

# The role of food and agriculture for job creation and poverty reduction in Jordan and Lebanon

*Agricultural Sector Note (P166455)*

Technical Note



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## Acknowledgments

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## Summary

1. **The purpose of this note is to inform potential World Bank engagements and interventions in the agricultural and food sector of Jordan and Lebanon.** This note is designed to serve as an input to the ongoing technical research in support of preparation of Mashreq's Maximizing Finance for Development (MFD) Strategy for FY 2019-2021 by informing the design of cross-cutting issues linked to sector governance and strengthening local financing options as well as better understanding of the likely gender and jobs dimensions of the draft Strategy. Except a few studies by Verner et al (2017) on climate change; World Bank (2016) on the cost of Irrigation in Jordan, which have a narrower focus than the agricultural sector, the World Bank has not conducted an agricultural sectoral study during the last few years. This note will therefore close this gap by synthesizing existing literature and data on the agricultural sector in the two countries. This report provides information on the role of the agricultural sector in poverty reduction and in rural livelihoods; sector growth and key drivers; and policy options to improve productivity and job creation in the agriculture sector. The note will rely on descriptive analysis using data principally from the FAO, World Bank, and the MoA of the respective countries. Besides the abovementioned work by the World Bank, we have widely consulted documents produced by several institutions, including strategic plans and program reports from the European Union and from UN agencies.
2. **Agriculture and food are important for the economies of both Jordan and Lebanon.** Approximately 20 to 25 percent of Lebanon and Jordan's active population are involved in the agriculture and food sector. While primary agriculture makes a small share of these countries' incomes (about 4 percent of the GDP of both countries), agriculture contributes 25-30 percent of the GDPs of these countries when indirect contributions (the food sector) is considered. Jordan has recently experienced an upward trend both in the value added of agriculture (in real terms) and its share in the country's GDP. The average agricultural value added and its share in GDP in Jordan during the last five years (2011-2016) has increased by 40 and 24 percent, respectively, compared to the respective average values during 2000-2010. Jordan's agricultural output grew in double digits during the past five years, reaching a peak growth rate of 16 percent in 2015. In Lebanon, despite a reduction in its GDP share, the average agricultural value added reached at US\$ 1560 million (constant 2010) during 2011-2016, up by 24 its average value in 1991-2000.
3. **Globally, there is a strong linkage between agricultural growth and poverty reduction.** Evidence shows that agriculture is above three times better than other sectors at reducing poverty in several countries (Christiaensen et al 2011). Given that it is one of the most labor-intensive sectors, investment into

agriculture creates a relatively large number of jobs both upstream and downstream of the food value chain. Studies show that a one percent increase in per capita consumption is associated with an average of 2-3 percent decrease in the poverty rate, with stronger growth elasticity of poverty in countries with more even income distribution (World Bank, 2001). Because of high poverty rates in rural Jordan and Lebanon (with rural poverty rates of 17 percent in Jordan and as high as 36-40 percent in North Lebanon and in Bekka), increasing agricultural growth could play a critical role in poverty reduction.

4. **Agricultural production has been increasing during the last three decades.** Livestock and crop production indices have increased by 84 and 71 percent in Jordan between 1995 and 2014. Similarly crop and livestock production indices have been increasing in Lebanon since the 1960s, reaching at peak levels in 1996 and in 2008, respectively. Between 1995 and 2015, however, livestock production index continued to increase while crop production has dropped by 27 percent. Among other factors, increasing labor and land productivity as well as application of chemical fertilizers have contributed to agricultural output growth in the two countries.
5. **There is a large untapped export potential in the agricultural sector, especially in fruits and vegetables.** Jordan has an untapped export potential of above US\$ 1 billion. For instance, only 50 percent of the fruit and 60 percent of the vegetable export potential is achieved, indicating an untapped export potential of US\$ 320 million in vegetable and fruit export in Jordan. Among vegetables, fresh tomato has the largest export potential that is worth of US\$ 135 million while fresh peaches and nectarines have the largest export potential among the fruits grown in Jordan. The untapped agricultural export potential amounts about US\$ 600 million in Lebanon, a third of which is from fruit and vegetable production. The main fruits with the largest export potential include fresh apples and bananas (fresh or dried), of which only a third of the total potential is achieved. Fresh potato is the vegetable with the largest export potential in Lebanon, with an unmet export potential of above US\$ 30 million.
6. **Limited access to rural finance, poor agricultural technologies, water use inefficiency, and poor-quality standards are some of the major challenges for the overall agricultural and food sector.** Capital flow into agriculture sector of Jordan and Lebanon has been very low compared to capital flows to other sectors as well as in comparison with the MENA regional average capital flow to the sector. Farmers and agribusiness have limited access to rural finance. For instance, the World Bank's Enabling the Business of Agriculture (EBA, 2017) indicate that Jordan's laws and regulations that affect access to financial services for farmers and agribusinesses are less developed than those in other middle-income countries. Benchmarking with Turkey and Morocco, Jordan and Lebanon performed poorly in terms of

total factor productivity (TFP).<sup>1</sup> While Jordan achieved a modest growth in TFP during the past quarter of a century, TFP declined in Lebanon during this period.

7. **Jordan and Lebanon could build on successful country experiences such as those in Poland in adopting key policy options to improve agricultural productivity and competitiveness, thereby enhancing its role for job creation.** These policy options include increasing investment in research and development, crowding in private sector finance for investments into the agricultural sector, and improving water use efficiency in agriculture. India was not only able to support public research programs in agriculture that resulted in highly improved seeds to increase productivity, it also attracted foreign firms and partnered with the private sector to conduct agricultural research and development. Improving food safety standards, as well as sanitary and phytosanitary measurements, and investing in technologies to enable traceability of export commodities could improve exports of fruits and vegetables to European countries where there is stable demand and where Jordan and Lebanon have seasonal advantages. By improving the food safety and sanitary and phytosanitary standards, Poland evolved as a food exporter country to the EU market. Some of the key lessons from Poland for Jordan and Lebanon to increase their fruit and vegetable export to Europe include capacity building and improving public advisory services.

Agriculture and food represents an important sector for economic growth, employment, and poverty reduction.

8. **Agriculture is the primary source of livelihoods for households in rural areas.** The agriculture and food sector contributes to the livelihood of about a quarter of the active population in Jordan and Lebanon (ESCWA, 2016). Agriculture is a catalyst for the creation of employment in several related sectors in the rural regions such as rural services, transport, communication, education, and tourism. According to the 2013 enterprise survey, for instance, 20 to 25 percent of the sampled enterprises were engaged in food manufacturing. Labor participation occurs not only at production stage but all along the food market value chain, including in processing, packaging, and distribution. For instance, a CGE modeling exercise that the World Bank's Jobs group has recently done for the preparation of the PforR project for Lebanon suggests that an additional job in the agricultural and food sector (including direct jobs in primary agriculture, indirect jobs in businesses linked to food value chains, and induced jobs created through greater aggregate demand) is created for every US\$ 9,000-29,000 of a one-off

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<sup>1</sup> TFP is a measure of the degree of efficiency in the use of all factors of agricultural production. It is calculated as the ratio of total agricultural output to total production inputs (IFPRI 2017).

investment. This job creation reflects a permanent increase in labor demand due to an increase in the capital stock, rather than transitory job opportunity. Empirical evidence also shows that agriculture has a relatively strong long term value- added elasticity of employment in the Middle East and North Africa region: for every percentage point of growth in the value added of the agriculture sector, employment increased by 0.36 percentage points (while the corresponding employment increases for industry and service sectors are 0.30 and 0.20 percentage points).<sup>2</sup> According to the jobs study by the International Finance Corporation (IFC, 2013), the agricultural sector leads in terms of both total value-added and number of jobs supported compared to the other sectors for the same amount of financing. For instance, the report indicates that agriculture has an economy-wide multiplier effect (both direct and indirect) of 3.8, that is, a dollar invested in agriculture adds close to a 4 dollar value to the Jordanian economy (compared to a return of 1.3 in industry and 0.5 in service sectors). Agriculture also typically employs the poor and marginalized portion of the population, including women – hence playing an important role in reducing unemployment. About 52 percent of the rural Jordanian women are employed in agriculture compared with nine percent for men. Although the official statistics show that agriculture employs only two and six percent of the population in Jordan and Lebanon, respectively, these data likely omit a large population of refugee agricultural workers.

9. **The agri-food sector makes up one quarter to one third of the economy and therefore can contribute to jobs and growth.** Primary agricultural on average contributes about 4 percent of the GDPs in Jordan and Lebanon during 2011-2016. When agricultural related activities are included, however, it contributes between 25-30 percent of the economy in these countries (Netherlands Enterprise Agency, 2016). The value added of primary agriculture to the Jordanian economy has increased by 24 percent during 2011-2016 compared to its average contribution in the prior decade (Table 1). The average agricultural value added during 2011-2016 reached at USD\$ 785 million (in constant 2010), up by 84 and 39 percent from the average agricultural added value during 1991-2000 and 2001-2010, respectively. In Lebanon, despite a reduction in its GDP share, the average agricultural value added (in constant 2010 US\$) has doubled between 1995 and 2015. Lebanon's agricultural value added reached at US\$ 1.6 billion (constant 2010) during 2011-2016, up by 24 and 12 percent from its average value in the prior two decades.

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<sup>2</sup> International Monetary Fund (2012)

Table 1. Agricultural value added grew during 1991-2016.

Country	<i>Agriculture, value added (% of GDP)</i>			<i>Agriculture, value added (million constant 2010 US\$)</i>		
	1991-2000	2001-2010	2011-2016	1991-2000	2001-2010	2011-2016
Jordan	4.7	2.9	3.6	427	567	785
<i>Change</i>	<i>-38%</i>	<i>24%</i>			<i>33%</i>	<i>39%</i>
Lebanon	7.2	5.2	4.1	1,261	1,393	1,559
<i>Change</i>	<i>-28%</i>	<i>-21%</i>			<i>10%</i>	<i>12%</i>
Egypt	17	14.8	12.1	18,162	25,300	31,884
<i>Change</i>	<i>-13%</i>	<i>-18%</i>			<i>39%</i>	<i>26%</i>
Morocco	17	14.2	14	6,699	9,343	13,309
<i>Change</i>	<i>-16%</i>	<i>-1%</i>			<i>39%</i>	<i>42%</i>
Turkey	14.8	10	8.3	52,246	60,376	75,746
<i>Change</i>	<i>-32%</i>	<i>-17%</i>			<i>16%</i>	<i>25%</i>
MENA	9.6	6.5	5.6	90,036	119,810	150,493
<i>Change</i>	<i>-32%</i>	<i>-14%</i>			<i>33%</i>	<i>26%</i>
World	6.3	4.3	3.9	1,748,799	2,268,530	2,793,508
<i>Change</i>	<i>-32%</i>	<i>-9%</i>			<i>30%</i>	<i>23%</i>

Source: World Development Indicators

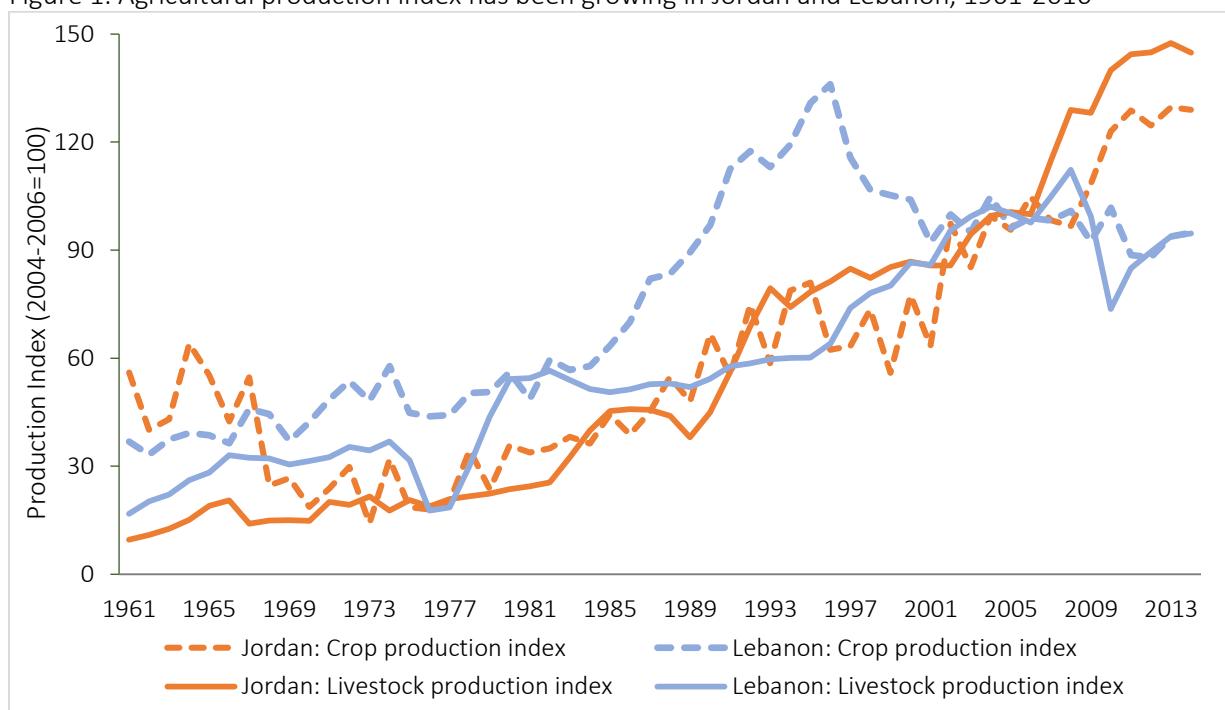
10. **Globally, there is a strong linkage between agricultural growth and poverty reduction.** Evidence shows that agriculture is above three times better than other sectors at reducing poverty in several countries (Christiaensen et al 2011). Agriculture requires relatively small amount of capital to enhance its productivity and efficiency viz-a-viz in the manufacturing sector. This explains why investments in the agricultural sector in general have higher marginal returns on capital than in other sectors (IFC 2013). Given that it is one of the most labor-intensive sectors, investment into agriculture creates a relatively large number of jobs both upstream and downstream of the food value chain. Studies show that a one percent increase in per capita consumption is associated with an average of 2-3 percent decrease in the poverty rate, with stronger growth elasticity of poverty in countries with more even income distribution (World Bank, 2001). Recent data show that poverty rates are higher in rural than urban areas in both Jordan and Lebanon. About 14.4 percent of Jordanians and 27.5 percent of the Lebanese population live with an income below the national poverty line. These numbers are higher in rural areas (17 percent in Jordan and as high as 36 percent in North Lebanon and 38 percent in Bekka).

**Total agriculture output has experienced growth in both Jordan and Lebanon.**

11. **Agricultural production (both crop and livestock) in Jordan and Lebanon has been increasing during the last three decades.** Livestock and crop production indices have increased by 84 and 71 percent in Jordan between 1995 and 2014. Similarly crop and livestock production indices have been increasing in Lebanon since the 1960s, reaching at peak levels in 1996 and in 2008, respectively (Figure 8). Livestock production index has increased by 57 percent during the last two decades (between 1995 and 2015),

whereas crop production has dropped by 27 percent during the same period. According to the Jordan Economic Growth Plan (JEPG) 2018-2022, agricultural output grew in double digits annually during the past 5 years, reaching a peak growth rate of 16 percent in 2015 (JEPG, 2018). Anecdotal evidence points at two main explanations for this. First, there is a growing local demand for food, thanks to population and income growth. Second, the large influx of migrants and refugees from several countries provides relatively cheap labor to work in agriculture. By the end of 2016, there were about 90 refugees per 1000 inhabitants in Jordan. The most important sector of employment before the crisis in Syria was in the agriculture sector (Verner et al, 2017).

Figure 1. Agricultural production index has been growing in Jordan and Lebanon, 1961-2016



Source: FAOSTAT

## 12. Production of high value crops, in particular fruits and vegetables, has been increasing in both countries.

Vegetable production has nearly quadrupled over the last five decades in both countries (tables A2 and A3 in the Annex). Jordan produced an annual average of 1.7 million tons of vegetables during 2011-2015 compared to just less than half a million tons during the 1960s. Lebanon's annual vegetable production was close to a million tons annually during the past five years, up from less than a quarter of a million during the 1960s. Similarly, fruit production (including citrus fruits) increased by 140 percent in Jordan and by about 40 percent in Lebanon since the 1961. In general, except for pulse production in both countries and cereals in Jordan, the positive increase in land productivity (yield) and

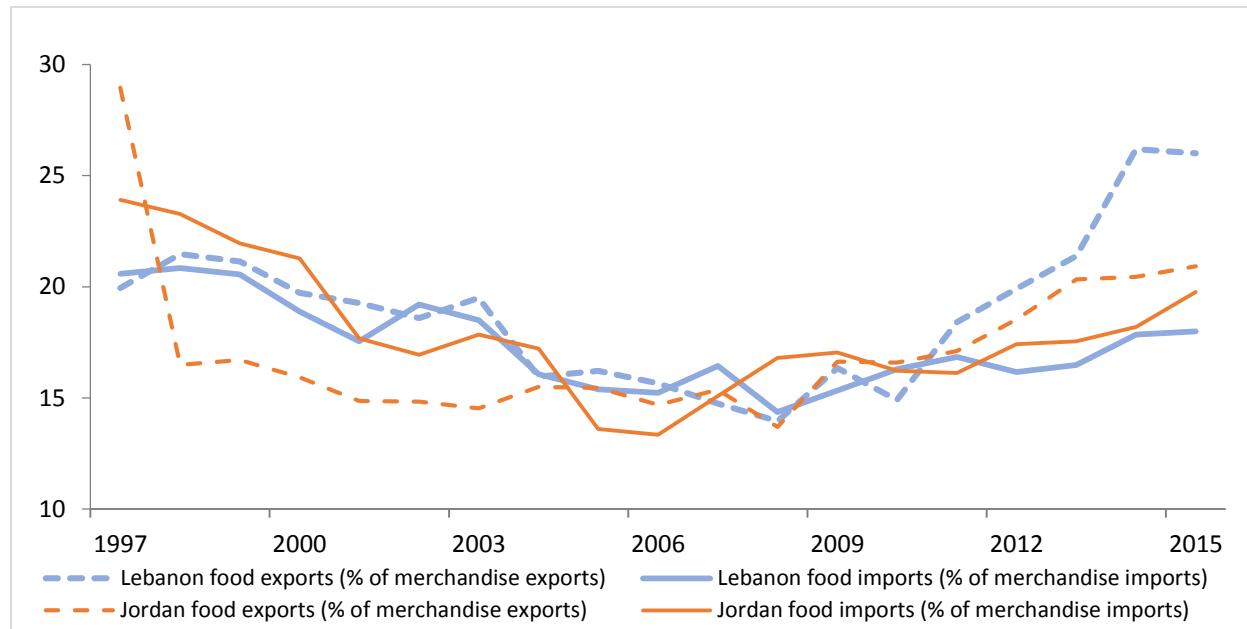
the changes in acreage resulted in larger agricultural production volume during 2011-2015 than in the 1960s. The strong decline in pulse acreage led to a fall in production volume of pulses by 84 and 23 percent in Jordan and Lebanon. Jordan's cereal production also declined from an average of 200,000 metric tons during the 1960s to 90,000 tons during 2011-2015. In Lebanon, however, the cereal yield increase outweighed the decline in its acreage, resulting in cereal production that is twice larger during 2011-2015 than the average production in the 1960s.

**13. Area under cultivation of cereals and pulses has declined sharply while that under cultivation of oil crops and roots and tubers increased since the 1960s in both countries (tables A2 and A3 in the Annex).** The average harvested cereal area shrank by 83 percent in Jordan and by 24 percent in Lebanon during 2011-2015 compared to the cereal area during 1961-1970. Area under cultivation of pulses in Jordan dropped by 92 percent during 2011-2015 from the 1960s (from 41,819 to 3,334 ha), whereas it dropped from 12,600 ha in the 1960s to 7,150 ha during the last five years. Most of this land was used to grow oil crops, which experienced a harvested area increase of 40 percent (from 44,390 to 62,200 ha) in Jordan and of 91 percent (29,900 to 57,200 ha) in Lebanon during the same period. Area under cultivation of roots and tubers increased by 376 and 97 percent in Jordan and Lebanon while harvested area of citrus fruits increased by 196 percent in Jordan and by 10 percent in Lebanon. Land allocated for cultivation of vegetables has been increasing in recent years; it reached an average of above 40,000 ha during 2011-2015 in Jordan (23 percent higher than the prior decade) while it was 30,000 ha in Lebanon (an increase by 40 percent from the 1960s).

**14. Agricultural export in Jordan and Lebanon has grown strongly since the late 1990s.** Jordanian Agricultural export reached US\$ 2 billion in 2015, up by more than 400 percent from its value in 2000. Lebanon achieved similar growth in the value of agricultural exports although the absolute export value is smaller (just less than a billion US\$ in 2015). Indeed, agricultural export accounted for a fifth of the total merchandized exports in Jordan and a quarter of it in Lebanon in 2015. The share of agricultural exports (in merchandize exports) has been increasing by an average of 12 percent in Jordan and by 15 percent in Lebanon during the last five years. As a result, the share of agricultural export in 2015 was 35-40 percent larger than what it was in the early years of the previous decade (Figure 2). Agricultural exports were severely affected following the Syrian crisis as half of Lebanese's agricultural products were exported to Syria or through Syria to other Arab countries and to the Gulf States (2010). The Ministry of Agriculture of Lebanon, in response to this crisis and in collaboration with other institutions, took the initiative in 2013 to open new shipping lines. There are positive signs of this initiative as agriculture and food product exports have been increasing recently (exports grew by 19 percent in

2013). The literature shows that growth in agricultural export is a source of agricultural growth, thereby contributing poverty reduction. For example, rapid increases in agricultural export since mid-1990s in countries such as Brazil and Chile led to an average growth in agriculture sector that exceeded growth outside the agriculture sector (Christiaensen et al 2011).<sup>3</sup>

Figure 2. The share of agricultural export in total merchandize exports is growing in Jordan and Lebanon



Source: World Development Indicators

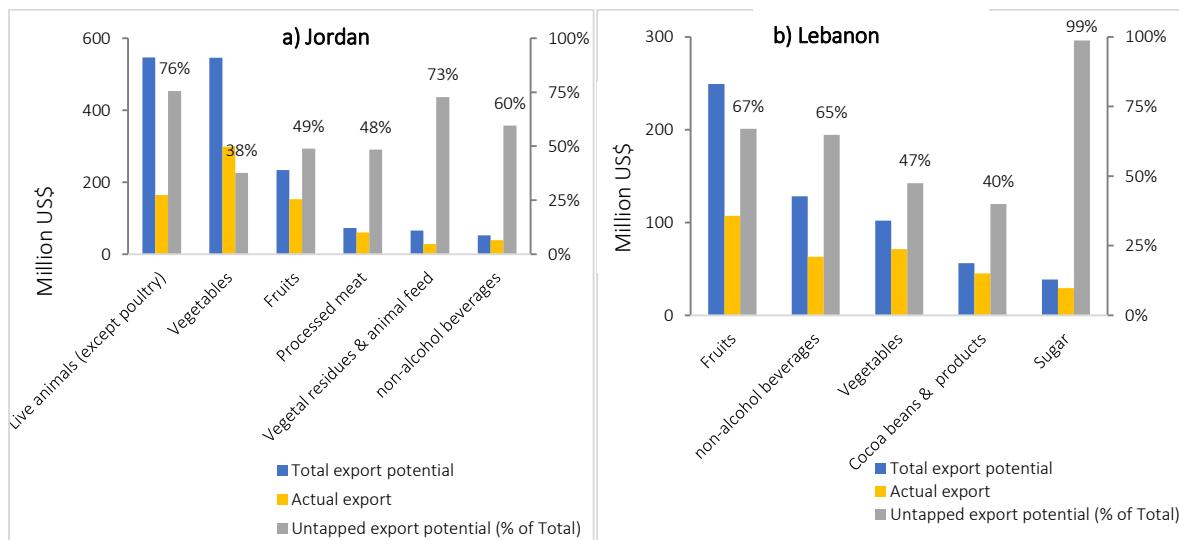
15. Jordan and Lebanon have as much untapped agricultural export potential as the actual export from these countries, more so in fruits and vegetables.<sup>4</sup> Jordan has an untapped export potential of above one billion US\$. Error! Reference source not found. shows that two third of the export potential in Jordan for live animals (other than poultry), which is an equivalent of US\$ 415 million, is untapped. Most of this untapped export potential comes from a potential export of live sheep, which has an unmet potential of US\$ 390 million. Similarly, only 50 percent of the fruit and 60 percent of the vegetable export potential is achieved, indicating an untapped export potential of US\$ 320 million in vegetable and fruit export in Jordan. Among vegetables, fresh tomato has the largest export potential that is worth of US\$ 135 million while fresh peaches and nectarines have the largest export potential among the fruits grown in Jordan. The untapped agricultural export potential amounts about US\$ 600 million in

<sup>3</sup> During the period 2000-2015, a one percentage increase in fruits and vegetables export value was associated with a 0.92 and 0.38 percentage increases in agricultural valued added in Jordan and Lebanon, respectively.

<sup>4</sup> The export potential is calculated by the International Trade Center (ITC) based on a decomposition of a country's potential exports of a product to a given target market into three factors: supply, demand and easiness to trade (Decreux and Spies, 2016)

Lebanon. Lebanon has an untapped export potential of US\$ 215 million in fruit and vegetable production, and about US\$ 85 million in non-alcohol beverages. The main fruits with the largest export potential include fresh apples and bananas (fresh or dried), of which only a third of the total potential is achieved. Fresh potato is the vegetable with the largest export potential in Lebanon, with an untapped export potential of above US\$ 30 million.

Figure 3. There is large untapped agricultural export potential in Jordan and Lebanon, 2016



Source: Calculations based on data from the International Trade Center (ITC)

Key drivers of agricultural growth have been increasing labor and land productivity as well as application of chemical fertilizer.

16. **Labor productivity:** Agricultural labor productivity in Jordan and Lebanon is much higher than labor productivity in MENA.<sup>5</sup> Official statistics show that there is a decline in the number of nationals working in agriculture in both Jordan and Lebanon although it is less dramatic in Jordan. Official statistics show that agriculture employs 100,000 workers in Jordan and just a fifth of that many in Lebanon in 2015, which is 14 percent smaller in Jordan and 56 percent smaller in Lebanon than what it was in 2000. This resulted in a strong increase in the agricultural value added per worker in these countries, in particular in Lebanon. Although the number of Jordanian and Lebanese agricultural workers has declined, agriculture is the sector where many refugees are employed in these countries. According to a report by IFPRI (2018), non-natives constitute most of labor in agriculture. For instance, about 85 and 92 percent of all the workers in the livestock and crop sector in 2015 were non-

<sup>5</sup> Compared to Jordan and the MENA average, agricultural labor productivity in Lebanon appears to be significantly inflated due mainly to underestimation of migrant workers in official statistics.

Jordanians. The report also indicates that household expenditure and income surveys may omit refugees that work in the agro-processing industry.

**17. Arable land and land productivity:** while land productivity has been increasing modestly in Jordan and Lebanon, there remain land tenure issues that contribute to land degradation in these countries. Despite a decline in 2007 and 2008, arable land has been largely increasing in Jordan since the turn of the century. Arable land was about 240,000 ha in 2014, which is higher by a quarter than it was in 2000. In Lebanon, however, arable land has increased only modestly, remaining at an average of 130,000 ha since the beginning of the century. The major part of the Jordan's land is state or treasury land, limiting the access to land of several Jordanians for agriculture. Although a new unified land project has recently been proposed by the Department of Lands and Survey (DLS), it is not much of an improvement on actual laws, except in unifying them into one law.<sup>6</sup> The Lebanese land market is inefficient and Land tenure problems are considered key factors in agricultural land degradation in the country. There is large registration and transaction costs. Roles and responsibilities for managing the common lands are not clear leading to their over-exploitation for grazing, quarrying and agriculture.

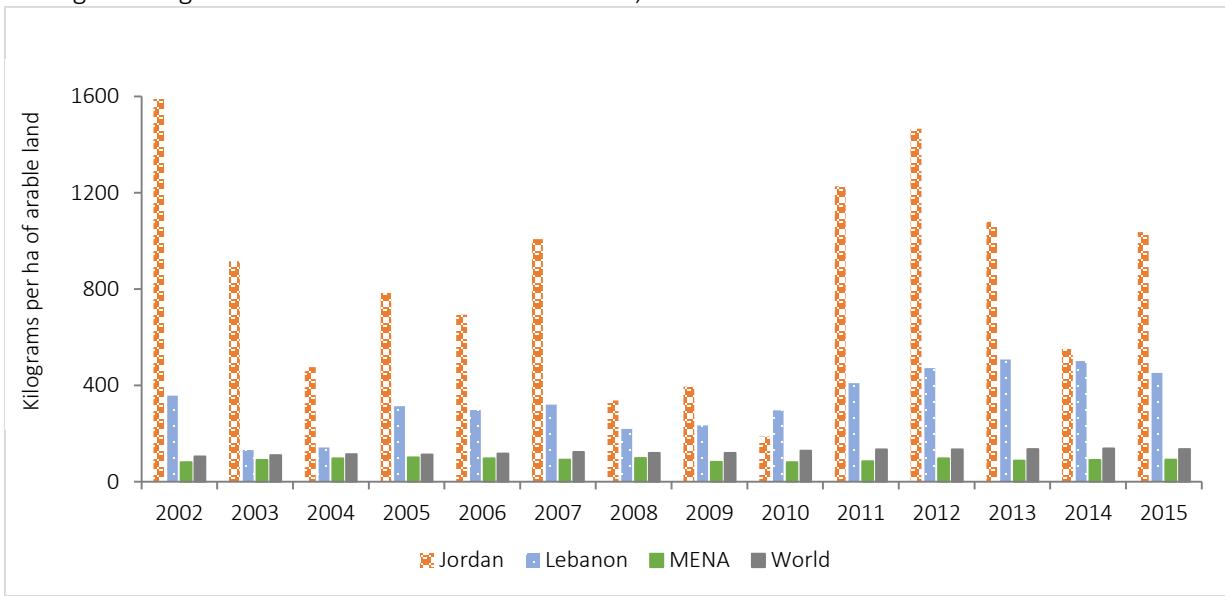
**18. Chemical fertilizer use in agriculture:** Fertilizer consumption, the quantity of plant nutrients used per unit of arable land, is much larger in Jordan and Lebanon compared to the MENA and the world average.<sup>7</sup> In Jordan, average fertilizer consumption during 2002-2015 was nine and four times larger than the average MENA and world consumption, respectively (Figure 4). The value is slightly lower in Lebanon but it was four times the MENA average and three times that of the global average fertilizer consumption during the same period. The per ha fertilizer use in both Jordan and Lebanon has shifted upward during the 2010-2015, partly explaining the significant increase in agricultural productivity during this period.

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<sup>6</sup> <http://www.fao.org/nr/tenure/land-tenure-journal/index.php/LTJ/article/view/12/6>

<sup>7</sup> Fertilizer products cover nitrogenous, potash, and phosphate fertilizers (including ground rock phosphate).

Figure 4. Agricultural use of fertilizers in nutrients, 2002-2015



Source: FAO and World Bank

Major constraints to agricultural growth and export are lack of rural finance, poor agricultural technologies, water use inefficiency, and poor food safety standards

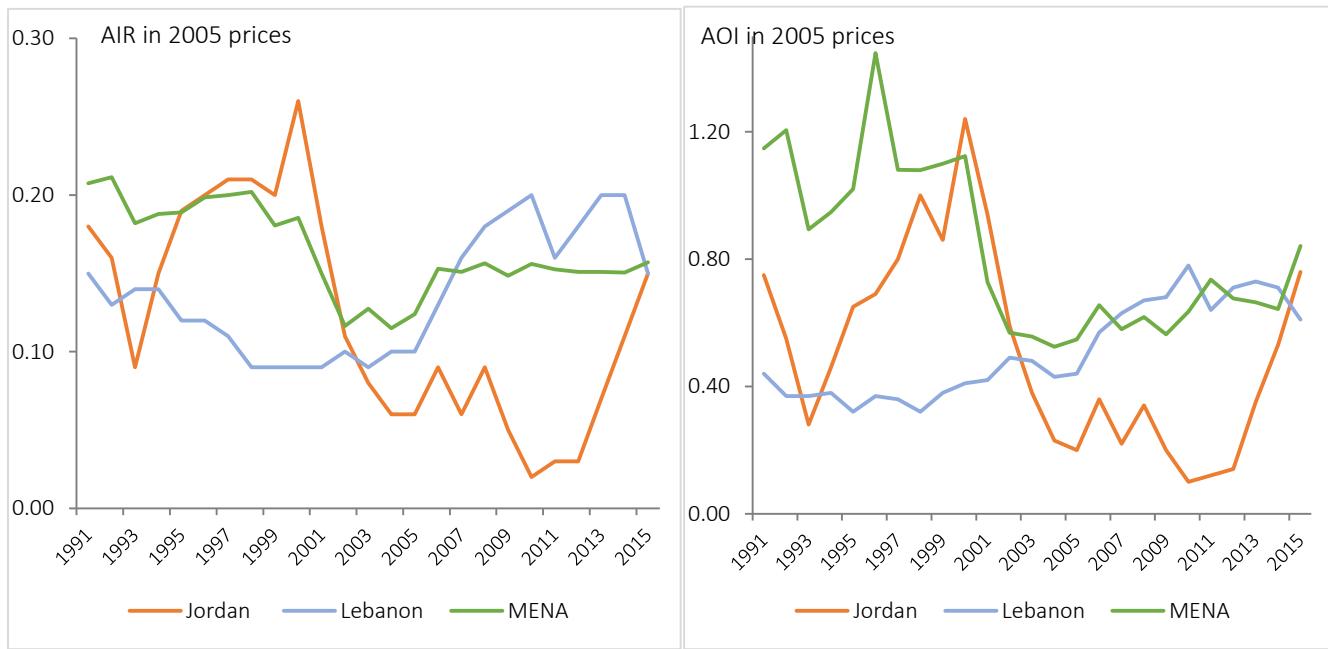
19. *Capital flow to agriculture:* Public spending into agriculture has been very low in comparison to capital flows to other sectors in both Jordan and Lebanon (Figure 5). Public spending on research and development as a percentage of agricultural GDP was 1.8 percent in Jordan and less than one percent in Lebanon (ASTI, 2015).<sup>8</sup> Agricultural investment, measured by agricultural investment ratio (AIR, left panel) and agricultural orientation index (AOI, right panel of figure 4), has a generally increasing trend in Lebanon while it has sharply declined in Jordan and reached its lowest level in 2010-11.<sup>9</sup> In Jordan, the average AIR and AOI were 56 and 43 percent lower during 2011-2015 than their respective values during 1991-2000. The average capital flow to the Jordanian agricultural sector (relative to other sectors) during 2011-2015 was half of the average agricultural investment in the MENA region. Although agricultural investment in Lebanon was lower than the investment in both Jordan and the MENA region during 1991-2000, it has overtaken agricultural investment in Jordan since about 2003 and became comparable with the MENA average.

<sup>8</sup> <http://www.asti.cgiar.org>.

<sup>9</sup> AIR indicates the proportion of aggregate spending on gross fixed capital formation in agriculture to the total agricultural value added. AOI indicates how the investment ratio in agriculture compares to that of the total economy (a value below 1 indicates that the investment ratio in agriculture (AIR) is smaller than the equivalent investment ratio in the rest of the economy combined).

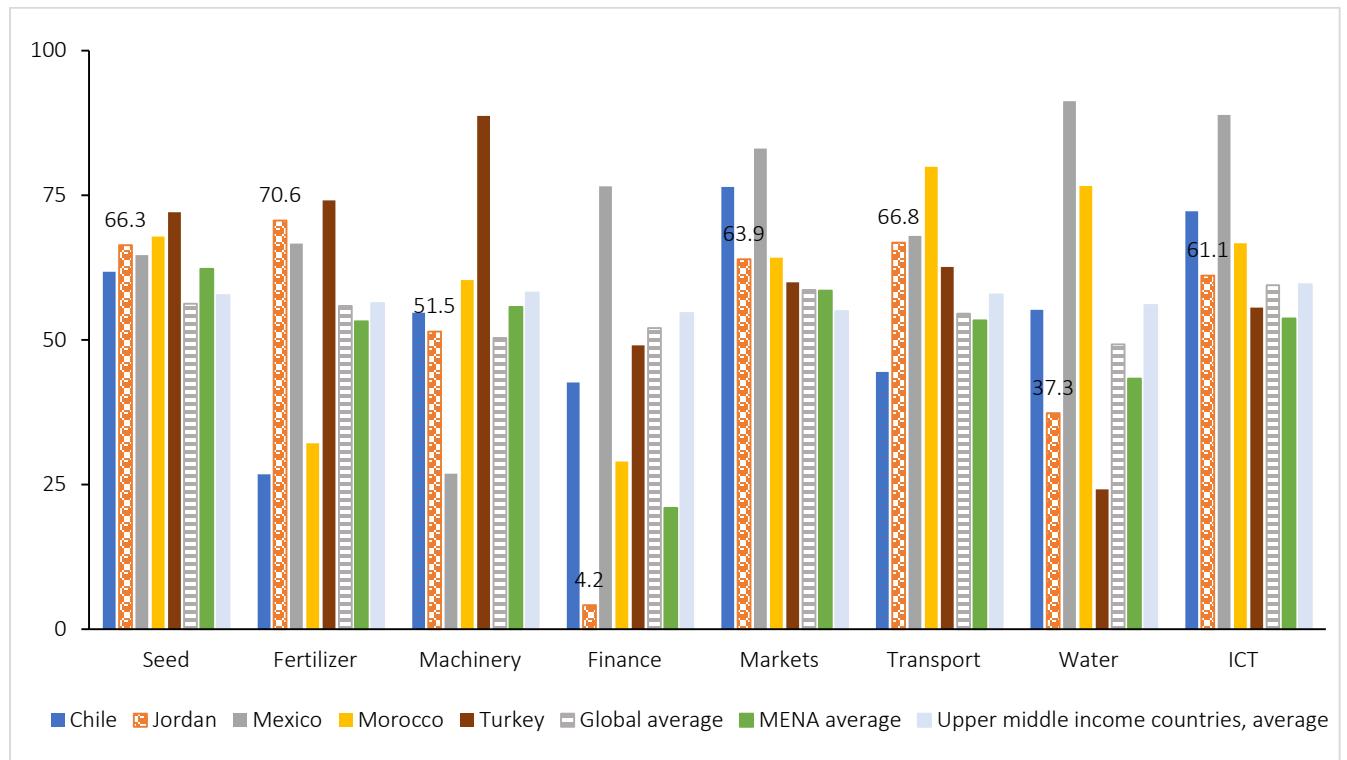
The World Bank's report on the Enabling the Business of Agriculture (EBA, 2017) similarly indicates that regulatory conditions are constraining for financial services that could be essential to farmers and agribusinesses in Jordan. These indicators provide valuable information on the constraints of the agricultural sector in general, and for the participation of the private sector in particular. The report identified that Jordan, compared to several other countries, is performing less strongly in at least two indicators—water and finance (Figure 6). Jordan's laws and regulations that affect access to financial services for farmers and agribusinesses has room for improvement compared to other middle income countries.

Figure 5. Gross fixed capital formation in agriculture is very low in Jordan and Lebanon, 1991-2015



Source: FAO Database

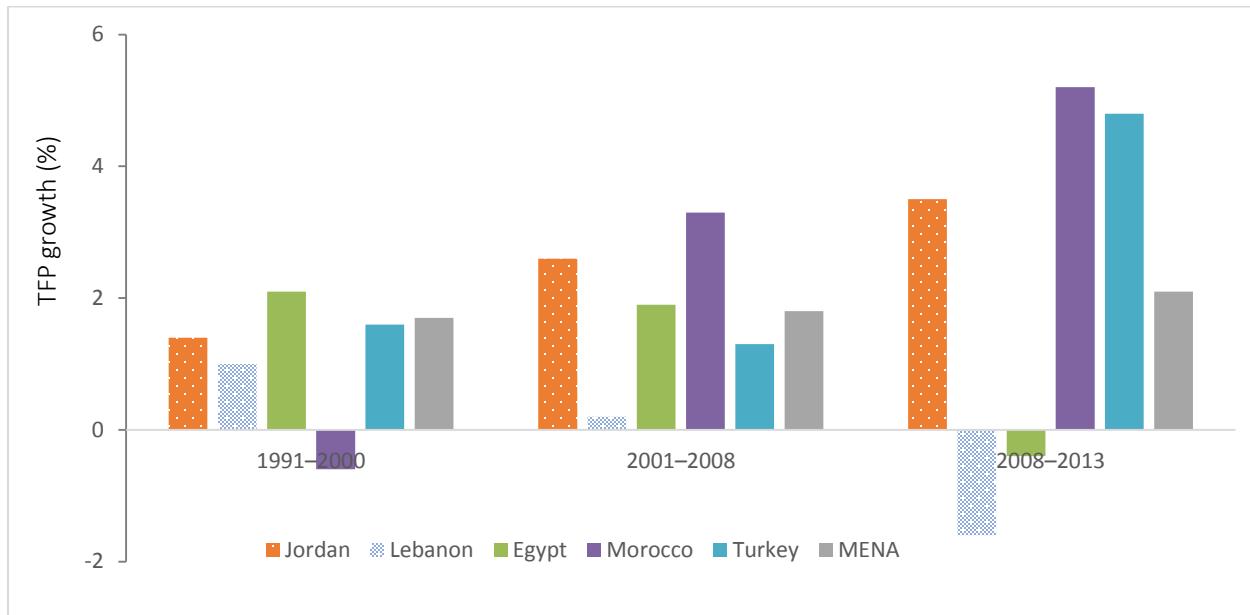
Figure 6. Finance is a major constraint for agribusiness in Jordan



Source: EBA 2017

**20. Agricultural technology (Total Factor Productivity, TFP):** While Jordan achieved a modest growth in TFP during the past quarter of a century, TFP declined in Lebanon during this period (Figure 7). During 2008-2013, TFP grew by 3.5 percent in Jordan (which is higher than the MENA regional average by two-third). Yet, TFP decelerated by 1.6 percent in Lebanon during the same period. There are various policy options to improve TFP in agriculture, including research and development in improved seed varieties, land management, water use efficiency, pest management, among others. The digital revolution in agriculture, including information and communication technologies (ICT), has large potential to increase agricultural productivity in general and TFP in particular. In Jordan, The National Center for Agricultural Research and Extension (NCARE) attempts to improve the quality of extension through establishing joint research and extension teams within the institute and improving outreach through field visits and farm schools. Yet, agricultural extension services are insufficient. The extension service in Jordan has limited budget, lowering incentive of extension agents to do a good job. In Lebanon, the quality and performance of practical research and extension are below the level to support companies that have the willingness and drive to develop positions in high-end markets. And adequate practical education is missing, which results in lack of graduates with practical skills (Ministry of Foreign Affairs, 2016).

Figure 7. Total factor productivity growth was modest in Jordan but negative in Lebanon during 2008-2013



Source: IFPRI Global Food Policy Report, 2017

**21. Irrigation: Irrigated agriculture contributes to a large share of the agricultural output but irrigation water use efficiency remains very poor in both countries.** In 2011, for instance, irrigated agriculture contributed to above 80 percent of the total value agricultural output in Jordan. The agricultural sector is the single largest consumer of water in both Jordan and Lebanon, with a water withdrawal share of 52 and 61 percent respectively. To improve efficiency of water use, the Jordan Valley Authority (JVA) has increased water tariffs for industrial use. However, water tariffs for irrigation use has been kept extremely low, as low as 0.011 Jordanian Dinar per cubic meter of water (World Bank 2016). The report recommends that irrigation water tariffs need to be increased to improve efficiency in water utilization in the agricultural sector. The report adds that irrigation water tariff would have to increase by at least 12 times the current rate to achieve the GoJ's Water Strategy (2009) of improving water efficiency. The current irrigation water tariff rates in Jordan are significantly lower than tariff rates in other countries where data are available (World Bank 2016). The National Water Sector Strategy (NWSS) of Lebanon indicates that the water sector in Lebanon has both infrastructural and management shortcomings, highlighting that more than half of the transmission and distribution networks have passed their useful life span. A large share of the current irrigations network in Lebanon is constituted of open channels, which makes the water use efficiency of irrigation quite poor. According to the 2017 EBA report, the legal framework for Jordan's water management system is ranked low (41 out of 62 countries),

indicating a significant number of issues related to water resource management and individual water use for irrigation that need to be improved.

**22. Food safety and quality standards hinder the export competitiveness of fruits and vegetables, in which Jordan and Lebanon have comparative advantage.** Jordan and Lebanon have a comparative advantage in high value crops such as fruits and vegetables. For instance, Jordan has a revealed comparative advantage (RCA) of 16.1 for edible vegetables whereas Lebanon has an RCA of 8.8 for preparations of vegetables, fruit, nuts or other parts of plants citrus fruit or melons (FAO 2015).<sup>10</sup> High income countries in Europe create a stable demand for fruit and vegetable exports from Jordan and Lebanon. These countries have seasonal market opportunities in meeting the demand of European markets for fruits and vegetables during the winter months. Moreover, growing income and population in the Gulf states creates strong demand for these high-value crops. However, poor food safety and limited traceability constrain agricultural exports to Europe where food safety standards are very high and strict compliance with maximum residue levels and microbial contamination are preconditions for entering into the market. The fruit and vegetable production in Jordan and Lebanon remains to apply poor practices of harvesting, sorting, grading, packing and labelling. Inadequate postharvest management limits the industry's capabilities to meet higher food quality and safety standards, hindering the export competitiveness of horticultural commodities in Jordan and Lebanon. Some studies indicated that on average 40-50 percent of the fruit and vegetable production in developed countries is lost (Aulakh, et al 2013). A fifth of this loss occurs at consumption stage while less than 10 percent is lost on the field.

#### Policy options to improve agricultural innovation, rural finance, and public advisory services

**23. Leveraging the limited domestic and international public sources to crowd in private investment in the agriculture and food sector will be critical.** Further investments into infrastructure, such as roads, irrigation technology or post-harvest storage directly affect agricultural output per capita and output per unit of land in Jordan and Lebanon. Capital investments can be conducted either through private or public-sector investments, public-private partnerships or Foreign Direct Investment (FDI). The "Nacala Road Corridor" spanning Malawi, Mozambique and Zambia represents a good example of a road construction project, which resulted in reduced transportation costs, improved access to markets, and increased road safety, which are crucial for increased agricultural productivity and fosters regional integration (Gajigo and Lukoma, 2011). Hence, the public sector in Lebanon and Jordan can play a

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<sup>10</sup> An RCA value of above one indicates that the country has a comparative advantage in that product.

crucial role by investing in essential infrastructure as well as in forging public-private partnerships to ensure capital investments. In this context the proposed Mashreq MFD Strategy could consider engagement of various instruments ranging from FDI and PPP promotion programs to develop innovative rural financing mechanisms and to support agriculture leasing.<sup>11</sup> Countries that reduce costly requirements and barriers to entry for the private sector perform well on the EBA indicators—inputs, finance, markets, transport, water, and ICT. Jordan, for instance, has a long way to go in its EBA performance and by improving its score in the EBA indicators it can stimulate private sector investment in agriculture and agribusiness.

24. **Increasing public investment in agricultural research and development and technology transfer can facilitate agricultural technology innovations.** Research and development (R&D) are essential to increase farm productivity and farm income of the growing population in Jordan and Lebanon (Pardey et al, 2013). Numerous examples on the positive effect of public and private-sector research as well as extension services on agricultural productivity exist. In the 1960s, India supported public research programs, which resulted in highly improved seeds for millet and sorghum and, consequently, increased their productivity. In the 1970s, India attracted foreign firms to enter the market and conduct further research on seed improvements. Further collaborations between the public and private sector on improving seed and nutritional quality were forged thereafter. In 2013, a partnership set up between the Georgia Ministry of Agriculture and two other institutes launched a three-year initiative on public extension and advisory services to provide farmers with the information and technologies needed (GHI, 2016). Numerous digital technology companies allow farmers to access information, compare market prices, pay input suppliers or get paid by produce buyers through their mobile phone. These examples positively affect their agricultural practices and have a positive effect on their agricultural productivity. Hence, Lebanon and Jordan's public sector can take on a supportive role by investing in agricultural research and development, while creating an enabling environment for private sector research and the development of firms providing digital technologies to farmers.
25. **Improve agricultural water use efficiency by creating the right market incentives for water saving technologies.** Water scarcity in Jordan and Lebanon makes increased water use efficiency and the adoption of water-saving technologies imperative. Improved water use efficiency could be gained by increasing water tariffs as well as the development of aquifer contracts. While increasing water tariffs for farmers is contested, it could potentially result in the active adoption of water management

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<sup>11</sup> Draft Mashreq MFD Strategy 2019-2021.

technologies. There is a potential for the private sector to engage in irrigation system management, hence creating jobs in service delivery. Furthermore, the increased adoption of water-conservation technologies, such as drip irrigation, variable rate irrigation, desalination, hydroponics, aeroponics, atmospheric water generation, and sensors and smart meters can prove beneficial for increasing water use efficiency. Government policies in Jordan and Lebanon can create the demand for water saving technologies by increasing water tariffs while at the same time cover certain upfront costs, which allow for a fast adoption of these new technologies and ensure a more efficient water usage. By increasing the demand for water saving technologies, the public policies create incentives for the private sector to supply these technologies. Furthermore, increasing coverage of collection networks and treatment capacities as well as improving existing wastewater treatment processes can improve water use efficiency.

26. **Improving food safety standards and sanitary and phytosanitary measurements through advisory services and by introducing new regulations could increase exports of fruits and vegetables.** The Governments of Jordan and of Lebanon can further promote exports by meeting international food safety standards and ensure food traceability through digital technologies. Considered as Non-Tariff Barriers, food safety standards can hamper trade. Hence, the public sector could have a prominent role in setting-up the regulatory framework as well as the institutions which oversee their implementation and execution. Furthermore, the public sector can assist farmers in adopting these newly developed standards by covering up-front costs and ensuring that their adoption results in a positive effect on farm revenue. Lessons can be learned from Poland's experience in harmonizing its food safety and sanitary and phytosanitary laws and regulations with those of the EU in less than a decade (ADB, 2014). The key lessons include a careful sequencing and timing in reviewing the regulations and food processing facilities, planning the adaptation of existing institutions with an emphasis on training, and then introducing new legislation and regulations. The private industry should be given adequate time to adapt to the new regulations, with a strong emphasis on capacity building and public advisory that is aligned with the Hazard Analysis and Critical Control Points (HACCP), good agricultural practices (GAP), and good manufacturing practices (GMP) codes and standards.

## Conclusions

27. **The agriculture and food sector plays an important role for the economies of both Jordan and Lebanon while its faces a few challenges.** The agriculture and food sector contributes approximately 20-25 percent of the active labor force in rural areas, 25-30 percent of GDP, and 20-25 percent of the total merchandise export. Agricultural production, including production of fruits and vegetables, has been increasing during the last three decades. While increasing labor productivity, chemical fertilizer use, expansion of arable land and irrigated land drive agricultural output growth in Jordan and Lebanon, poor agricultural technology, lack of rural finance, water use inefficiency in irrigation remain key constraints for the sector. For instance, Agricultural labor productivity and chemical fertilizer use are much higher in Jordan and Lebanon than the MENA regional average. However, Investment into agriculture and technological innovations in the sector have been very low in both Jordan and Lebanon. Although the constraints related to rural finance and technology contribute to underachievement of agricultural exports in the two countries, the constraints related to food safety and standards more directly hinder export competitiveness of Jordan and Lebanon especially to European countries. Successful country experiences show that adopting appropriate public policies could improve agricultural productivity and hence enhance the sector's role for job creation. The major policy options to improve agricultural productivity and enhance its role for job creation include increase investment in research and development, crowding in private sector capital flow to the agricultural sector, improve water use efficiency in agriculture.

This analysis reveals that while Jordan and Lebanon have many similarities in terms of resource endowments and trading partners as well as face similar external effects such as conflicts in the neighboring countries, inflow of refugees, and climate change, the performances of their agriculture sector has been different. The data show that agriculture in Jordan has performed (in some respects) better than in Lebanon over the last two decades. This is true in terms of agricultural valued added growth, livestock and crop production indices, as well as TFP. It could be useful to conduct a detailed analysis of differences in policies that may have caused this differences in sectoral performance between the two countries. Such analysis is likely to involve assessment of the impacts of non-agricultural policies, which was beyond the scope of the note. This is an interesting area for further study.

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## Annex

Table A1. Average agricultural production in Jordan during 1961-2015.

	1960s	1970s	1980s	1990s	2000s	2011-2015	Change (between 2011-2015 and 1960s)
Area (ha)							
Cereals	318,060	208,013	121,389	77,962	55,494	53,200	-83%
Citrus Fruit	2,237	2,519	4,882	6,365	6,916	6,622	196%
Fruits excluding melons	28,655	9,680	14,078	21,131	22,043	22,552	-21%
Oil crops	44,390	27,687	33,104	55,766	62,946	62,180	40%
Pulses	41,819	27,137	11,184	8,378	3,187	3,334	-92%
Vegetables	52,112	30,558	31,807	30,648	33,852	41,721	-20%
Roots and Tubers	1,156	526	1,436	3,573	4,470	5,502	376%
Yield (ton/ha)							
Cereals	0.6	0.6	0.8	1.5	1.3	1.7	182%
Citrus Fruit	14.8	9.8	20.3	24.2	17.5	15.9	7%
Fruits excluding melons	5.1	6.4	11.2	12.9	12.7	13.6	169%
Oil crops	0.4	0.4	0.3	0.4	0.5	0.5	31%
Pulses	0.6	0.6	0.8	0.8	1.2	1.3	117%
Vegetables	8.5	10.1	19.3	26.8	36.0	40.7	379%
Roots and Tubers	9.2	11.7	20.4	24.7	30.4	30.5	234%
Production (tons)							
Cereals	196,426	126,527	90,840	96,752	70,576	89,664	-54%
Citrus Fruit	34,161	25,377	101,117	150,859	120,477	105,453	209%
Fruits excluding melons	137,797	60,493	153,361	265,286	280,618	306,921	123%
Oil crops	11,172	5,067	8,023	17,044	28,993	32,714	193%
Pulses	26,443	16,884	8,722	6,464	3,751	4,146	-84%
Vegetables	444,597	309,528	596,913	819,255	1,225,370	1,691,362	280%
Roots and Tubers	9,644	6,477	31,862	86,075	135,733	168,059	1643%

Source: FAO Database.

Table A2. Average agricultural production in Lebanon during 1961-2015.

Crop	1960s	1970s	1980s	1990s	2000s	2011-2015	Change (between 2011-2015 and 1960s)
	Area (ha)						
Cereals	82,050	56,132	31,022	44,833	60,190	62,654	-24%
Citrus fruit	10,652	11,207	13,167	13,723	15,610	11,684	10%
Fruits (excl. melons)	53,558	52,682	65,304	75,811	69,587	60,129	12%
Oil crops	29,866	32,923	37,831	50,050	60,020	57,173	91%
Pulses	12,606	13,071	12,762	16,019	7,723	7,148	-43%
Vegetables	21,433	23,155	32,971	41,871	27,225	29,574	38%
Roots and tubers	6,921	6,852	10,574	13,859	17,772	13,601	97%
	Yield (ton/ha)						
Cereals	1.0	1.1	1.5	2.1	2.6	2.6	165%
Citrus fruit	21.8	29.0	28.1	26.1	22.4	23.7	9%
Fruits (excl. melons)	9.9	13.4	13.6	15.2	12.9	12.8	29%
Oil crops	0.4	0.4	0.3	0.4	0.5	0.5	31%
Pulses	0.9	0.9	1.2	1.8	1.4	1.2	34%
Vegetables	11.4	12.5	16.4	25.1	29.9	29.2	157%
Roots and tubers	10.6	12.4	17.4	21.5	23.6	24.5	132%
	Production (tons)						
Cereals	80,792	62,172	49,424	93,411	155,927	162,837	102%
Citrus fruit	229,653	324,208	370,810	353,792	349,982	276,918	21%
Fruits (excl. melons)	524,450	705,293	898,082	1,160,433	894,856	771,784	47%
Oil crops	11,245	12,145	11,321	22,019	28,916	28,373	152%
Pulses	11,463	11,107	16,145	29,504	10,461	8,846	-23%
Vegetables	240,590	290,275	546,198	1,005,333	813,995	864,777	259%
Roots and tubers	72,622	87,267	184,404	298,560	420,615	335,738	362%

Source: FAO Database.