IFPRI MIDDLE EAST AND NORTH AFRICA

REGIONAL PROGRAM | WORKING PAPER 09 | April 2018

The Role of Agriculture and Agro-Processing for Development in Tunisia

Jose Luis Figueroa, Mai Mahmoud, and Hoda El-Enbaby

Series name change: The IFPRI Egypt Strategy Support Program (EgSSP) Working Paper series has been renamed the Middle East and North Africa Regional Program Working Paper series beginning with report #05. The numbering for this series will continue from the EgSSP series.

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1. INTRODUCTION

The 2011 Arab Spring political movement began in Tunisia. Since then, Tunisia has been recognized as one of the countries in the Arab region with the highest economic and social potential. Several factors contribute to Tunisia's potential including a highly educated labor force; good transportation infrastructure that includes a well-connected network of roads, ports, and airports; and a strategic location with good physical access to high-value international markets (World Bank 2014). The Tunisian economy grew on average by 4.3 percent annually between 2000 and 2010. Within this same period, poverty declined by more than half from 32.4 percent to 15.5 percent of the population living below the national poverty line (INS 2012a). Extreme poverty also fell from 12 percent to 4.6 percent between 2000 and 2010 (INS 2012a). The country has also made substantial progress in promoting democracy after the 2011 uprising – for example, the presidential and parliamentary election of 2014 were carried out under a fair and transparent process (National Democratic Institute 2015).

However, Tunisia keeps struggling to unleash its full potential as pressing social and economic challenges remain in the country. Youth unemployment, particularly among graduates of higher education institutions, is one of the major threats for the future of the country. According to 2014 estimates, overall unemployment in Tunisia was 12.4 percent, with youth unemployment reaching 31.8 percent. Further, only 64 percent of men were employed in 2014, a share lower than what is seen in other countries in the region like Egypt or Jordan where these percentages are 77 and 65 percent, respectively (Assaad, Ghazouani, and Krafft 2016). At the same time, women face significant constraints to their participation in labor markets – female participation in the workforce has remained at about 25 percent since the 2000s (Mouelhi and Goaied 2017). Rapid growth of the working age population together with improvements in educational attainment are seen as the primary causes of the low capacity of the labor market to absorb the growing population looking for work (Assaad, Ghazouani, and Krafft 2016).

These social challenges in Tunisia are accompanied by sluggish economic performance in recent years. Economic growth accelerated from 1.6 percent in 2016 to 2.3 percent in 2017 (World Bank 2017), but budget, trade, and current account deficits; foreign reserves; the exchange rate; and inflation all deteriorated during 2017 (Economist Intelligence Unit 2017). Tourism, a key sector for the economy, has experienced a moderate recovery. However, recent trends show the country is still far from reaching the numbers of tourists arrivals observed before 2015, when a series of terrorist attacks severely affected the industry. There was an increase of 30 percent in the number of arrivals in 2017, but this number is still 15 percent below that observed for 2014.

Moreover, the reduction in poverty levels has not yet translated into a better distribution of wealth as inequality remains high. The Gini index of per capita consumption for Tunisia declined from 40.8 to 35.8 within the 2000s. However, these numbers are high relative to other middle-income countries (Jemmali 2017). At the same time, economic disparities between regions within Tunisia persist and contribute to Tunisia's poor economic performance. Economic disparities between rural and urban areas and between the northern-coastal areas and those in the southwest keep widening (Jemmali 2017; World Bank 2014).

Tunisia needs to leverage its full potential by developing economic opportunities in all sectors, including those that have not been prioritized in the past, such as in the production of high-value agricultural products. As a strategic sector for the economy, agriculture has the potential for creating jobs, fostering food security, and boosting rural development. Moreover, due to its strong links with other sectors, agriculture can potentially accelerate economic growth broadly, especially

in rural areas where poverty is more prevalent. Estimates show that the acceleration of the economy in 2017 was partly lead by a 5 percent expansion of agricultural production, primarily due to rapid expansion in citrus production (Economist Intelligence Unit 2017a). Agriculture also is critical to Tunisia's food security. From 2012 to 2017 the food security index improved thanks to good performance in food production and availability, although affordability challenges persist (Economist Intelligence Unit 2017b).

To respond to these challenges, the Tunisian government introduced the 2016-2020 Strategic Development Plan with the aim of restoring the economy's historical long-term growth of 5 percent by 2020 (African Development Bank 2017). Several new trade agreements have been signed between Tunisia and the European Union (EU), within the context of Euro-Mediterranean cooperation, to regulate trade and remove trade barriers, especially in agriculture. In 1995, Tunisia and the EU signed the Euro-Mediterranean Association Agreement, which entered into force in 1998. Several agreements followed, such as the Deep and Comprehensive Free Trade Area agreement, which deepens bilateral integration of Tunisia's economy into European markets. These trade agreements, along with the 2020 development strategy, provide a powerful opportunity for growth for some agricultural sub-sectors, particularly the olive oil sub-sector[1]. Increased prospects for trade in agricultural products will provide Tunisian farmers with incentives to increase production and also to promote agro-processing and exports. Given the damage that terrorism and other concerns have inflicted on the Tunisian tourism sector, increased agricultural exports can provide an additional source of foreign currency.

This paper is part of a series of three country-case studies to investigate the potential role of agro-processing for economic development based on the strong backward and forward linkages agro-processing firms have with the agricultural sector. Previous analyses for Egypt and Jordan (Figueroa, Mahmoud, and Breisinger 2017; El-Enbaby et al. 2016) have shown how developing the agro-processing sub-sector as well as encouraging the production of high-value crops can promote economic and social well-being, especially in rural areas where the majority of the poor are concentrated. In continuation with this line of research, this paper aims at analyzing:

- What role agriculture has played for the Tunisian economy in recent years;
- What is the role of agricultural productivity and structural change in fostering agricultural growth in Tunisia; and
- What is the potential of agro-processing for economic development and rural transformation in the country.

The paper is organized as follows: Section 2 provides an overview of the demographic and geographic characteristics of Tunisia. Section 3 explores the development of the agricultural sector in recent years as well as the role of ago-industry in the economy. Section 4 describes an analysis of farm households and provides a profile of rural households according to their level of involvement in agricultural activities. Section 5 discusses the future of agriculture and agro-processing development for Tunisia. Section 6 concludes.

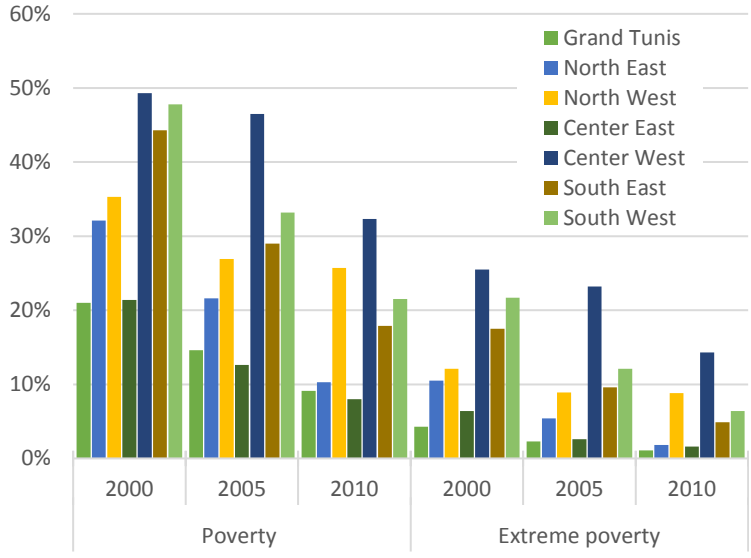
[1] Within this agreement, the EU decided to offer a temporary unilateral duty-free rate quota for Tunisian olive oil exports to the EU. A total of 35,000 tons annually will be made available for two years, from the beginning of 2016 to the end of 2017, to be opened once the duty-free tariff rate quota of 56,700 tons is exhausted (European Commission 2015)

2. POPULATION, GEOGRAPHY, AND MIGRATION

As in the case of Jordan and Egypt, in Tunisia economic and social development has evolved at a different pace across different regions within the country. Traditionally, coastal areas in the north-east show better economic performance than do regions in the south and west. Areas along the coast are usually well connected with access to ports, airports, and other economic infrastructure that is unavailable or deficient in the south. The main economic centers of the country are on the coast. Tunis, the capital, is the major center for employment in the services and manufacturing sectors, while important tourist centers, like Sousse, are also on the coast. As a consequence, Tunisians living in the coastal areas in the north of the country face better economic opportunities than do their peers in the south. A similar imbalance is seen in contrasting urban and rural areas.

Tunisia has cut by half the number of people living in poverty in recent years. At national level, the poverty headcount dropped from 25 to 15 percent between 2000 and 2015, while extreme poverty was reduced by 62 percent over the same period (INS 2017). Sub-national poverty estimates from the National Statistical Institute – using different poverty lines for cities, small towns, and non-communal (rural) areas – show that western regions are still lagging behind (Figure 2.1). Two western regions, North-West and Center-West, saw a decline in poverty of less than 50 percent between 2000 and 2010. In the other regions, poverty decreased by 50 percent or more, with largest decline in the eastern coastal areas. Declines in extreme poverty were even sharper in these areas with an average of 75 percent in coastal areas, while extreme poverty only dropped by about 35 percent in western areas over this period. In the region of Grand Tunis, for example, poverty is four times lower than it is in the Center-West. Coastal areas also show significantly lower poverty rates than interior regions (11 versus 27 percent on average). This suggests that development policies need to prioritize interventions in these more economically vulnerable areas in order to close such inter-regional gaps in welfare levels.

Figure 2.1: Tunisia: Poverty headcount across the regions

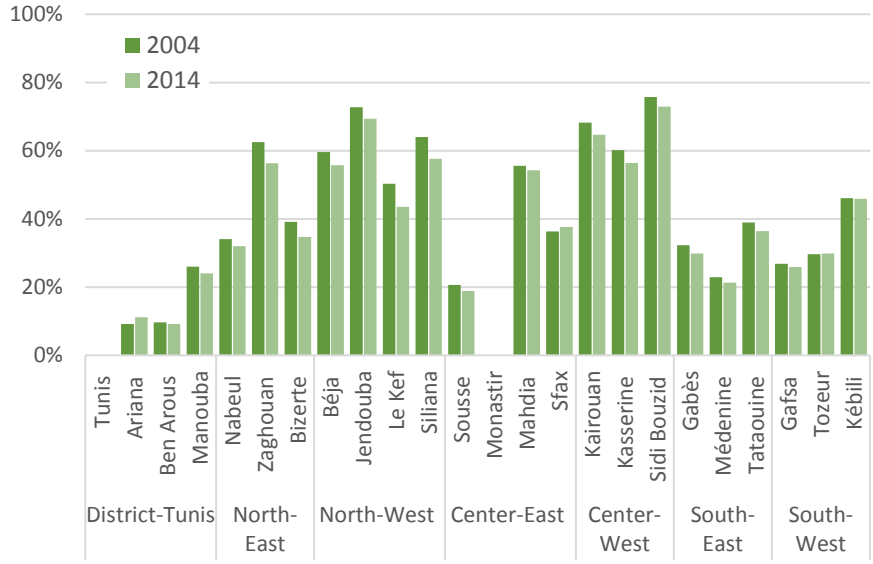


Source: Author's calculation based on INS (2012a).

As in other countries, in Tunisia poverty still has a rural character. As observed in Figure 2.2, those regions with higher poverty concentrations are often those with the highest share of their population living in rural areas. In particular, the Center-West and North-West regions had 65 and 56 percent of their populations living in rural areas in 2014, respectively. Moreover, the governorates

with the highest share of rural inhabitants in 2014 are in the Center-West – Sidi Bouzid with 73 percent – and in the North-West – Jendouba with 70 percent.

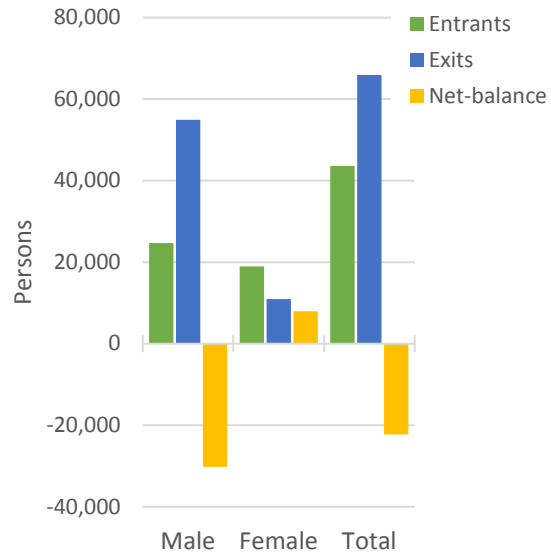
Figure 2.2*:* Rural population as percentage of total population, by governorate, 2004 and 2014



Source: Author's calculation based on INS (2018)

Another observation on these regional disparities is accelerated migration, both internal and external. The relaxation on migration restrictions after the 2011 political uprising has facilitated international migration. Migration has also become less urban with rural communities now sending the majority of international migrants. Compared to trends before 2011, recent migrants are also less educated (although a third of all migrants have some higher education, suggesting brain drain from the country). Between 2009 and 2014 the number of international migrants exceeded the number of people emigrating to Tunisia by more than 60,000 persons officially (Figure 2.3). Most of these migrants were males, possibly due to more economic opportunities for men and more social barriers facing women who wish to emigrate. As can be seen in Figure 2.3, the balance between those coming to and leaving Tunisia was positive for women whereas the balance was negative in the case of male migrants. In consequence, there is a growing share of households in Tunisia being headed by women (David and Marouani 2017).

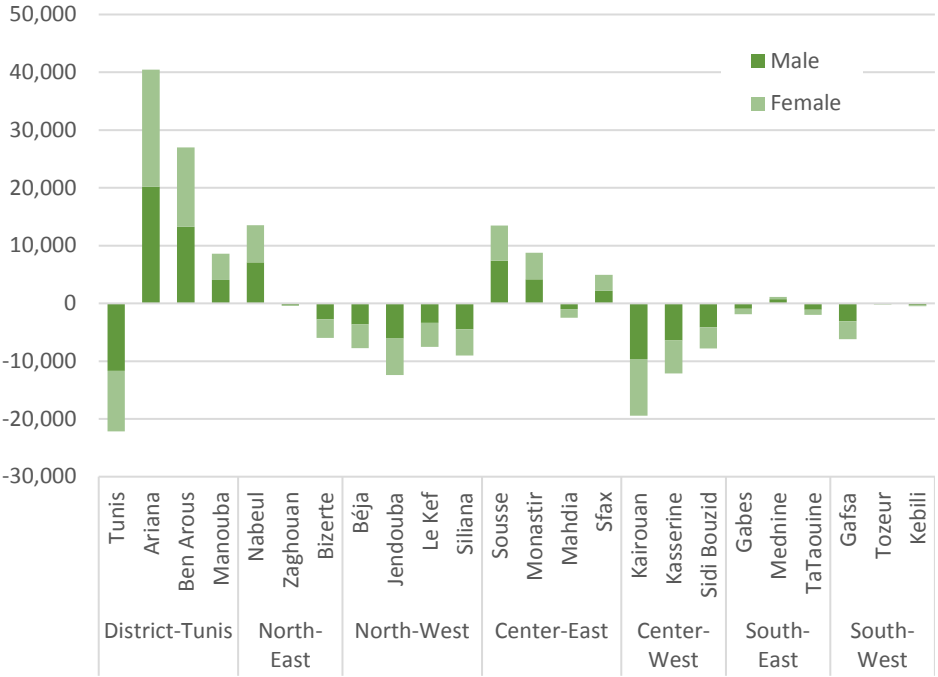
Figure 2.3: International migration into and out of Tunisia between 2009 and 2014, persons



Source: Author's calculation based on INS (2018)

On the other hand, despite the fact that total internal migration at national level has remained stable over time, large disparities across regions are observed (Figure 2.4). Except for Tunis City, the capital city itself, the other governorates of District-Tunis region received the largest number of internal migrants on net between 2009 and 2014. In contrast, governorates in the North-West and Central-West regions experienced large exit of migrants to other regions. There is also a large exit of domestic migrants observed in Tunis City.

Figure 2.4: Net domestic migration in Tunisia by governorate between 2009 and 2014, persons

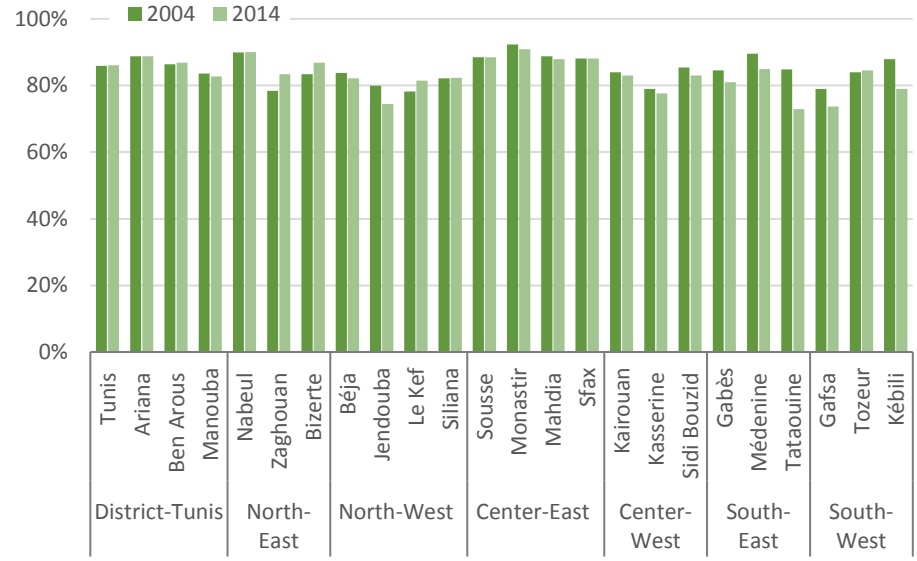


Source: Author's calculation based on INS (2018)

The evolution of employment between 2004 and 2014 also confirms the economic disparities across regions. In contrast to the North-East region where employment has slightly increased, Southern governorates have experienced a decrease in employment by an average of

5.6 percent between 2004 and 2014 (Figure 2.5). Noteworthy, the fall in employment rates is most prevalent in the governorates of Tataouine and Kebili, both of which have high potential for agriculture, as is discussed further in section 3 of this paper.

Figure 2.5: Employment by governorate in Tunisia, 2004 and 2014



Source: Author's calculation based on INS (2018)

Tunisia confirms the importance of looking at sub-national differences when designing national economic and agricultural development strategies and policies. In some parts of Tunisia, especially in the poorer south, agriculture still plays an important economic role and could help reduce poverty levels.

3. AGRICULTURE AND THE AGRO-PROCESSING INDUSTRY IN TUNISIA

Tunisia's 2016-2020 Strategic Development Plan seeks to foster inclusion, sustainability, and efficiency (Zouari 2016). Within the strategy, the public-sector is to solely contribute to several economic activities while simultaneously engaging in public-private partnerships in other projects. The strategy aims to promote inclusive growth, employability, and competitiveness; reduce disparities between and within regions; strengthen local governance; and enhance the attractiveness of different regions for investment. Agriculture and agro-processing are key components of the development strategy, with an emphasis on public investments to develop the agricultural sector. It aims to improve rural infrastructure and natural resource management, develop agri-businesses, and market local products. In addition, the government plans to rehabilitate irrigated areas and to increase irrigated land by over 1,000 hectares.

Since the 1980s and the implementation of the Agricultural Structural Adjustment Program, the agriculture sector in Tunisia experienced a series of policy reforms to liberalize the sector. These included liberalizing input and output prices, cutting input subsidies, and abolishing import protection. However, these reforms remained incomplete as the government continued to intervene to protect the country's farmers and to safeguard food security. It has been estimated that 11 percent of fiscal incentives went to the agricultural sector; with no positive discrimination in favor of exports (Ghali and Rezgui 2015). Some observers feel that these policies have jeopardized the sector's efficiency and competitiveness, because their implementation might have reduced resource allocation efficiency. The agricultural policies have favored production of milk, sugar, beef, and

cereals on the grounds of food security concerns. As a result, production of high-labor intensive products, like olives and citrus, for which Tunisia has a comparative advantage, have received significantly less support. Regional disparities have also increased as a result of these policies since many products with high marketing potential are produced by smallholders in interior regions; while agricultural subsidies were found to benefit a few large producers who were mainly concentrated in coastal areas in the north (World Bank 2014).

The agricultural sector in Tunisia constitutes nearly 9 percent of its GDP, with crops contributing about 82 percent of agricultural value added (Table 3.1). Olives, dates, and two types of wheat have the largest shares in Tunisian agricultural GDP at 12, 7, and 7.8 percent, respectively. Cultivated wheat is produced for local consumption, while olives are used for olive oil production, largely for export. Wheat imports account for about a third of agricultural imports. Together with barley and other cereals, cereals make up almost 60 percent of agricultural imports. Dates, by contrast, have the largest export intensity among all Tunisian agricultural crops, accounting for 65 percent of agricultural exports. Livestock constitutes only 18 percent of agricultural GDP, with sheep farming contributing more than half of this output. Livestock in Tunisia is all locally consumed, as none of it is exported. Overall, agricultural outputs account for 1.7 percent of total exports from Tunisia.

The contribution of agro-processing to GDP is less than half of that of agriculture (3.6 percent of GDP) but accounts for almost four times the contribution of agriculture to exports (6.6 percent of total exports). Almost 2 percent of Tunisian exports comes from olive oil, which is one of the focus areas of the 2020 development agenda. Tunisia was among the world's largest olive oil exporters in 2014/15 (UN COMTRADE 2016). Olive oil makes up about 50 percent of the value of the country's agricultural and food exports, and the Tunisian government intends to increase both production and exports of olive oil in the coming years. Olive oil has an export intensity of 43.4 percent, the second highest under agro-processing exports, topped only by canned products with an intensity of 51.4 percent.

Table 3.1: Social Accounting Matrix for Tunisia, 2012, percent

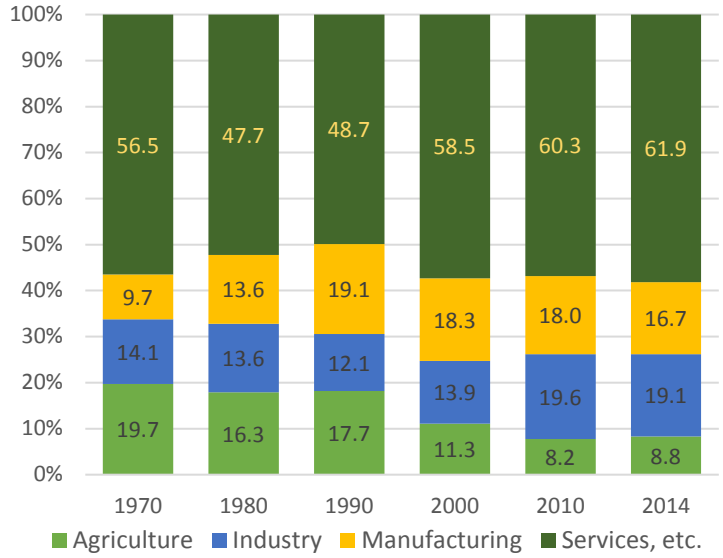
		Share in agriculture or in agro-processing GDP		Exports		Imports	
	Share in GDP		Share in employ-ment	Share in exports	Export intensity*	Share in imports	Import intensity**
Agriculture	**8.9**	**100.0**	**3.4**	**1.7**		**5.6**	
Crops	**7.3**	**82.2**	**3.1**	**1.7**		**5.5**	
Durum wheat	0.6	6.7	0.3			0.5	27.2
Soft wheat	0.1	1.1	0.1			1.4	87.6
Barley	0.2	2.3	0.1			0.2	32.5
Other cereals	0.0	0.3	0.0	0.0	13.8	1.2	95.8
Olives	1.1	11.9	0.4				
Citrus	0.4	4.6	0.1	0.1	4.4		
Dates	0.6	7.1	0.3	1.1	53.4	0.0	0.6
Other fruits	1.0	10.8	0.4	0.1	3.8	0.1	4.1
Tomatoes	0.5	5.7	0.1	0.1	5.4		
Potatoes	0.2	2.7	0.0	0.0	2.1	0.1	15.1
Other vegetables	1.1	11.9	0.3	0.2	5.7		
Other agriculture & forestry	1.5	17.1	1.0	0.1	4.0	2.0	43.4
Livestock	**1.6**	**17.8**	**0.3**			**0.1**	
Cattle breeding	0.4	4.4	0.2			0.0	1.8
Sheep farming	1.0	10.8	0.1			0.1	3.4
Poultry farming	0.2	2.6	0.0			0.0	1.6
Agro-processing	**3.6**	**100.0**	**3.2**	**6.6**		**5.0**	
Fishery	0.5	14.1	0.2	0.1	3.2	0.1	7.0
Dairy products	0.2	4.5	0.2	0.2	4.3	0.3	6.9
Meat	0.3	9.2	0.1			0.2	3.2
Olive oil	0.2	5.7	0.1	1.9	43.4		
Canned products	0.2	5.9	0.1	1.1	51.4	0.4	32.5
Sugar	0.0	1.3	0.1	0.0	1.1	0.6	70.1
Milling	0.4	10.2	0.3			0.1	4.1
Beverages/tobacco	0.6	17.1	1.0	0.4	16.5	0.5	31.4
Other agri-food	1.1	31.9	1.3	2.8	25.2	2.9	32.0
Other manufacturing	**13.7**		**18.6**	**63.2**	**58.1**	**67.2**	**66.9**
Construction	**4.6**		**3.3**				
Other non-manufacturing	**9.5**		**11.0**	**15.6**	**55.7**	**17.8**	**64.4**
Services	**59.8**		**60.5**	**12.9**		**4.4**	
Transport services	7.9		5.9	7.1	30.2	1.1	7.7
Hotels and restaurants	4.6		4.1				
Other services	47.3		50.5	5.8	4.7	3.3	3.2
Total agriculture	**8.9**		**3.4**	**1.7**	**5.0**	**5.6**	**22.9**
Total non-agriculture	**91.1**		**96.6**	**98.3**	**26.0**	**94.4**	**32.0**
Total	**100.0**		**100.0**	**100.0**	**24.6**	**100.0**	**31.3**

Source: Thabet (2016).
* Export intensity is the share of exported goods and services to total domestic output.
** Import intensity is the share of imported goods and services relative to domestic consumption.

Tunisia has been witnessing the expected structural change trend as agriculture's role in the economy has been declining. The share of agriculture in GDP declined by more than half between 1970 and 2014, from around 20 percent to about 9 percent of GDP, as shown in Figure 3.1. Meanwhile, the share of GDP of all other economic sectors rose. Industry increased from 14 percent of GDP in 1970 to 19 percent in 2014. Similarly, manufacturing increased from 9 percent to

17 percent of GDP in the same period and services also rose from around 57 percent to 62 percent of GDP.

Figure 3.1: Value added by sector in Tunisia, 1970 to 2014, percentage of GDP

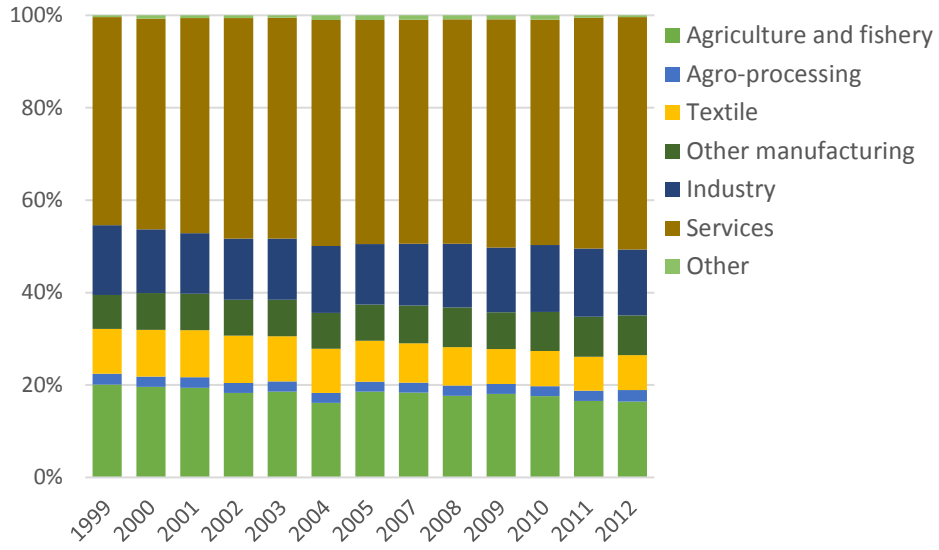


Source: Authors' calculations based on World Bank (2017).

Agriculture and agro-processing for employment creation

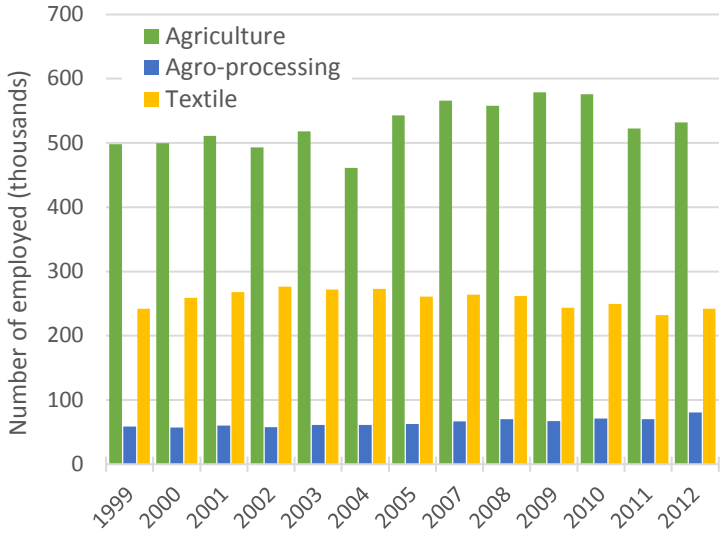
The role of agriculture for employment has been decreasing over time. In 1970, agriculture accounted for 20 percent of total employment whereas by 2012, the share of employment in agriculture was about 16 percent. In absolute numbers, the number of people employed in agriculture by 2012 was higher than what was observed in 1998 (498,000 vs 532,000 (Figures 3.2 and 3.3). From 1999 and until 2008, manufacturing employed almost 20 percent of the labor force. Yet, with the decline of exports to Europe after the 2008 financial crisis, manufacturing started employing fewer people, both in absolute terms and as a share of total employment, before starting to recover in 2012. Textiles has been one of the vital sectors for the Tunisian economy. Tunisia once was one of the world's top textile exporters, but production declined from 5.6 percent of GDP in 2000 to slightly more than 3 percent in 2012. The share of employment in textile manufacturing also declined from 10 percent to 7.5 percent in the same period. Despite this decline, the textile sector still contributes more value-added and employment than other agro-processing sectors. Finally, between 2000 and 2012, agro-processing employed between 2.1 percent and 2.5 percent of the employed work force, and made up between 3.1 percent and 3.4 percent of GDP (INS 2012b).

Figure 3.2: Employment by sector in Tunisia, percentage share of all employed, 1999 to 2012



Source: Author's calculations based on INS (2006; 2008; 2009; 2011; 2012b; 2013).
Note: No information was available for 2006.

Figure 3.3: Employment by agriculture-related sector in Tunisia, number employed, 1999 to 2012

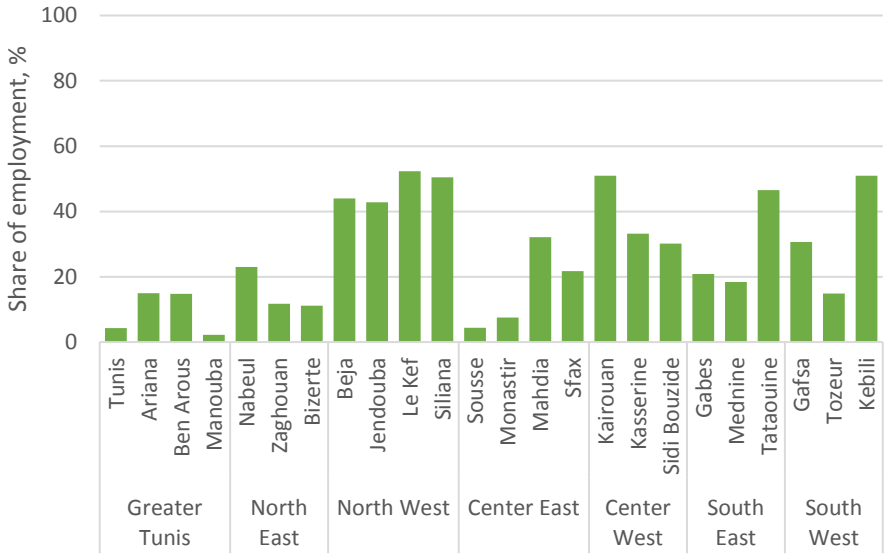


Source: Author's calculations based on INS (2006; 2008; 2009; 2011; 2012b; 2013).
Note: No information was available for 2006.

Despite changes in agricultural GDP and employment at the national level, the agriculture sector's role remains prominent in some areas around the country. In particular, agriculture employs the majority of people in regions where poverty rates are highest and where the share of the rural population is also among the highest. The most recent Tunisian Labor Market Panel Survey (TLMPS) (OAMDI 2016) shows that the highest share of employment in agriculture is in the North-West region where almost half of the population is employed in agriculture (47.5 percent). Across different governorates in the North-West, Siliana and Le Kef have over 50 percent of the population employed in agriculture. The sector also plays a relatively important role in the Center-West region as well, where it accounts for 38 percent of employment, while in the South-West it accounts for almost 32 percent. In these two regions there are also some governorates where agriculture is particularly important for employment. Kairouan in the Center-West and Kebili in the South-West,

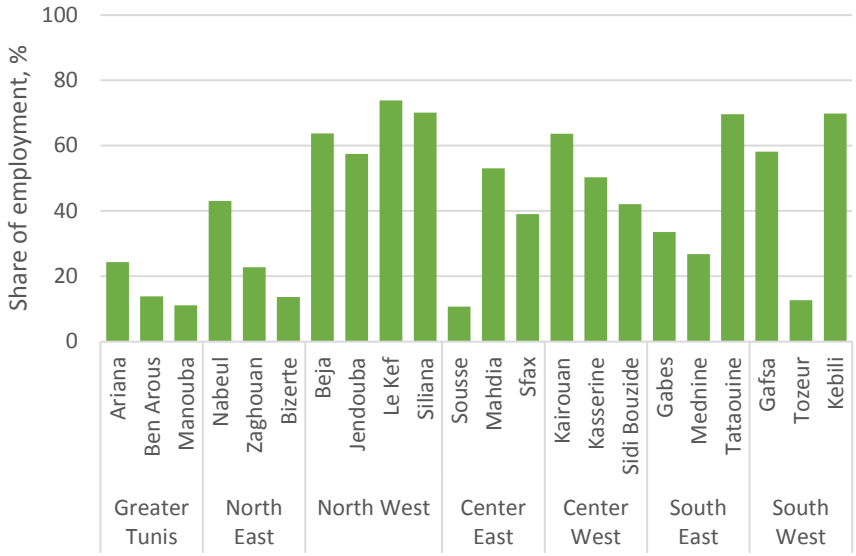
for example, have over half of the population employed in agriculture. In contrast, areas with lower shares of rural populations and lower poverty rates show less reliance on agricultural employment. For example, in Greater Tunis only 9.0 percent of the population is employed in agriculture (Figure 3.4). Similar patterns are observed in rural areas, but the lowest share of rural employment in agriculture is in Sousse rather than Manouba. Yet as expected, the employment share of agriculture is higher in all governorates when considering rural areas only—except for Tunis, which is predominantly urban (Figure 3.5). This is particularly true for the South-West region, where most Tunisian oases are located and where agriculture remains the core economic activity. Also, the South-West region includes Tozeur and Kebili, where the majority of the country's date production is located.

Figure 3.4: Employment in agriculture, by governorate, percentage share of all employed, 2014



Source: Authors' calculations based on TLMPS 2014 (OAMDI 2016).

Figure 3.5: Employment in agriculture in rural areas, by governorate, percentage share of all employed, 2014

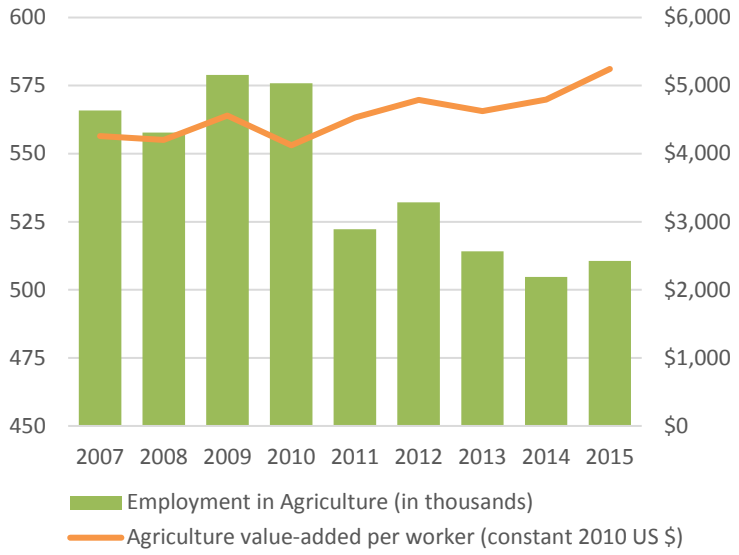


Source: Authors' calculations based on TLMPS 2014 (OAMDI 2016).

Structural change in agriculture

Despite witnessing changes in employment and GDP shares across sectors, structural change in Tunisia was not dependent on productivity gaps between agriculture and other sectors. Studies have shown that Tunisia has a small productivity gap between manufacturing and agriculture. In 2005, labor productivity in manufacturing was 1.7 times that of agriculture, compared to 3.9 times for Asia and 2.8 in Latin America (McMillan and Rodrik 2012; World Bank 2014). This small gap was attributed to low productivity in the manufacturing sector, which is mostly dependent on simple assembly activities (World Bank 2014). Marouani and Mouelhi (2016) show that productivity in Tunisia increased at a relatively sustained pace in the past three decades. Also, productivity growth was mainly within sectors, suggesting no structural change (Marouani and Mouelhi 2016). Moreover, high-productivity sectors, such as communications, did not witness an increase in labor share. Labor moved from agriculture to tourism and commerce, activities which have relatively low value added and are mostly informal. In fact, Figure 3.6 shows that agriculture productivity per worker has been increasing since 2010. At the same time, the number of individuals working in agriculture has been decreasing, as a result of out-migration as well as movement between different economic sectors.

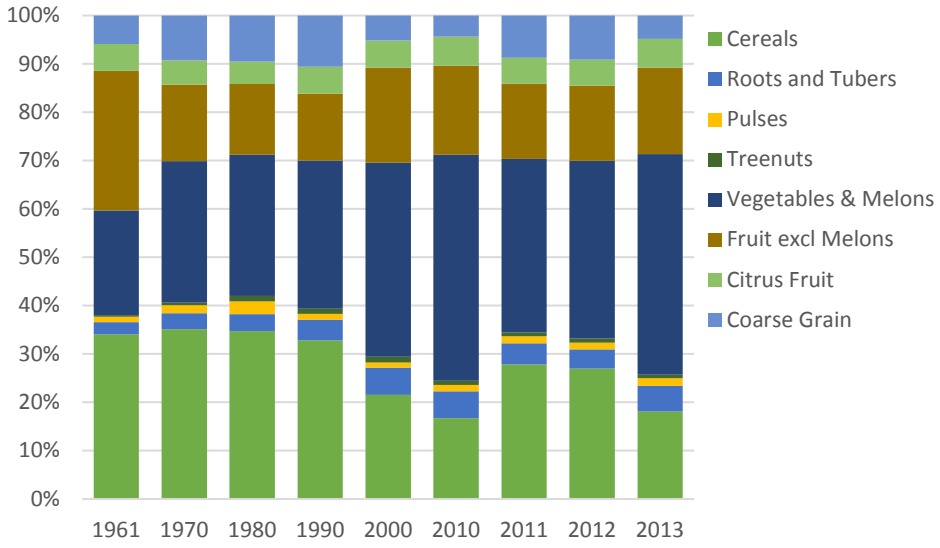
Figure 3.6: Agriculture labor productivity in Tunisia, 2007 to 2015



Source: Author's calculations based on INS (2018) and World Bank (2017)

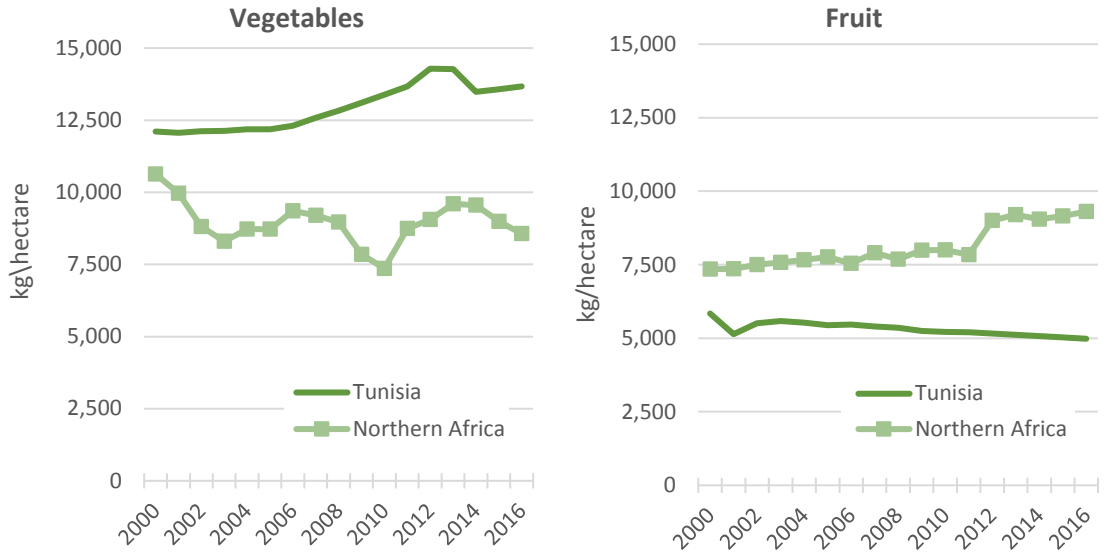
As Figure 3.7 shows, Tunisia's cropping pattern has been changing in recent decades. Between 1961 and 2013, the share of cereals in total agricultural production declined from 34 percent of crop output to only 18 percent. Meanwhile, the share of vegetables more than doubled, increasing from 22 percent in 1961 to 46 percent in 2013. Roots and tubers also doubled, from 2.5 percent to 5.3 percent of production during the same period. The share of fruit production in total output, by contrast, declined from 29 percent in 1961 to 18 percent in 2013, while the share of other crops remained almost the same. At the same time, the sector has become more mechanized. According to INS (2012b), almost 80 percent of large farms are mechanized, and equipment rentals have given an increasing number of farmers access to mechanization.

Figure 3.7: Composition of total crop output in Tunisia between 1961 and 2013



Source: Authors' calculations based on FAOSTAT (2017).

Figure 3.8: Average fruit and vegetable yields in Tunisia and North African countries, 2000 to 2016



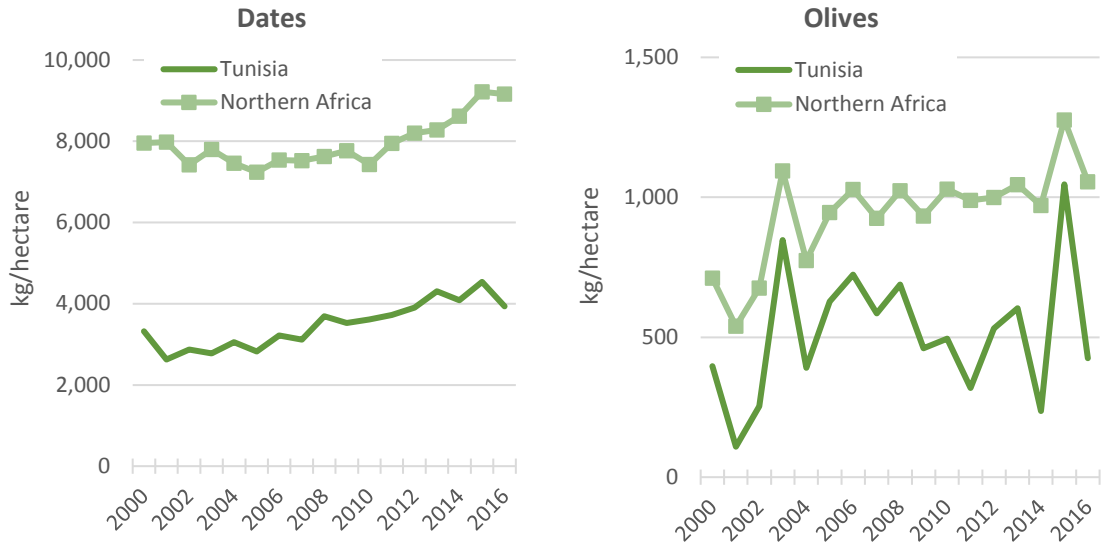
Source: Authors' calculations based on FAOSTAT (2018)

On the other hand, yields of high-value crops, including vegetables, have increased in Tunisia. As observed in Figure 3.8 (left), vegetable yields in Tunisia grew from 12,000 kg per hectare in 2000 to almost 14,000 kg per hectare in 2016. As a consequence, Tunisia shows a clear comparative advantage in vegetable production over other countries in the region like Algeria and Egypt. Such an advantage, however, is not observed in the case of fruits for which average yields in Tunisia are lagging behind those in other North-African countries[2] (Figure 3.8, right). However, production of olives and dates, two crops with high shares of agricultural exports, do not show a comparative advantage for production in Tunisia with respect to other North African countries (Figure 3.9), and their production has barely changed between 2000 and 2016, although with large fluctuations in the case of olives during this period. However, there are some patterns that suggest

[2] North African countries included in the figure are: Algeria, Egypt, Libya, Morocco, Sudan (including data on former Sudan up to the year 2011), and Tunisia.

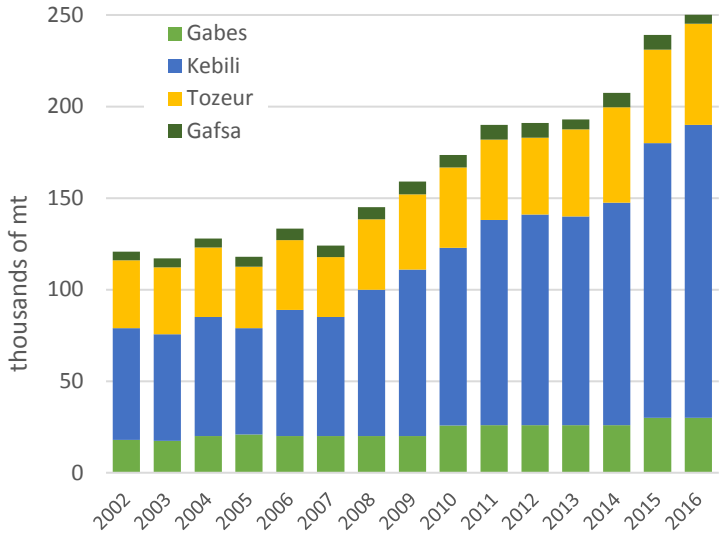
that some areas in the country have great potential for producing these crops. In southern governorates, in those areas with a comparative advantage for date production, total production increased about 100 percent between 2002 and 2016. The majority of this increase came from Kebili governorate, where date production increased more than 160 percent over this period, from 61,000 to 160,000 mt (Figure 3.10).

Figure 3.9: Average date and olive yields in Tunisia and North African countries, 2000 to 2016



Source: Authors' calculations based on FAOSTAT (2018)

Figure 3.10: Production of dates in southern governorates of Tunisia, 2002 to 2016



Source: Authors' calculations based on INS (2018)

4. THE ROLE OF AGRICULTURE AND AGRO-PROCESSING FOR HOUSEHOLDS EMPLOYMENT AND WELFARE

Following the same categorization used in previous papers (Nin-Pratt et al. n.d.; Figueroa, Mahmoud, and Breisinger 2017; El-Enbaby et al. 2016), we analyzed the evolution of a number of household's welfare indicators based on the level of involvement of these households in agricultural activities. The analysis is to better understand which factors are associated with the choices

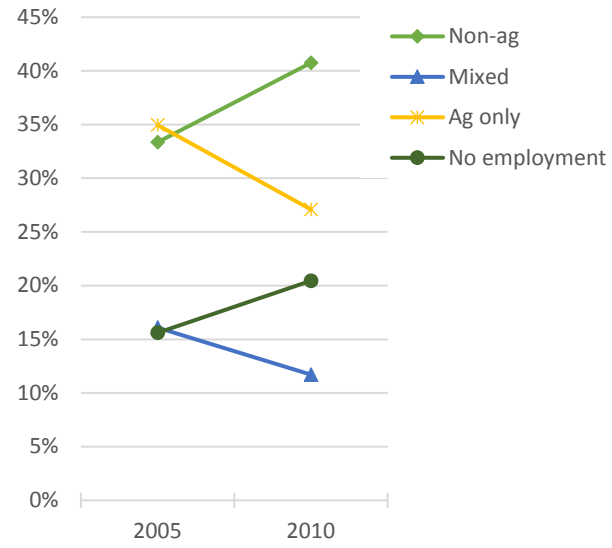
households make to move away from agriculture, as well as how this process has affected the well-being of households in rural areas. As observed in other countries, this economic transformation process affects rural families in different ways depending on demographic structure and socioeconomic characteristics. For example, it is expected that rural families who traditionally rely on agriculture as a main source of income start moving to other sectors when better opportunities are available in these sectors. This process however does not occur simultaneously for all household nor for all members in these households. As a result, the level of involvement of households in agriculture differs, with some members remaining employed mainly in agricultural activities while others, usually younger members, are employed in other sectors like services or industry.

Four types of households are identified for the analysis based on this classification[3]:

1. **Only-Agricultural households** which are those with all members reporting working in agriculture as their main source of employment.
2. **Mixed households** with only some members working in agriculture, while other members work in other sectors
3. **Non-Agricultural households** in which there are no members working on agricultural activities
4. **No employment households** in which all members were reported to be unemployed.

As in Egypt, the share of rural households employed full- or part-time in agriculture in Tunisia has declined. In 2005, about 35 percent of rural households were working full time in agriculture, and 16 percent were in mixed households where at least one member was working in agricultural activities. However, by 2010 these shares had decreased to 27 and 11 percent of rural households, respectively. These changes resulted in an increase in the share of non-agricultural households up from 33 percent in 2005 to about 41 percent of rural households in 2010 (Figure 4.1).

Figure 4.1: Rural households in Tunisia by primary employment, 2005 and 2010



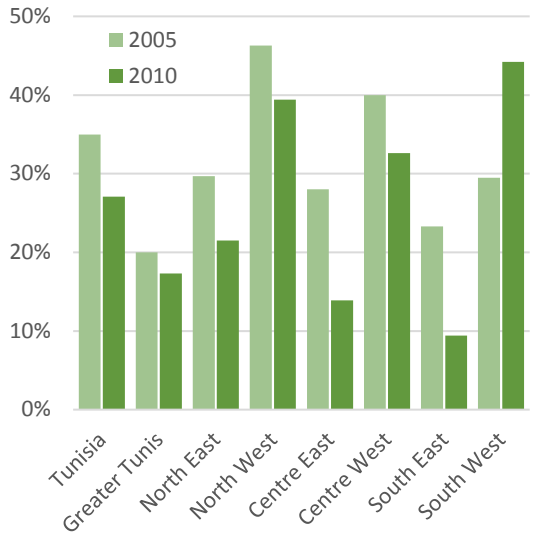
Source: Authors' calculations based on EBCNV (OAMDI 2014a; 2014b).

As Figure 4.2 shows, all regions experienced a reduction in the share of households that depend on agriculture as their source of income. The South-East witnessed the steepest decline,

[3] The characterization of type of household into Only-Agriculture, Mixed, and non-Agriculture is based on primary employment. Information on secondary occupation of household members and information on income sources was not available and, thus, was not included in the analysis.

where the share of households solely working in agriculture dropped from 23 percent to 9 percent. The only exception to these changes is the South-West region, where the share of only-agricultural households increased from 30 percent to 44 percent of total rural households in the region. The South-West is the region of Tunisia with the highest share of only- agricultural rural households.

Figure 4.2: Agricultural-only rural households in Tunisia, 2005 and 2010, as percentage of all households



Source: Authors' calculations based on EBCNV (OAMDI 2014a; 2014b).

In general, non-coastal areas still show the highest share of households in agriculture. In contrast, interior regions remained with high shares of households depending on agriculture. For example, in the North-West and Center-West areas, between 30 and 40 percent of rural households still depended on agriculture. At the same time, the regions with the highest poverty rates in 2010 were Center-West (32.3 percent), North-West (25.7 percent) and South-West (21.5 percent) which are the areas that maintained the highest share of households still working exclusively in agriculture, suggesting a correlation between poverty and agricultural activities in Tunisia. The Center-West and North-West areas made modest progress in terms of poverty reduction in comparison with coastal areas. Interestingly, the only non-coastal area where poverty decreased by more than half is the South-West which is also the only area where the share of agricultural households increased in the same period, possibly due to the booming dates industry in this region.

Among households that work exclusively in agriculture, regional variations are minimal, with the exception of the South-East region. Table 4.1 looks at the demographic characteristics of rural agricultural households and the share in every region of such households in the lowest three deciles of per capita expenditure nationally (last row in Table 4.1).

Table 4.1: Demographic characteristics of agricultural rural households

	Grand Tunis	North-East	North-West	Center-East	Center-West	South-East	South-West
Age of household head, years	52.4	54.8	57.2	51.5	55.52	59.0	56.8
Age of spouse, years	46.0	46.6	50.7	45.1	48.40	46.9	47.8
Household members, avg. number	4.84	4.41	4.37	4.90	4.71	5.44	5.20
Household members per room, avg.	2.01	1.90	2.03	1.89	2.19	2.16	1.97
Male household head, share	0.97	0.92	0.85	0.87	0.88	0.87	0.87
Educational attainment of household head, %							
None	90.2	99.2	96.0	96.3	99.7	98.7	97.0
Primary/Lower Secondary		0.8	0.6	1.5		1.3	
Secondary	6.6		2.3	2.2	0.4		3.0
Post-secondary			0.3				
University	3.3		0.9				
Post-graduate							
Educational attainment of spouse, %							
None	92.8	100.0	98.1	98.2	99.4	98.4	97.4
Primary/Lower Secondary	3.2					1.6	
Secondary	4.0		1.2		0.6		2.1
Post-secondary							
University			0.7	1.8			0.6
Post-graduate							
Highest level of education in household, %							
None	39.4	58.1	61.1	61.0	64.6	45.7	47.0
Primary/Lower Secondary	29.5	28.7	20.0	24.6	22.9	36.6	22.0
Secondary	15.7	9.2	12.6	7.3	7.6	12.7	13.7
Post-secondary	9.3	1.9	2.6	2.6	1.7	5.0	8.1
University	6.1	2.1	3.4	4.5	3.2		8.8
Post-graduate			0.3				0.4
Households in lowest three deciles of per capita expenditure, share	0.22	0.36	0.59	0.37	0.59	0.48	0.49

Source: Authors' calculations based on EBCNV (OAMDI 2014a; 2014b).

To further investigate how these characteristics determine households' involvement in agriculture, we conduct a multivariate regression analysis to model household involvement in agricultural labor. We estimate a multinomial logistic model using a nominal variable that indicates whether a household is employed only in agriculture, mixed, or is not employed in agriculture based on the share of those employed in the household whose primary occupation is agriculture. The estimation results are presented in Table 4.2.

Not surprisingly, compared to only-agricultural households, those that do not depend on agriculture are more likely to be located in the urban area of Grand Tunis. However, interesting patterns emerge when analyzing mixed employment households where we see that the association between location and agricultural type is positive and statistically significant for the North-East and the Center-East regions (0.163 and 0.477, respectively). This suggests that, compared with only-agricultural households, mixed employment households are more likely to be found in these two regions with the lowest levels of poverty (apart from Grand Tunis). Also, mixed households tend to have younger heads on average compared with households in agriculture, but also tend to have a relatively higher probability of older spouses.

Table 4.2: Multinomial logistic regression to predict employment type of households in Tunisia, 2010

Base outcome: Agricultural households	Non-agricultural households	Mixed households
North-East[1]	−1.782***	0.163***
	(0.0111)	(0.0166)
North-West[1]	−2.888***	−0.721***
	(0.0108)	(0.0165)
Centre-East[1]	−0.810***	0.477***
	(0.0117)	(0.0172)
Centre-West[1]	−2.607***	−0.656***
	(0.0108)	(0.0167)
South-East[1]	−1.223***	−0.618***
	(0.0140)	(0.0235)
South-West[1]	−2.582***	−0.422***
	(0.0126)	(0.0190)
Head is between 25 and 34 years of age[2]	0.109	−0.921***
	(0.0717)	(0.0902)
Head is between 35 and 49 years of age [2]	−0.126*	−1.020***
	(0.0715)	(0.0893)
Head is older than 50 years[2]	−0.398***	−0.743***
	(0.0716)	(0.0893)
Spouse is between 25 and 34 years of age [2]	0.588***	−0.171***
	(0.0192)	(0.0356)
Spouse is between 35 and 49 years of age [2]	0.455***	0.546***
	(0.0196)	(0.0354)
Spouse is older than 50 years[2]	−0.172***	0.714***
	(0.0201)	(0.0358)
Household head is male	0.276***	0.715***
	(0.00951)	(0.0158)
Head has primary education[3]	1.156***	0.389***
	(0.0223)	(0.0319)
Head has secondary education[3]	1.451***	0.409***
	(0.0169)	(0.0230)
Head has more than secondary education[3]	1.561***	0.00395
	(0.0342)	(0.0486)
Maximum education level in household is primary[3]	0.238***	0.264***
	(0.00620)	(0.00914)
Maximum education level in household is secondary[3]	0.897***	0.590***
	(0.00750)	(0.0105)
Maximum education level in household is more than secondary[3]	0.845***	0.885***
	(0.0120)	(0.0155)
Household head is a housewife[4]	1.766***	0.669***
	(0.0179)	(0.0272)
Household head is a pensioner[4]	0.914***	−0.557***
	(0.00763)	(0.0120)
Household head does other activities[4]	0.381***	−1.570***
	(0.0251)	(0.0639)
Constant	2.646***	−1.011***
	(0.0722)	(0.0918)
Observations	8,497	

Source: Authors' calculation based on EBCNV 2010 (OAMDI 2014a).
[1.] Reference is Grand Tunis. [2.] Reference is 15 to 24 years of age. [3.] Reference is no education. [4.] Reference is employee.
Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Finally, a higher level of education is associated with households that do not depend on agriculture. Regardless of the education of the head of the household or the maximum level of

education for all members in the household, higher levels of education are strongly correlated with non-agricultural households in comparison with only-agricultural ones. In the case of mixed employment households, the results are similar but less dramatic, as shown by the smaller magnitude of the coefficients for educational level of the head of the household. Also, a level of education above secondary school does not predict a household being categorized as mixed. Finally, in comparison with only-agricultural households, non-agricultural households are more likely to rely on pensioners or to be headed by a housewife.

5. THE FUTURE OF AGRICULTURAL AND AGRO-PROCESSING DEVELOPMENT IN TUNISIA

As mentioned in the introduction, Tunisia has taken significant steps to accelerate economic development by promoting social and economic reforms. Tunisia's prime geographical location with access to high-value markets and the good shape of the country's infrastructure can also potentially facilitate take-off in the agricultural and agro-processing sectors. However, there are challenges ahead that the country will need to resolve in order to assure the sector becomes a key motor for well-being and economic development in coming years. For example, further market integration and removal of non-tariff barriers are needed to boost exports and assure the needed creation of jobs, especially in rural areas (Ghali and Zitouna 2017; World Bank 2014).

Tunisia has potential for developing high-value horticulture and arboriculture products, as well as developing agro-processing industries around these. Dates, olive oil, and citrus are particularly promising and Tunisia has a clear comparative advantage in their production. The sector, however, is still dominated by low-value-added products, partly as a result of policies which have favored production of traditional crops, like wheat and dairy products, for which the country has limited capacity to compete and which are mainly produced in coastal areas. Furthermore, these policies have hindered agricultural development in interior areas where non-traditional crops are produced, contributing to increasing disparities among regions in the country (Chebbi and Lachaal 2007; World Bank 2014). By encouraging production of high-value crops in these interior regions, the country could address poverty and foster economic and social inclusion for some groups who remain especially disadvantaged (Hanmer, Tebaldi, and Verner 2017). As women's participation in the labor market remains particularly low at around 25 percent, the agro-processing sector could provide job opportunities for women, especially those who face restrictions in looking for jobs that require mobility either through internal or external migration (Mouelhi and Goaied 2017).

Similar to most countries in the region, Tunisia's water resources are scarce, which could pose a serious threat for the future of the agricultural sector. In this sense, the main challenges result from increasing demand for irrigation, growing rainfall variability, and climate change. Tunisia's per capita share of fresh water is around 400 m^3/year, even less than the figure for Egypt and well below the international water scarcity threshold (Wilby 2013). The country is characterized by limited renewable water resources, a semi-arid climate, and high variability in rainfall with periodic droughts (Dhehibi, Frija, and Aw Hassen 2014). The agricultural sector is the largest consumer of water resources, taking up 75 percent of total freshwater resources. As more than 90 percent of Tunisia's agriculture is rainfed, the sector is highly vulnerable to variability in precipitation (Wilby 2013). The high variability and scarcity of rainfall are especially harmful for cereals, as they are the main rainfed crops (Breisinger et al. 2013).

Although irrigated areas make up only around 8 percent of Tunisia's total agricultural area, they account for 35 percent of agricultural value, employ 27 percent of the agricultural workforce, and contribute 20 percent of agricultural exports. Groundwater from shallow and deep aquifers

supplies 48 percent of the total irrigated area. However, groundwater resources are limited to around 2 billion m^3 and 32.5 percent of groundwater is estimated to be nonrenewable (Benabdallah 2007). Agricultural production under irrigation also has high energy requirements. Around 95 percent of the irrigated areas are equipped with a pumping system. In 2005, the total pumping capacity of irrigated agriculture was 160,000 kW (Dhehibi, Frija, and Aw Hassen 2014).

The southern region of Tunisia is particularly disadvantaged with regards to water quality and quantity. Covering 62 percent of the country's area and already an arid area, the south has only 190 million m^3, or 6 percent, of Tunisia's surface water (Benabdallah 2007). Further, 28 percent of Tunisia's surface water is considered saline. Surface water in the southern region has the lowest quality, where only 3 percent of the water is classified as good, compared to 82 percent in the north (Benabdallah 2007).

Tunisia faces a high risk of a significant decline in water resources due to climate change, with an estimated decline of 5 percent for surface water resources and 28 percent for groundwater resources. The country is among the most exposed countries globally to accelerated sea level rise (UNECA 2015). Agricultural yields are expected to be negatively affected by climate change. As shown in Table 5.1, yields of both irrigated and rainfed wheat would decline under different climate change scenarios.

Table 5.1: Projected average annual yield changes for selected crops in Tunisia over the period 2000 to 2050 under different climate change scenarios

	MIROC (% yield change)		CSIRO (% yield change)	
Crop	**Irrigated**	**Rainfed**	**Irrigated**	**Rainfed**
Wheat	-0.17	-0.18	-0.03	-0.11
Barley	n.a.	-0.10	n.a.	-0.12
Potato	-0.04	0.20	-0.02	0.05

Source: Breisinger et al. (2013). n.a.=not applicable.

Tunisia is highly dependent on food imports, especially cereals, importing 50 percent to 88 percent of its cereal consumption. This dependency presents a great challenge for Tunisia and makes it highly vulnerable to global climate change and food price rises (Breisinger et al. 2013). Climate change adaptation, stabilization of agricultural yields, and decreasing vulnerability to climate variability are all important considerations for Tunisia.

Climate conditions not only impose a major risk on agricultural production, but also on poverty and food security. Tunisia ranks 53 out of 113 on the Global Food Security Index, with a "good" food security situation. However, it is the lowest-scoring MENA country in terms of volatility of agricultural production (Economist Intelligence Unit 2016). With high shares of agriculture-dependent households, this volatility poses a major challenge to improving poverty levels and providing social protection. Tunisia has two main social protection instruments: universal food subsidies for products mainly consumed by the poor, and direct transfer for the poorest families (INS 2012a). After the 2010-11 political uprising, transfers and subsidies increased to 7.6 percent of GDP from a pre-uprising level of 3.6 percent (Matta, Appleton, and Bleaney 2016). However, more climate change adaptation mechanisms will need to be put in place, particularly for areas where a high share of households depend solely on agriculture.

6. SUMMARY AND CONCLUSIONS

Over the last two decades, Tunisia has experienced a series of economic, political, and social changes that have benefited large sections of the population. Thanks to positive economic growth, the country managed to halve the number of poor people between 2000 and 2010. The country has also put in place reforms after the Arab uprising in 2011 to move towards a democratic political system. Economic reforms also are foreseen with the development of the 2016-2020 Strategic Development Plan, which aims at promoting inclusive economic growth. These efforts, together with Tunisia's prime geographical location, well-developed economic infrastructure, and a highly educated population points to Tunisia's high development potential among countries in the Arab region. However, the country still faces economic and social challenges in coming years, including rising unemployment, particularly among youth and women; political instability; and increasing migration. These all hinder the economic development potential of the country.

This paper has analyzed the role of one key sector for development in Tunisia – agriculture. Our findings suggest that the role of agriculture in the economy has been decreasing over the past few decades from 20 percent of GDP in 1970 to less than 9 percent by 2014. However, the sector has an important role for employment since one-sixth of the economically active population in the country still works in agriculture. Furthermore, employment in agriculture is particularly important in the poorest non- coastal regions of the country where about 40 percent of the population depend on agriculture. The country has also experienced significant changes in crop production over the past 50 years, with cereal production decreasing about 50 percent during this period, while vegetable production increased significantly, particularly between 2000 and 2016. In addition, the south of Tunisia has experienced a sharp increase in the production of dates. Such trends point to the potential of non-traditional crops for improved poverty alleviation and rural development – our analysis suggests that the South-West region, the main producer of dates, was the only non-coastal region where poverty decreased by at least half and the only region where the share of households relying exclusively in agriculture increased. The South-West is also the only region where the share of the rural population remained stable with low emigration to other regions.

To better understand which factors might drive these trends, we analyzed characteristics of households in rural areas categorized by their sectoral employment patterns. From a policy perspective, knowing which characteristics shape household decisions to remain in or leave agriculture is crucial for designing targeted interventions to foster economic development. Well-designed, targeted policies to promote rural development and inclusive economic growth need to consider the structure and characteristics of rural households and how they are affected by the economic and social changes of economic transformation processes. Examples from other countries have shown the importance of analyzing such determinants, showing that strategies to promote income from nonfarm activities in rural areas are crucial for alleviating poverty in developing countries. For instance, we find that more educated households are less likely to participate in agriculture. There is also an association between households that have diversified economic activities (mixed households) and being located in areas with lower poverty rates. Our analysis suggest that compared with households engaged only in agriculture, mixed employment households are more likely to be found in the two regions with the lowest levels of poverty (apart from Grand Tunis).

On the other hand, the results show that there are demographic and social characteristics that are associated with a household's decisions to remain in agriculture. Education, for example, was found to be a strong predictor of the level of agricultural involvement of household in Tunisia. The results show that a higher level of education is associated with households that do not depend

on agriculture. This observation emphasizes the potential role of education policies that aim at enhancing economic diversification and reducing poverty. Also, the role of women among agricultural households is more prominent than among households in other sectors, as female-headed households are more likely to be found among only-agricultural households, possibly due to migration of males to other areas to look for employment in other sectors. Women's participation in labor markets is very low in Tunisia, which is partly explained by women facing more restrictions in looking for work outside of their own communities (Mouelhi and Goaied 2017). By promoting development of the agro-processing sector, Tunisia could provide local job opportunities to women in rural areas.

In sum, Tunisia's agriculture sector could play a central role in accelerating economic and social development, particularly, in rural areas. However, the country needs to improve agricultural productivity, especially for non-traditional crops for which Tunisia has a comparative advantage, like fruits and olives. Production of olives and dates, in particular, have high potential and could help to boost the development of agro-industries around these crops. Besides exploiting its comparative advantage in producing olives and dates, the country also could exploit commercial trade agreements that favor Tunisia's products in European markets. At the same time, adoption of agricultural practices to improve water use efficiency and climate change adaption are needed to assure Tunisia's agriculture sustainability, food security, employment, and poverty reduction.

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About the Author(s)

Jose Luis Figueroa is an Associate Research Fellow in the Egypt Strategy Support Program of IFPRI's Development Strategy and Governance Division, based in Cairo. **Hoda El-Enbaby** and **Mai Mahmoud** are Senior Research Assistants in IFPRI's Egypt Strategy Support Program, based in Cairo.

Acknowledgments

This report was prepared as part of an agreement between IFPRI and the Food and Agriculture Organization of the United Nations (FAO). The authors are grateful for constructive comments from the FAO team at the Regional Office for Near East and North Africa, particularly those from David Sedik and Abdessalam Ould Ahmed.

The preparation of this paper was co-funded by the International Fund for Agricultural Development (IFAD) under the Agricultural Investment for Development Analyzer (AIDA) project. We are thankful to IFAD for their support. Useful comments were also received from participants at the AIDA country focus group workshop that took place in Tunis on 12 December 2017.

INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE
1201 Eye Street, NW | Washington, DC 20005-3915 USA
T: +1.202.862.5600 | F: +1.202.862.5606
Email: ifpri@cgiar.org | www.ifpri.org

IFPRI-EGYPT
World Trade Center, 1191 Corniche El Nile, Cairo, Egypt
T: +2(0)22577612; Mobile: +2(0)1066910782
http://egyptssp.ifpri.info/

The Middle East and North Africa Regional Program is managed by the Egypt Strategy Support Program (EgSSP) of the International Food Policy Research Institute (IFPRI). The research presented here was conducted as part of the CGIAR Research Program on Policies, Institutions, and Markets (PIM), which is led by IFPRI. This publication has been prepared as an output of EgSSP. It has not been independently peer reviewed. Any opinions expressed here belong to the author(s) and do not necessarily reflect those of IFPRI, PIM, or CGIAR.