



Food and Agriculture Organization
of the United Nations

Tunisia Case Study

**Prepared for FAO as part of the
State of the World's Forests 2016 (SOFO)**

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2015

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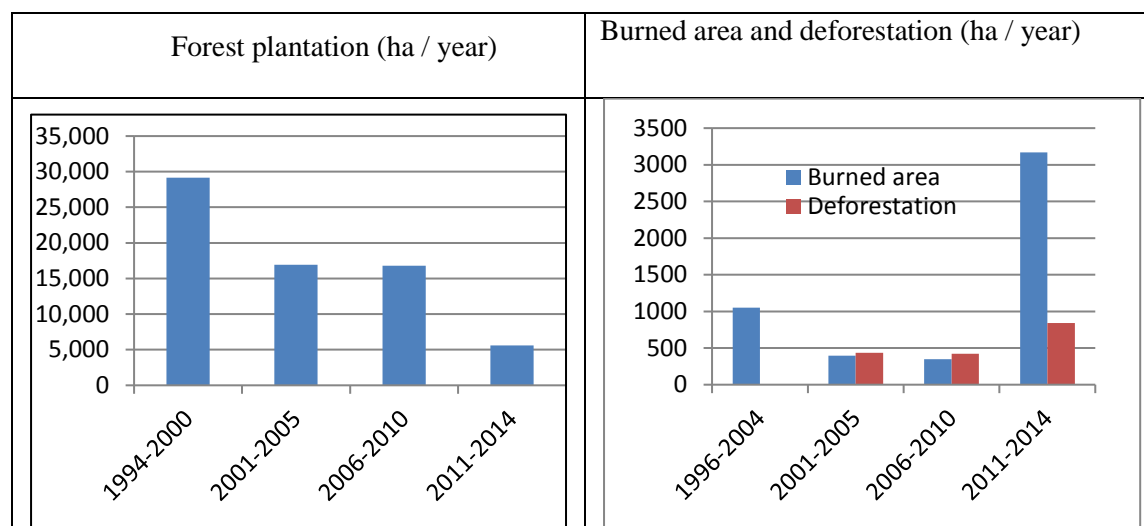
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1. Country Trend Observation (1-2 pages):

Forests and woody vegetation cover a total surface area of 1.3 million ha in 2015 (FAO 2015) that represents 8% of the country surface area. It includes 1 million ha of forests and 0.3 Million ha of shrubs and other woody area. The forest area has increased from 643,000 ha in 1990 to 1,041,000 ha in 2015 ((FAO 2015) that corresponds to an increase by 62% in the last twenty five years or an annual increase of 1.9%. The most important programs of forest and pastoral plantation were between 1990 and 2010, with a rhythm of plantation of 22,000 ha annually (FAO 2015), recently, during the period 2010-2014, forest and pastoral expansion concerned only 6,000 ha per year. In the other side, forest fires have affected about one thousand ha per year during the period 1996-2010, and 3167 ha per year on average during the 2011-2014. Similarly, annual deforestation has increased from 400 ha (1996-2010) to 800 ha for the period 2011-2014. It should be indicated that half of the plantation consists on pastoral plantation. Forest and pastoral plantation is usually conducted in forest area (replanting burned areas when natural regeneration is not possible, reforestation of harvested areas, replacing shrubs (1400 ha per year; FAO 2015)), in agricultural lands (planting the banks of ravines, for soil conservation purposes and for windbreaks), and in the pastoral lands (plantation of forage species).

Evolution of forest plantation and deforestation



Source : DGF Database, 2015

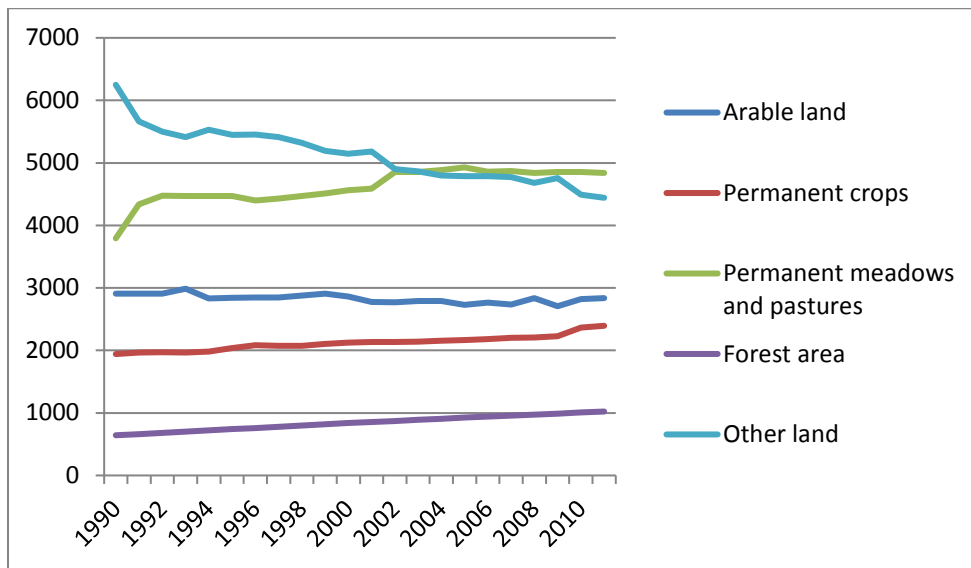
Similarly, the surface area of permanent crops (especially olive groves) and pasture have increased during the same period, 1990-2010. The surface area of arable land is quite stable, with an annual variability related to drought, but the surface area of desert and other marginal lands is decreasing (from 5.7 million ha in 1991 to 4.4 million ha in 2011) (FAOSTAT). In addition, the surface area of irrigated agricultural land has increased from 350,000 ha in 2003 to 437,000 ha in 2013. This surface area, even if it represents only 10% of the total cropping area, contributes from 30 to 40% of the agricultural production (Cena et al. 2005). Hence, even if the surface area of agricultural land remains stable, its productivity is improved with the increasing of arboricultural land and irrigated areas. These global changes do not indicate the conversion between different land uses, only some indications can be given about land use changes.

In addition to the better use of agricultural land resources, labor productivity per worker has increased by 1.2% from \$ (cst2004-2006) 3671 in 1991-2001 to \$ (cst 2004-2006) 4163 in 2001-2012 (FAO 2015). Concerning the prevalence of undernourishment, the level is very low, less than 5% for all the period 1990-2014 (FAO, Food security indicators).

Some observations can be given about forests, agricultural land and food security :

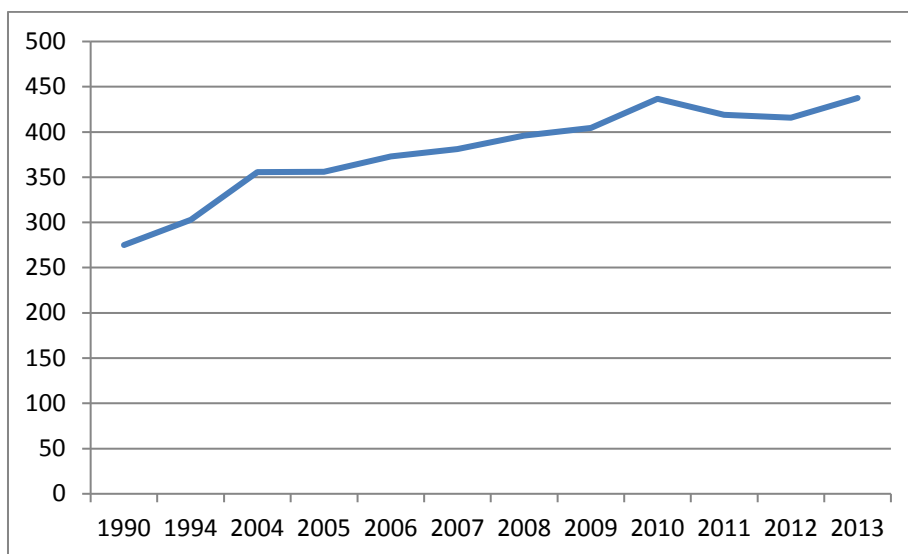
- Forest expansion is conducted in marginal areas where the contribution to agricultural and forage production is very low. This afforestation contributes to enhance the forage production at middle and long term.
- The increase of food production is mainly related to a better use of agricultural land. The forestland, mostly in mountainous areas, is not suitable for agriculture: in addition to environmental problems that it can create, the agricultural production would be very low.
- The population resident inside or near the forest area, 8% of the total population, earns about one third of their income for forests, in addition to the contribution of forests in providing food and energy. Therefore, forests contribute to insure food security for this population. Although, the poverty rate of this population remains high, 46% in 2010 (FAO 2012) compared to 25% in the country (INS)

Evolution of different land uses (in 1000 ha)



Source : FAOSAT

Evolution of irrigated area (in 1000 ha)



Source : Ministère de l’agriculture 2015 et Banque mondiale 2006

2. In-depth country assessment

A. Context Assessment

2.1. Economic development

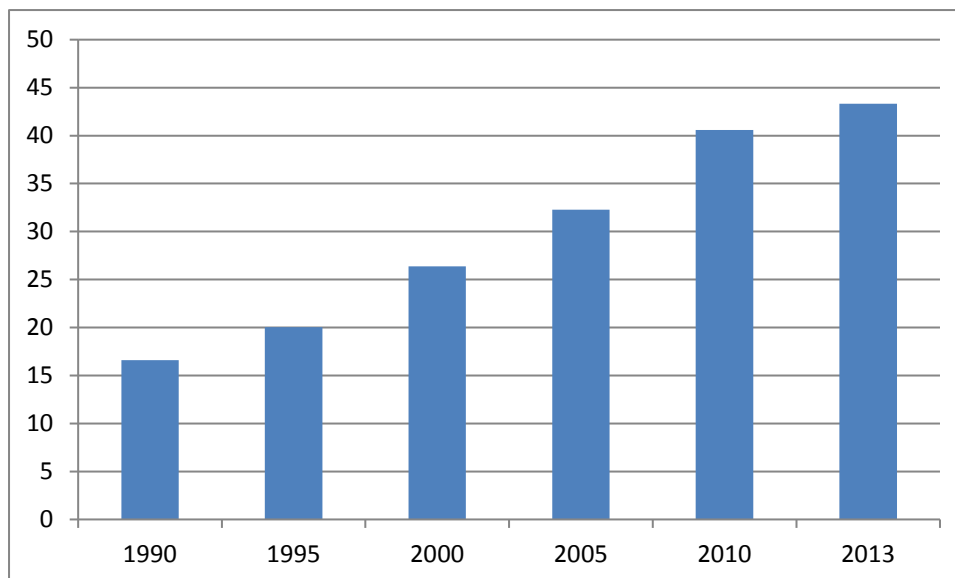
2.1.1. Country's structure of economy and income:

In 2013, Tunisia produced GDP of USD 47 billion, representing a per capita ratio of USD 4317 (World Bank). The GDP has increased by 4% to 5% per year in the last 20 years. A slowdown was observed after the revolution in 2011, the annual growth is only 2.2% for the period 2010-2013. Demographic change and the increase in employment represent 1/3 of GDP growth during the last decade 2000-2010, although, the labor productivity has contributed with 68%. The latter has increased by 2.5% per year.

The major GDP contributors sectors in 2013 were manufacturing industries (16.8%), agriculture and fisheries (9.4%), non manufacturing industries (13.6%) and services (61.4%) (INS). While the relative importance of agriculture has decreased from 14.5% in 1990-1995 to 9.3% in 2010-2013, those of services has increased from 60% in 1998 to 62% in 2013. Since the 1990s, import tariffs on industrial products, including wood products, from EU has decreased to reach 0% in 2008, however, the industry managed to improve its competitiveness and the contribution of manufacturing industries is maintained at the same level, 17 to 18%. Even if the contribution of the agriculture in GDP has decreased, the growth rate of the value added of the agriculture sector was 2.9% in constant prices 1990 (Ministry of Agriculture)

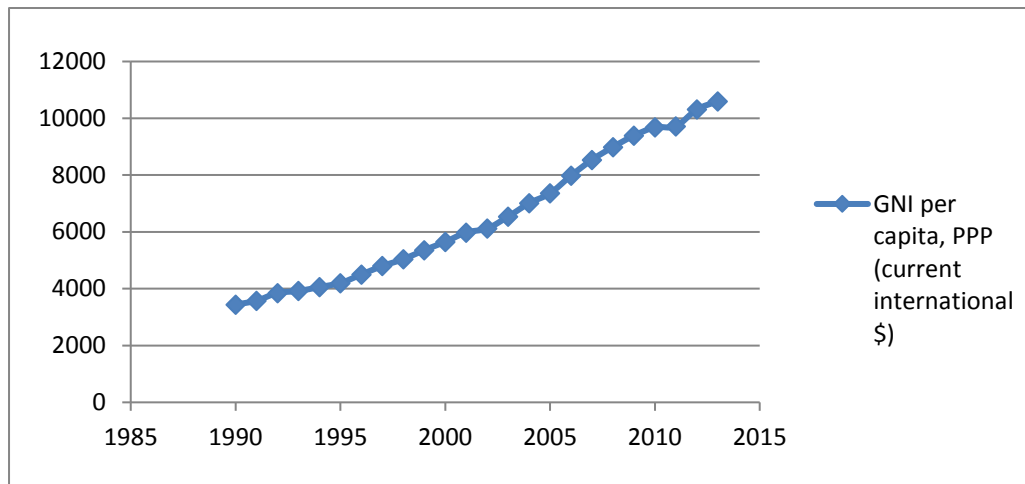
In terms of international purchasing power parity (PPP), the Gross National Income (GNI) per capita has increased from USD 3442 to USD 10606, which corresponds to an annual increase of 5% in average. This increase is maintained considering the low population growth (1.3%).

Evolution of GDP of Tunisia (constant 2005 billion US\$)



Source: World Bank national accounts data, and OECD National Accounts data files.

Evolution of the GNI per capita PPP, Atlas method (current US\$)



Source: <http://data.worldbank.org/indicator/NY.GNP.PCAP.PP.CD>

The share of public investment in GDP experienced a structural decline from 10% in 1990 to 6.5% in 2008, after revolution, there was an increase by 2% to attain the same level in the 1990's (World Bank, 2014). In 2012, public investment is mainly directed towards equipment (18%), agriculture (16%), regional development (14%), employment (10%) and education (9%). In 2013, gross fixed investments represents 21.2% of the nation's GDP. The share of agriculture in these investments is also decreasing from 13.8% to 8.2% in 2013 (Ministry of Agriculture).

The added value of the forest sector is relatively small at only USD 42.5 million in 2011 (Ministry of Agriculture), which represents only 0.1% of the GDP. This situation is explained by the fact that most of goods and services generated by forests are not marketed. The main marketed products are work and industrial wood.

The Migrant remittance inflows remains very low, even if it has increased from 0.5 million in 1990 to 2.3 US\$ million in 2014, or 0.05% of the GDP (World Bank).

2.2. Demography

The Tunisian population increased from 8.154 million in 1990 to 10.983 million people in 2014, with an increase of the active population from 57% to 64% in 2014. Although, the average annual growth rate has decreased from 1.8% in 1990-1995 to 0.8% in 2010-2014. Despite the decrease of the share of the rural population from 40.4% to 32.8% in the same period, the rural population increased from 3.3 to 3.6 million in the same period. The internal migration contributes to the increase of urban ~~population~~ population compared to rural population. In fact, there is a continuous increase of the annual flow of internal migration from 59,000 persons in 1987/1994 to 160,000 in 2012. In this last year, negative net migration was observed in the main forestry regions: the Northwest (-28,227) and central west (-27,626). The NW population is maintained at the same level (1.2 million) in the last twenty years. The internal migration affects mainly young populations (15-29 years) that represents 70% of migrants. In fact, main reasons of migration are looking for a job and continuing studies. In the 14 governorates covered by forest, the population living inside the forest and nearby (5 km of it) is estimated at 733,613 people in 2012. Only 28,759 live inside forests (FAO, 2012). This population represents 20.3% of the rural population. The average population density of forest area is quite high, estimated at 86.7 inhabitants / km², while the average density in rural areas is 32.9 inhabitants / km².

2.3. Agricultural tenure, investment, production, productivity and trade

2.3.1. Tenure

There are three forms of agricultural land tenure in Tunisia : (i) private lands (4.7 million ha of which 54,000 ha of forest), state-owned land and forest domain (1.3 million ha of which 926,000 ha of forests) and collective lands (about 4 million ha, mainly rangelands) (Banquemoniale 2006). Besides, private forests (54,000 ha) and some private and collective rangelands (956,000 ha) are submitted to the forest regime, and therefore, they cannot be converted and they are submitted to strict regulation for their exploitation. Private-owned forest are classified in two categories: the first one is submitted to forest regime (due to their protection role) where harvesting is submitted to a special authorization from the ministry in charge of forests that precise the harvesting conditions. For the second category, private owners practice all their property rights, but they should notice to DGF the harvesting activities in their owned land. Forest clearing is not allowed when the private forest has a protective role (protection against erosion, protection of water sources and environment, protection of endangered species). In this case, the private owner can claim for a compensation for restriction of enjoyment.

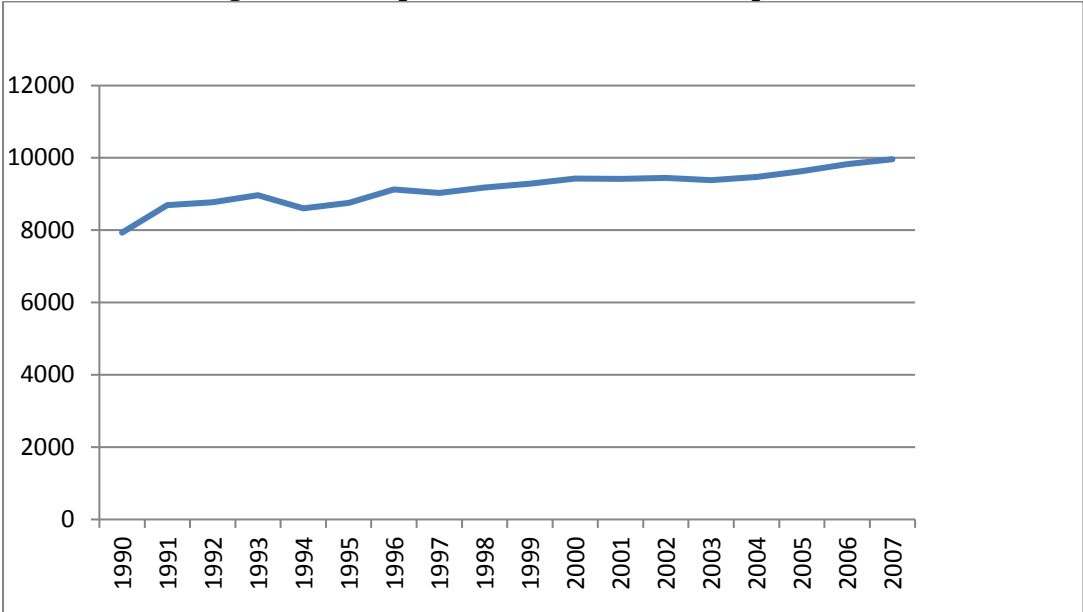
The number of farms is estimated to 516.000 in 2004 that cover an agricultural surface area of 5.3 million ha (ONAGRI), therefore, a farmer controls about 10 ha in average. Although, there are large disparities between farms: 54% of farms have less than 5 hectares and own 11% of agricultural land, while farms with an area exceeding 50 hectares represent only 3% of all farms and account for 34% of agricultural land. There is an increase of the proportion of small farms due to heritage, and an increase of the aged land holders (43% are aged over 60 years in 2004).

2.3.2. Investment

The net capital stock has increased from 8 to 10 Million constant 2005 US\$ per year (FAO, SOFA 2012). The average annual foreign direct investment inflows to agriculture is about 8 Million current US\$ in 2005-2007, whereas the official development assistance was decreasing from 83 Million constant 2005 US\$ in 1990 to only 4 Million constant 2005 US\$ in 2010 (FAO, SOFA 2012).

Agricultural investments are oriented mainly towards irrigation (33%), animal livestock production (13%), equipment (14%), arboriculture (11%), fisheries (6%), forestry (6%) and watershed management (5%) (Ministry of Agriculture). Government expenditures in agriculture has increased from USD 910 Million cst 2005 PPP in 1990 to USD 1076 Million cst 2005 PPP in 2007, while their share of total expenditures decreased from 9.6% to 6%. Public expenditures in Research and development represents about 3.5% of them in 2000. The government expenditures per agricultural worker remains at the same level, about USD 1,400 cst 2005 PPP in these two years (FAO, 2012 SOFA).

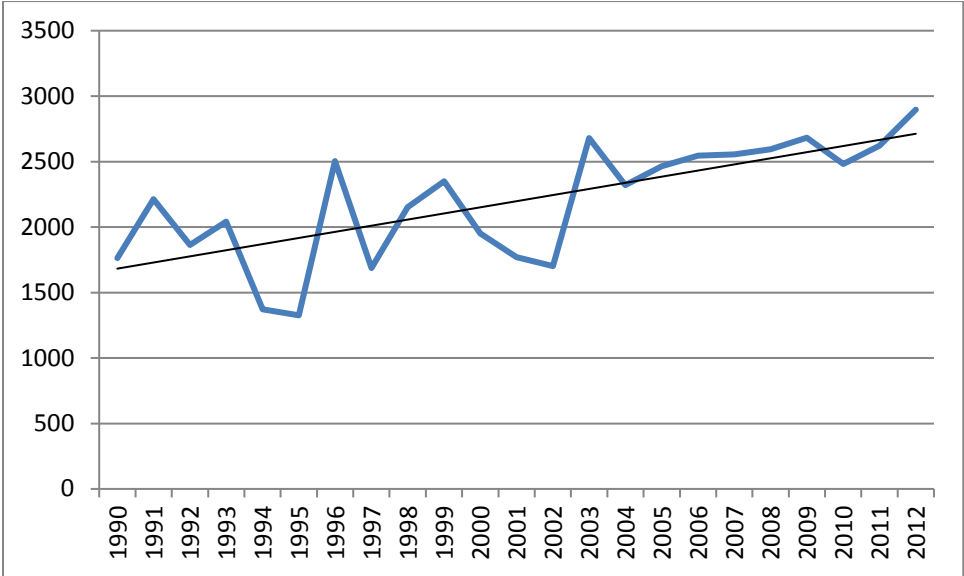
Evolution of the Agricultural capital stock (Million cst 2005 prices US \$)



2.3.3. Land productivity

The gross Production Value is estimated at USD 3.6 billion in 2012. The annual growth is estimated at 2.3% in average at constant prices, but there a high decrease in some years (1994-1995, 200-2002) mainly related to drought(Figure). In fact, production of olives and cereals is very dependent on annual rainfall.

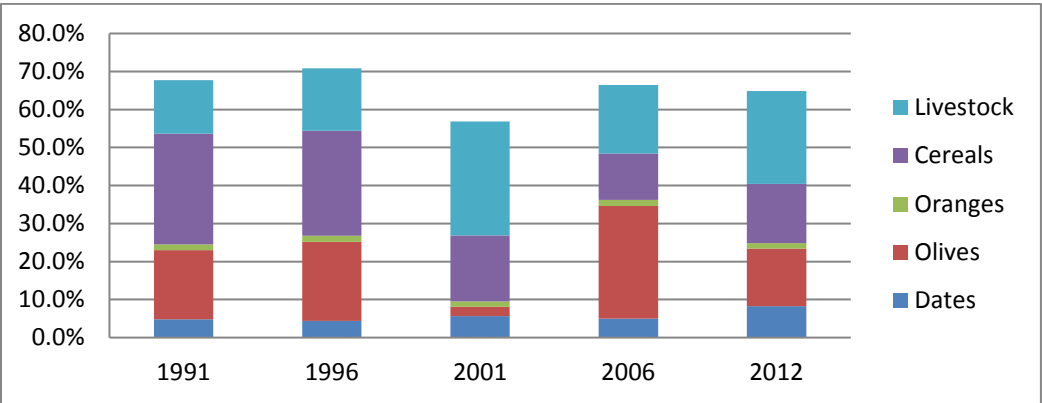
Evolution of Gross Production Value of agriculture (constant 2004-2006 million US\$) (USD)



Source : FAOSTAT

The main products in 2012 are livestock (24.4%), cereals (15.6%), olives (15.1%), dates (8.3%) and oranges (1.4%). Figure shows an increase of the share of livestock production in the total value from 14.1% in 1991 to 24.4% in 2012. Globally, there was an increase in meat production (chicken, cattle and sheep), and milk from cow, and vegetables (tomatoes, watermelons, etc.).

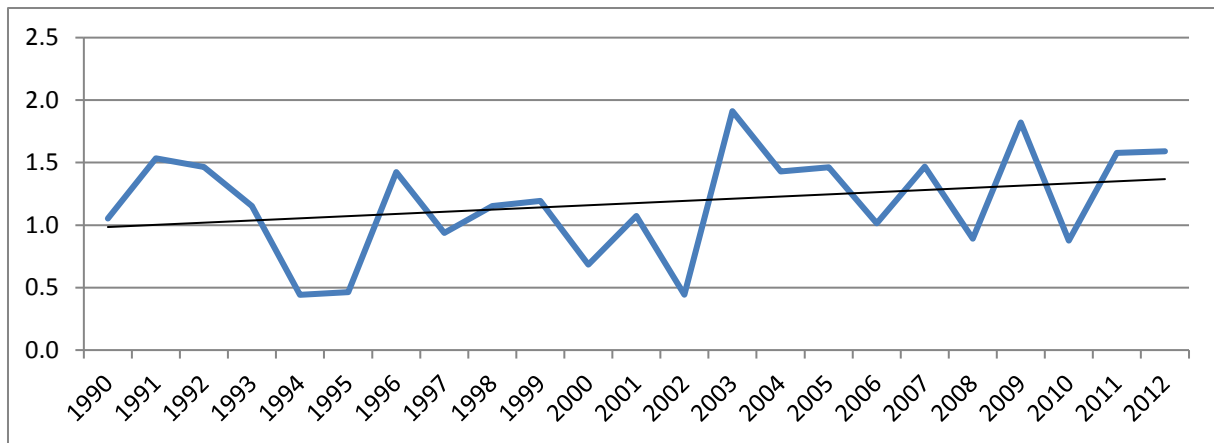
Evolution of the share of the main types of agricultural production in the total value (%)



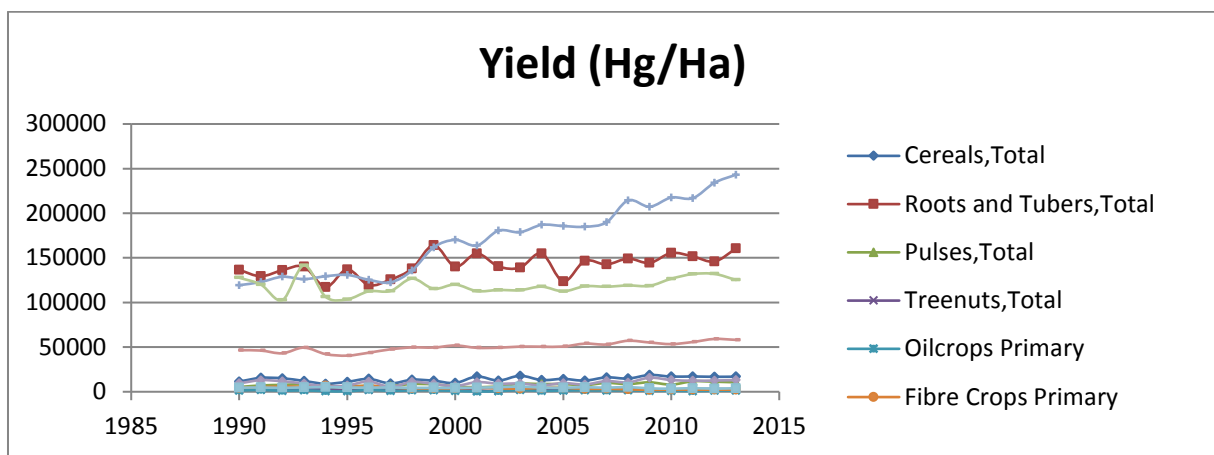
Source : FAOSTAT

This increase in the value of agricultural production is explained by the growth in average yields. It was estimated at 2.8% for the period 1989 to 2003, thanks to greater use of fertilizers, chemicals, mechanization and improved seeds, also through more competent farmers and the expansion of irrigated crops (Banque Mondiale, 2006). In fact, irrigated land accounted for 35% of agricultural production. For cereals, there was an annual growth of yields by 1.9% from 1.1 t/ha in 1990 to 1.6 t/ha in 2012 despite the effects of climate change.

Evolution of the average yield of cereals (t/ha)



Source : INS

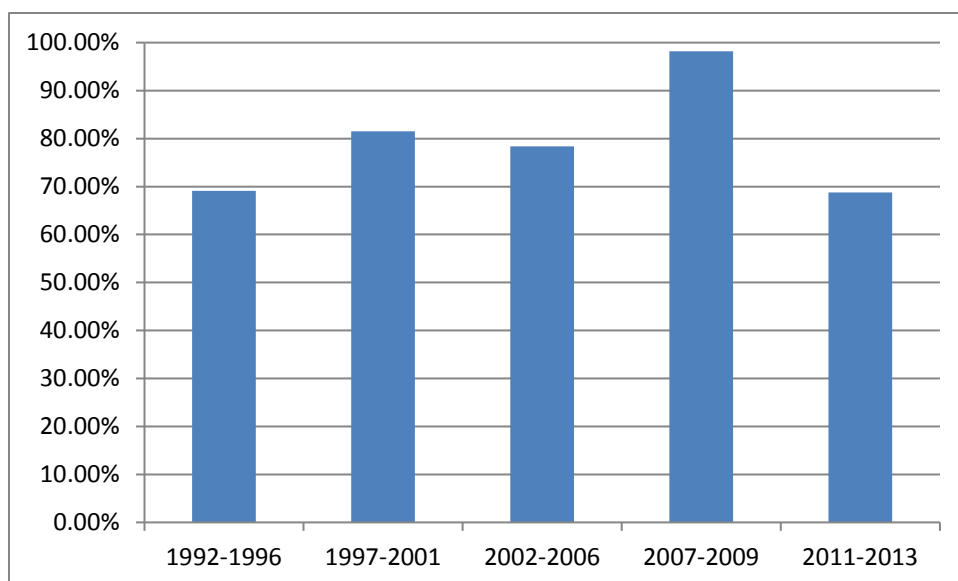


Source : FAOSTAT

2.3.4. Trade

The balance of foreign trade of agricultural and food products was usually negative except for some years : 199-2004-2006 and 2008-2009. This balance is dependent on the import of cereals that represents one fourth to half of the value of imports. In the last twenty years, wheat, sugar, soybean oil and maize remain the main agricultural products imported, while olive oil and dates remain the main products exported. There was a high decrease of imports of meat and milk and milk products in these last twenty years, despite the increase of national demand.

Evolution of the coverage rate of foreign trade of food and agricultural products



Source :Banque mondiale, 2006 (1992-2006) and Ministère de l'Agriculture, 2015. (2007-2013)

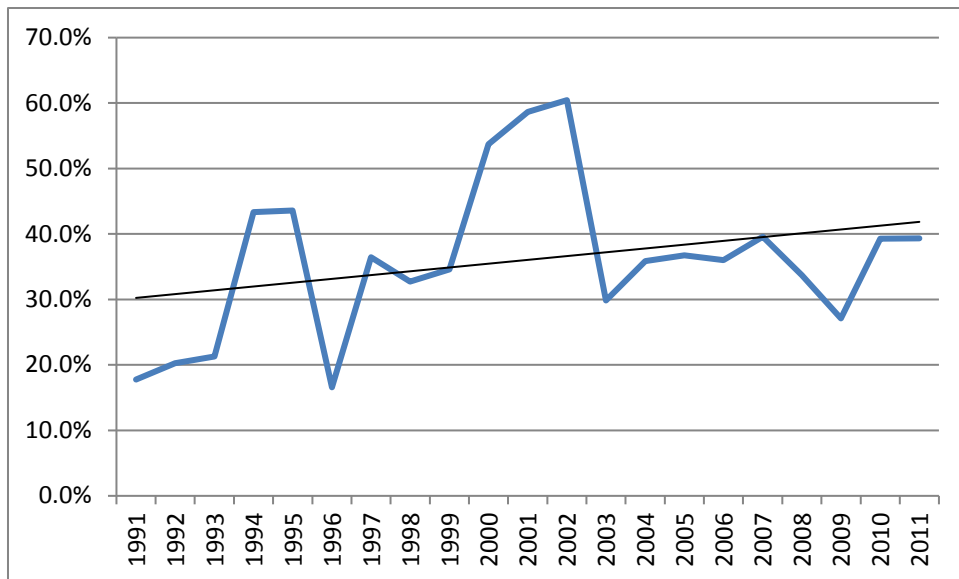
Change in type of imports and exports between 1990 and 2012

Main items imported in 1990 and 2012				Main items exported in 1990 and 2012			
1990		2012		1990		2012	
Wheat	29,5%	Wheat	24,6%	Olive oil	50,8%	Olive oil	28,7%
Sugar refined	13,4%	Soybeans	11,8%	Dates	21,3%	Dates	16,9%
Cotton lint	10,5%	Maize	11,8%	Cigarettes	5,2%	Oil, maize	14,1%
Maize	8,5%	Sugar refined	7,0%	Oranges	4,6%	Macaroni	4,3%
Oil, soybean	8,4%	Oil, maize	5,9%	Crude materials	4,0%	Pastry	4,0%

The food import dependency¹ ratio was increasing from 20% in 1991 to 40% in 2011. Similarly, the cereal import dependency ratios increasing from about 15% in 1991 to 60% in 2012. The share of food and agricultural products in total trade remains low (10 to 16%), but there is a slight increase of the share of imports and inversely an increase of the share of exports. This dependency can be explained by the increase of the population, the consumer behavior (high consumption of cereals) and the non suitability of some crops to climate.

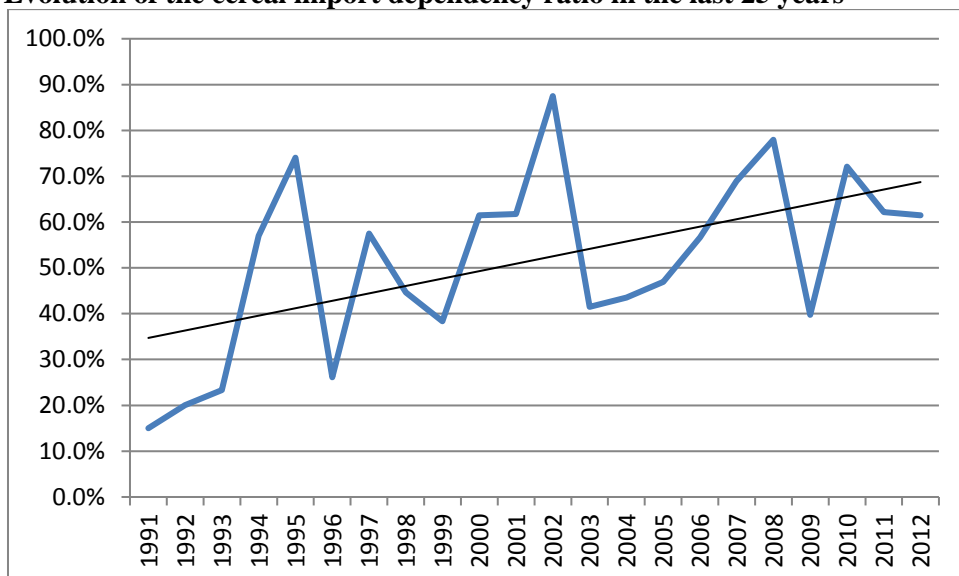
Evolution of the food import dependency ratio

¹food imports/(production + imports - exports)*100



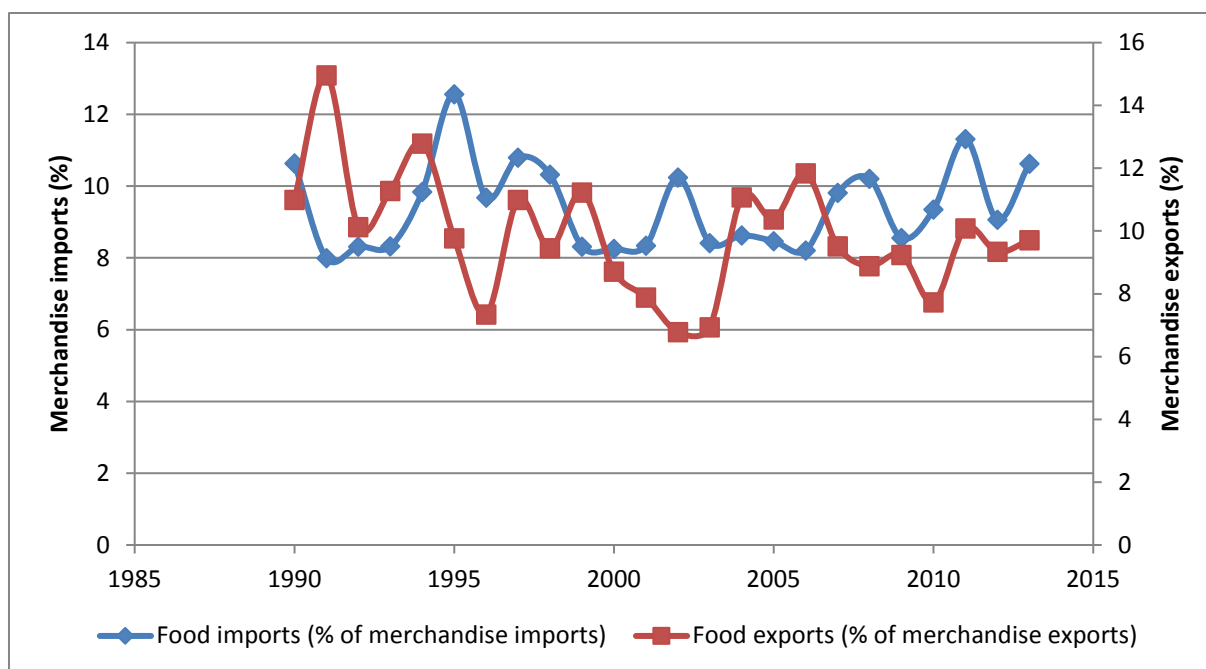
Source : FAOSTAT <http://faostat3.fao.org/download/Q/QV/E>

Evolution of the cereal import dependency ratio in the last 25 years



Source : FAOSTAT <http://faostat3.fao.org/download/Q/QV/E>

Evolution of Shares of food in merchandise imports and exports



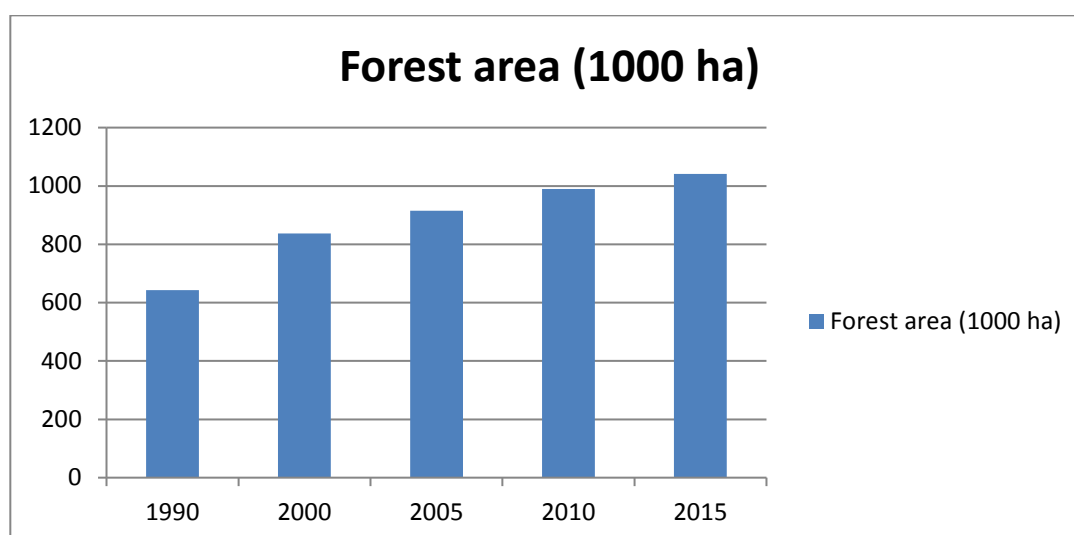
Source: <http://data.worldbank.org/indicator/TX.VAL.FOOD.ZS.UN>

There are no food aid shipments since 2001 in Tunisia. There were specially shipments of cereals where the quantity was decreasing from 1990 to 1997.

2.4. Forest condition, productivity and trends

The forest area increased from 643,000 ha in 1990 to 1041,000 ha in 2015. It was increasing annually by 1.9% for the period 1990-2015. Although, the rhythm of growth was decreasing from 2.7% for the period 1990-2000 to 1% for the period 2010-2015.

Evolution of the forest area



2.4.1. Forest tenure

The forest area is mainly state owned. No shifts in forest tenure was done in the last 25 years. The prevailing forest tenure types in Tunisia are as following :

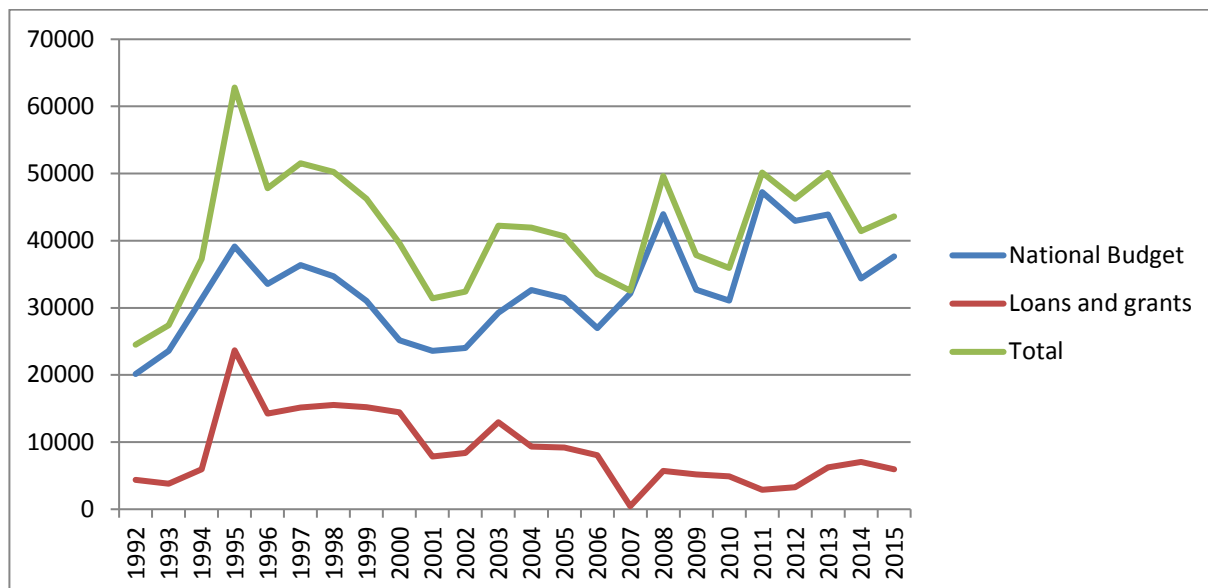
- State-owned forest area : 925,736 ha
- Private land submitted to forestry regime : 54,492 ha (contract of afforestation (9524 ha) + 21229 (fixation of sand dunes)+23739 ha). Most part of this area was afforested under some specific conditions in the 60's, without the .
- Other private lands : Wind breaks, shrubs, forest plantation on river banks or for soil and water conservation purposes.

2.4.2 Investment in the forest sector

The investment budget allocated to forest operations and activities has almost doubled in the last 25 years, from \$ 24.5 million in 1992 to \$ 43.6 million in 2015. It includes the national program financed by the national budget and other projects funded by loans and donations from bilateral or multilateral cooperation (USD 5 million).

During the period 1992-2015, the national investment budget for forests and pastoral activities varied between USD 20 and 47 million, with an average amount of USD 33 million per year. The budget showed significant fluctuations over time (Figure), mainly explained by the implementation of ambitious afforestation programs, which started in 1992. Usually, the most part of the public budget is allocated to afforestation and pastoral plantations. In 2012, the national budget program was allocated mainly towards plantation (61%), protection against fires and insects (13%) and infrastructure (10%). Also, Tunisia has succeeded to harness international funds because it has placed the development of forest areas among its priorities. This means that a forestry project can have priority over other development projects related to transport or water distribution. Funds obtained from the national budget increased from \$30 million in 1995-2000 to \$ 40 million in 1995-2000, while those of bilateral and multilateral Official Development Assistance (ODA) sources decreased, from \$ 12 million in 1995-2000 to \$ 6 million in 2011-2015.

Investment forests and pastoral lands(\$ 1000)



Source : Ministry of Agriculture

2.4.3 Forest production and management

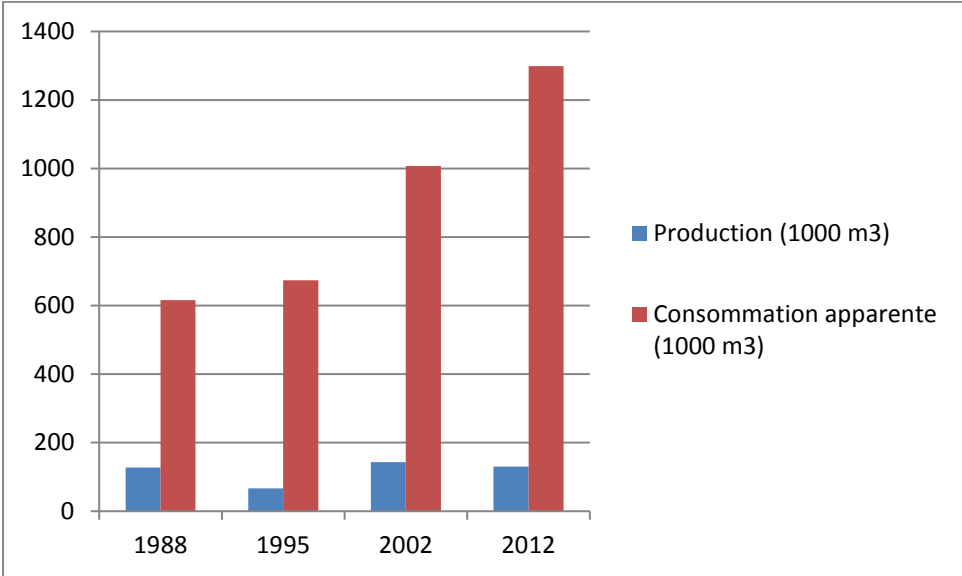
The total revenue of forest products has increased from 4.4 million TND to 16.2 million TND in 2014. The main forest products sold in 2014 are cork (49.1%), wood (25.5%) and other non wood products (16.7%) (REF). The revenue from sales of forest products (10 million TND in 2012) is far below the estimated economic value of forest goods and services (182 million TND). This value results from the difference between social benefits (208 million TND) and costs of degradation (26 million TND). Social benefit is compounded of forage (38%), carbon sequestration (24%), non wood forest products (12%),

protection against erosion (12%), wood (5%), option value of pharmaceutical plants (6%) and cultural value (2%)(Banquemoniale 2015). In fact, most forest benefits are not marketed; some of them contribute to the development of other sectors, such as forage for the development of livestock production, or watershed management for the increase of agricultural production.

2.4.4 Forest products import and export

Despite the expansion in forest cover, Tunisia remains highly dependent on imports of wood and wood products. In fact, net imports had increased from 80% of the consumption in 1988 to 90% in 2014 (Daly-Hassen 2014). The value of imports has increased from \$ 197.2 million in 1990 to \$ 388.3 million in 2014, while values of exports followed the same trend, but remain low: 8.8 million in 1990 and 36.5 million in 2014. The coverage rate has increased from 4.3% to 9.4%. The main imported products are sawnwood and chemical pulpwood for all the period 1990-2014. In fact, the scarcity of timber and the absence of woodpulp production induced a continued dependency in these products. The main changes in imports are the increase of MDF imports in detriment of sawnwood, the increase of chemical pulp wood in detriment of paper and paperboard. These changes can be explained by the progressive reduction of import tariffs from 1996 to 2008 and the technological change in furniture industry and wood carpentry. The main exported product was the paper pulp from esparto grass for decades, but its value has decreased from \$ 8 million in 2000 to 3.4 million in 2014 because of the lower demand and the renovation of the paper pulp factory. In the last years, there was an increase of export of paper and paperboard. In addition to wood products, Tunisia exports cork products, with a trend of decrease of its value from \$ 10.8 million in 2000 to \$ 8.3 million in 2014. There was an increase of export values of other non wood products, such as essential oils from rosemarinus and thyme (from \$ 1.1 million in 2000 to \$ 7.4 million in 2014), and carobs (from 0.1 million to 1 million for the same period).

Evolution of the gap between production and consumption



Main imported and exported wood products in 1990 and 2014

Main items imported in 1990 and 2014				Main items exported in 1990 and 2014			
1990		2014		1990		2012	
Sawnwood (C)	38,0%	Sawnwood ©	24,2%	Other Fibre Pulp	97,6%	Household+Sanitary Paper	56,1%

Sawnwood (NC)	7,3%	Sawnwood (nC)	7,2%	Ind Rwd Wir (NC) Other	2,4%	Wrapg+Packg Paper+Board	20,9%
Wrapg+Packg Paper+Board	27,1%	Wrapg+Packg Paper+Board	18,9%			Wrapping Papers	13,0%
Chemical Wood Pulp	7,4%	Chemical Wood Pulp	17,8%			Folding Boxboard	7,0%
Graphic papers	9,5%	Folding Boxboard	16,3%				

B. Policies, Strategies, Programmes and Institutions

2.6. Policies and legal aspects

Since 1990, the country has established new political and economic policies, with particular emphasis on the liberalization of the economy and the important role the private sector. The Social and Economic Development Plan (2010-2014) was the main policy document for social and economic development in Tunisia. This policy aimed at increasing the income per capita and reducing poverty, through the exploitation of all potential resources and the promotion of job creation in order to reduce unemployment. Other major social and economic objectives of the policy include the consolidation of social benefits, the integration of all regions of the country through improved complementary ties linking them, the introduction of an environmental economy, and the improvement of the quality of life. The new plan (2016-2020), in preparation, is mainly oriented towards an integrated and sustainable development, a competitive and innovative economy, a social justice, a high capacity of employment, and the integration of regions. According to these orientations, the protection of land against erosion and desertification needs the forest development and the integration of forest inhabitants in the management system for its protection and valorization of forest products.

Agricultural strategy considers the agricultural and rural space as watersheds in which the interventions should be from upstream to downstream. Interventions are interested successively to forest and pastoral land, then the land suitable for agriculture in the middle areas and downstream areas that include lowland and irrigated areas. Tunisian forest policy is an integral part of the policy governing the agricultural sector where investments for water infrastructure are highly prioritized. In fact, the main priorities of the agricultural policy reside in achieving food self-sufficiency, improving competitiveness, developing exports, and promoting the conservation of natural resources. The forest sector aims essentially at the preservation and development of forest resources, and all forest management plans have always been in harmony with the country's development policy where fighting unemployment and poverty is of utmost importance. Budget allocation to the forestry sector is mostly governed by the national policy dealing with poverty reduction and absorption of unemployment, rather than by the development of the forestry sector itself.

Several forest strategies and programs were elaborated and implemented since 1990:

- 1) Strategy for afforestation and combating desertification for the period 1990-2001,
- 2) National program of forest protection against forest fires (1992),
- 3) National master plan of silvopastoral development (1997),
- 4) National strategy for the development of the forest sector, period 2001- 2011,
- 5) National strategy for forest conservation (2001),
- 6) National Forest program (NFP) (2007),
- 7) The five-year development plan 2010-2014.
- 8) The national strategy for the development and sustainable management of forests and rangelands 2015-2024

These forest strategies have helped in increasing the extent of forest cover from 5.9% in 1990 to a level of 8.0% in 2010, representing an average annual increase of 17,000 ha or 0.10% of **the country surface area** (FAO 2010).

According to NFP, the most important issues of the forestry sector are preservation and development of forest resources, biodiversity conservation, socio-economic development of forest populations, creation of green spaces and recreational forests in urban areas, as well as the respect of commitments vis-à-vis the international community (FAO 2007). Most recently, the national strategy of forestry for the period 2015 – 2024 has identified four strategic axes: (i) create an enabling environment for sustainable development of forests and rangelands (ii) securing sustainable added value of forest and rangeland resources (iii) establishing sustainable management (iv) consolidate and improve forest and pastoral cover. The current strategy has a clear target of increasing the area covered by forests by 1%, from 8.2%

in 2014 to 9.2% in 2024. In addition, a surveillance system for the prevention and protection of forests against fires and pests and diseases is planned.

Since the independence in 1956, some fundamental principles were undertaken for the conservation of the forest resources and their expansion. In this context, a tree celebrating day was decided in 1958, and an annual presidential price was created in 1978. In the tree celebration day, the President follows by himself the increase of the forest cover and takes some decisions in order to enhance the afforestation activities, among them funds allocation measures. Thus, the increased forest cover can be explained by the regular support of policy makers. This is followed by the support from public budget and the ODA.

Despite the orientation towards the extension of forest land and control of deforestation, there is a lack of coordination between sub-sectors of agriculture, in addition to a weak agricultural policy coherence with policies devoted to other sectors. In fact, the partnership between forest and other non-forest sectors is developed only for the formulation and implementation of agricultural development projects using territorial and participatory approaches, and management of natural resources projects. The only known clear coordination is the distribution of funds among sectors (GIZ 2012). The forest administration (FA) is usually invited by other sectors to develop environmental externalities in the forest strategy. This is because forests provide these environmental externalities that contribute to the development of sub-sectors related to watershed management, protection of water reservoirs and infrastructures, biodiversity conservation, recreation, climate change adaptation and mitigation, etc. Therefore, there is a need for better integration of the forestry sector with other sectors through:

- (i) Integration of forest policy into national policies devoted to sustainable development in general, and particularly into the different strategies adopted by the major sector of agriculture, such as the protection of water reservoirs against siltation, conservation of soil and water, crop protection, and forage production, etc.
- (ii) Encouragement of afforestation in private lands through setting needed incentives for forest investment.
- (iii) Clarification of land tenure definitions and revision of some ownership regulations.
- (iv) Satisfaction of social demands in terms of urban green spaces and recreational forests. (FAO 2007)

A sound process for co-managing Tunisia's forest resources under a new concession system was introduced in 2005 through new legislation supporting a policy intended to devolve forestry activities to local communities, NGO's, and the private sector in general. Indeed, Article 75 of the Forest Code allows temporary occupation and concessions of State owned forest areas due to "cause of public utility", for undertaking silvopastoral development projects or other activities intended to consolidate the preservation of forests, and the conservation of their original purpose and sustainability. The maximum duration for granted temporary occupation is five years renewable per periods of one year each. Temporary occupation permits are granted by the Minister in charge of Forests in conformity with specific conditions.

Control and repression of illegal acts of exploitation is carried out under the supervision of local forest agents, with an average ratio of about 1 guardian per 200-400 ha. Major forest offenses which include clearing, logging, forest fires and plowing (conversion of forest land into agricultural or cultivation area) are usually transmitted to courts for judgment. Minor law violations are settled out of court through conciliatory fine transactions, with fine amounts reflecting the severity of damage. Usually, there is some tolerance and/or reluctance of forest officers and guardians to report offenses due to poor socio-economic conditions of forest law violators.

The number of illegal acts has increased four times between 1992 and 2014. In 2014, the number of illegal acts of transgressions against forests was reported to be around 4,200. The surface areas affected by different forest offenses were also quite significant: clearing (764 ha), conversion of forest to cropping land after plowing (561 ha), forest fires (1734 ha), illicit occupation (20 ha), and logging of 100,000 trees (Data from DGF). Illegal forest activities usually result in the acceleration of erosion processes and siltation of water reservoirs, reduced forage production levels, lowered forage quality and

thus diminished animal productivity, loss of biodiversity and prevention of forest regeneration. They also result in reduced government income, especially from NWFPs, cork, and wood, reduced supply of vital needs for local inhabitants, lower income, as well as reduced employment opportunities.

Evolution of forest offenses between 1990's and 2010's

	Annual mean count 1989-1996	Annual mean count 2012-2014	Increase
Clearing	177	822	364%
Logging	167	926	454%
Ploughing	111	651	486%
Grazing	79	224	184%
Poaching	38	190	400%

Source : Ben mansoura et al., 2001 and DGF 2015

2.7. Institutional frameworks for land use change governance

A law enacted in 2003 about the protection of agricultural land. It distinguished three classes: prohibition zone, safeguard zone, and zone submitted to authorization. State owned forests and forests submitted to forest regime are classified in prohibition zone. Olive trees, other fruit trees, forest non submitted to forest regime and managed forests are included in the safeguard zone. Any touristic, industrial and urban management should be done in the less fertile lands in the zone submitted to authorization (FAO 2003)

Within the Ministry of Agriculture, active organizations in the forestry sector include the General Directorate of Forests (*Direction Générale des Forêts* DGF) which is responsible for applying the forest code and for managing, protecting, and developing the state forests and other woodlands, in addition to grazing lands submitted to the country's forest regime. This administration is also responsible for the extension of forest plantation. Two of the four administrative directorates are responsible of silvopastoral Development (Forest and Rangeland Afforestation, Rangelands and Sand Dune Stabilization), and Forest Control and Regulations (Legislation and Regulation, Management of State Forests). At the regional level, forest management is carried out within 26 Regional Commissariats for Agricultural Development (*Commissariat Régional de Développement Agricole*, CRDA) covering every administrative district in Tunisia. Each district is further divided into a number of forestry Subdivisions (usually 2 to 4), and a total of 292 sectors (called triages in French) scattered nationwide and covering more or less dense forests and/or natural rangeland zones. In addition, the Silvopastoral Development Office for the North West (ODYSEPANO) is a public institution, established in 1981, in charge of promoting agro-silvopastoral development in the five administrative districts of northwestern Tunisia. Its activities encompass implementing forest and agro-forestry plantations.

There was also the creation of Agricultural Development Groups, called "*Groupeement de Développement Agricoles (GDA)*" in 1999, for a greater involvement of forest users in forest management issues. However, rigidity and inadequate regulations have hindered the organization of local forest populations and limited their participation to the management of forest areas.

The number of forest officers decreased from 509 in 2000 to 424 engineers and technicians in 2014. The number of workers is about 12,000 in 2014, half of them are forest guards. In total, the number of forest workers was about 27,000 year full time Equivalent (FTE) in 1990 and 2010, with some fluctuations : 37,000 in 2000 and 32,000 in 2005.

2.8. Financial strategies, programmes and instruments

In Tunisia, the agricultural sector is protected through imports and price support in order to protect producers against fluctuating world prices and help the rural poor and small farmers. In fact, imports effect was high for a number of farm products (beef, lamb and wheat). In addition, there is a support for some agricultural products (cereals, milk, sugar beet, tobacco, etc.) and input subsidies (chemical fertilizers, pesticides, water distribution, etc) through domestic price control (AFDB 2012). It could be argued that protecting cereals and sheep production would lead to an increase in cereal farming and grazing, causing more pressure on forest areas. Also, some incentives are given in the form of premiums for studies, specific bonuses and additional financial incentives granted to farmers performing arboriculture projects in forest and pastoral lands. (FAO, 2003)

The 1988 forest laws and regulations provide incentives encouraging afforestation of private lands through a special fund. These regulations were later replaced by the country's unique code of Incentives to Investments. According to this Code, subsidy premiums are given for plantations of forest and pastoral tree species in privately owned lands. Premiums vary between 50% of the total cost (for a project with an amount of investment less than USD 150 000) and 30% (if amount of investment is more than USD 150 000). However, despite incentives attributed by the investment incentive code to forest and pastoral tree species plantations, no pastoral or forestry development projects were implemented by private land owners nationwide (APIA, personal communication). They are afraid that with such plantations their land will get submitted to strict rules and regulations of the country's forest regime, limiting the exploitation of their land the way they want.

The main concrete incentives for farmers to plant forest and pastoral trees are :

- Small private landowners can benefit from free seedlings, and in some cases, they can be paid for the plantation work carried out in their own farms, under provisions made in some projects. They are mostly oriented towards the creation of wind breaks using forest tree species plantations, e.g. cypress hedges especially in fruit tree orchards.
- Private owners can benefit from an incentive mechanism for pastoral plantation. It is a compensation scheme which is implemented by OEP in order to cover half of the investment cost and the loss of income during the three years following the plantation. This mechanism contributes to the plantation of pastoral trees and cactus (3 000 ha/year) (Ministry of Agriculture, XIIth Plan 2010-2014).

In the other side, about forest clearing, some local inhabitants proceed to forest clearing and its conversion into agriculture, hoping the allocation of land to private ownership after its conversion to cereals or olive tree plantation.

The progressive reduction of trade tariffs on wood and wood products imports from 1996 to 2008, has not any effects on the trend of wood harvesting and thus on land use change.

Many financing opportunities are offered by the Rio conventions (Global Environment Facility (GEF), REDD+, CDM, Adaptation Funds, Access and Benefits Sharing, etc.). During the period 2010-2014, the GEF has allocated initial national envelopes to Tunisia. These include USD 1.5 million for biodiversity, USD 4 million for climate change, and USD 5.36 million for land degradation which is considered a new task.² The GEF foundation has already approved 29 national projects for a total cost of USD 92.2 million³. About one fourth of this grant is dedicated to projects dealing with the forestry sector, while the other projects concern climate change and other thematic tasks.

Developing a financing strategy can effectively align the forest strategy with the national budgeting process and raise and mobilize the required funds for all the priority tasks and overcome the dependence on foreign sources and the shortage of funding for management. This strategy should be based on the increase of forest revenue generation, in addition to the establishment of economic instruments and mechanisms that encourage private investments and international funding. Another challenge is related to the effective use of the funds allocated to the forest sector. Funding that was intended to forestry is directed to social purposes that can be detrimental to the SFM and attaining forestry goals. There is a major concern represented by the imperative use of funds allocated to the forest sector towards the creation of jobs for poor and unemployed people in marginal areas of the countryside even if no activities were scheduled to take place in some of those areas. This major constraint imposed on budget expenditures has a drastic negative effect on the physical achievements of projected tasks.

The targeted budget management (GBO) can permit to avoid these inefficiencies. Moreover, private sector funding is a challenge for financing SFM, being that there are incentives but they fail to encourage forest plantation because of the prohibitive policies. The Forest Code places strict requirements due to which the land owners perceive that they lose control over the land⁴. It should be also indicated that the profitability of forest plantation is usually low, except from some species producing fruits such as caper, carobs, walnut, or eucalypt for honey production.

3. Analysis of positive trends: key contributing factors

² http://www.thegef.org/gef/STAR/country_allocations

³ http://www.thegef.org/gef/project_list?keyword=&countryCode=TN&focalAreaCode=all&agencyCode=all&projectType=all&fundingSource=all&approvalFYFrom=all&approvalFYTo=all<gt=lt<gtAmt=&op=Search&form_build_id=form-686b3449a94d00aa1b72651d8baf4aeb

⁴ The perception of the private owner that they lose the control of their lands comes from the continuous conflicts between forest administration and forest private owners.

This section attempts to highlight the key contributing factors to the positive trends observed in agriculture, food security and forest condition.

- Persistence of a high density of population living inside or nearby the forest area (87 inhabitants / km²). This population ensures the labor needs for forest plantation and management, but constitutes a pressure on forest resources through grazing, clearing (0.07% of the forest area), logging and charcoal production. Forest investments permit to improve the income of this poor population through labor wages, and therefore contribute to reduce this pressure. They also contributed to an increase of forests and forest plantation areas by 1.9% per year. In fact, the main activities contributing to the income of this population are forest employment (28% of forestry income) and livestock production (58%) (DGF/FAO, 2012)
- The level of prevalence of undernourishment remains low, less than 5% for all the period 1990-2014 (FAO, Food security indicators). A part of this concerned population may live nearby or inside the forest because the average income of this population is below one third of the national average. Therefore, all forest strategies and programmes have always focused on the employment of the poorest population living inside the forest.
- Forests reduce the potential siltation of reservoirs by 35% (Banque mondiale 2015). A decrease of the siltation in some reservoirs such as Nebhana, El Houareb, Lakhmes and Bir Mchergua (Ben Mammou, ElOuati 2007). Contrarily, there was an increase of siltation in the reservoirs of Mellègue and Sidi Salem. This decrease can be attributed to the increase of forest cover and soil erosion control despite the increase in the annual events (9% during the period 1993-2003, Jebari et al., 2010)
- Forest and pastoral plantation contributes to increase the forage production, and therefore to satisfy the increasing feeding needs of livestock (sheep and goat). The number of sheep livestock in Tunisia increased from 6.3 million in 1991 to 7 million in 2011. The number of goats remains stable (1.3 million in the same period) (FAOSTAT).
- Forest plantation protects agricultural lands in proximity of ravines. Acacia plantation protects against the loss of cereal lands, estimated at 1% of the surface area per year (Banque mondiale 2010)
- Windbreaks, composed of forest trees lines, contribute to an increase of the productivity of different crops, mainly orange orchards, a minimum of 15% was observed (INRAT, 1989).
- The increase of the agricultural production is explained by the growth in average yields and the expansion of irrigated crops and an increased production of livestock. In fact, the production of sheep and goat meat has increased by 25% from 1990 to 2013. Although, the production of cereals has increased slightly by only 6% from 1.8 million t (1990-1994) to 1.9 million t (2009-2013).

Conclusion

In Tunisia, most of the Tunisian forest area (94%) and forest plantations are usually located within and along the three mountain chains. The forest cover is always considered for its role in water regulation such as infiltration, protection of soil from water erosion, prevention of flood risks that contributes to the protection of agricultural land and the conservation of water resources, and therefore the increase of agricultural production. Furthermore, most of forests are situated in the North of country where the most important water storage reservoirs are present and which constitutes the main source of food for the country's population. Recently, the cost of water degradation (especially siltation) was estimated at 0.6% of the GDP in 2002, it could have been much higher with lower forest cover rate. In addition, grazing constitute the main benefit of forests, that contributes for a significant part to animal livestock production.

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