, food science and technology. The outputs of these research activities are B.Sc. graduation projects, M.Sc. thesis or scientific publications in local or international journals.
- The National Agriculture Research Center (NARC) which is the “research arm” and an institute managed by the Ministry of Agriculture. At present agricultural research is carried out through the NARC in eleven research stations in the WBGS, although they are operating at a low level.
- Research by individual farmers or by the private sector, which tends to be more observations and trial and error. This type of research is very limited, rarely funded or supported and results are in many cases difficult to generalize or validate, and lack proper experimental design or data analysis. In rare cases the research output is translated into prototypes or commercial final products for local markets. The main reason for this is that universities are teaching oriented in addition to low funding and absence of an innovation technology transfer system.

**Table 2. Universities in the West Bank that are conducting research in agriculture related topics**

| University                               | Location - city | College of Agriculture / related studies |
|------------------------------------------|-----------------|------------------------------------------|
| An-Najah National University             | Nablus          | Yes                                      |
| Arab American University                 | Jenin           | Yes                                      |
| Bethlehem University                     | Bethlehem       | Yes                                      |
| Birzeit University                       | Ramallah        | Yes                                      |
| Hebron University                        | Hebron          | Yes                                      |
| Palestine Technical University - Khadori | Tulkarem        | Yes                                      |
| Palestine Ahliya University              | Bethlehem       | No                                       |
| Palestine Polytechnic University         | Hebron          | Yes                                      |
| Al-Quds University – Abu Dis             | Jerusalem       | Yes                                      |
| Al-Quds Open University                  | all             | Yes                                      |
| Al-Zaytouna University                   | Salfeet         | No                                       |
| Al-Istiqlal University                   | Jericho         | No                                       |

Table 3 lists some examples of research outputs and attempts to cope and solve some local problems in Palestinian plant agriculture. In very rare cases the research output is translated into a prototypes or commercial end products in local markets. The main reason behind this is that all universities are teaching oriented in addition to low funding and absence of technology transfer system. Table 3 lists some examples of research outputs and attempts to cope and solve some problems in the Palestinian agriculture. Figure 2, in turn, provides an example of an innovative solution that was brought to life by multidisciplinary cooperation at Palestine Polytechnic University. As these examples in only one branch of the economy confirm, the human capital needed to power a process of scientific innovation in Palestine is not lacking, but a systematic

approach to nurturing and coordinating the process and in investing in realizing the best ideas seems to be missing.

**Table 3. Examples of applied research in plant production run by universities and their outputs**

| Problem / need                                                         | Solution/ Product / Project output                                                                                                                                                                                                                                                              | University/ institute                |
|------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|
| Deficiency and shortage in irrigation water                            | Introducing water use efficiency techniques like “Waterboxx” to mitigate the drought effect in summer crops and trees                                                                                                                                                                           | NARC + NGOs                          |
|                                                                        | Using special formulas and fertilizers that encourage stronger root growth especially for rainfed crops                                                                                                                                                                                         | PPU                                  |
|                                                                        | Hydroponic and aquaponic agriculture in cash crops like leafy vegetables and strawberry                                                                                                                                                                                                         | Universities projects+ NGOs          |
| High cost pesticides, low efficiency pesticides, banned herbicides     | Isolation of local strain of the fungus <i>Trichoderma harzianum</i> and use as a fungicide against soil pathogenic fungi                                                                                                                                                                       | Hebron University                    |
|                                                                        | Using the aqueous extract of wild plants like <i>Inula viscose</i> to control plant pests: control of powdery mildew on squash                                                                                                                                                                  | PPU + NARC                           |
|                                                                        | Insect control by the entomopathogenic fungus <i>Zoophthora radicans</i>                                                                                                                                                                                                                        | An-Najah University                  |
|                                                                        | Isolation and identification of local strains of entomopathogenic nematodes from the Palestinian territories, following a study of their biological characteristic such as infectivity, heat and desiccation tolerance,                                                                         | Bethlehem University                 |
|                                                                        | Using herbs extracts as natural herbicides                                                                                                                                                                                                                                                      | NARC                                 |
| Smart Farming (IT + agriculture) / digital agriculture                 | - Develop insect monitoring software (Figure 2).<br>- Software for the detection and estimation of foliage plant diseases                                                                                                                                                                       | PPU                                  |
| Crop quality management, preharvest and postharvest quality management | Sensing olive diseases using Visible/Near Infrared (VIS/NIR) spectroscopy                                                                                                                                                                                                                       | PTU                                  |
|                                                                        | Design and use of vegetables/fruits grading and sorting machine                                                                                                                                                                                                                                 | PPU                                  |
|                                                                        | Design and use of vegetables/fruit drying and demisting machine                                                                                                                                                                                                                                 | PPU                                  |
| Introduction and culture of new crops                                  | New crops which are not planted in Palestine before have been recently introduced. Examples are cereal crops by NARC, Al-Quds Open University, plant tissue culture produced crops by PPU: examples are pineapple (ananas), blackberry, <i>Paulownia</i> , <i>Moringa</i> and many other crops. | Al-Quds Open university, PPU<br>NARC |

Conventionally, agricultural innovation is understood as an invention, output, or concrete return on investment that brings about productivity gain or other concrete, measurable improvement (Berdegú 2005). The main sectors of a fully functioning agricultural innovation system are illustrated in (Figure 3). However, when looking at the Palestinian situation, the desirable clear distinction and interaction between the research system, the educational system and extension services all serving the agricultural sector is lacking and suffers from constraints that are summarized in the following points:

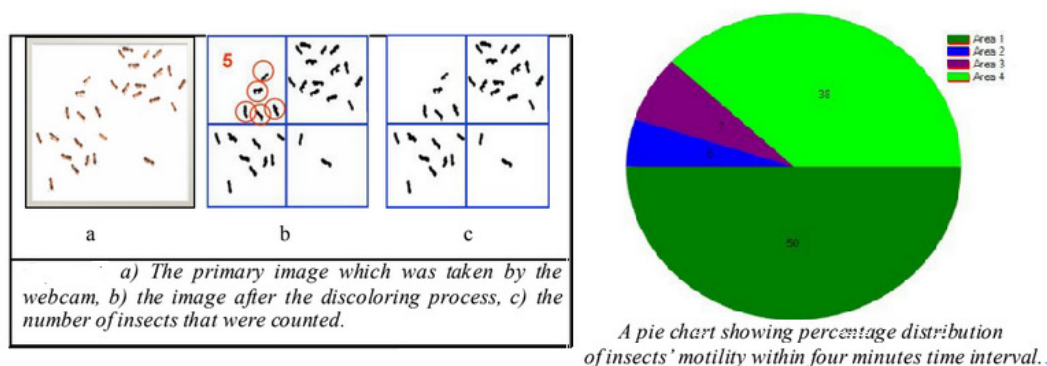
1. Funding research and innovation from the MoA is almost non-existent. The MoA has an estimated annual budget less than 1.0% of the total budget. This budget goes automatically to maintenance and basic needs of the Ministry.
2. Absence of Intellectual Property (IP) policy and regulations. This is reflected directly in the very low number of patents in Palestine in general and absence of patents related to products or services in the agriculture.
3. Influence of climate change: in the last two decades the entire Middle East region has suffered from pronounced fluctuations in annual rainfall quantities. This has also been a major issue challenging the agricultural sector in Palestine, and directly affecting agricultural production,



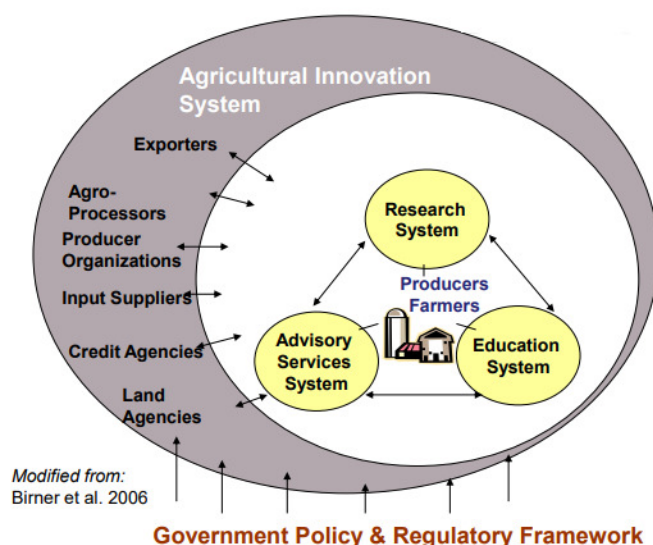
mainly due to changes and fluctuations in rainfall and lengthy periods of drought accompanied with limited accessibility to water for agriculture.

4. Disintegration of agricultural holdings and the trend towards increasingly small scale farming which is less profitable and efficient, notwithstanding its important social cohesion dimensions.
5. Weak functional relationships between stakeholders (farmers and people working in agriculture), market (agriculture companies) and research bodies (universities and MoA).
6. Low profitability, high input costs and high losses which resulted in decreasing the percentage of people working in the agriculture sector every year.

**Figure 2. The insect monitoring software that has been developed by cooperation between IT department and the Biotechnology Research Center at the PPU.**



**Figure 3. Illustration summarizing the agricultural innovation system in the oPt.**



#### **b) Alternatives and potentially innovative solutions by farmers in Palestine**

Much of the ongoing and potential innovation in agriculture targets a range of constraints imposed through occupation that render market forces secondary in the development process. Hence, what is innovative in a Palestinian context might be common practice or established technology elsewhere.

*i. Shortage of available water for agriculture.*

Lack of water is becoming a major limitation to plant production of both types; rainfed and irrigated crops. To cope with this challenge, farmers have developed some techniques for water harvesting and enhanced water efficiency, which can be summarized in the following points:

- Starting the rainfed crops earlier in the season (March– mid April) in order to maximize the use of water and avoid shortage in rain water expected in March and April.
- Using “Waterboxx” in growing trees and summer vegetables. It is a water container mounted underground then filled with water to supply the plant with constant amount of water in summer and enabling growth.



Figure 4. An illustration of Waterboxx (left) and a tree planted using a Waterboxx (right). Picture of a product from Spain. <https://www.youtube.com/watch?v=jvc1Wm9KKro>

- Use of special types of fertilizers immediately after planting which encourage growth of a stronger root system which automatically will cope with water shortage in summer. Examples are in rainfed cucurbit crops like squash, snake-melon, cauliflower and tomatoes. Examples of the chemicals used are Inicium® and Disper-Root® from Spain. Use of natural polymers with high water holding capacity under the root system. Some polymers were introduced to recently to the market. Example: ZEBA from USA. Tree crops are increasingly adopting this alternative especially newly planted date palms and forestry trees.

*ii. Restrictions on some key agricultural inputs by the occupation authorities*

After the second Intifada in 2001, the Israeli authorities issued a military order to ban number of agrochemicals claiming “dual uses”, among them are some key fertilizers and pesticides. Israel’s restrictions on access to fertilizers of suitable concentration have been especially punitive. (UNCTAD 2015: p5) Israel has restricted imports of many goods and chemical components as such imports may be used to make explosives or other weapons. As a result, Palestinian farmers are allowed to import only specific types of fertilizers, which are suboptimal and sometimes ineffective. Restrictions on key fertilizers include mainly urea, potassium nitrate and the compound fertilizer (N-P-K) 20-20-20.

- In order to compensate the shortage in these fertilizers, farmers shifted to use amino acid based or biofertilizers in addition to adopting more cheaper alternatives like producing “Tea-compost” from the available animal manure.
- Some important agrochemicals mainly broad spectrum pesticides (e.g. granular sulfur, Methomyl insecticide (Lannate®)) are prohibited from import and use in the WBGS.
- After the ban of some important pesticides, many farmers started using homemade formulas like insect repellants prepared from available natural herbs or weeds. An example is using extract of a strong smelling herb “*Inula viscosa*” which works as a natural fungicide and repellent to some economic insects and using the oil from *Macromeria fruticosa* as a general use herbicide.

*iii. Low prices of locally produced crops due to concentrated and short harvest time and due to strong competition from Israeli market.*

Farmers tend to avoid planting their crops and produce at the natural season peak, they use some techniques to delay harvesting time to other more profitable time. A common example is using

paper or cloth bags in grapevines to delay bunch harvesting to late summer or winter (Figure 5). Bagging as well gives protection against pests like insects and fungal diseases. Another example is when farmers in Jericho and Jordan Valley manipulate irrigation in snake melon crop to encourage flowering and fruiting this crop in winter where they have high prices.

**Figure 5. Grape-bunch bagging for protection against pests and delaying ripening and harvesting time to more profitable time in the year.**



During the past two decades many farmers have changed their crops towards quick and cash crops. This is observed more in the southern part of the West Bank, particularly in Hebron district. An example is replacing grapevine orchards with greenhouse tomato as summer crop in open field and train the plants on two leaders (stems) to double the production (Figure 6) and growing cucumber in open field on a special net used for cut flowers to prolong production period (Figure 7).

**Figure 6. Doubling the production by pruning greenhouse tomatoes on two leaders (stems)**



**Figure 7. Growing and training open-field cucumber vertically on plastic nets to prolong production period**



*iv. Postharvest losses due to mishandling and conventional harvesting, bad storage and transportation.*

To overcome this problem for example in harvesting olives and dates, farmers start using plastic packing boxes that allows proper ventilation, reduce fruit decay and prolong shelf life.



v. *Shifting from traditional crops towards more profitable and introducing new crops to new areas.*

During the last decade, prices of some agriculture products became extremely high; most of these crops are imported or enter from Israeli markets. Some examples are strawberries, avocado, pineapple and cherimoya where one kilogram could reach around 30 NIS ( $\approx 8.0$  US\$). Automatically many farmers invested to shift to “new” crops despite the high establishment cost, some examples shown (Figure 8).



Figure 8. Some newly introduced fruit crops in the oPt: a) a strawberry greenhouse in Tulkarem – Jbara. b) baby cucumber, a vegetable crop used mainly for pickle industry, introduced by agriculture companies (photo by: Agr. Muhammad Abu Mutawee). c) newly established avocado orchard near Tubas. D) pineapple in Tulkarem greenhouse. Source: Maan report. E) Cherimoya fruits picked by a farmer in Qalqilia. F) Carambulla in Qalqilia. G) A newly established orchard of lichi in Qalqilia. H) mango fruits in Gaza at harvesting time. Pictures source: Aljazeera media network.

### 3. PRIORITIES & RECOMMENDATIONS

As seen in this report, agriculture in Palestine is currently facing many challenges at the external as well as the internal. However, still many things can be done to support this vital sector. In emphasizing the case for sustained and systematic investment in innovation in Palestinian plant production, the case for an “agro-ecological” policy becomes more pertinent and feasible. Indeed much of the innovative practice reviewed in this report is ecologically friendly and is intuitive in the Palestinian conditions of natural resource and territorial constraints.

Agricultural innovation that is ecologically aware can produce more with less (“precision agriculture”). There is a growing market for ecological and healthy products, e.g. many prefer (including in potential export markets) Palestinian agricultural products because of their quality/flavor (vs. Israeli mass-produced tasteless products with poor nutritional value). Palestine is a frontrunner in this field in the Arab region, which could provide advantages in exporting these eco products regionally. Agro-ecological innovation would also help secure investment because the message to investors is that you can produce more with less and also ask for a higher price in the market. Precision agriculture and similar techniques also support climate change adaptation efforts because the whole goal is to constantly monitor and preserve resources (e.g. farmers are alerted to shift planting/harvesting times as ideal weather conditions change due to climate change).

In line with such an overarching innovation systemic policy, the following are some points where there is a potential to intervene and to enhance performance through a greater focus on and support for innovative solutions; these are areas where both government and private sector actors can intensify extension services, and where research centers in universities can be supported to assist in engineering and adapting innovative technologies to Palestinian needs:

1. Technologies which ensure coping with water scarcity and improving water harvesting and water use efficiency in addition to coping with soil problems like elevating salinity and wastewater usage and treatment. This should be carried out in the dry areas (less than 300 mm annual rainfall) in collaboration between MoA and the private sector or agricultural companies.
2. Introducing what is known as advanced “Smart Farming”: All areas of farming are affected by new technologies: soil, water, crop management, plant protection, mechanization etc. Smart farming aims to make farms more efficient, optimize processes, minimize losses, increase yields and minimize impact on the environment. Smart farming is practiced in Switzerland in different applications that help decision-making for managing plant protection problems encountered in large-scale crops.
3. Introducing new technologies that are connected directly with production inputs. This also should be carried out with involvement of/cooperation between MoA, universities, and private sector. Some examples in this proposal are:
  - Introducing new hybrid seeds that is resistant to certain pests. Many varieties are now sold by seed broker companies to farmers and nurseries especially in areas with infested soil or other plant diseases. A success story nowadays is re-planting Jenin area with grafted watermelon on pest resistant rootstock; this revived the watermelon crop in the area again after it disappeared during the last three decades following a devastating fungal disease.
  - Introducing new varieties that are characterized by earliness or lateness to avoid producing at the “season peak” and encountering high market supply and low prices. This can be efficiently done in different experiment stations managed by the MoA in collaboration with the private sector.
4. Research and innovation towards efficient crop storage and decreasing losses due to postharvest mishandling and bad storage and transportation. There are some examples of investors who established business to fulfill market demand with frozen vegetables, fruits, meat and fish as Al-Salam Investment Group – Cooling facility.
5. Supporting the shift towards more nonconventional and profitable crops especially in new

areas. This should not be restricted only to introduce new fruit and vegetable crops, but should go to medicinal and industrial plants, forage crops, and limber production especially in areas with recycled water.

6. Fertilizers and soil fertility: A lot could be done by the MoA to encourage the use of organic fertilizers and investing the available animal manure to compensate the shortage or ban of some essential fertilizers, subject to careful programming by crop and region.
7. Encourage shift towards organic agriculture and adoption of new environmentally friendly pest control chemicals, possibly derived or extracted from local sources. Here, it is noteworthy to mention and learn from the Swiss experience in organic agriculture. During the past two decades, agriculture in Switzerland witnessed a dramatical shift towards organic farming. In terms of area, the most significant organic crops grown in Switzerland are bread cereals, fodder cereals, vegetables and potatoes. The shift towards organic farming in Switzerland was accompanied with change in the governmental policy started in the early 90s.
8. Adopting modern and scientific farm management systems. This option should be adopted in academic institutes and universities and in all curricula by teaching agriculture engineers with all necessary skills needed for efficient farm management.

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## I- Appendix

**Table 1. Cultivated area in dunums of horticulture trees, vegetables and field crops in the Palestinian territory by governorate, 2010 - 2011. Source: PCBS report – 2012**

| Governorate                  | المجموع<br>Total | المحاصيل الحقلية<br>Field Crops | الخضراوات<br>Vegetables | أشجار البستنة<br>Horticulture Trees | المحافظة           |
|------------------------------|------------------|---------------------------------|-------------------------|-------------------------------------|--------------------|
| <b>Palestinian Territory</b> | <b>1,034,901</b> | <b>245,414</b>                  | <b>129,593</b>          | <b>659,894</b>                      | الأراضي الفلسطينية |
| <b>West Bank</b>             | <b>929,372</b>   | <b>220,882</b>                  | <b>95,841</b>           | <b>612,649</b>                      | الضفة الغربية      |
| Jenin                        | 199,752          | 58,997                          | 22,470                  | 118,285                             | جنين               |
| Tubas                        | 64,801           | 31,740                          | 23,680                  | 9,381                               | طوباس              |
| Tulkarm                      | 83,803           | 6,040                           | 7,993                   | 69,770                              | طولكرم             |
| Nablus                       | 139,240          | 29,334                          | 6,914                   | 102,992                             | نابلس              |
| Qalqiliya                    | 53,443           | 11,421                          | 2,749                   | *39,273                             | كثليّة             |
| Salfit                       | 69,490           | 1,994                           | 864                     | 66,632                              | سلفيت              |
| Ramallah & Al-Bireh          | 80,202           | 7,745                           | 3,785                   | 68,672                              | رام الله والبيرة   |
| Jericho & Al- Aghwar         | 33,633           | 5,844                           | 19,522                  | *8,267                              | أريحا والأغوار     |
| Jerusalem                    | 16,457           | 1,061                           | *884                    | 14,512                              | القدس              |
| Bethlehem                    | 33,557           | 4,438                           | 1,087                   | 28,032                              | بيت لحم            |
| Hebron                       | 154,994          | 62,268                          | 5,893                   | 86,833                              | الخليل             |
| <b>Gaza Strip</b>            | <b>105,529</b>   | <b>24,532</b>                   | <b>33,752</b>           | <b>47,245</b>                       | قطاع غزة           |
| North Gaza                   | 20,973           | 4,074                           | 8,809                   | 8,090                               | شمال غزة           |
| Gaza                         | 19,649           | *6,099                          | 2,663                   | 10,887                              | غزة                |
| Deir Al- Balah               | 15,870           | 1,786                           | 4,178                   | 9,906                               | دير البلح          |
| Khan Yunis                   | 28,017           | 6,229                           | *11,019                 | 10,769                              | خان يونس           |
| Rafah                        | 21,020           | 6,344                           | 7,083                   | 7,593                               | رفح                |

(\*) : High Variance

(\*) : التباين مرتفع

**Table 2. % age distribution for area of vegetables in the Palestinian Territory by type of irrigation and governorate, 2010 – 2011. Source: PCBS report – 2012**

| Governorate                  | المجموع<br>Total | محمي<br>protected | مكتثوف مروي<br>Open Irrigated | مكتثوف بطي<br>Open Rainfed | المحافظة           |
|------------------------------|------------------|-------------------|-------------------------------|----------------------------|--------------------|
| <b>Palestinian Territory</b> | <b>100</b>       | <b>20.1</b>       | <b>66.3</b>                   | <b>13.6</b>                | الأراضي الفلسطينية |
| <b>West Bank</b>             | <b>100</b>       | <b>19.7</b>       | <b>62.9</b>                   | <b>17.4</b>                | الضفة الغربية      |
| Jenin                        | 100              | 12.1              | 72.6                          | 15.3                       | جنين               |
| Tubas                        | 100              | 26.2              | *64.1                         | *9.7                       | طوباس              |
| Tulkarm                      | 100              | 49.2              | 41.7                          | 9.1                        | طولكرم             |
| Nablus                       | 100              | 17.8              | 70.6                          | 11.6                       | نابلس              |
| Qalqiliya                    | 100              | 41.4              | 25.9                          | 32.7                       | كثليّة             |
| Salfit                       | 100              | *7.9              | 3.9                           | 88.2                       | سلفيت              |
| Ramallah & Al-Bireh          | 100              | 0.1               | 11.0                          | 88.9                       | رام الله والبيرة   |
| Jericho & Al- Aghwar         | 100              | 14.0              | 84.7                          | 1.3                        | أريحا والأغوار     |
| Jerusalem                    | 100              | 0.8               | 40.4                          | 58.8                       | القدس              |
| Bethlehem                    | 100              | 10.9              | *15.5                         | 73.6                       | بيت لحم            |
| Hebron                       | 100              | 12.9              | 39.0                          | 48.1                       | الخليل             |
| <b>Gaza Strip</b>            | <b>100</b>       | <b>21.0</b>       | <b>76.3</b>                   | <b>2.7</b>                 | قطاع غزة           |
| North Gaza                   | 100              | 15.8              | 83.3                          | 0.9                        | شمال غزة           |
| Gaza                         | 100              | 15.1              | 83.1                          | 1.8                        | غزة                |
| Deir Al- Balah               | 100              | 37.6              | 60.3                          | 2.1                        | دير البلح          |
| Khan Yunis                   | 100              | 13.9              | *80.4                         | 5.7                        | خان يونس           |
| Rafah                        | 100              | 31.1              | 68.0                          | 0.9                        | رفح                |

(\*) : High Variance

(\*) : التباين مرتفع



**ASSESSMENT OF INNOVATIVE APPROACHES IN FOOD  
SECURITY AND AGRO-ECONOMIC  
DEVELOPMENT IN PALESTINE:  
ANIMAL PRODUCTION**

**Submitted to:  
Swiss Development Cooperation (SDC)**

**By:  
Palestine Economic Policy Research Institute (MAS)  
Lead author:  
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This report provides an overview about the state of innovation and technology in animal production, and discusses the possible interventions, innovations and technologies to improve the animal production sector, which in turn could create jobs opportunities. This is achieved through an analysis of the data provided by literature reviews and stakeholder interviews.

## **1. SECTOR BACKGROUND**

The animal production sector is an integral part of Palestine's agricultural sector and plays a significant role in Palestinian livelihoods by providing jobs opportunities, the growth and development of the rural economy and its cultural influence which has a social importance at both the household and national levels. Subsectors as cattle, sheep, goats, camels poultry, beekeeping and fishes constitute the animal production sector in Palestine, which provides the main source of income and food security for thousands of Palestinian households in the rural areas and Bedouin communities in the West Bank and Gaza Strip (MoA, 2015, p. 6). According to the last agricultural census by the Palestinian Central Bureau of Statistics (PCBS, 2012), during the year 2010/2011, the total number of agricultural holdings in Palestine is 105,238 of which 10% is only animals and 21.8 % mixed holdings.

The PCBS (2014, p. 55) reported 32,177 animal and mixed holders of which 20% are located in Gaza. Of all holders 25%, 25%, 29%, 16% and 4% were, over 60 years of age, and between 50-59, 40-49, 30-39, and 15-29 years of age, respectively. The distribution of the educational attainment of holders was 8%, 5%, 13%, 25%, 24%, 14%, and 10%, for those with Bachelor degree and above, Associate diploma, Secondary, Preparatory, Elementary, literate and illiterate, respectively.

The agricultural sector in Palestine for the year 2012 (closest to the agricultural census year) contributed about 5.9 % of the GDP while the livestock produced about 40% of that (2.4% of GDP) (MoA, 2015, p. 5). Historically, the agricultural sector has played an important role in providing employment opportunities, thus enhancing the role of the agricultural sector in strengthening the resilience of the Palestinian society and increasing their capacities to adapt. However, since 2006, the agricultural sector has witnessed significant decline in the number of agricultural workers due to restrictions imposed on the sector's development, and its low production. In 2006, labor in the agricultural sector constituted 16.7% of total labor force (12.6% male, 35.1% female), falling to 10.4% in 2014, and to 8.7% in 2015 (MoA, 2016).

On closer inspection, the results indicated that there were 8,628 paid employees in animal and mixed holdings in Palestine during the agricultural year of 2012/2013: 75% of them in the West Bank and 25% in Gaza. Temporary employees represented around 70.1% of all the waged employees. Male employees represented 65.9% of total employees in animal and mixed holdings in Palestine during the agricultural year of 2012/2013. The average daily wage of employees in animal and mixed holdings in Palestine was 68 NIS, around 79 NIS in the West Bank and NIS 34 in Gaza Strip. The average daily wage of permanent male employees was around 65 NIS and 70 NIS for temporary male employees, while it was 37 NIS for permanent female employees and 53 NIS for temporary female employees.

However, the informal nature of the sector makes it difficult to estimate total employment in the sector. Unpaid family members employed in animal and mixed holdings in Palestine totaled 82,765 during the agricultural year of 2012/2013: 83.3% of them in the West Bank and 16.7% in Gaza. Permanent unpaid family members represent around 80.4% of all unpaid family member employees. Many factors have caused the decline in most livestock branches, such as restrictive Israeli policies on land access and supply of animal feed, and climate change which have a negative influence on both feedstuffs resources and animals' health. Other factors that negatively influence the development and profitability of this vital sector are traditional breeding, lack of knowledge in terms of the diversity and quality of products as well as the interventions of stockholders. Consequently, many animal holders immigrate to work in Israel so as to seek a better income. However, investment opportunities remain high in this sector through the possibilities of

improvement of production in terms of quantity and quality by better allocation of existing natural and human resources as well as embodying innovative technologies (MoA, 2013; PCBS, 2013).

Even though the animal production sector provides a source of income and food supply for many Palestinians, especially in times of crisis (MoA, 2016b), the number of animals is progressively decreasing in most branches (see Table 1). This is a critical indicator of the need for urgent intervention before this vital branch of a viable agricultural sector is imperiled.

**Table 1: Basic indicators of the Livestock Sector in the Palestinian Territory, 2000, 2005, 2010, 2013**

| Variable year    | 2000       | 2005       | 2010       | 2013       | Percentage reared in Gaza |
|------------------|------------|------------|------------|------------|---------------------------|
| Cattle           | 26,601     | 36,284     | 39,625     | 33,980     | 33%                       |
| Sheep            | 615,838    | 793,874    | 732,399    | 730,894    | 8.3%                      |
| Goats            | 313,583    | 387,123    | 240,136    | 215,335    | 4.8%                      |
| Chicken Broilers | 47,890,000 | 31,533,000 | 36,547,523 | 31,515,383 | 22.7%                     |
| Chicken Layers   | 2,518,000  | 3,372,000  | 1,626,457  | 1,776,778  | 10.2%                     |
| Beehives         | 46,585     | 65,921     | 44,278     | 46,226     | 12.6%                     |

Source: PCBS. (2009). Agricultural Statistics 2007/2008.; PCBS. (2012). Agricultural Statistics Survey, 2010/2011, Main Results. and PCBS. (2014). Livestock Survey, 2013, Main Results.

## 2. INNOVATION IN ANIMAL PRODUCTION

According to García-Martínez, et al. (2016) innovation in agriculture entails an integrated system to improve agricultural productivity and agro-ecosystem resilience, involving different agronomic and management components within a synergistic relationship. Others like Paul-Morse (2017), define innovation in simpler terms as “invention plus commercialization”.

The many bottlenecks in the sector seem to be obvious candidates for the first potential areas for innovation. However, in Palestine, the lack of clear laws or regulations can hamper success of innovative start-ups, and in general there are only few institutions or enterprises that support innovation. Gianfrancesco, Estephan, and Maher (2015) noted that in 2015 and until this day the situation is the same. Therefore, many of those institutions and enterprises such as the NGOs and Palestinian National Authority (PNA) institutions may be identified as potentially active actors for innovation and safeguarding food security for all subsectors in agriculture. Such institutions have implemented donor-supported programs for creating or accelerating start-ups in the agricultural sector. The Higher Council for Innovation and Excellence (HCIE), which is intended to function as an Innovation Support Organization (ISO) is the only source of limited financial support to develop new ideas for prototypes and start-ups in all sectors. However, the work of the HCIE is not designed to enable research.

On the other hand, individual farmers have conducted trials based on innovative ideas such as using plants extraction instead of antibiotics in poultry farms, grinding feed ingredient to maximize animal performance and soaking the grains before feeding their animals. However, all these trials are executed without scientific reference or stakeholders support so their innovation value has yet to be realized. Regarding the adapted innovative technologies, many agricultural associations have provided farmers with some innovative technologies in form of pilot projects but most of them failed to succeed. Important production technologies such as hydroponic feed units, milk industry units, feed preparation units and farm management software unfortunately failed when applied, because they were poorly adapted to the Palestinian situation, with high operating expenses and little domestic experience in problem solving.

It is obvious that the Palestinian farmers are eager to apply new innovative techniques in order to reduce the input cost and develop the animal production as well as increase their income. However, their attempts need to be incubated and be based on scientific proof in order to be considered as successful innovations. Most stakeholders in the agricultural sector confirm the priority of research and innovative technologies in order to develop the agricultural sector by creating new start-ups, improving productivity and enhancing new products. This can be found mostly in all the new and old strategies of the stakeholders. Ministry of Agriculture (2013, p. 19) noted that one of the weaknesses are the “weak activities and means of supporting innovation and distinction among farmers and other stakeholders”.

The MoA, the main authority responsible for the development of the agricultural sector, has contributed to the lack of a research and innovation process by neglecting the role of the ISOs (Innovation Support Organizations) and research centers such as the National Center for Agricultural Research (NARC), while delegating such functions to the various general directorates in MoA. In addition, the MoA does not provide an enabling work environment that attracts researchers to NARC. With limited government budget resources devoted to its activities MoA's work with the agricultural sector is spontaneous and not systematic even with the different strategies that have been rolled out over the years in order to develop the agricultural sector. Most of its policy, planning and research functions are underwritten by donor or international agency project funding. In other words, this seems more like managing the problem instead of developing sustainable solutions, which might partly be due to MoA's inability to influence the concrete realities of the critical issues of the animal production sector.

#### **a) Innovative Technologies and Business Models in Animal Production**

The percentage of the total PNA government operating budget allocated to agriculture is about 1% (<https://paltoday.ps/ar/>). This low resource level is an indication of the limited support for innovative technologies and business models that should be promoted by government in animal production. The PCBS (2014, pp. 69-77) revealed that the number of trainees and holders who participate in agricultural organizations or unions in the field of livestock was 2,309 and 3,179 respectively. Furthermore, 54% of all holders didn't receive any kind of extension services, while for the other 47% their main source of extension was: 14% from the Ministry of Agriculture, 13% from wholesalers of agricultural inputs, 6% by NGO's, 5% by farmers and 8% by others. In 2016, 2,688 agricultural engineers were registered in the syndicate of agricultural engineers, of whom 497 were in animal production. Meanwhile, the number of agricultural engineers who work in the extension services of the MoA for all holders was 168, of which 10 were in Gaza Strip (<http://www.pcbs.gov.ps>).

A former senior official in the MoA- Directorate of animal production notes that there are only 60 agricultural engineers specialized in animal production who are working in the extension services for all subsectors of animal production in MoA, while 90% of animal shelters are not appropriate for animal breeding. He adds that inbreeding contributes to an increase in mortality and decrease in the quantities of production. These indicators are in line with the findings of the Livestock Survey 2013 (PCBS, 2014, p. 75), which states that the percentage of agricultural practices and technologies used by holders in the animal production are still traditional. Examples of such practices are depicted by the percentages of the castration technique which was 1%, marking 10%, and artificial insemination 8%.

Nevertheless, the sub-sectors in the animal production such as dairy cattle, Broilers and Layers are using purchased innovative technologies more than other sectors in order to improve their production and industries for the needs of the local markets. The use of these technologies depends on many factors, such as the size of the farm (number of animals reared), the criteria of production, the legislation and regulation, the knowledge of holders and the type of animals. But these types of innovative technologies are still limited because of their high cost when applied, the lack of experience and knowledge and the lack of regulations regarding the quality of the product.

An unpublished study from 2016 (conducted by the Faculty of Agriculture in Hebron University) evaluates the effects of the management, practices and technologies used in dairy farms on the milk quality in terms of the somatic cells count and milk composition. It detected a high level of somatic cells count (an average of 700,000 cell/ml) in Palestinian dairy farm products and an inverse relation to milk quantities, quality and composition. The results show, however, that every reduction of 100,000 of somatic cell count will improve the quantity of milk by 3% (not to mention its quality and safety). However, farmers do not consider the somatic cell issue as an important factor in the evaluation of milk quality since the government does not impose any regulation on this matter, as is the case in most developed countries. In addition, milk factories do not take into consideration the somatic cell count in the evaluation of their products' quality.

#### **b) Innovation Policy and Coordination in Animal Production**

The Global Innovation Index 2017 ranking for Palestine was beyond the 128<sup>th</sup> and this was mainly due to the poor investment capacity of businesses which hardly finance innovation processes in the absence of public support (Antonelli, Petruzzella, Jawhar, & Scivetti, 2017). However, many actors and key stakeholders underscore the need to promote innovative technologies towards food security, sustained agricultural sector, as well as generating jobs opportunities. As a result, in 2016 and again in 2018, key stakeholders of the Palestinian agricultural sector agreed on a common ground for creating change towards a more innovative and sustainable approach in the agricultural sector (Moghrabi, et al., 2016, p. 3; <http://www.fao.org> 2018). Furthermore, in 2016 the MoA finalized the research strategies in agriculture for the years 2017-2021, and this was accomplished in consultation with all parties concerned in food security and agricultural development. In addition, some of the important issues tackled in these strategies were the need for more applied research that focuses on the creation of startups that develop the agricultural sector (MoA, 2016b). In 2018 an agreement between the Palestinian MoA and the Ministry of Environment of Qatar established an agricultural business incubator based in Jericho to enhance food production, applied research and technology transfer ([www.palestineconomy.ps](http://www.palestineconomy.ps)).

There is no structure or organization specialized only in innovation related to animal production. Furthermore, the number of specialized researchers in this field is very low in Palestine since is estimated that there are a handful of expert researchers in animal production, distributed between four faculties of agriculture and one at a research center. This reflects the limited number of research opportunities and initiatives to promote agro-economic innovation in animal production. Many of the initiatives that were supposed to help in the improvement of this sector are still not functional as in the case of the animal gen bank, food safety laboratory in MoA, and the milk testing laboratory in Hebron University. Moreover, the lack of infrastructure in this field affects the application of some innovative technologies and can lead to their failure. Furthermore, limited coordination and cooperation between stakeholders concerned with this matter, even within the same institution, prevents the success of initiatives to promote agro-economic innovation in animal production. This gap and the lack of coordination is confirmed by various sources (MoA, 2015, p. 16; 2016b, p. 19; Moghrabi, et al., 2016; PCBS, 2013, p. 93).

In addition, the Higher Council for Innovation and Excellence (HCIE) was established in 2012 to encourage innovation and entrepreneurship and with the intention to establish a code that includes values, directives and standards which function and stimulate creativity and excellence. HCIE is responsible for the coordination with the Government to develop policies and regulations as well as stimulate supportive programs for innovation and excellence, especially at the level of primary education and higher education and strengthen the structure of the innovative system in the various sectors. Moreover, in 2016 the MoA joined the Mediterranean Innovation Partnership (MIP) Network to create a continuous growing environment for sharing and developing the needed knowledge and skills to support the future of new generations of innovative agro-food entrepreneurs in the Mediterranean.

### **c) Potential of the sector – Value Added, Innovation and Job Creation**

Every livestock subsector has its own unique characteristics and structure in terms of value, economic potential and job creation, so it will be different among regions within the OPT.

#### *i. Cattle*

The value of cattle production in Palestine (in 2013) totaled around NIS 209 million: 82.0% in the West Bank and 18.0% in Gaza Strip. Milk constituted 87.7% of the total value of cattle production, followed by new births which constituted 10.7%. It is worth mentioning that the cattle sector depends entirely on the importation of feeds and a large part of the replacing dairy cows from Israel. Also, most of the existing dairy farms are in need of huge investments that are totally linked to dairy factories or cooperatives that manufacture dairy products.

There are about 41 Palestinian dairy factories, of which 15 are located in the Gaza Strip. Those factories and dairy farms employ more than 1754 workers and the investment in dairy products industry is more than USD 67 million. 3 of the 41 factories are at advanced categories in terms of quantity of production, namely the Al-Janaidi, Al-Jabrini and Alban Hamouda factories. These three companies account for more than 70% of the Palestinian market share. Most of Palestine's cattle are located in Hebron, Jenin and Gaza with 25% ,17.5% and 17% respectively, where also, quite naturally, the Palestinian dairy cattle industry are located (see Table 2).

#### *ii. Sheep and goats*

During the agricultural year 2012/2013 the value of sheep production in total was around NIS510 million: 95.7% in the West Bank and 4.3% in Gaza Strip. Milk constituted 51.9% of the total value of sheep production, followed by new births which constituted 44.3%. The value of goat production in Palestine totaled around NIS170 million: 98.0% in the West Bank and 2.0% in Gaza Strip. Milk constituted 63.7% of the total value of goat production, followed by new births which constituted 32.7%.

This sub-sector differs from the rest of the animal production sector:

- Most of the rearing system is traditional and depends on family work.
- About 37% of sheep and goat holders are located in the region of Hebron and Bethlehem, which could be related to culture and dietary tradition of people from that region, who consume more sheep and goat meat and dry yoghurt (Jameed), made from ewe's or goat's milk, than other regions of Palestine.
- Depends on feeding animals with barley, wheat barn, corn, crop residue, pastures and cultivating the land with field crops that are not suitable for cultivation with other crops.
- Low performance and productivity are the main reasons for insufficient sheep farming profits.
- Most of the milk produced goes to nursing lambs, and the rest to household consumption.
- The sale of products is done through intermediaries who buy the lambs for purpose of fattening.
- The Gaza Strip depends more on cattle for milk products and red meat, because of the high prices of sheep milk and meat and because of limited area for pastures and field crops cultivation.
- Mixed farming is more successful than other systems especially in the case of small ruminants, which are more capable to subsist on crops residue and natural pastures than other animals.

#### *iii. Poultry (broilers, layers, turkeys, rabbits):*

In the agricultural year 2012/2013, there were 31.5 million broilers, 994.6 thousand mothers of broilers, 1.8 million layers, 546.4 thousand turkeys and 19,690 rabbits in Palestine. The value of poultry production in Palestine totaled NIS1,115 million: 70.2% in the West Bank and 29.8% in Gaza Strip. Birds constituted 71.0% of the total value of poultry production, followed by eggs used for hatching which constituted 14.4%.

According to the MoA, the poultry sector in the West Bank depends on some 5 companies to regularly produce broiler chickens, and if any of them face setbacks, the entire local market is

affected. The current farms cover about 80% of the local production, while market shortfalls are compensated from Israel. Broiler rearing systems vary in Palestine and differ from region to region and their conditions. For example, in Gaza there are problems in the entry of goods (chicks, feeds and medications) putting the whole poultry breeding industry at risk, as it depends on the availability of goods. In Hebron, farmers rear poultry at the expense of the poultry dealer, compared to the north of Palestine where farmers take the full risk of rearing the broiler and then selling the products to the dealer. Investment in this sub-sector is risky for the following reasons:

- Profits are dependent on minimal price fluctuation.
- A large capital is needed to invest, so those who have access to finance and can do marketing control the local market and prices according to their production.
- Unauthorized access of poultry and chicks from Israel when the price is in favor of small farmers forces many farmers to cease production, which is why the numbers of poultry farmers vary significantly from season to season.

#### *iv. Beehives*

During the agricultural year of 2012/2013 the value of beehive production in Palestine totaled 116.8 million NIS: 61% in the West Bank and 39% in Gaza Strip. Honey constituted 93.2% of the total value of beehive production, followed by colonies which constituted 5.8%. This subsector is fairly sophisticated and is very much influenced by the prevailing atmosphere in the region. It suffers from a large number of diseases and agricultural pesticides used. There are about 1800 holders of beehives, of which 500 in Gaza, and it is estimated that every beehive colony can provide from 800 to 1200 NIS as yearly income, but this kind of activity requires experience, more so than the other sub-sectors. Also, production varies among regions depending on climatic conditions, diseases and bee breeds.

**Table 2: Basic indicators of the Livestock holders in the Palestinian Territory and Governorates 2013**

| Governorate          | Ruminants    |            |            |             |       | Poultry       |             |       |               |                  | Total  |
|----------------------|--------------|------------|------------|-------------|-------|---------------|-------------|-------|---------------|------------------|--------|
|                      | Cattles Only | Sheep Only | Goats Only | Camels Only | Mix   | Broilers Only | Layers Only | Mix   | Beehives Only | Mix of Livestock |        |
| Palestine            | 648          | 5,242      | 940        | 13          | 2,660 | 1,227         | 132         | 1,263 | 360           | 19,692           | 32,177 |
| West Bank            | 568          | 4,831      | 930        | 1           | 2,220 | 1,001         | 91          | 656   | 333           | 15,045           | 25,676 |
| Jenin                | 177          | 828        | 34         | -           | 568   | 239           | 5           | 193   | 83            | 2,028            | 4,155  |
| Tubas                | 22           | 195        | 4          | -           | 130   | 25            | -           | 87    | 10            | 653              | 1,126  |
| Tulkarm              | 23           | 148        | 1          | -           | 48    | 95            | 18          | 138   | 42            | 928              | 1,441  |
| Nablus               | 155          | 885        | 68         | -           | 253   | 136           | 10          | 57    | 73            | 2,100            | 3,737  |
| Qalqiliya            | 9            | 247        | 10         | -           | 51    | 50            | 13          | 12    | 30            | 808              | 1,230  |
| Salfit               | -            | 53         | 65         | -           | 50    | 7             | 10          | 2     | 14            | 503              | 704    |
| Ramallah & Al-Bireh  | 10           | 172        | 158        | -           | 195   | 38            | 25          | 27    | 35            | 1,083            | 1,743  |
| Jericho & Al- Aghwar | -            | 52         | 38         | -           | 76    | 1             | -           | 1     | 27            | 805              | 1,000  |
| Jerusalem            | 1            | 61         | 193        | -           | 90    | -             | 3           | 10    | 4             | 857              | 1,219  |
| Bethlehem            | -            | 740        | 161        | -           | 313   | 17            | 2           | 42    | 12            | 1,247            | 2,534  |
| Hebron               | 171          | 1,450      | 198        | 1           | 446   | 393           | 5           | 87    | 3             | 4,033            | 6,787  |
| Gaza Strip           | 80           | 411        | 10         | 12          | 440   | 226           | 41          | 607   | 27            | 4,647            | 6,501  |
| North Gaza           | 31           | 201        | 10         | -           | 96    | 164           | 4           | 170   | 25            | 1,006            | 1,707  |
| Gaza                 | 30           | 38         | -          | -           | 50    | 7             | 14          | 86    | 2             | 740              | 967    |
| Deir Al- Balah       | -            | -          | -          | -           | 97    | 18            | 18          | 13    | -             | 873              | 1,019  |
| Khan Yunis           | 16           | 70         | -          | -           | 94    | 15            | 5           | 265   | -             | 1,270            | 1,735  |
| Rafah                | 3            | 102        | -          | 12          | 103   | 22            | -           | 73    | -             | 758              | 1,073  |

Source: PCBS, Livestock Survey, 2013, Main Results.

Most stakeholders are well aware that the animal production sector is under threat since its output is not sufficient to cover the needs of the local market, but at the same time has a high importance in the establishment of job opportunities. As a result, the importance of innovation and new technologies is mentioned in the strategies of the MoA and NGOs (MoA, 2013, 2015). In 2016, the MoA (2016a) formed a group of 10 experts in animal production to devise a national executive program for the development and improvement of livestock productivity. In addition, it was found that the small ruminant (sheep and goats) is the most affected sub-sector. Accordingly, a list of recommendations was presented in this report to improve this sector, such as: introduce new innovative technologies, improve farm management, enhance applied research, genetic improvement and selection, nutrition, improve farm biosecurity, using autovaccination, and improve environmental condition in farms. It was estimated that the application of these recommendations will reduce mortalities by 80% and increase milk production by 40% to 50% in small ruminants and 18% in dairy cattle as portrayed in Table 3.

An example of the productivity gains possible in this sector are noted in a successful start-up, located in the south of Hebron rearing 1200 cross breed sheep of Afec-Awassi, which provides stable jobs for 8 persons. The difference between this farm and others is that the productivity is four times more than the other farms and the use of the latest innovative technologies for every aspect related to sheep breeding and sanitary milk production. It was noticed that the extension and veterinary services as well as technologies used in this start-up were all obtained from Israel.

**Table 3: Expected changes in animal production with application of innovative technologies**

| Animal       | Current animal performance |           |           |                               | Expected performance after the intervention |                              |                |                               |           |
|--------------|----------------------------|-----------|-----------|-------------------------------|---------------------------------------------|------------------------------|----------------|-------------------------------|-----------|
|              | % Twins/season             | Open days | Mortality | Seasonal milk production (kg) | Milk goes for lambs                         | Milk available for marketing | % twins/season | Seasonal milk production (kg) | Mortality |
| Local awassi | 1.11                       | 290       | 0.25      | 100                           | 60                                          | 42                           | 1.28           | 200                           | 0.05      |
| Cross breeds | 1.38                       | 271       | 0.25      | 180                           | 60                                          | 131                          | 1.6            | 300                           | 0.05      |
| Assaf        | 1.39                       | 243       | 0.25      | 180                           | 60                                          | 145                          | 1.6            | 300                           | 0.05      |
| Local goat   | 1.2                        | 280       | 0.28      | 125                           | 70                                          | 53                           | 1.6            | 180                           | 0.08      |
| Shame        | 1.8                        | 280       | 0.28      | 250                           | 70                                          | 162                          | 2.2            | 300                           | 0.08      |
| Cross breeds | 1.6                        | 280       | 0.28      | 170                           | 70                                          | 76                           | 2              | 200                           | 0.08      |
| Cattle Dairy | 1                          | 365       | 0.18      | 8500                          | 0                                           | 8500                         | 1              | 10000                         | 0.02      |
| Local cattle | 1                          | 365       | 0.18      | 1500                          | 1500                                        | 0                            | 1              | 3000                          | 0.02      |

Source: MoA. (2016). The national executive program for the development and improvement of livestock productivity in Palestine (pp. 21).

### 3. PRIORITIES & RECOMMENDATIONS

To maximize profitability in more sustainable animal production in Palestine, a number of important challenges in this sector should be addressed.

#### a) Animal nutrition.

As most components of animal diets are imported from Israel as shown in Table 4, feeding represents one of the major costs for the livestock production input. It accounts for 75-85%, 55-65% and 60-70% of total cost of milk production, small ruminants and poultry production, respectively (MoA, 2015, p. 17). Only for ruminants feeding there is a yearly deficit of 503,000 tons (MoA, 2016b, p. 43). The high cost of feeding has forced small-scale famers to use low quality alternatives, thus affecting animal health and productivity as well as profitability.



**Table 4: Overview of the Livestock Feed in Palestine**

| Type of Animals | Feeds count for % of cost of production | Percentage of Imported feed from Israel | Feeds count for % of cost of production |
|-----------------|-----------------------------------------|-----------------------------------------|-----------------------------------------|
| Dairy Cattle    | Concentrate                             | 100%                                    | 70%                                     |
|                 | Roughage                                |                                         |                                         |
|                 | Silage                                  |                                         |                                         |
| Sheep and Goat  | Wheat                                   | > 95%                                   | 70%                                     |
|                 | Corn                                    |                                         |                                         |
|                 | Barley                                  | Protein feed > 85%                      |                                         |
|                 | Concentrate                             | 100%                                    |                                         |
|                 | Roughage                                |                                         |                                         |
| Poultry         | Concentrate                             | 100%                                    | 60-70%                                  |

Source: MoA. (2015). Livestock Sector Strategy 2015-2019. In (pp. 34). Ramallah - Palestine: MoA.

The possible interventions in improving animal feeding can be achieved by pursuing the following:

- Increasing feed production: maximized soil fertility, pastures management, increasing grazing area by using irrigation technology in arid areas and waste water recycling in irrigation, cultivation of adapted plants for animal feeding.
- Maximize diet efficiency: Improving nutritive value of by-products to be integrated in animal diets, using technologies in feed processing, and using feed additives as probiotic and prebiotic.
- Feeding management: decreasing nutrition disorders in ruminants, preparing diets in farms to decrease feed cost, giving calibrated diets as animal needs, avoiding feeding disorders and applying suitable ways for feed storage.
- Integration of feedstuffs evaluation techniques: in vitro and in vivo evaluation, as feedstuff has direct impact on environment, on production profile as well as on animals' health and performance.

#### **b) Genetic improvement.**

The importance of selecting and applying breeding techniques to improve and to bring desirable traits in livestock plays a major role in the improvement of production. Meanwhile, innovation techniques as artificial insemination and embryo transfer have many benefits in the rapidity of genetic improvement and safety to avoid the transmission of infectious diseases. Possible interventions include enhancing animal gene bank, artificial insemination centers and increasing knowledge of farmers regarding inbreeding risks.

#### **c) Disease management and health.**

As mentioned above, the high mortality rate which is caused by various diseases is considered to be one of the main threats affecting the improvement and profitability of the livestock sector. Furthermore, these diseases also affect the human health and products qualities. For example, in 2015 the Ministry of Health registered 833 cases of Brucella affecting humans who consumed animal products, while in 2016 there was another increase in the number of cases reported (<http://info.wafa.ps2016>). However, possible intervention will be through improving new methods of diagnoses, controlling antibiotic bacterial resistance by creating database among regions and using alternatives antibiotics and autovaccines technologies as well as increasing biosecurity levels in farms.

#### **d) Improve livestock housing handling facilities and animal welfare.**

Rehabilitate animal shelters especially for small ruminants, water resources and roads, using alternative energies resources as solar cells, wind and biogas especially for Bedouin communities.

Animal welfare is positively correlated with animal health, animal performance and product profile.

**e) Farms management and recording, training and knowledge exchange.**

Most animal holdings are not using recording system. Data shows that the holders' level of business knowledge is traditional and the extension services visits are very low, increasing knowledge in animal breeding will improve farms profitability.

**f) Reducing environmental impact.**

Processing of animal by-products especially in dairy cattle farms and reducing emission of gases by animals through feed processing technology will positively improve carbon footprint of farms.

**g) Potential for scaling up and/or new entry points**

The Applied Research Institute (2015, p. 28) recommended to “encourage the effective work of agricultural cooperatives and associations, in order to protect farmers and reduce input costs” as one of the ways to improve sustainable agriculture in Palestine. There are 418 registered cooperatives of which 247 are active and about 37% of the active cooperatives are agricultural (Ministry of Labor, 2017). Enhancing the role of cooperatives will help in reducing input costs, increasing knowledge transfer between farmers and improving marketing. However, this will only succeed if cooperatives function as the collectively owned and community managed institutions they are supposed to be.

It is furthermore necessary to further enhance the role of unemployed and new graduate engineers specialized in animal production. The role of cooperatives and associations in this field is vital in establishing a new foundation that leads towards a better situation in terms of jobs opportunities, new products with high quality, reduction of input costs and creation of a new market with higher qualifications.

Another important point is the need to develop the role of the National Agricultural Research Center (NARC), which is not operating as needed in terms of improving infrastructures, coordinating the cooperation between the concerned parties and conducting the required applied research and innovation in the domain of animal production. The General Director of NARC points out that: the center fails in getting the interest of researchers because of the inconvenient work conditions which are not appealing to them. Moreover, there are many proposals with good ideas that are pending for donor funding. He added that even the laboratories are not well equipped and many other laboratories are needed. For instance, there is one sheep station to provide rams to farmers for genetic improvement and there are no stations in the regions where most animal holders are concentrated (Hebron and Bethlehem).

Enhancing the role of innovation in animal production by using innovative labs, incubators, accelerators, innovation training workshops, as well as the engagement of the private sector in the process of innovation will help in finding solutions for many challenges and creating job opportunities. In comparison to other countries, a research and development (R&D) department is not found in Palestinian factories and enterprises that use animal products in their industries. Innovation in animal production in oPt is essential as it will affect the creation of new startups and will help in finding solutions for many issues related to this sector.

There are a number of potential areas for the initiation of new startups and creation of job opportunities, and which combined point to a possible R&D and investment agenda for the sector:

- Organic animals' farms and products have a potential local and export market.
- Feeds additives, all of which are all imported.
- Natural products (Plants origin) for animal treatments, and feed additives based on plants extraction for animal are not used and could be made from Palestinians resources.
- Use of animal's by-products in alternative energies as biogas, compost making and producing mono gastric protein source.

- There is a market for greater diversity of dairy products.
- Milk factories only use dairy cattle and greater use of sheep/goat milk is possible.
- Artificial insemination is almost not used for small ruminants and should be promoted.
- Beekeeping is neglected even though it is very important when it comes to crops pollination.
- Many other products are not on the Palestinian food chain as rabbit's meat.
- Using animal by-products to produce larva as natural fish feed is an important needed practice.
- Conduct research to resolve local problems, such as:
  - regional screening study for antibiotics bacterial resistance;
  - alternative medication for mastitis;
  - management of genetics animal resources;
  - anti-drought techniques to cultivate shrubs in pastures;
  - autovaccination;
  - improving dairy products quality;
  - reducing antibiotics residue in animal products;
  - using treatments based on natural products for honey bees; and
  - using crop byproducts in feedstuffs.

#### **h) Partnerships and Modalities to Integrate Innovation Sustainably in the Domain**

The innovation process needs time in order to obtain long term and successful results. Therefore, the integrity of every stakeholder is crucial especially in the case of animal production. Improving the infrastructure for innovations by further focusing on applied research will result in the form of prototype, practices or legislations. The initiation of an ISO is also essential to ensure the integrity and sustainability of an innovation process in this sector. Another important aspect for the innovation process is the deficient relationship between sponsors, since each works individually without coordinating with others. This applies to inter-institutional relations in the PNA, as well as between universities. The infrastructure for research and innovation in animal production could be enhanced by:

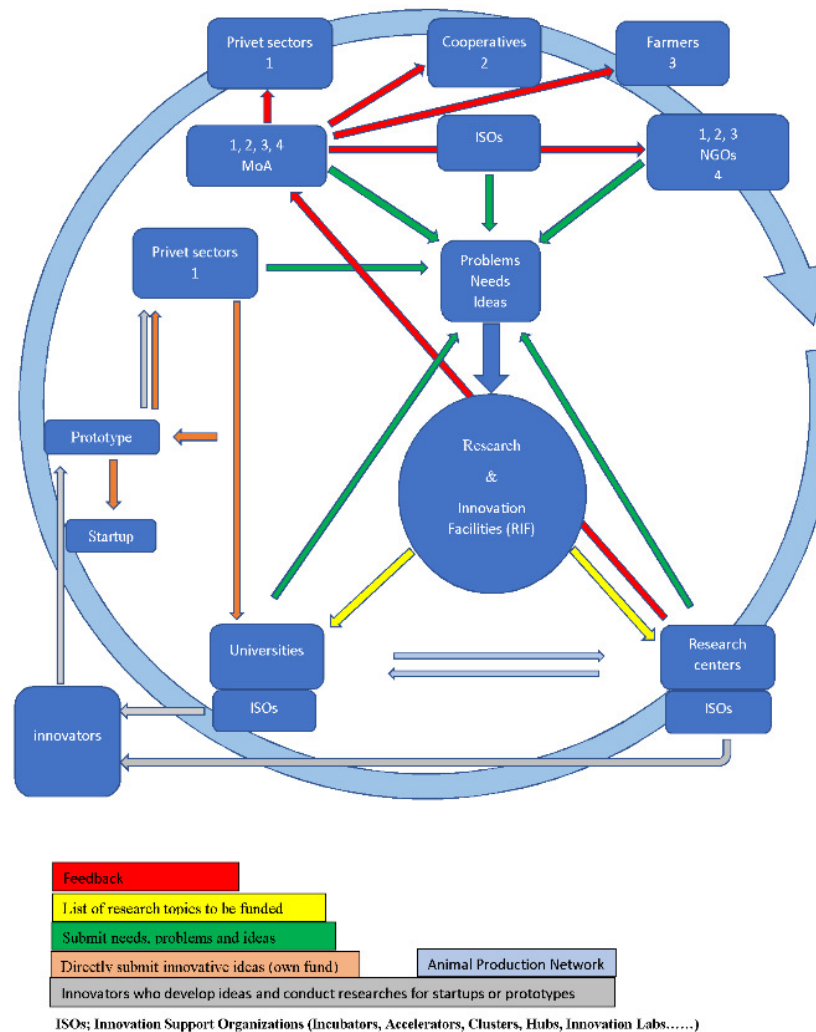
- Grouping research centers, incubators, accelerators, hubs and innovation labs within a national animal production innovation network.
- Creation of animal experimentation stations.
- Prioritize funding for applied research and innovation in animal production.
- Integrate government, the private sector, universities, NGOs and agricultural cooperatives in the processes of innovation.
- Enhancing the role of (R&D) in dairy and related enterprises.

An ISO with research and innovation capacity (covering both or separately animal and plant production) could have the following responsibilities (as in Figure 1):

- Bring together the stakeholders by facilitating the process of research and innovation.
- Receive and screen issues, needs and problems for consideration by research centers or universities as topics that need solutions through collaborative research and innovation.
- Study innovation proposals and seek funding for further research and to advance innovation.
- Accelerate and support existing start-ups and incubators.

On the other hand, the ISO can monitor creative ideas and promote them for adoption by the research and innovation facilities in order to identify the funds needed to conduct the required research. Afterwards, the innovative concept design may be forwarded for the production of the prototypes and registered for its protection to be either sold to the private sector or established as startup. The private sector would be in direct contact with the universities or research centers and contribute to the cost of the research and innovation. Figure 1 displays the possible feasible modalities and partnerships that integrate innovation in the animal production sector in a sustainable manner.

**Figure 1: Feasible modalities and partnerships between stakeholders of animal production that could integrate innovation in a sustainable manner**



#### i) Potential Impact on the Youth and Women and the Poorest

There are about 2628 women who are members in agricultural cooperatives, representing about 11% of all members (Ministry of Labor, 2017, p. 9). Moreover, in animal and mixed holdings, only 4.5% of holders are female and 1.1% are co-holders. Likewise, in most holders women do the majority of the work as milking, cleaning, feeding as well as making other milk products (PCBS, 2014, p. 57). For example, around 30 students have graduated since 2015 from the Department of Animal Production at Hebron University, 6 of them are females not working at all, while 3 are males working in the animal production domain and the rest are males working in Israel. These graduates are ready to initiate their own start-ups but they failed so far since they have no resources or innovation support.

The impact of institutionalizing and supporting the innovation process will have great effects on Palestinian society, beyond any specific sector. In the case studied here, the success of such innovative projects will lead to an increase in the number of animal holders and will result in providing diversity in the animal products. This increase in the number of animals will allow even the poorest to afford to buy these products. In addition, these innovations will create jobs

opportunities for the youth in the rural area and especially women since most of the farm work is done by them. In addition, most animal holdings are located in rural area and in zone C which represent the poorest class in society. Therefore, the creation of start-ups in these regions will improve standard of living, reinforce social fabric and help to keep the rural population on the land. It is well known that small ruminants are an effective way to use lands that can't be cultivated by economic crops as most of grazing areas besides small ruminants are located in zone C.

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**ASSESSMENT OF INNOVATIVE APPROACHES IN  
INCLUSIVE SERVICE DELIVERY AND  
LOCAL GOVERNANCE IN THE OPT**

**Submitted to:  
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## **1. SECTOR BACKGROUND**

The provision of public services by local authorities in the occupied Palestinian territories such as waste management, water access and social services have a massive impact on the daily lives and well-being of all Palestinians, all of whom are still living under differing degrees of Israeli military occupation. The poor and the disadvantaged communities in specific regions in Palestinian cities, specifically in Area C, often lack access to these important services. Fortunately, local governments have the ability to challenge this reality, by taking action. Different levels of government can cooperate effectively with citizens and the private sector, to promote pro-poor local service delivery.

The local government sector has witnessed a great deal of progress since the Palestinian national Authority (PNA) assumed jurisdiction in 1994. The strong will of leaders at the local community level to advance basic services and the strong coordination between the Ministry of Local Government (MoLG) and the donors helped grow the local government sector. Finally, the strong growth potential of this sector in Palestine creates incentives for concrete programmes and project that show results. Progress during the last two decades reflected on the quality of infrastructure that improved significantly, including the level of management of the local government units in the West Bank and Gaza Strip. However, there is still a great deal to be done, in terms of coordination with the NGO sector as well as with the Palestinian private sector.

The 1997 Palestinian local government law states 27 responsibilities required of local government units (LGUs), regardless of their size and capacity. However, LGUs focus on a small number of the most essential responsibilities, such as, Water, Electricity, Solid waste management, Sanitations and Roads. Moreover, LGUs provide other secondary services, such as, public parks and sports centers. According to reports published by the World Bank, MLDF and Global Community, there is a gap between the services provided by LGUs in Gaza and the West Bank. For instance, a high percentage of citizens are connected to piped water services; in the West Bank, the majority of citizens receive clean water, whereas, in Gaza only one percent of the citizens receive clean water, and the rest are dependent on the use of water tanks. Similarly, while a similar percentage of citizens in both the West Bank and Gaza Strip have access to electricity services, the West Bank has unlimited electricity supply, whereas in Gaza it is limited to 4-6 hours a day. Moreover, in Gaza houses are connected with sewage networks, similar to the urban areas in the West Bank, whose rural areas are not.

The only level of PNA government that has had regular elections are the local authorities, which puts the onus on the elected officials to work with transparency and accountability, otherwise they will not be re-elected. This is a clear reason for the advancement of the local government sector ahead of other Palestinian governance sectors.

Despite the quick spread of information technology, on an international level and later on, at the local level, the importance of information technology (IT) in the work of many public service organizations is still to be recognized. Since the late 1990s, most of the large - and some medium sized - Palestinian municipalities created websites to promote their work. The main objective was to connect with the outer world. Recently, social media has become the strongest platform to connect with stakeholders and a way to publicize the work of municipal councils. However, rural councils are still incapable of using this technology effectively.

Throughout the past ten years, the use of technology to provide municipal services increased, especially after developing service centers, through which citizens became able to acquire all the needed municipal papers efficiently and effectively. Before this step was implemented by municipalities, citizens had to go through multiple departments to acquire the necessary approvals. Based on a citizen satisfaction survey, which took place in 2015, the majority of the surveyed citizens who were aware of the existence of community service centers (88.3%), were satisfied by the services provided by these centers. However, over 52% of the surveyed citizens were aware of the existence of these centers (Alpha International).



The use of technology in local governance in Palestine was introduced in the beginning of the 21<sup>st</sup> century, by international organizations, such as, CHF, GIZ, and UNDP. Palestinian government interest in Information Technology in local governments was first demonstrated in 2012. The introduction of technology in municipal work came as an idea from the Municipal Development and Lending Fund (MDLF), which started several capacity building initiatives to improve the internal management of municipalities in the West Bank and Gaza Strip. This process was introduced through two stages, the first was building the technical capacity in finance, operation and maintenance, fixed assets registration, and information management. The second stage was to introduce the latest technology in terms of software to automate the work in the form of information systems. Considering, the history of local governance in Palestine, this was a vital step towards creating an enabling environment for sustainable e-municipality.

The challenges to digitalizing municipal services are threefold; first, the current laws governing the local government and the ICT sector are outdated and need to be developed according to the newly adopted strategy by the local government sector. Second, the commitment of the municipality administration is a major factor, as currently, the interference of the mayor and the members in the role of community service centers (CMS) can limit their role. Thus, the mayor and Municipal council members need to adhere to the strategy of CMS, which aims to provide services to citizens without any interference from the administration. Third, in terms of staff capacity, problems might arise in municipalities due to their staff not having acquired capabilities of operating an e-municipality or a CMS. Moreover, the staff members could be worried about losing positions within the municipality due to the process changes digitalization often entails.

## **2. INNOVATION IN INCLUSIVE SERVICE DELIVERY AND LOCAL GOVERNANCE**

Based on primary research, the feedback from key MLDF staff and other experts, as well as the available research regarding the status and role of ICT in local government, we can identify the following innovative approaches currently being used in local governance.

### **a) E-municipality**

Some municipalities tried to move from public service centers to e-municipality directly, while overlooking necessary prerequisites that are vital for the sustainability of the initiative, such as developing internal controls, employee training, and raising citizen awareness. The four municipalities that tried to apply e-municipality lacked the needed resources both in terms of workers as well as internal and external electronic systems, which is why they did not succeed. Now, the MDLF is implementing a capacity building program to avoid same mistakes and to improve municipalities' competence. This includes setting nine stages (discussed below) which are important steps before launching e-municipalities. They help build a basis for sustainability by utilizing success measurements and lessons learned by other municipalities. Currently, MLDF is implementing a pilot project with four municipalities (*Beit Jala, Halhul, Beitunia and Anabta*) after they had received capacity building training, learning from the obstacles faced during previous experiences.

### **b) MLDF's Strategy Towards e-Municipality**

Due to budget constraints, municipalities had to start with one IT system built on another, without the luxury of developing a comprehensive integrated information system that covers all the services provided by the municipality. With each new software introduced, parallel work was needed in technical fields, such as, finance, operations and maintenance, etc. So, the municipalities had to deal with a number of consultants and spend vast amount of time on each system they tried to establish. Following the purchase of hardware, and the installation of the software for each area, the municipality staff had to undergo a serious number of workshops, training and coaching in order to be able to operate the systems properly. The IT consultants continued working one year after the installation of the software, to make sure they solve any bugs or problem that may arise. It is worth noting that this experience replicates the failure at the national level, despite 20 years of

fragmented initiatives, to establish single window facilities for external trade, fiscal operations or local business start-ups and other private economy enabling environment features that are still lacking in Palestine.

Several capacity building packages were provided to municipalities by MDLF to improve their institutional performance, transparency, accountability and participation. These include:

1. Revenue Management Information System (RMIS)
2. Financial Systems (IFMIS)
3. Operation & Maintenance (O&M)
4. Strategic Development & Investment Plans (SDIPs)
5. Fixed Assets Registration and Valuation (FARV)
6. Financial Policies & Procedures Manual (FPPM)
7. Citizens Services Centers (CSCs)
8. E-municipality (EMS)
9. Social Accountability

**c) Technologies in Service Delivery**

MDLF and other partners have introduced 81 Citizen Service Centers (CSCs) in the municipalities, which improved the service delivery mechanism drastically. Before, it was an extremely bureaucratic process to obtain some basic service, thus, citizens had to visit a number of offices in the municipality to complete paperwork. After the introduction of this one-stop shop, all citizens, including those with disabilities and senior citizens, can enjoy easy access to the services, since the new methods allow citizens to obtain all the services needed efficiently from one counter located at the entrance to the municipality. In the first phase, the CSCs were implemented through institutional assessment for Introducing Citizen Service Centers (mapping, identifying gaps in the working processes, and their optimization, developing system requirement specifications and developing citizen guidelines for CSCs). The strengths of CSCs include:

- The CSCs makes the process more efficient, by reducing the time and cost of service provisions, which is done by reorganizing the administrative distribution of tasks, modernization of IT facilities and software, and reducing and restructuring procedures (including communication procedures).
- The CSCs will be a more efficient and effective way to access and segment citizen complaints and monitoring progress of the responses.

**d) Technologies in Citizen Information and Participation**

For many citizens such progress became visible only after the municipalities adopted the use of social media and mobile applications, making information available online or on Facebook and WhatsApp. Although this is a positive step, the breadth and depth of using new technologies is expected to improve over time. Palestinian municipalities are aware of the fact that informing their citizens of their accomplishments and their future plans is not sufficient, and that they are also required to increase citizen involvement and participation in the planning process and in monitoring the progress of these projects.

Around thirty municipalities received social accountability capacity development support from MDLF in the past three years. Building the capacity of municipalities in social accountability serves to empower local government bodies by contributing to the building of institutional systems in municipalities, consistent with local governance policies and good governance principles aiming towards municipal responsiveness, quality of services, and community participation and engagement. The support for municipalities aims at institutionalizing citizen engagement and social accountability in municipal governance through formal guidelines and procedures for strengthening citizen/beneficiary feedback on service delivery and municipal management, and enhancing the effectiveness of grievance redressal mechanisms. Enhancing transparency and

accountability of municipalities will ensue through improved disclosure of budgets and increasing citizen access to and knowledge of the municipal budgeting process.

Numerous donors supported pilots to advance methods, such as developing models for a “readable budget” and participatory monitoring and evaluation of pilots in selected municipalities. Advances were achieved in terms of better defining and communicating the “social compact” in the form of norms (via the creation of CSCs and associated public information around them). Citizen monitoring of municipal Strategic Development and Investment Plans were strengthened via a Participatory M&E manual. Grievance redressal systems were improved with a move towards computerization, which allows citizens to track their transactions/services via the web and via the CSC, applicable to many municipal services.

It is expected that the next step in improving social accountability will be based on improving, deepening and mainstreaming a number of these advances in transparency as well as citizen engagement, and focusing on how they can contribute to improvements in municipal performance. MDPIII will also seek to strengthen the quality of municipal-citizen relationship and opportunities for citizen feedback through all phases of the municipal expenditure cycle including implementation of the capital grant sub-projects. Complaints mechanisms will be scaled up and linked to the national Grievance Redressal Mechanism of the Ministry of Local Government. Part of the shift to quality will include looking at how feedback is handled, and whether grievances, satisfaction surveys, or feedback from participatory planning is integrated into municipal decision-making and management processes (“closing the feedback loop”).

The MDP project will continue its explicit focus on gender; quotas (30% minimum) for the inclusion of women and youth in community committees were embedded in the Manual and Policy Notes for Strategic Development & Investment Plans (SDIP) planning processes. Grant application forms were made gender sensitive, and specific efforts were made to ensure gender balance in the capacity development components (with 27 of 90 participants being women) in training under MDP II. CSCs are now able to generate gender sensitive reports (i.e. records and statistics per gender) which can be the basis for analysis to better understand any existing gender gaps in service provision, problem identification, or response times. The new generation of SDIPs and new SDIP manual will include recommendations on strengthened community participation, including women and youth.

MDLF, through the MDPIII program intends to achieve a number of objectives in introducing the Social Accountability package in the coming four years, which includes achieving further development needs at Local Government Units (LGUs):

- Increase awareness among LGU decision makers regarding social accountability.
- Build capacity of LGUs employees in applying social accountability concepts and.
- Integrate social accountability concepts and tools in LGUs affairs.
- Increase cooperation between LGUs and community service centers.
- Implement different social accountability tools in accordance with a National Toolkit.
- Support the institutionalized implementation of social accountability tools.
- Enhance complaints mechanisms in the targeted locations and citizens’ role in using them.

**e) Youth integration and women empowerment**

Since 2009, youth integration in local government affairs has been a major initiative, implemented through several civil society organizations in full partnership with MOLG. For instance, Sharek Youth forum and global community, worked on establishing youth local councils in certain areas. Whereas Al-Marsad, along with AL Maurad, did the same with village councils. Also, the “Community Thrive Program”, implemented in partnership with Arab World Democracy and Electoral Monitor (Al-Marsad), Juhud and the Community service center, targeted 55 municipalities in 2018 in the election of youth local councils. On the other hand, GIZ and five

partner organizations worked on a project called “Youth Create Change”, to enhance youth participation in local government.

Judging by the last two local election rounds, the youth are much more encouraged to participate in the elections as candidates. Even though their representation cannot yet be considered satisfying, they currently make up 16% of local council members.

Only a few initiatives have been implemented to foster women’s empowerment in local government, including but not limited to training female candidates for local government and training women after they were selected as local council members. These initiatives were implemented by MIFTAH, Al Marsad, and Women Technical Affairs Committee. Other initiatives were implemented since the 2012 local elections, such as the women shadow local councils, which was led by the Working Women’s Society for Development. To add to this, the GIZ piloted a gender audit program in five municipalities, and worked with MOLG to create a code of conduct, addressing gender equality, in local government, which was signed by the Mayors in 2013. According to the results announced by the central election commission, women make up 21% of LGU members.

#### **f) Targeting Vulnerable Citizens**

Since the PNA was established, whole regions (as a unit) were classified in local governance terms as vulnerable. However, recently, the definition of vulnerability has changed, to include sections of these regions, rather than the region as a whole. For instance, Um-Alsharayet is a region that is considered to be a part of Al-Bireh Municipality, but was recently considered as a vulnerable area due to the fact that it is near the barrier wall and part of it lies in area C. Moreover, the Gaza Strip was segmented into vulnerable and invulnerable areas, however, it is currently considered to be a vulnerable area, because of the continuing conflict and the blockade.

MLDF and MOLG have taken initiative to deal with these vulnerable areas by developing the MLDF rule from something that governed only municipalities, into one that applies to all LGUs, whether they are municipalities or village councils. Both MLDF and MOLG have developed a \$2 million fund to deal with the most vulnerable communities and areas, which will be followed by a \$3 million fund to deal with the same. MLDF has also started a pilot project on renewable energy which targets several municipalities and village councils, such as, Anata, Kabalan, Baqa al Sharqiyah, Hebron city, Al-Thahreya, and Nablus city. The project aims to tackle both economic and environmental issues in these areas. Based on MLDF’s projections, solar energy project will generate around NIS71.5 million annually in revenues throughout its life cycle.

#### **g) Community contributions**

Even before the establishment of the PNA in 1993, community contributions used to be the top source of support for services. Recently, several Palestinian citizens living abroad donated to services in small and large communities, however the majority of donations go to marginalized areas. For instance, in Abu Dis they built a clinic and repaired schools; in Al Mazraa Al Sharqieh, they built a school and a play ground; in Tubas, a businessman made a donation to build a new school. This indicates that several communities enjoyed the support of either citizens residing within Palestine or abroad, attesting to the importance of this approach. On the other hand, the capacity of LGUs in those communities is still not developed and is in need of enhancement.

#### **h) Incubators and Tech Hubs as Catalysts of Inclusive Service Delivery**

In the past, initiatives were launched aimed to promote tech hubs and incubators in Palestine to foster innovative ideas and companies, and to create new work opportunities in the Palestinian job market. However, these initiatives came from the private sector and a number of donors, rather than municipalities that still believe their services are limited to the basic services they provide. Recently, however, the municipality of Hebron has partnered with the municipality of Turin, Milan and the Environment Park-Science and Technology Park for Environmental Technology of Turin, to create the Hebron Innovation Technopark. The Technopark will include three main functions:

- offering space for innovative enterprises and infrastructures.
- Business Incubators, to support the creation of start-ups working inside innovative sectors, involving local academic and university students and graduates.
- Innovation Cluster, to support and promote Hebron's business community, by providing them with high level services in the fields of innovation, quality and internationalization/Exportation.

Other than this initiative, there are few local government level engagements with incubators and tech hubs, albeit they are indirect beneficiaries of private sector and donor led initiatives through potential job creation. With increased engagement, municipalities could leverage the ideas and innovations from such platforms and use them directly to increase their digitalization process that adds to inclusiveness, transparency and efficiency of local governance.

### **3. PRIORITIES & RECOMMENDATIONS**

Based on the above review of the progress in local governance innovative approaches and modalities, the following areas are recommended as potential activities for either scaling up or entering into new avenues of value adding engagements for SDC in the oPt.

#### **a) MOLG and LGUs – Digitalization & Capacity Building**

Despite the PNA announcing their strategy towards transforming the ministries into e-ministries in 2005, the progress is not yet visible. Completion of this step is vital for the community service centers in the LGUs to provide municipal services, as well as, providing other ministerial services. Otherwise, the bureaucracy will remain an obstacle for CSCs to be fully functional. This is not only the responsibility, but other line Ministries and private sector organizations which should be linked through e-platforms to provide services to the business community have yet to agree on the design of such a one-stop shop. The Palestine Export Council (PEC) has had this item on its agenda for three years, with no concrete progress to report to date. The Ministries of National Economy, Finance, Labor and Agriculture, as well as the Chambers of Commerce should be actively led in this process by commitment at the highest levels of government to decisively move towards business e-services. Hence, while municipalities are transforming into e-municipalities, the Ministries are yet to adopt electronic platforms. The delay in the e-transformation of ministries will create a gap between the capacity of the e-municipalities and the various departments of the MoLG and its regional offices. For the e-municipalities to be fully functional, MoLG should adopt an e-ministry platform and develop the skills of their staff in information technology and the use of electronic platforms.

Recently elected council members have had an incentive to transform the municipalities into e-municipalities, as a major visible accomplishment they can realistically hope to achieve. However, the internal analysis of staff capacities, needed before such a transformation, has not been considered. Consequently, resistance from senior staff members could pose difficulties in the transformation process. However, this is expected in any context where people face change and can be mitigated by proper training, communications and support. For example, the GIZ conducted an assessment on the progress of e-municipality transformation in Ramallah. The major finding was the resistance of senior staff members, and the lack of training received by the employees. Recommendations were focused on the importance of finding a way that will incentivize/encourage senior staff members to allow/ease the transformation. Moreover, the assessment recommended adding on the job training program for staff members.

There are many benefits to increasing the capacity in the Ministry of Local Government; The use of ICT could improve its data collection along with its data analysis. This could help them better direct their investments and follow up on project implementation. Moreover, the use of ICT could help vulnerable LGUs better communicate with the ministry. On the other hand, the capacities of

the Ministry's staff, in various departments, need to be enhanced. Furthermore, the approach taken should be changed, since most of the capacity building support they received did not affect their performance. We recommend a long-term intervention plan that could include a resource center on local government literature with a translation unit, which can increase their capacity to suggest policies and intervention plans. Assistance to MoLG could include developing employment procedures that ensure the selection of qualified staff members. Moreover, coaching instead of training is the best method to ensure that the skills are practical, rather than theoretical.

In parallel, further digitizing of LGUs will also be beneficial as ICT would boost productivity by distributing the tasks among staff and the elected members, so each individual has a specific role inside the institution. Thus, the LGU will depend on teamwork instead of the mayor handling most of the tasks at hand. Capacity building for the LGU staff can also enhance the quality of service delivery as it would allow the LGUs to provide quick and professional services for increased citizen satisfaction. On the other hand, competition between LGU members to enact their ideas could incentivize them to design and deliver superior services.

Overall, the use of technology promotes teamwork, which leads to the sustainability of LGU service delivery. Transparency, flow of information and easing of municipality transactions, in turn, encourages private sector companies to invest in the cities and villages of the LGUs. Furthermore, active citizen participation along with citizen satisfaction on LGU service delivery, will increase commitment to paying user fees, which leads to the sustainability of the LGUs. In the long-term the use of IT in LGU work will reduce the expenses of the LGUs.

#### **b) Citizen Engagement and Social Accountability**

Nowadays, community participation can be enhanced through the use of IT, which can be developed as a mobile application sample or an interactive social media page. This step could also be a tool used to encourage youth and women's participation in the community. Even though the level of citizen participation is still weak, using ICT can increase citizen participation and allow increased citizen input in municipal service delivery. It will also be good deal in terms of youth empowerment, since they can use it to send their feedback and suggestions to develop service delivery and make sure their innovative ideas reach the municipality officials. This could also benefit women as it will help them to overcome conservative social norms and make their voice reach decision makers on local levels and share their views in public municipality issues. In this regard the two initiatives aiming to enhance citizen participation in the local government, (youth local councils and the shadow women local council) could be a good area to invest in and disseminate, with specific attention to village councils, since the current experience focused mainly on municipalities.

**Social accountability and citizen engagement** Social accountability is a useful concept in the development of local council service delivery, since it increases citizen engagement and addresses the needs of the community from the perspective of the citizens instead of the council members themselves. Furthermore, citizen engagement could play a vital role in encouraging citizens to pay their municipality fees, which is considered to be a major challenge faced by the local council. Furthermore, the adoption of a social accountability code of conduct will increase citizens' confidence in the work of the councils and can boost the morale of the members themselves. What is more, internal and external accountability in the LGU units would also enhance service delivery.

To summarize, further digitalization of municipal services can help vulnerable groups raise their voices for better service delivery and inclusiveness while being able to bring them to the attention of local and national decision makers. Citizen participation also creates an array of inputs provided by the community, which can aid the productivity and quality of local service delivery.

#### **c) Local Government Policy**

The local government law was adopted by the Palestinian legislative council in 1997, however, the law lacked the required legal coverage of e-municipalities, such as an appropriate electronic

payment service/platform, or an e-municipality protection law. Moreover, the law limits the amount of innovative work a municipality can perform. To add, the relations between the municipalities and the ministries need to be redefined to be able to allow citizen participation in the work of local councils. Furthermore, the local government election law adopted in 2005, despite being amended several times by the President, still needs to be reviewed and adjusted to overcome certain problems faced during the two previous election rounds. Two thirds of the local councils during the last two elections, were won by acclamation, which led to internal disputes inside the council and the resignation of several members. Consequently, a large portion of the council meetings focused on disputes, rather than the council functions. Furthermore, village councils are currently experiencing difficulties in providing basic services to their citizens, due to the lack of resources. Considering, the large number of village councils, improvements and amendments should be made to the law, such as allowing neighboring councils to merge.

**d) Partnerships Between Municipalities, NGOs and Private Sector**

A permanent network should be created between municipalities, NGOs and the private sector to strengthen municipalities ability to provide their services effectively. Convincing the LGUs of the importance of partnerships and the important role partnerships can play in improving the services of the LGUs, instead of considering this step to be an undermining of their capabilities. Several services currently offered by LGUs such as water management, could be outsourced to private sector companies, something done with electricity, that could provide a superior service and allow the LGUs to focus on other important tasks. Moreover, LGUs could partner with NGOs on tasks such as awareness campaigns, since they are more specialized in this field and could help provide superior services.

**e) National Incubator on Local Governance**

Hosting incubators and tech hubs are often considered to be of secondary importance to LGUs, since they do not provide any short-term benefits. Consequently, LGUs are missing out on opportunities that in the long-term could provide them superior benefits. Furthermore, hosting incubators and tech hubs can create potential job opportunities for the youth. Currently, many ideas that could be of use to the local government are not developed enough or do not receive the required publicity to be of aid to municipalities. Thus, the establishment of a national incubator for local service delivery innovation, could help youth to capitalize on innovative ideas, while municipalities could benefit from new fresh modalities and technologies they could adopt in their work. Moreover, these incubators can create job opportunities for youth.

**f) Expanding e-Municipalities**

With the rise of ICT, and the availability of electronic devices to a large portion of the Palestinian community, reliance on traditional ways of working at municipalities would affect their performance negatively, since it isolates the municipality from their citizens. However, transforming into e-municipalities could provide the municipality a base for institutionalizing the municipality and guarantees the sustainability of their service delivery.

Developing e-village councils could be challenging for village councils, due to their limited financial and human resource capacities. However, the use of ICT could be of great use to village councils, in helping them provide superior services with limited resources. A good entry point could be the creation of a pilot e-village council(s) to test these assumptions.

**g) Increasing Renewable Energy**

Palestinian experts and business have been suggesting for a long time the greater resort to renewable energy to satisfy Palestine's electricity needs. However, there is still little to no interest shown by the LGUs in terms of investing in the field of renewable energy. Recently, a small number of LGUs, with a co-operation with MLDF, started a pilot project, aiming to secure a percentage of the energy via solar panels. The use of renewable energy in Gaza could play a vital role in dealing with the electricity problem they face at the moment. During what could be

described as a chronic electricity crisis, the Gaza municipalities have yet to invest in alternative sources of energy, instead of relying on the traditional method.

#### **h) Partnerships to Integrate Innovation Sustainably in the Domain**

Current partnerships between the private sector companies and the LGUs are focused on the basic/traditional types of services, such as construction and local park management. These partnerships are visible in many municipalities, such as Al-Bireh, Nablus and Bethlehem. Recently there has been a new trend developing in some municipalities, such as Ramallah and Bethlehem, which is the installation of parking meters in the streets of the cities in a partnership with private sector operators. There are still numerous opportunities for partnerships between LGUs and private companies that are yet to materialize, especially in the fields of recycling, revenue collection and waste management.

Partnerships between Municipalities and civil society organizations have developed over time in several sectors, including agricultural roads, clinics, social accountability, youth local councils and shadow women local councils. An effective and practical partnership would operate on:

1. The national level: we recommend initiating a permanent partnership body, which includes the municipality union, Palestinian NGOs network, Businessmen Union Association. These partnerships need to be based on a mutual understanding of the policy level of local government. Moreover, we recommend the use of ICT in this partnership to make it more effective and efficient.
2. The sectoral level: we recommend building a partnership with sectoral focus, between municipalities, private sector companies, and NGOs. The partnership between the three parties could enrich ideas and projects and the allocation of tasks based on the specializations of each. Taking an alternative energy project as an example, the three-party partnership could be useful, since the municipality could improve their revenues, the private sector has the experience needed in project development, and the NGOs can focus on the environmental effects and spread awareness on the issue.

#### **i) Enhance women's role in local government**

Women empowerment is key to the development of the local government sector; therefore, women's role should not be limited to pre and post elections. Instead, it should be an ongoing process that focuses on including women in various committees and to monitor the Municipality's service delivery. Indeed, innovative solutions to enhance women's role in local government should not end with proper representation, but is the bare minimum and the human right of women to engage in issues of governance, even more so when it relates to their living conditions.

Potential areas to innovate for increasing gender considerations in local government include: forming of new coalitions; development and lobbying for gender equality demands and commitments; planning of competitions for local governments on initiatives in favor of gender equality; nurturing gender equity champions in the local councils; fostering elected female leaders' on-going engagement with women's and civil society organizations, inter alia. While women's participation in decision-making ensures policies better respond to their needs and requirements, real gender mainstreaming in local government's decision-making processes is not reached until gender balanced local government is considered natural by everybody involved.

#### **j) Assisting marginalized areas**

There are two dimensions that could be addressed to help these communities:

- **Capacity of LGUs:** Since most of the LGUs in these locations are village councils, with very limited resources and capacities, investing in their capacity, with more focus on the youth (both sexes) who have the energy and will to advocate for their communities.



- Provide funding to village councils: even though the MOLG and the MLDF announced two rounds of funding for village councils, it is still insufficient, with 200+ councils to be funded.

#### **h) Legal reform**

The current laws governing the local government sector need to be reviewed in light of the newly adopted strategies by the sector. The first national conference on local economic development (LED), last year came up with clear recommendations to change certain articles related to encouraging LGUs to work on LED, and to develop public private partnerships. To add, the articles that relate to municipal lending need to be changed to encourage municipalities to borrow money from banks for project development. The current election system was tested in three local election rounds and certain problems arose during the implementation. A major problem faced was that more than 200 local councils, were chosen by the powerful families, not through election, which caused a lack of confidence in these councils. Moreover, the turnout was low, mainly due to limited youth participation. Due to the aforementioned, we believe that the law should be revisited to ensure greater accountability of all LGUs.

#### **i) Clear government policies**

Whether on decentralization, amalgamation or agglomeration, municipalities as well as donors to the sector, need to have a clear understanding of the policies that the MoLG is adopting to advance this sector. The key challenge that faces the local government sector is the big number of LGUs. The West Bank has 125 municipalities and almost 200 village councils and 100 joint service councils. With this huge number of LGUs over a dispersed fragmented geography, it is extremely difficult to build their capacity especially in human resource development. The recent PNA decision to design a system of Palestinian regional governance for better developmental and administrative results will provide a useful guiding framework for organizing public policy on local governance going forward,