Forest Fire in Tunisia:
importance and prevention

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Fire is the most important natural threat to forests and wooded areas of the Mediterranean basin. It destroys many more trees than all other natural calamities: insects, pathogen, tornadoes, frost, etc.

FOREST LAND COVER

During the Roman period (200 years BC) the Tunisian forest covers 3 million ha. In 1880, one year before the French occupation it covers 1.250.000 ha. But in 1956, when the French colonial leaved Tunisia they destroyed about 2/3 of the area, because they kept only 368.000 ha. According to the last forest and pasture inventory (2006) the Tunisian forest land is about 5.8 ha divided as follow:

 Forests : 667 876 ha
 Other type of forests : 337 116 ha
 Shrubs : 148 543 ha ha
 Stipa : 0.75 M ha
 Range lands : 4 M ha

Table 1. The dominant forest species

Species	Area (ha)	Percentage (%)
Acacia sp.	33 658	4.96
Acacia raddiana	9 190	1.35
Quercus coccifera	180	0.03
Quercus suber	69 933	10.30
Quercus ilex	2 416	0.36
Quercus canariensis	8 192	1.21
Eucalyptus sp.	40 595	5.98
Sub-total	164 164	24.18
Cupressus	3 888	0.57
Juniperus	8 702	1.28
Pinus halepensis	364 357	53.66
Pinus pinaster	5 277	0.78
Pinus pinea	20 933	3.08
Thuya	30 860	4.55
Sub-total	434 018	63.92
Various broad-leaved	29 366	4.33
Various resinious	30 065	4.43
Mixed broad-leaved & resinous	21 368	3.15
Sub-total	80 799	11.90
Total	678 981	100

The first forest specie in Tunisia is the coniferous Aleppo pine (*Pinus halepnsis*) which covers 365.000 ha (54%) and the broad-leaves cork oak (*Quercus suber*) 70.000 ha (10%). However, the cypress which covers only 4.000 ha (0.58%) play a major role as wind-break where about 30% of the irrigate area used the *Cupressus sempervirens*.

Table 2. Evolution of the total burnt area and the average fire.

Period	Burnt area (ha)	Average/fire (ha)
1903-1955	259265	99.5
1956-1965	19800	56.2
1966-1975	12800	12.5
1976-1985	12498	14.8
1986-1995	17962	13.8
1996-2004	8783	7.3
2005-2010	1554	2

The average annual number of forest fires throughout the Tunisian forest (2005-2010) is close to 750 and less than 50000 for the Mediterranean basin. A large decrease in the number of forest fires can be observed from the beginning of the 1900s: from 2600 to 750. The average burnt area (2005-2010) is close to 2 ha (Table 2). Like in the Maghreb countries, in Tunisia the involvement of local populations was maintained, especially in forest villages. The demand for food and energy (fuelwood) has increased to the point of seriously reducing the forest area and the inhabitants view forest fires as a direct threat to their living conditions. In these countries, the incidence of forest fires has remained at a relatively constant level.

CAUSES OF FIRE

Like in other countries of the Mediterranean basin the high number of fires of which the cause is unknown: 60 % unknown (supposed accidentally). Some are associated with fixed installations (power lines, rubbish dumps) and some are directly related to human activity (badly controlled charcoal kilns, uncontrolled burning, smokers, campfires, fires set by shepherds). It seems, however, that these involuntary fires are directly related to agricultural and forestry activities: the parties at fault in the case of forest fires are mainly permanent inhabitants (and seldom passing tourists).
The remaining 40 % are distributed as following:
- 57 % Smoking
- 14% Cooking & heating
- 14% Honey extraction
- 9% Wood carbonization (Charcoal)
- 4% Natural (Lightening)
- 2% Criminal (vengeance)

ANALYSIS OF MAIN PROBLEMS

The forest fires in Tunisia are important because of the Mediterranean climatic conditions, to the species inflammability and the forest population.

Climate:

The characteristics of the Mediterranean area are:
- Long dried period (4-6 months)
- Lack or few rainfall
- High temperatures
- Sirocco

Species inflammability:

The classification of the easy-burning species according to seasons is as following:

During the whole year :
- *Pinus halepensis*
- *Quercus ilex*
- *Erica arborea*
- *Erica scoparia*

During Summer season:
- *Quercus suber*
- *Pinus pinaster*
- *Cistus libanotis*
- *Stipa tenacissima (*alfa*)*
- *Rosmarinus officinalis*
- *Phyllerea angustifolia*

Forest population:

The Tunisian forest is inhabited by a large poor population using the land for grazing and its other resources. The average density for the country is 36 inhabitant/Km², the higher densities are in NW and NE areas (40 -120 h/Km²). The population activity is among the causes of fire such as:
- Farming in glades
- Grazing in forests
- Not aware of ecosystem fragility

ECONOMICAL AND SOCIAL CONTEXT

The budget and the fund allowed improving the infrastructure are insufficient.
- Fire break density : 0.75 %
- Fire break width < 35 m
- Insufficient track network
- Water supply, interventions take longuer time

- Tools for 1st interventions

The first plans were made especially for unemployment and reforestation and about 1,000,000 inhabitants are involved in fire risks problems. The number of engineer and technical person involved in fire risks problems is weak: 1 technician for 10000 to 30000 ha. They don't receive any training and the relationship between foresters and population is not good.

NATIONAL PLAN FOR FOREST PROTECTION

The national plan for forest protection is based on different aspects and international conventions, it aims to:
- Reduce the fire risks in 1 Million ha forest and shrubs
- Reduce burnt area < 1 ha/fire
- Conciliate between administrative interest and population interest with its integration in the development process
- Protect the population, infrastructure and goods
- Promote researches and training on fire management &prevention.

CONTROL POLICIES AND PROGRAMS

There are four main traditional categories of control: prevention (including all measures intended to prevent the occurrence of forest fires); pre-suppression (covering all provisions intended to improve interventions and safety in the event of fire); suppression (including all means of intervention); and rehabilitation (the measures taken after a fire to limit its negative consequences).

Table 3. The situation of infrastructure

Work	Scale	Rate of lose (%)
Forest tract	2 km / 100 ha	40
Stalk firearms	2 km / 100 ha	60
Protective strips along forestbroads	1 km / 100 ha	74
Water points	1 / 1000 ha	79
Watch towers (look up towers)	1 / 40000 ha	20
Fire fighting and water supply vehicles	1 / 20000 ha	58
Heavy equipment	1 / 40000 ha	69
Cars early intervention	1 / 5000 ha	92

In Tunisia, the infrastructure of control fires is very bad (table 3), and need revision and rehabilitation.

Some observations must be presented
- Infrastructure situation
  - According to major forest blocks
  - Or to departure points
- Lakes of infrastructure (priorities)
- Equipment dispatching
- Water point distribution
- Firebreak
- Dangerous points, fuel reduction

Despite these problems, the processing of the Tunisian program presents many advantages:
- Computing and calculation of length / ratio / standards
- Overlaying with forest resources map (forest inventory)
- Detection of the most vulnerable forests
- Types of trucks according to heavy firefighting equipment
- Localization of look up towers according to forests
- Localization of recorded fires (according to fire database)
- Priorities & decision making.