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Associative institutional innovations in forest management:

Elements for an analytical framework grounded in the Portuguese case

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Chapter 1

Introduction

The issues

This report fulfills the commitments of the Faculty of Economics and Management of the Portuguese Catholic University, under Action 5 of the EUROSILVASUR Project. The aims of this report are twofold:

1) provide an overview about the **situation of forest owners' organizations** in Portugal;

2) based on those observations, provide some elements towards an **analytical framework** able to deal with the following issues:

a) what are the **factors contributing to the emergence and development** of this kind of organizations?

b) what can be the **effects of these organizations** on the **behaviours of the forest owners** regarding the management of their forests.

The purpose of this framework should be not only to explain the situation in Portugal, but also to contribute for a comparative study to carry on in the future throughout the Southwestern European regions.

Contents of the report

The report delivers the available official data on the situation of forest owners' organizations in Portugal, but it is more focused on the contributions for an **analytical framework** of this kind of organizations. By this later expression we mean the following:

- a definition of boundaries for the analysis of the facts at stake;

- a definition of the main components of that analysis and the type of interactions among these components to focus on.

For some of these components the report makes a step forward by providing already some bits of a **theory**. However, at this stage, we could not make the next step which would be the empirical testing of the hypotheses derived from those theoretical models.

The contents of the report is structured according to what we have just said:

- chapter 1 is a presentation of the available official data on the trends of forest organizations in Portugal;

- chapter 2 outlines the analytical framework to deal with the research issues mentioned above;

- the following chapters present either empirical evidence or theoretical contributions about each of the elements of the analytical framework outlined in chapter 2.

Chapter

2

The motivating facts

Forest ownership in Continental Portugal: the major importance of non industrial private forestry

In Continental Portugal **84,8% of forest lands are under private management**, the rest being almost entirely communal forests managed by the Forest Services. Behind each of the three major species existing in the country (pine, eucalyptus and cork oak) can be found the four major stakeholders concerned with forestry in Portugal:

- the **non-industrial private forest (NIPF) owners of Northern and Central Portugal**, typically with small holdings, managing 3/4 of the pine forests, the **Forest Services** managing the other 1/4, mostly in communal lands;

- the **pulp industry** managing 1/3 of the eucalyptus forests, the other 2/3 being with **non-industrial private forest owners** and in communal forests;

- the **non-industrial private owners of the cork oak forests in the South** with much larger holdings than the ones in Northern and Central Portugal.

Table 1: Ownership of forest land in 1995

Regions	Total area	Private forest lands		Forests managed by the Forest Services			
				State forests		Communal forests	
	ha	ha	%	ha	%	ha	%
Northwest	340 700	254 476	74,7	143	0,0	86 081	25,3
Northeast	292 500	98 708	33,8	0	0,0	193 792	66,2
North	633 200	353 184	55,8	143	0,0	279 873	44,2
Others	2 672 900	2 450 594	91,7	71 748	2,7	150 558	5,6
TOTAL	**3 306 100**	**2 803 778**	**84,8**	**71 891**	**2,2**	**430 431**	**13,0**

Sources: INE (1997) and our own estimations.

Table 2: Forest lands by types of management and tree species in 1995 (1000 ha)

	Total		Conifers		Broadleaves							
					Eucalyptus		Cork Oak		Other		Total	
	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%
State forests	72	2,2	60	5,6	0	0,0	0	0,0	15	2,0	15	0,7
Communal forests	430	13,4	410	37,9	0	0,0	0	0,0	20	2,7	20	0,9
NIPF	2453	76,6	581	53,7	482	71,7	687	96,4	700	95,2	1869	88,2
Forest industries	246	7,7	30	2,8	190	28,3	26	3,6	0	0,0	216	10,2
TOTAL	**3201**	**100,0**	**1081**	**100,0**	**672**	**100,0**	**713**	**100,0**	**735**	**100,0**	**2120**	**100,0**

Sources: INE (1997), DGF (1991, 2001), completed with data collected from the pulp and paper industry and some own estimates.

There is no census or survey of the forest owners. The only information available about the distribution of forest holdings by size comes from agricultural censuses and surveys and is not of very good quality. It is this kind of data that is reported in the next table.

Table 3: Forest holdings size distribution in 1995 (%)

Regions		Forest holdings class sizes (ha)						
		0-4	5-9	10-19	20-49	50-99	100 and more	Total
Northwest	N.º holdings	89,7	6,4	2,2	1,2	0,2	0,3	100,0
	Forest area	34,4	13,6	9,0	10,2	4,1	28,7	100,0
Northeast	N.º holdings	90,6	6,6	2,2	0,4	0,1	0,1	100,0
	Forest area	53,7	19,9	13,2	5,4	3,4	4,4	100,0
Central West	N.º holdings	91,5	5,8	1,7	0,8	0,1	0,1	100,0
	Forest area	53,1	18,4	10,7	10,8	2,4	4,6	100,0
Central East	N.º holdings	73,1	14,3	7,3	3,9	0,7	0,7	100,0
	Forest area	18,1	13,8	14,1	15,3	5,9	32,8	100,0
Ribatejo Oeste	N.º holdings	84,8	6,5	3,6	2,5	1,1	1,5	100,0
	Forest area	8,3	3,8	4,1	6,6	6,7	70,5	100,0
Alentejo	N.º holdings	23,8	12,0	15,6	14,9	11,3	22,4	100,0
	Forest area	0,5	0,9	2,5	5,4	9,2	81,5	100,0
Algarve	N.º holdings	58,9	14,2	11,6	9,5	3,5	2,3	100,0
	Forest area	7,5	7,5	12,5	23,2	17,9	31,4	100,0
Continental Portugal	N.º holdings	**85**	**8**	**3**	**2**	**1**	**1**	**100,0**
	Forest area	**15**	**7**	**7**	**9**	**7**	**55**	**100,0**

Source: INE (1997)

Table **3** shows the **contrasting forest landownership structures between the North and South**: small scale forestry (mostly below 10 ha) in the Northern and Central regions, and much larger holdings (mostly above 100 ha) in the South. The communal forests are located mostly in the Northern and Central regions.

Forest owners' organizations in Portugal: a recent phenomenon

Regional distribution

Given such a high percentage of forest land under private and fragmented ownership, it is a surprising fact that collective organization of private forest owners is a recent phenomenon. The rest of this chapter presents data on the number and variation of these organizations by year and region, as reported by the Directorate General of Forests for Continental Portugal.

Table 4: Number of forest owners' organizations by regions, in January 2002

Regions	Number
Entre Douro e Minho	22
Trás-os-Montes	25
Beira Litoral	28
Beira Interior	28
Ribatejo e Oeste	13
Alentejo	8
Algarve	6
TOTAL	130

Source: DGF

Variation by year

As the next table shows, the emergence of forest owners' organizations in Portugal is a fact dating mostly from the late 90s. In fact, from 1998 to 2002 the number of these organizations almost doubled. This increase happened mostly on the Northern and Central regions where small scale forestry is predominant.

Table 5: Number of forest owners' organizations by regions and by years

Region / Year	EDM	TM	BL	BI	RO	AL	ALG	TOTAL
1977	1	1	9	1	4	3	0	**19**
1998	13	6	13	14	9	6	6	**67**
1999	14	40	15	20	11	4	6	**110**
2002	22	25	28	28	13	8	6	**130**

Source: DGF

Legal status

The next table presents the distribution of the forest owners' organizations by type of legal status. The organizations with statutes under the Civil Code ("associations" not for profit) predominate by far. Cooperatives were only 31 out of 130, in January 2002. This shows that forest owners prefer forms of collective organization having lower transaction costs to be established. In a stage where the economic activities of most of them are not likely to generate a significant taxable income, that advantage overcomes the tax benefits awarded to cooperatives.

About the cooperatives, two groups can be diferentiated:

- one group comes from the first generation of forest owners' organizations and consists of cooperatives specialised in forest management which were set up with the assistance of the Forest Services;

- another group developed in more recent years and grew out from existing agricultural cooperatives.

Some of the cooperatives in the first group are now inactive. What we said about the recent developments in the second group is illustrated by the data presented in table 7.

Table 6: Forest owners' orgnisations by type of legal status

Regions	2000			2002		
	Associations	Cooperatives	TOTAL	Associations	Cooperatives	TOTAL
Entre Douro e Minho	13 + 1*	1 + 1*	**14**	**16**	**6**	**22**
Trás-os-Montes	39	1	**40**	**23**	**2**	**25**
Beira Litoral	10	5 + 4*	**15**	**16**	**12**	**28**
Beira Interior	16	4 + 4*	**20**	**18**	**10**	**28**
Ribatejo e Oeste	11	-	**11**	**12**	**1**	**13**
Alentejo	4	2*	**4**	**8**		**8**
Algarve	5	1	**6**	**6**		**6**
TOTAL	**98**	**12**	**110**	**99**	**31**	**130**

Source: DGF
Note: (*) Non actives

Table 7: Forest owners' organizations by type of activities and legal status

Activities	Forestry		Agriculture and forestry		
Legal status	Associations	Cooperatives	Associations	Cooperatives	TOTAL
2000	73	3	22	10	**110**
2002	71	5	28	26	**130**

Source: DGF

Chapter

3

Elements for an analytical framework

The emergence and development of forest owners' organizations can be viewed as the combined result of the following social forces:

a) **macro social forces**

- changes in the **beliefs systems** at the wide social level, namely those concerning the roles of public administration and of private initiative of forest owners in forest management;

- **public policies** supporting or impeding the collective organization of forest owners;

b) **micro social forces**

- the importance of **private ownership** in forest lands;

- the **motives** of private forest owners for keeping their forests;

- the **costs and benefits** for forest owners of joining a forest owners' organization.

In dealing with these micro social forces one has to take into account that, for being successful in attracting some membership a forest owners' organisation has to be meet an **individual rationality constraint** for the potential members: considering the additional benefits and the additional costs for them resulting from joining the association, they have to be better off.

Te fact that complicates the effort of forest owners' organizations to meet this constraint is that their outputs are not made only of private goods and services to be delivered to their members. They also produce **public goods** of the following nature:

- **pure public goods** for the society at large which are all the positive externalities generated by forests;

- **collective goods**, namely the promotion of the interests of forest stakeholders, either they are members of the association or not;

- **public goods with exclusion**, or "club goods" which are non rival goods and services provided to their members only;

Between the private services and these public goods provided by these organizations there is an **order in time**:

- an association can provide private services only after it exists as an association;

- this requires that before that a group of forest owners recognised that they have some common interests.

So the public goods nature of the association comes first, even though the provision of private services may already be in the minds of the founding members from the outset. This priority on time of the public goods provision creates a problem for the emergence of associations. It is the well known **"free**

rider" problem typical of public goods: since this type of goods once they are produced are accessible to those who didn't contribute for that production (absence of mechanisms of exclusion) and its consumption by anyone does not reduce the amount available for consumption by others (non rivalry), there is no incentive for egoistic people to contribute voluntarily for the production of these goods. So the big issue is, how to cope with this problem without resorting to coercive methods for supporting the production of public goods?

The macro social forces mentioned above may contribute to this voluntary collective action, but they are not enough. Also forest owners' private benefits from collective organization and the corresponding willingess to pay for these organizations is a positive factor in the same direction. However to reach an new **"organizational equilibrium"**, that is, a situation where a group of forest owners finally decide to get together to set up a forest owners' organization, it may be necessary some sort of **catalysing agent**.

The role of this type of agent is to promote the combination of the following factors:

- favourable trends in the macro environment;

- forest owners initially dispersed, but willing to contribute for collective action.

Once this initial **mobilization** of resources, is achieved it may have capacities to attract further contributions which will reinforce the **initial resource mix** and support the development of the organization. If this happens the organizational equilibrium will be **sustained**. Otherwise it will be **fragile**, and may end up in failure of the new organization.

Certainly the sustainability or failure of the new organization will be heavily dependent on the evolution of its macro environment, but it will also depend very much on how its founding fathers will establish its **internal structure** and its **output mix** in terms of club goods and private services provided to the members. The **effects this organization's policies will have on the behaviours of its members** influence the way they will contribute to the organization's survival.

In brief, one needs three main building blocks for an analytical framework of the emergence and development of forest owners' organizations:

a) supporting or impeding trends in their **macro environment** (changes in belief systems and public policies)

b) forest ownership structure and private **motives** of forest owners with respect to their forests;

c) **internal structure and output mix** of the forest owners' organizations, and their effects on the behaviours of their members.

Chapter 4 deals with the first of these building blocks taking Portugal as a case study.

Chapter 5 deals with the second building block, again taking some empirical evidence from the Portuguese case.

Chapter 6 deals with the third building block, at a theoretical level.

Chapter

4

The macro environment

Main issues

Taking Portugal as a case study, the main issues addressed in this chapter are the changes in the macro environment of forestry which were supporting or impeding factors for the emergence of forest owners' associations. The factors dealt with here are embodied in the public policies towards forestry and they are basically of two kinds:

a) the orientations in public policy reflecting **belief systems** that dominate in the wider social structure about what should be the roles of public administration and the private initiative of forest owners in forest management;

b) the **resources** made available by public policies to induce the collective organization of forest owners.

A snapshot at Portuguese forest history[1]

When Portugal was established as an independent country in the beginning of the XIIth century there were forests in the valleys of difficult access and on the hillsides, but the top of the mountains, more exposed to wind and erosion, had poor forest coverage. These were mostly the remains of old natural forests (*Quercus robur*, *Quercus pyrenaica*, *Quercus faginea*, *Quercus suber*, *Quercus ilex* and chestnuts). The demographic growth of the Middle Ages and the corresponding need for farmland, grazing, wood and coal lead to deforestation, even though some complementarity was kept between farming and forestry. During the first dynasty, which lasted until the end of the XIVth century, most of the forests were in Crown lands, or belonged to noblemen or religious orders. They were used by the royal family and the aristocracy mostly for hunting. These rights were often in conflict with the uses of the forests by the local communities for fuelwood and grazing.

The second big push for deforestation after the Middle Ages came with the navigations and the expansion of the Portuguese empire in the early XVth century. The demand of wood for shipbuilding became very strong since this was the most important industry in the country at that time. The species most demanded were oak (namely cork oak) and pine (*Pinus pinaster* and *Pinus pinea*). This demand was already emerging at the beginning of the XIVth century when King Denis ordered the plantation of pines in the coast lands of Leiria. This is still today one of the best managed pine forests in the country. As the gap between supply and demand was widening, the imports of wood for shipbuilding started to grow in the XVth century, the major supplier being the Hanseatic League. The interest groups involved in this import business probably contributed for the lack of a strong and comprehensive policy to stop the depletion of forest resources. So with a few exceptions like the "Law of Trees" of 1565, forest resources continued to shrink until the XVIIIth century, without any breakthrough in public policy towards reforestation. At that time, the forest cover rate might have reached its lowest level, at about 7% of the country land area.

[1] This one and the next section are, for the most part, taken from Mendes (2002b).

We had to wait until the beginning of the XIXth century to see an active and scientifically based forest policy reversing the secular trend towards forest resources depletion. This policy was strongly influenced by a group of foresters trained in Germany. This group advocated the need for reforestation, improved protection and management of existing forests, reorganization of the administration of the royal forests, and scientifically based sylviculture. These recommendations lead to the creation of the Forest Services, in 1824, whose initial mission was to manage the public forests. In the beginning, the Forest Services were part of the Ministry of Navy, a legacy from the time when wood supply to the shipbuilding industry was very important. In 1835, public forests expanded substantially, with the nationalisation of the lands belonging to the religious orders expelled from the country by the liberal revolution. Four years later a group of experts was commissioned to prepare a Forest Code in order to consolidate and reform the forest legislation. In 1864, a degree in Forestry was created for the first time, in the General Institute of Agriculture, in Lisbon, this being the start of forest higher education in the country. In 1886, the Forest Services were incorporated in the Directorate General of Agriculture. This integration of the Forest Services in the public administration for agriculture, with more or less autonomy, has been the rule in Portugal since then.

The Forest Services did a great job in the afforestation of about 25.600 ha of dunes along the coast, contributing for the protection of this vulnerable ecosystem. Since the beginning of the XXth century their efforts gradually moved to the afforestation of the commons, in the mountains of Northern and Central Portugal. These were lands covered with forests, or with natural pastures, managed by local common property rules which were, for the most part, out of the control of central administration. So it was not indifferent for afforestation of the commons in this period the authoritarian and centralised political regime established in 1926. This is why the afforestation of the commons carried on according to the "Afforestation Plan of the Commons North of the Tagus River" approved in the 1930s took sometimes an authoritative attitude towards the local communities, resistant to the destruction of their traditional land uses which were important for their survival. In spite of these conflicts, the Forest Services carried on their plan, resulting in the afforestation of 318000 ha, from 1935 to 1972.

The intervention of the Forest Services in the private forests was less active. Only in 1945 a special public agency was set up for this purpose, called the Forestry Development Fund, but it didn't do very much until it was restructured in 1966. However, this and all the other reorganizations that followed didn't succeed in an effective policy to deal with one of the biggest problems of private forestry in this country which is the fragmentation of private forest ownership, especially in the Northern and Central regions.

The big leap forward in stimulating the initiative of private forest owners and forest contractors has been the series of programmes funded by the EEC/EU structural funds, since 1987.

Forest resources

Trends in land use since the mid of the XIXth century

Forest land has been growing at least since the first estimation available for its size which refers to the year 1867. Until the 50s there was simultaneous growth of forest and agricultural land. This was possible because of the large amount of uncultivated land fit for cultivation existing in the XIXth century, due to the secular process of deforestation. With the intense rural emigration in the 1960s and 1970s farmland started to fall, while forest land continued to expand. However, since the 1970s the growth in forest land has not taken all the abandoned famland, the result being an increase in uncultivated land after its secular fall.

According to the most recent forest inventory (DGF, 2001), agricultural land represents 33,5 % of the area of Continental Portugal, while forest and other wooded land[2] represents 37,7 % corresponding to an area of 3349327 ha.

[2] "Other wooded land" is defined here as being burnt forests, areas of clear cut and land with trees below the density needed to be classified as "forests".

Table 8: Land use in Continental Portugal since 1867[3]

SPECIES	1867	1902	1910	1920	1929	1939	1950/56	1963/66	1968/78	1980/85	1995/98
1. FOREST AND OTHER WOODED LAND	**1240000**	**1736938**	**1956500**	**2022491**	**2332000**	**2467000**	**2832268**	**2825700**	**2969120**	**3108200**	**3349327**
A) Forest land by tree-species dominance											*3201131*
a) Conifers	210000	250000	430194	913689	1132000	1161000	1189524				
- Maritime pine								1287600	1293040	1252300	976069
- Other conifers											
b) *"Montados"*:	370000	712986	782653	868850	940000	1050000	1274490	1215400	1192480	1128700	1174390
- Cork oak	121000	325493	365995	413713	560000	690000	651406	636800	656580	664000	712813
- Holm oak	249000	387492	416658	455137	380000	360000	623084	578600	535900	464700	461577
c) Other oaks and chestnut	60000	173952	130986	173952	193000	188000	170000		99840	143200	171478
- Other oaks	n.d.	78165	47006	78165	108000	108000	94000		70550	112100	130899
- Chestnut	n.d.	95787	83980	95787	85000	80000	75000		29290	31100	40579
d) Eucalyptus	0	-----	-----	-----	8000	n.d.	113288	98900	213720	385800	672149
e) Other	600000	600000	612667	66000	59000	68000	84966		170040	198200	207045
B) Other wooded land	n. a.	n. a.	n. a.	n. a.	n. a.	n. a.	n. a.	n. a.	n. a.	n. a.	*148196*
2. AGRICULTURAL LAND	**1886000**		**3111882**	**3229000**	**3282000**	**3380000**	**4762000**		**4205882**	**3902362**	**2972883**
UNCULTIVATED LAND FIT FOR CULTIVATION	**5462862**	**n. a.**	**3426618**	**3245671**	**2883162**	**2648000**	**885594**		**1279860**	**1419300**	**2054571**
Productive, but uncultivated land (fallow, grazing, etc.)	2116000		1926000	1639000	1565000	1484000	395594	n. a.	n. a.	n. a.	n. a.
Other uncultivated land fit for cultivation	3346862		1503780	1606671	1318162	1164862	490000	n. a.	n. a.	n. a.	n. a.
3. LAND UNFIT FOR CULTIVATION	**291000**	**374000**	**381700**	**382700**	**382700**	**384000**	**400000**	**n. a.**	**425000**	**450000**	**503081**
4. TOTAL LAND AREA	**8772520**	**8772520**	**8772520**	**8772520**	**8772520**	**8772520**	**8772520**	**8772520**	**8772520**	**8772520**	**8772520**
5. INLAND WATERS	**107342**	**107342**	**107342**	**107342**	**107342**	**107342**	**107342**	**107342**	**107342**	**107342**	**107342**
6. TOTAL AREA	**8879862**	**8879862**	**8879862**	**8879862**	**8879862**	**8879862**	**8879862**	**8879862**	**8879862**	**8879862**	**8879862**
Forest coverage (1./4.)	**14,1%**	**19,8%**	**22,3%**	**23,1%**	**26,6%**	**28,1%**	**32,3%**	**32,2%**	**33,8%**	**35,4%**	**38,2%**

Sources and methodology: Mendes (2002)

Trees species origin and distribution

According to the 1995 Forest Inventory, the major forest species in Continental Portugal are *Pinus pinaster* (29,1%), cork oak (21,3%) and eucalyptus (20,1%).

The major pine species is *Pinus pinaster* which might have been introduced by man's hands, but long time ago, because there are traces of it since the Neolithic period. This species expanded since the XVIth century by plantation and by natural dissemination and regeneration.

The major species of eucalyptus existing in the country is *Eucalyptus globulus* originated in Tasmania. In the 1960s the eucalyptus plantations took off to supply pulpwood for the paper companies recently installed in the country. This species has been replacing part of the pine forests damaged by forests, especially in the Northern and Central regions.

The Alentejo is the region of the most important agro-forestry systems in the country ("*montados*") based on cork and holm oak trees. Holm oak lost most of its economic value in the 1960s due to the swine fever which decimated the stock of Iberian pigs fed on the acorns from these trees. Cork oak has kept its economic value because of the continuing demand from the cork manufacturing industries where Portugal is the leader in the world since the Spanish Civil War, in 1936. More recently, the EU funds for the afforestation of farmland (Reg. 2080/92) have been used at great profit by the landowners to renovate and expand the cork oak forests.

Still far from the importance they had in the past, other oaks and chestnut forests have been growing since the 1960s, especially in the Northern and Central regions.

Forest functions

In 1995, the main function of 51,8% of the forest area was wood supply. The second main function corresponding to 48,2% of the forest area was for non-wood forest products, essentially cork oak, in the

[3] Data reported in this table for the years 1995/98 is from the more recent publication of the last forest inventory (DGF, 2001). Data in other tables referring to 1995 coming from older publications are from the same inventory, but are provisional. This is the reason why sometimes there are discrepancies between areas in table 8 and in other tables.

Southern regions. In the Natura 2000 areas there are 594509 ha of forests which represents 17,8% of the total forest land.

Table 9: Forest according to main functions

Functions	1985		1995	
	1000 ha		1000 ha	%
Wood supply	**1846**	**57,6**	**1698**	**51,8**
predominantly conifers			735	22,4
predominantly broadleaves			584	17,8
mixed stands			379	11,6
Non-wood forest products	**1357**	**42,4**	**1577**	**48,2**
predominately conifers			52	1,6
predominately broadleaves			1161	35,5
mixed stands			364	11,1
TOTAL	**3203**	**100,0**	**3275**	**100,0**

Source: DGF- Inventário Florestal Nacional (In Leite & Martins, 2000a, 2000b)

Forests for wood supply

The 11200000 m^3 o.b. of annual feelings for wood supply are almost of the same amount as the 12900000 m^3 o.b. of net annual increment in the forests with the same main function. So the **derived demand by forest industries is in tight tandem with wood supply**.

Net annual increment per hectare in forests for wood supply (4,6 m^3/ha/year for *Pinus pinaster* and 9,0 m^3/ha/year for *Eucalyptus globulus*) is relatively small due to poor forest management. With better management these increments could be increased by 20% or more.

Table 10: Area, growing stock, increment, fellings and removals in 1995

	Area	Growing stock volume	Annual net increment	Fellings	Annual removals	
	(1000 ha)	(1000 m^3 o.b.)	(1000 m^3 o.b.)	(1000 m^3 o.b.)	(1000 m^3 o.b.)	(1000 m^3 u.b.)
Trees in forest, total	**3 383**	**275 760**	**14 312**	**11 500**	**11 300**	**9 400**
Conifers	1 179	147 782	8323	6 200	6 100	4 900
Broadleaves	2 204	127 978	5 989	5 300	5 200	4 500
Trees in forest for wood supply[4]	**1 897**	**188 020**	**12 900**	**11 200**	**11 000**	**9 100**
Conifers	1 021	140 871	7 890	6 200	6 100	4 900
Broadleaves	876	47 149	5 010	5 000	4 900	4 200

Source: DGF (1998c)

Main non wood forest products

Cork is the major non-timber forest product in Portugal, the country being the main producer of raw cork in the world (more than 50% of the world production). Since the Spanish Civil War, in 1936, Portugal also became the main manufacturer of this material in world.

Table 11: Cork production (t)

Years	Total	Virgin cork	Reproduction cork
Average 43/51	170 666	44 222	126 444
Average 52/60	188 334	57 778	130 556
Average 61/69	221 555	78 444	143 111
Average 70/78	185 966	47 033	138 933
Average 79/87	149 422	33 700	115 722
Average 88/96	170 444	30 000	140 444
Average 97/00	165 500	30 000	135 500

Source: Mendes (2002)

Portugal also had in a recent past a leading position in the production and processing of pine resin. However, the lower labour costs in China in the extraction of this product lead to a quick decline of this activity, the annual production falling from 108.000 tones in 1986 to 15.000 tones in 1995.

The other relevant non-timber forest goods are the following:

[4] We evenly split the 344000 ha of mixed stands between conifers and broadleaved species.

- pine cones with an average production around of 70 millions cones;

- chestnut with a total production of 22022 tons in 1998;

- honey with a production of 3703 tons in 1998;

- mushrooms with an estimated harvest for commercial purposes of 6500 tons in 1998;

- grazing with an estimated production of 1525606 tons DM in 1995/98;

- acorns from cork and holm oak trees with an estimated production of 529813000 tons FU per year in 1995/98.

Almost all the production of pine nuts comes from a relatively small area located in the county of Alcácer do Sal, south of Lisbon. The chestnut production comes mostly from the Northeastern part of the country.

Without regulations enforcing private property rights on mushroom picking, this activity is done mostly by rural people seeking a complementary revenue by selling the mushrooms collected to middlemen or food companies. So recreational motives are not yet a relevant driving force behind this activity. Since this production is still in an "open access" regime, the result is that some species are being harvested beyond sustainable levels. Also more and more private forest owners are becoming aware of the commercial importance of this non wood forest product and are claiming for public interventions to enforce their property rights. For these reasons an interinstitucional task force was set up recently to propose regulatory measures in this matter. This task force included relevant agencies from the public administration, as well as research institutions and forest owners' organizations. Their report came out in 2001 (ICN *et al.*, 2001).

Grazing as well as acorns are used under private property rights in private forests and under "common property" rights in communal lands.

Non wood forest products: hunting and recreation

All the forests can be used for hunting, the Forest Services having issued in 1996/97 about 306000 hunting permits. Hunting rights can be used under two different and mutually exclusive regimes: the "general" regime and the "special" regime. Most of the land under special regime is managed by hunting clubs. The other major form of special regime corresponds to the touristic hunting zones. These are private lands managed for gaming by private firms selling access to game hunting and related services. The general regime covers the rest of the territory where hunting is allowed to everyone who has a permit issued by the Ministry of Agriculture. In this regime game is "collected" by the hunters but is not actively managed by them. As the special regime expands, the territory for the general regime shrinks, leading to conflicts between the hunters in the two regimes, calling for delicate political arbitration from the public administration, under the rules established in the law on hunting.

Since, in the general regime, access to hunting is conditioned by hunting licenses and by regulations on the seasons, species and amount of game that are allowed to be hunt, it is not a full "open access" regime. However, since almost everybody who wants to be a hunter gets a license and the other regulations on this regime are not always well enforced, the situation is not very far from that type of regime. So it is mainly the creation of hunting zones under the special regime which may contribute to the sustainability of gaming resources.

Table 12: Area under the special hunting regime in 1998

Types of zones	N.º	Area (1000 ha)
Associative	1176	1534
Touristic	623	851
Other	40	122
TOTAL	1839	2507

Source: DGF (1998c)

Forest and other wooded land according to "naturalness" and protection status

Almost three fourths (73,7%) of the Portuguese forests are considered to be "semi-natural", meaning that they were developed through natural regeneration. Most of the rest (24,7%) is made of "plantations" (MCPFE, 1998, p. 58).

About 1520000 ha (17,1% of the total land area of Continental Portugal) are land under some special protection status. In the Natura 2000 sites there are 594509 ha of forests and in the National Network of Protected Areas there are 162613 ha, which represents respectively 18,6% and 5,1% of the total forest land. As expected, the species of main commercial interest such as maritime pine, cork oak and eucalyptus have a lower incidence in these areas.

Table 13: Total area under special protection status in year 2000 (ha)

Natura 2000		Directive Birds	744 844	
		Directive Habitats	1 094 340	
		Total		594 509
National Network of Protected Areas (NNPA)	Areas of national protection status	National parks	70 290	
		Natural parks	527 069	
		Natural reserves	63 218	
		Botanic reserves	24	
	Areas of regional protection status	Protected landscapes	12 835	
		Classified sites	2 301	
	TOTAL (without double counting)		638 311	162 613
TOTAL (without double counting)			1 520 000	

Sources: DGF (2001) and data collected from the DGF Internet site, on 19 November 2000.

Table 14: Tree species by protection status in year 2000

Species	Natura 2000		NNPA	
	ha	% of the total area of the species	ha	% of the total area of the species
Maritime pine	135474	13,9	59061	6,1
Cork oak	145481	20,4	13906	2,0
Eucalyptus	86300	12,8	18315	2,7
Holm oak	109932	23,8	22791	4,9
Other oaks	42021	32,1	17221	13,2
Pinus pinea	24371	31,4	5563	7,2
Chestnut	10220	25,2	4806	11,8
Other broadleaves	26244	25,7	10922	10,7
Other conifers	14466	52,9	10028	36,7
TOTAL	**594509**	**18,6**	**162613**	**5,1**

Source: DGF (2001**)**

Main forest risks

Distribution of damaged forest land by types of damages

Forest fires are publicly perceived as the major threat to forest resources in Portugal and actually cause very severe and irreversible damages every year. Besides this important threat to forest resources, there are others also important, namely the damage caused by insects and diseases. This type of damage has an incidence in terms of forest wider than forest fires.

Table 15: Degree of forest damage by types of damages in 1995

	Area (ha)	% of the total forest area
Degraded forest and other wooded land	**641000**	**18,5**
- primarily damaged by insects and diseases	391000	11,3
- primarily damaged by wildlife and grazing	23000	0,7
- primarily damaged by fire	88000	2,5
- primarily damaged by known local pollution	0	0
- primarily damaged by storms, snow or other identifiable abiotic factors	101000	2,9
- area with damage by unidentified causes	38000	1,1

Source: TBFRA-2000

Forest fires

Fire is a major threat to Portuguese forests, especially to the pine forests in the Northwest and Central West regions which were reduced respectively in 41 and 21% between 1982 and 1995. This problem definitely emerged in the 1960s when the emigration from the rural areas was more intense. So the abandonment of traditional uses of forests which until then helped keeping some minimum management standards has certainly been an amplifying factor of the meteorological conditions favourable to the ignition of forest fires.

Since 1968, when data started to become available on the number and area of forest fires, the annual and cumulated areas of afforestation and reafforestation have tended to be below the annual and cumulated area of forests burnt. More precisely, the cumulated forest area burnt from 1968 to 1999 is about the double of the area afforested or refforested during the same period.

Table 16: Forest fires, afforestation and reafforestation in Continental Portugal since 1968 (ha)

Year	Burnt area				Afforestation & reafforestation	
	Forest		Scrubs	TOTAL	annual	Cumulated
	annual	Cumulated				
1966/80					**181272**	**181272**
1968/80	**354487**	354487	162562	517049		
1981	**63649**	418136	26148	89797	**17920**	199192
1982	**27436**	445572	12121	39557	**19785**	218977
1983	**32427**	477999	16953	49380	**18742**	237719
1984	**26580**	504579	26133	52713	**20829**	258548
1985	**79440**	584019	66815	146255	**18278**	276826
1986	**58612**	642631	40910	99522	**24882**	301708
1987	**49848**	692479	26420	76268	**22936**	324644
1988	**8628**	701107	13807	22435	**21183**	345827
1989	**62165**	763272	64070	126235	**17410**	363237
1990	**79549**	842821	57703	137252	**20888**	384125
1991	**125488**	968309	56998	182486	**17575**	401700
1992	**39701**	1008010	17311	57012	**21803**	423503
1993	**23839**	1031849	26124	49963	**17193**	440696
1994	**13487**	1045336	63836	77323	**34390**	475086
1995	**87554**	1132890	82014	169566	**69546**	544632
1996	**30497**	1163387	58059	88556	**23472**	568104
1997	**11466**	1174853	19068	30524	**39588**	607692
1998	**57393**	1232246	100975	158368	**34691**	642383
1999	**31052**	**1263298**	39561	70613	**38294**	**680677**
2000	**68646**	**1331944**	90958	159604		

Sources: DGF for burnt area; Table 19 for afforestation and reafforestation

Forest policies[5]

Afforestation: the main stated priority of forest policy since its beginning

The large amount of uncultivated land fit for cultivation and without a productive use existing in the middle of the XIXth century (38,2 % of the total land area) explains why afforestation was, by far, a major priority of the Forest Services which were making their beginnings by that time. However, since those days, there has been a wide gap between the wishes of forest policy makers and foresters and the actual implementation of forest policy. If we look at where the Forest Services started their activities what we see is that they were devoted almost entirely to the management of some state owned forests representing a very small part of the total forest land in the country.

By the end of the XIXth century and in the beginning of the XXth century forest policy and Forest Services priorities moved to another front also in the public domain, more precisely the afforestation of the 25600 ha of dunes along the coast which remains until today one of the most socially valuable projects carried out by those services.

[5] For the most part, this section is taken from Mendes & Dias (2002).

The next front to which forest policy and Forest Services moved their priorities was the afforestation of the communal lands in Northern and Central Portugal. After some preparatory work, this afforestation finally started in the 1930s, after the political regime had taken a dictatorial turn. These political conditions have to be mentioned because this afforestation was often implemented in a authoritative way, against the traditional uses of those lands by the local communities. The major output of this programme (*"Plano de Povoamento Florestal"* - PPF) was the afforestation of 318000 ha from 1935 until 1972, mostly with maritime pine. The management of these forests on behalf of the local communities made up the essential of the Forest Services activities from the 1930s until the present days. The Forest Services had to give part of the proceeds from the communal forests to the local communities, but they were allowed to keep the rest, making these services a potentially self-funded public agency.

Where and who actually made most of the afforestation since the middle of the XIXth century?

The gap we mentioned before between the stated priorities of forest policy and Forest Services and their actual practice has to do with the fact that their three major fronts of intervention (public forests, afforestation of the dunes, and communal forests) are certainly a valuable part of the total forest land in the country, but are far from being the main one. Also they are certainly not the domains where took place most of the afforestation observed since the middle of the XIXth century. To see that, let us look in more detail to the trends in forest land use since then:

- conifers (basically maritime pine) rose from 210000 ha in 1867 to 1293040 ha in 1968/78 which cannot be driven essentially by the afforestation of 25600 ha of dunes and 318000 ha of communal lands, even if these 343600 ha were entirely made up of pine forests which is not true;

- cork oak and holm oak forests rose from 370000 ha in 1867 to 1174390 ha in 1995/98 which again, cannot be imputed essentially to the action of the Forest Services because these forests are mostly in the South, so far from the main domains of intervention of this agency;

- eucalyptus rose from a situation of almost non existence in the middle of the XIXth century to 672149 ha in 1995/98 which was due essentially to the direct investment of the pulp and paper companies and to the investment of non industrial private forest owners stimulated by the demand from those companies.

As we will see later on, most of this investment in eucalyptus plantations has not benefited from public incentives. So what are today the main three segments of Portuguese forests owe most of their growth since the middle of the XIXth century, not so much to public interventions, but to other factors and actors. Among these factors certainly processes of natural regeneration might have played an important role, but we should not forget the actions of non industrial private forest owners' (NIPFOs). In fact, according to data referring to 1995, this type of owners are responsible for 76,6% of the forest land, pulp and paper companies manage 7,7 %, and only the 2,2% of state owned forests and part of the 13,4% of communal forests are left for the direct intervention of the Forest Services.

Afforestation remains the main stated priority of forest policy

Whatever might have been the relative roles of forest policy and private initiative in the triplication of forest land since the middle of the XIXth century, afforestation remains today, as it was at that time, the main stated priority of forest policy, both for public policy makers and for private stakeholders. Several reasons contribute to these attitudes:

a) forest land and forest production are still far from having reached the maximum of their economic and ecologic potential:

- further growth in forest area up to 5280000 hectares (60,2 % of the land area) is possible through afforestation of 1068000 ha of marginal agricultural lands non suitable for farming and about 863000 ha of other lands with forest potential (Banco Português de Investimento *et al.* 1996);

- substantial productivity gains (around 20 % more in annual increments of *Pinus pinaster* and *Eucalyptus globulus*) resulting from improved forest management and use of better plants (Banco Português de Investimento *et al.*, 1996);

b) afforestation and reafforestation through the 1970s, 80s and 90s supported by public incentives lagged far behind the area of deforestation due to forest fires (the former was only 54 % of the latter) and have not taken up most of the land released from agriculture due to farm outmigration (agricultural land fell by 1233000 ha during this period while forest and other wooded land increased only by 380207 ha);

c) timber and cork production are lagging behind the demand from the forest industries leading to increases in the real prices paid for these products by the industries, since mid 1995.

Table 17: Volume and price indices of the Final Forest Product

Years	Final Forest Product		GDP deflator (basis 1995)	(2)/(3)
	Volume index	Implicit price index		
	1	2	3	4
1980	100	100	11,8	8,47
1981	73,39	124,21	13,9	8,94
1982	75,59	134,53	16,8	8,01
1983	80,07	145,54	20,9	6,96
1984	88,55	175,42	26,1	6,72
1985	91,15	228,83	31,8	7,20
1986	92,68	248,95	43,8	5,68
1987	95,29	288,14	48,2	5,98
1988	92,43	326,31	53,6	6,09
1989	114,83	325,45	60,1	5,42
1990	101,82	408,22	67,6	6,04
1991	100,69	368,69	75,8	4,86
1992	93,07	347,23	83,9	4,14
1993	86,92	414,51	89,8	4,62
1994	78,05	513,71	95,2	5,40
1995	87,70	478,64	100,0	4,79
1996	83,51	567,41	103,1	5,50
1997	74,39	638,62	105,9	6,03
1998	84,50	733,61	110,2	6,66
1999	78,11	873,23	113,7	7,68

Sources:
(1) and (2): own estimation (Mendes, 2001);
(3): 1970-1998: Fondo Monetario Internacional (2000), *Estadísticas Financieras Internacionales: Anuario*; 1999: Banco de Portugal (2000), *Relatório do Conselho de Administração.*

The main programmes of financial incentives to private forestry in the 80s and 90s

As we said before, the main front of forest policy in Portugal since the 1930s, that is, the afforestation of communal lands in the Northern and Central regions, was coming to an end in 1974, when the dictatorial regime finished its days. While this engagement in communal forests was declining, the Forest Services made some moves towards the support of private forestry with the creation of the Forestry Development Fund (*"Fundo de Fomento Florestal"* - FFF), a public forest service initiated in 1966 for that purpose. The action of this agency, however, was not enough to respond to the needs of the forest industries, especially the pulp and paper industry. This lead the forest policy makers to the first major programme of public intervention in private forestry since the Forest Services creation in the XIXth century. That was the so called **"Portuguese Forest Project"** (PFP) funded by the World Bank which was implemented from 1981 to 1988.

After this came a new external source of funds open to the funding of forest programmes, more precisely the EEC pre-accession funds. It was with this money that the next major programme of public intervention in private forestry was funded. That was the so called **"Forest Action Programme"** (PAF, in the Portuguese initials) which was implemented from 1987 to 1995.

The third generation of public interventions in private forestry came when Portugal was already a full member of the EU, eligible for support from the structural funds and other EU financial means. It was with this money that were funded the two main forest programmes which were in action from 1994 to 1999:

- the **"Forest Development Plan"** (PDF, in the Portuguese initials);

- **Regulation (EEC) 2080/92**, this one continuing beyond 1999.

The area of (re)afforestation and stand improvements financed by these programmes are presented in Tables 18 and 19 taken from our contribution to the CESE report (CESE, 1996), updated with more recent data.

Table 18: (Re)afforestation and stand improvements financed by public programmes until 1981 (hectares)

Years	Total area	PPF		Forest Services
		Dunes	Communal forests	FFF
until 38	38 318	17 345	20 973	0
Total 39/65	249 348	8 255	241 093	0
1966/80	181 272	0	55 828	10 627	114 817
Total	468 938	25 600	317 894	10 627	114 817

Source: DGF

Table 19: (Re)afforestation and stand improvements financed by public incentive schemes since 1981 (hectares)

Years	TOTAL		FFF	PFP		PAF		Reg. 797/85		Reg. 2080/92**		PDF**		
	Affor. & Reaffor.	Stand impr.		Forest Services	PORTUCEL	Affor.	Stand impr.	Affor.	Stand impr.	Affor.	Stand impr.	Affor.	Stand impr.	Reaffor.
1981	**17920**	**0**	8979	1441	7500*									
1982	**19785**	**0**	2837	9448	7500*									
1983	**18742**	**0**	301	10941	7500*									
1984	**20829**	**0**		13329	7500*									
1985	**18278**	**0**		10778	7500*									
1986	**24882**	**0**		17382	7500*									
1987	**22936**	**13435**		7390	7500*	8046	13435							
1988	**21183**	**30719**		1199	7500*	12484	30719							
1989	**17410**	**52156**				17410	52156							
1990	**20888**	**41511**				20888	41511							
1991	**17575**	**20254**				15320	19644	2255	610					
1992	**21803**	**24197**				16906	21948	4897	2249					
1993	**17193**	**12306**				11312	9995	5881	2311					
1994	**34390**	**72640**				6054	11480			20171,3	1993,9	4199,62	24776,18	3965,11
1995	**69546**	**130118**				5138	7106			40318,6	2279,3	13652,06	51186,57	10437,8
1996	**23472**	**37100**								18981,3	985,1	2889,17	12642,52	1601,42
1997	**39588**	**69357**								30087,1	577,8	6150,02	29190,29	3351,37
1998	**34691**	**65877**								24861,7	293,9	4324,71	30892,07	5504,4
1999	**38294**	**52819**								30599,6	720,3	2040,68	13804,5	5653,75
TOTAL	**499405**	**622489**	**12117**	**71908**	**60000**	**113558**	**207994**	**13033**	**5170**	**165019,6**	**6850,3**	**33256,26**	**162492,1**	**30513,85**

Sources: data collected from DGF and IFADAP
* annual average
** projects approved for funding; included those that were cancelled later

The Portuguese Forest Project

Context and procedural characteristics of the forest policy process

The Portuguese Forest Project (PFP) was prepared in a time when the country was coming out from the peaceful revolution of 1974 which had overthrown a long lasting dictatorial regime. On the economic side, this political change combined with the 1974 "oil chock" brought about serious macroeconomic problems, namely large and increasing government budget and current account deficits from 1974 to 1980 which lead to a stabilization programme supported by an agreement signed with the International Monetary Fund. This helped to reverse the worsening in the macroeconomic situation, but, in 1982-84, the same type of problems happened again which lead to another stabilization programme supported by the International Monetary Fund covering the period from October 1983 to February 1985.

In the first years after the Revolution the decades of right wing economic interventionism were replaced by left wing **interventionism**. When the PFP was prepared and implemented the traces of this traditions were still very string in the economy and in the public administration.

Another outcome of the 1974 Revolution was the occupation of the large farms in Southern Portugal by landless farm workers which took the cork oak forests away from the control of their former owners for some time until they got their land back in the 80s.

Finally it is worth mentioning another outcome of the 1974 which was the nationalisation of many private companies, including some pulp and paper companies which were consolidated in one group called PORTUCEL.

Concerning the Forest Services, except for some changes in the personnel at the top ranks of the agency, their basic structure inherited from the old political regime was not changed. For 20 years after the 1974 Revolution, they remained a centrally managed and specialised directorate general in the Ministry of Agriculture, controlled by professional foresters who knew each other well, since they all came from the single school of forestry existing in the country until the late 1970s. The regional and the local levels were hierarchically dependent on the Director General the Forests and their geographic organization was structured in view of the management of the public and communal forests. After the golden days of the afforestation of the commons, the Forest Services in the 70s and 80s were suffering from an ageing of human and material resources in many parts of their structure. This fact together with the profile of the personnel of these services described before might have contributed for some institutional inertia to which we will come back later.

With this type of Forest Services, and in a situation where the pulp and paper companies were the most organised stakeholder in the forest sector, the NIPFOs were lacking collective organization and the environmental groups were still weak, it is no surprise that the forest policy process had the following characteristics[6]:

- **technocratic and central agency driven process**;

- **without participatory and intersectoral coordination mechanisms**;

- with some **corporatist leaning** towards the needs of the pulp and paper companies.

It is also no surprise that such type of policy process had as an **output** a programme with the following characteristics:

- **fixed targets**;

- strong reliance on instruments appealing to **direct public interventionism;**

- **weak reliance on the private sector** (except the pulp and paper company) for implementation.

Forest policy outputs: measures funded and beneficiaries

The major objective of this programme was to overcome a projected shortfall in timber supply to the **export oriented** pine-based and pulp and paper industries through the establishment of commercial forest plantations of conifers and eucalyptus, especially in Northern and Central Portugal where there was more under-utilised potential for these species. So the programme did not cover the cork oak forests in the South (Alentejo) which, by that time, were still mostly in the hands of farm workers' co-operatives resulting from the occupations of the large farms after the 1974 Revolution.

Planned and implemented in a period of the Portuguese political history marked by strong **public interventionism** in the economy, this programme, like the previous ones, is still one where the state played a **direct** role in afforestation. More precisely the main direct agents in the implementation of this programme were two **state controlled agencies**: the Forest Services and the nationalised pulp and paper company (PORTUCEL).

[6] For a theoretical perspective on this and other types of approaches to policy planning see Mendes (2000c).

The **Forest Services** assumed the direct responsibility for preparing and implementing the afforestation projects in two types of lands:

a) in the **public and communal lands** under the management of those services;

b) in the **lands of NIPFOs** willing to accept afforestation under the following conditions:

- all the technical responsibility and almost all the funding of the investment costs were was on the shoulders of the Forest Services;

- the landowners had to commit themselves to keep their lands in this kind of use and manage the new plantations appropriately;

- the public funding of the investment costs was a **loan** which had to be paid back by the forest owner with 40 % of the revenues from the fellings of the new plantations when they come to age, until the total amortisation of the loan, for no more than 60 years.

The programme also provided a **loan** to PORTUCEL for afforestation of the lands already owned by company, or in new lands bought or leased in for this purpose.

There were also funds available to support the creation of **cooperatives of private forest owners** and for the organization of a **public forest extension service** within the structure of the Forest Services. We should remember that since their creation in the XIXth century, these services lived most of their life focused on the management of public or communal forests leaving without enough technical support the three fourths the forest lands in the hands of NIPFOs.

Forest policy outcomes: implementation analysis

Comparing with previous programmes, the PFP represents an **increase in the annual average of afforestation** supported by public intervention:

- from 1939 until 1965 the average was 9235 ha per year;

- from 1966 until 1980 the average was 12085 ha per year;

- with PFP the average rose to 16489 ha.

Table 20: Targets and outcomes of the Portuguese Forest Project

	Targets	**Outcomes**
Time horizon	1980/85	1981/88
Afforestation (ha)		
1. By the Forest Services		
- total area	90000	71908
- conifers	60500	50026
- eucalyptus	16000	8429
- other broadleaves	13500	7886
- natural regeneration	-	5586
2. By PORTUCEL (pulp and paper company)		
- total area	60000	60000
- conifers	30500	n. a.
- eucalyptus	29500	n. a.
Creation of a forest extension service	X	nothing was done
Credit for co -operatives of forest owners	X	nothing was done

Let us compare now the outcomes of PFP with the targets initially set for the programme. The targets for PORTUCEL were fully accomplished. Concerning the Forest Services, there were **large implementation failures**:

- afforestation: from the 90000 ha the Forest Services were supposed to plant, only 71908 ha were established, even after extending the project horizon for three years;

- creation of a forest extension service: nothing was accomplished;

- support for the creation of co-operatives of forest owners: nothing was accomplished.

Table 21: Distribution by region and ownership category of the afforestation funded by PFP

Regions	Communal forests			Private forests			Total	
	Number of projects	Area		Number of projects	Area			
		ha	%		ha	%	ha	%
Northwest	129	21 778	27,9	197	6 297	12,2	28 075	21,6
Northeast	212	38 442	49,3	63	4 153	8,1	42 595	32,8
North	**341**	**60 220**	**77,3**	**260**	**10 450**	**20,2**	**70 670**	**54,5**
Central West	124	12 488	16,0	191	4 993	9,6	17 481	13,5
Central East	34	4 954	6,4	147	14 965	28,9	19 919	15,4
Ribatejo-Oeste	**1**	**270**	**0,4**	**155**	**9 503**	**18,3**	**9 773**	**7,5**
Alentejo	**0**	**0**	**0,0**	**281**	**10 455**	**20,2**	**10 455**	**8,1**
Algarve	**0**	**0**	**0,0**	**15**	**1 451**	**2,8**	**1 451**	**1,1**
TOTAL	**500**	**77 932**	**100,0**	**1 049**	**51 817**	**100,0**	**129 749**	**100,0**

Source: Louro (1988)

The data available are not detailed enough to identify in which type of ownership category was the intervention of the Forest Services more important. However, based on the data in tables 8 and 9, it seems a plausible hypothesis that most of the afforestation done by the Forest Services was on the commons of Northern and Central Portugal and not on the lands of NIPFOs. The afforestation in this kind of lands was done mostly by PORTUCEL either by leasing in or by buying lands from these owners.

If this hypothesis is true, as far as the action of the Forest Services is concerned, the PFP was not a radical change in afforestation policy compared to the policy implemented since the 1930s. It was actually an **incremental change** in the continuation of the afforestation of communal lands by the Forest Services, with a new source of funds (World Bank loan instead of state budget). This means that the Forest Services stayed mostly in their familiar places (communal lands), and did not make substantial moves towards the NIPFOs either by relying on their private initiative and providing them financial incentives for afforestation, or by providing indirect measures such as extension services and capacity building (co-operatives).

Still as an hypothesis, we propose two contributing factors to explain these implementation failures:

- **institutional inertia** in the Forest Services making difficult the reconversion from decades of direct state interventionism to a posture of facilitating the private initiative;

- **substantial differences**, from the point of view of the NIPFOs, **between the incentives** provided by the type of afforestation under the responsibility of the Forest Services and the one under the responsibility of PORTUCEL.

Institutional inertia seems a plausible hypothesis given the fact that the Forest Services, since their beginnings in the XIXthcentury, focused most of their activity on the public and communal forests. Most of the foresters working in those services at the time this programme was conceived and implemented were educated in that type of activity. Also in many segments of the Forest Services, there was an ageing of the human and material resources preventing a more active posture to reach out to the large and dispersed mass of NIPFOs. This type of factor is an example of **"path dependence"** and **"lock in" effects** in policy making and implementation: policies are not independent from their "initial conditions".

The main differences we see in the types of incentives for the NIPFOs embodied in the afforestation done by the Forest Services and by PORTUCEL are the following:

a) by opting in for a Forest Services project, a NIPFO not only does not receive any cash, but also might have to spend some money to pay part of the forest investment costs which is not the case if he sells or leases out his land to PORTUCEL;

b) by opting in for a Forest Services project, a NIPFO puts himself under the burden of a debt that him or his successors have to pay back, which is not the case if he sells or leases out his land to PORTUCEL;

c) by opting for a Forest Services project, a NIPFO locks in his land in one type of use which has the following inconveniences:

- it is a use of very long duration;

- the potential benefit may not go to the current land owner (he might be dead when the plantations come to age);

- it is subject to high risks (many of the plantations were with maritime pine, a species very vulnerable to forest fire) beyond the control of the land owner;

- in order to catch the benefits from the forest investment the owner has to incur in forest management costs which are high and not supported by public incentives;

- by locking in his land to this type of use, the land owner might forego potentially more profitable alternative uses (urbanisation, for example);

d) if the forest owner prefers to put his land under a long term lease to PORTUCEL the land use is also frozen for a long time, but, at least here, he gets the compensation of an annual cash rent, with no cost of maintenance of his property.

So with this type of **incentive structure**, it is not a surprise to see the NIFPOs behaving in the following manner:

- for many of them it was **not individually rational** to opt in for the programme, that is, they were better off staying out given the type of reasons we mentioned before;

- for those who opted in, there were many cases where they **didn't behave in a manner compatible** with the targets of the programme by not fully complying with the duties attached to this option.

We still lack a good empirical study about what remains today of these Forest Services afforestation projects in private lands, but we know about many stories of failures on those that were implemented (destruction by fire, lack of proper maintenance, etc.) and we ear complaints from these forest owners about their disfavoured position compared to the situation of those who opted for the programmes that came after the PFP.

The Forest Action Programme

Context and procedural characteristics of the forest policy process

The Forest Action Programme (PAF) came in a different political and social environment than the PFP:

- the country was going to become a member of the EEC in 1986 and therefore was eligible for financial support from the structural funds even before that date, through the pre-accession funds;

- while the industrial demands behind the PFP were still very important, new demands were emerging in the Portuguese society, namely the **environmentalist pressure** against fast growing species and the rise of **land use planning regulations** where the municipalities became major stakeholders, with an agenda not always compatible with the interests of forest owners and forest industries;

- as the problem of forest fires was getting worse and environmental awareness was rising, the type of projects supported by the PFP, that is, afforestation based on monospecific plantations almost exclusively oriented for timber production, was getting more and more criticisms;

- the **large farms in the South** were in the process of being returned to their former owners who, in many cases, were willing to make improvements in their cork oak forests which were left aside in the PFP;

- in this changing environment more attention was called for afforestation with **broadleaves** (fast growing species excluded) and for **stand improvement**;

- on the political and economic fronts, **direct state interventionism was definitely regressing** with privatizations of nationalized companies and a growing appeal to the initiative of the private sector.

In a context of mounting criticisms to the past action of the Forest Services, new social demands to the forest sector on the rise, and a changing economic and political environment more prone to the private initiative, those with responsibilities in the Forest Services were not able to carry on institutional changes capable of adjusting successfully to this new situation.

During the period through which this programme was prepared and implemented there was no major institutional change in the Forest Services which remained the major public agency for forest policy planning and implementation. The main change was the liquidation of Forest Products Institute (Instituto dos Produtos Florestais - IPF) which had resulted from the consolidation of public agencies existing before the 1974 revolution for the state regulation of the domestic and foreign trade of forest products. This institute was funded by a tax paid by the forest industries suppressed, in a obscure way, during the negotiations of the 1988 state budget in the parliament, due to lobbying of some of these industries. With the extinction of this institute was lost, without proper substitute, what had been, for some decades, the better source of statistical and economic data on the Portuguese forest sector. This loss still waits to be fixed.

Loosing confidence on their own capacities and loosing sight of their public responsibilities in building capacity for the development of the initiative of NIPFOs, the Forest Services turned from a posture of "technocratic and direct interventionism" to one of **"incentive-based regulation"** (Mendes, 2000c) with provision of attractive subsidies paid with EEC cheap money, and **reliance on the private sector (NIPFOs and forest contractors) for implementation**. This policy turn raises the issue of the **transaction costs** faced by the NIPFOs when applying for these public incentives. These costs are different among these owners. The Forest Services could have had an active role in lowering these costs especially with those NIPFOs for whom they were relatively higher. As we will see, the Forest Services were very passive in this matter.

Forest policy outputs: measures funded and beneficiaries

Looking back at the implementation failures of their own direct interventionism in a recent past, the Forest Services switched almost 180º and decided to entrust most of their hopes in the private initiative of forest contractors and forest owners. To do so they thought they had a powerful instrument which was the cheap money coming in from the EEC. So they formatted a programme which introduced major changes compared to the PFP:

- instead of loans to be repaid with the revenue from fellings, the financial incentives to forest owners turned to be **grants** varying between 30 and 100 % of the total investment cost;

- the favourable treatment given to **eucalyptus** plantations in the PFP suffered drastic reductions and finally was suppressed, which was accompanied with new regulations restricting these plantations;

- the most favourable treatment turned to **other broadleaves**, including the cork oak forests, with some attempts to promote **multiple use** forestry (grazing and agro-forestry, etc.);

- **stand improvement** which was almost left out from the PFP, became a major target for financial incentives to forestry.

With this type of incentives, the pulp and paper companies and other stakeholders interested in expanding eucalyptus plantations could not count any more on public financial incentives. With the pulp and paper companies almost out from the benefit of this programme, we didn't see the other two main segments of the Portuguese forest industries (wood based and cork industries) to come in. So the main stakeholders of this programme in the private sector were the **NIPFOs** and the **forest contractors**.

The Forest Services remained as an agent directly eligible for public funds, in case they presented projects for **public or communal forests**, these being the type of projects with the most favourable incentives provided by this programme.

So compared with previous programmes, the major innovation in terms of stakeholders brought about by this programme was the development of a **private business of forest contractors**. We still lack an empirical study about the implementation of PAF, but from what we could observe so far on this matter, it is a plausible hypothesis that this network of contractors played a major role in stimulating and assisting the NIFPOs who applied for the public incentives provided by PAF.

Again, like in the PFP, there were funds available in the PAF for the organization of forest extension services which could have had an important role in lowering the transactions costs faced by the NIPFOs when applying for these incentives. This would have contributed to raise the number of the NIPFOs interested in the programme. However, as we will see in a short while, such role was not played by the Forest Services and might have been played mostly by the forest contractors.

Forest policy outcomes: implementation analysis

To the credit of PAF, compared with the PFP, is the fact the annual average of afforestation and stand improvement supported by public financial incentives **more than doubled**, rising from 16489 ha to 36068 ha. Stronger reliance on the private sector for implementation in a country where 76,6 % of the forest are in the hands of NIPFOs, together with a more attractive profile of financial incentives might have been important factors contributing to this policy outcome.

This positive note should not deviate our attention from **large implementation failures** in all the main components of this programme:

- for a target of 400000 ha of afforestation, only 113561 ha were planted;

- for a target of 400000 ha of stand improvement, only 211054 ha were improved;

- for a target of 100000 ha of grazing lands in forests nothing was accomplished;

- nothing was done to set up a forest extension services and to organize associations of forest owners, as was initially planned.

We will come back to the plausible reasons for these failures. For the moment let us look at the outcomes of the programme.

Table 22: Targets and outcomes of PAF

	Targets	Outcomes
Time horizon	1987/94	1987/95
Afforestation (ha)	400 000	113 561
Improvement of existing stands (ha)	400 000	211 054
Establishment of grazing areas (ha)	100 000	0
Forest roads (km)	7 700	6 690
Divisional roads (km)	3 400	2 903
Dams	400	1 053
Forest extension services	X	nothing was done
Total cost of the programme in 1000 escudos	62 939 400	32 553 020
- Private projects		22 214 235
- Public projects		10 338 785

Source: DGF

Table 23: Distribution by region and ownership category of the total investment funded by PAF

Regions	Public projects	Private projects

	Number of projects	1000 escudos	%	Number of projects	1000 escudos	%
Northwest	88	2 335 368	31,6	183	1 228 478	7,1
Northeast	120	1 977 833	26,7	166	3 761 323	21,6
North	**208**	**4 313 201**	**58,3**	**349**	**4 989 801**	**28,9**
Central West	125	1 657 909	22,4	181	1 115 790	6,4
Central East	24	623 791	8,4	215	3 460 266	19,9
Ribatejo Oeste	26	340 268	4,6	303	1 876 481	10,8
Alentejo	20	249 756	3,4	437	3 046 302	17,5
Algarve	5	214 978	2,9	246	2 909 979	16,7
TOTAL	**408**	**7 399 903**	**100,0**	**1 731**	**17 398 619**	**100,0**

Source: IFADAP

Looking first at the types of beneficiaries, 70,2 % of the total investment supported by PAF was for private forestry. From the remaining 29,8 %, more than half was for public projects in the North which were almost entirely in communal lands. These projects, however, represented only 17,4 % of the total investment supported by PAF which is much lower than what happened in the PFP. So with PAF, the direct engagement of the Forest Services in communal forests was regressing. Also in most of the projects in private forests supported by PAF there was neither the direct intervention of the Forest Services, nor the direct investment of the forest industries (pulp and paper or other). So it is here that comes in our hypothesis about the major role played by forest contractors, since most of the NIPFOs are not large enough to plan and implement forest projects on their own.

Looking now in more detail to what types of NIPFOs might have been more active in opting in for this programme, the data available are insufficient to give a clear answer, since only indirect evidence is provided on this subject. These data are about the distributions by regions and by tree species of the areas of new or improved forests supported by the programme. What these distributions show us compared to the PFP is the following:

- while with PFP 54,5 % of the plantings were in the North, with PAF the percentage of the North in afforestation and stand improvement fell to 21,3 %;

- the Central region also lost ground;

- the region which was on the rise was Alentejo;

- this regional shift is consistent with what happened in the tree species distribution, where the maritime pine (the dominant species in Northern and Central Portugal) fell from 49,9% in the PFP to 33,9% in the PAF, and cork oak (the dominant tree in Alentejo) rose from 1,4% in the PFP to 36,0% in the PAF.

Table 24: Regional distribution of the plantings and stand improvements funded by PFP and PAF

Regions	PFP		PAF					
			Afforestation		Stand improvement		Total	
	ha	%	ha	%	ha	%	há	%
North	70 670	54,5	40 443	35,6	28 671	13,6	69 114	21,3
Centre	37 400	28,8	29 137	25,7	33 395	15,8	62 532	19,3
Lisbon & Tejo Valley	9 773	7,5	13 137	11,6	43 823	20,8	56 960	17,6
Alentejo	10 455	8,1	13 861	12,2	88 395	41,9	102 256	31,5
Algarve	1 451	1,1	16 984	15,0	16 720	7,9	33 704	10,4
TOTAL	129 749	100,0	113 561	100,0	211 054	100,0	324 615	100,0

Source: Instituto Florestal

Table 25: Tree species composition of the plantings and stand improvements funded by PFP and PAF

Species	PFP		PAF					
			Afforestation		Stand improvement		Total	
	ha	%	ha	%	ha	%	ha	%
Maritime pine	65 083	49,9	46 938	41,3	63 180	29,9	110 118	33,9
Eucalyptus	37 929	28,8	10 375	9,1	5 107	2,4	15 482	4,8
Cork oak	1 809	1,4	22 307	19,6	94 534	44,8	116 841	36,0
Others	27 087	20,5	33 941	29,9	48 233	22,9	82 174	25,3
TOTAL	131 908	100,0	113 561	100,0	211 054	100,0	324 615	100,0

Source: Instituto Florestal

These data are enough to state, as a plausible hypothesis, that with PAF, there was a major shift in the beneficiaries of the public incentives compared to the PFP, the forest owners in Alentejo gaining ground and the forest owners in Northern and Central Portugal loosing their dominant position in this matter. In terms of species, cork oak and other long rotation broadleaves emerged as the main beneficiaries of public support instead of eucalyptus and maritime pine. This is an expected outcome, given the profile of private forest ownership distribution (small scale forestry predominant in Northern and Central Portugal; large scale agro-forestry predominant in Alentejo), the lack of collective organization of NIPFOs in the regions of small scale forestry and the total inaction of the Forest Services during the PFP and the PAF to promote this kind of capacity building, in spite of the funds available for this purpose.

This should not be taken as a criticism to the NIPFOs in Alentejo who did their best to apply for the public incentives available in the PAF. It is simply an attempt to explain why things happen the way they did. Also the revival of the cork oak forests in Alentejo is certainly an welcome result of this programme after almost fifty years of stagnation and even degradation of what is still the forest product where Portugal has the leading position in the world, but where shortness in supply is creating increasing problems to the industry.

Let is move now to the analysis of the large implementation failures which happened in this programme. Still as hypotheses that should be submitted to empirical testing, we propose the following list of factors for those failures:

- **optimism in target setting**;

- **institutional inertia** on the side of the Forest Services;

- **absence of what had been so far the main private direct investor** in forestry (the pulp and paper companies);

- **government budget constraints**.

Concerning the first factor in the list, it is an obvious one if we consider the following facts:

- the recent experience with the PFP was an average of 16489 ha of afforestation per year;

- for the PAF the target was set at 100000 ha of afforestation and stand improvement per year;

- on the top of these irrealistic targets, given the recent experience in the country in this matter, was also the fact that in the PAF compared to the PFP, the major and best organised private investor in forestry (pulp and paper industry) was practically out.

A great deal of this irrealistic optimism can still be imputed to a **technocratic approach** to policy planning which was the dominant characteristic of the policy process leading to the PFP. As explained by one of us in another paper (Mendes, 2000c), this type of approach does not care very much about the **implementability constraints** (individual rationality and incentive compatibility constraints) faced by public policy in private economies.

We talked already before about the institutional inertia on the side of the Forest Services, but we want to add some further remarks on this topic:

- so large mistakes in target setting as the ones we have just mentioned are a sign of serious weaknesses in the policy planning capabilities of the Forest Services;

- in a time where the political an economic winds were turning to the side of private business, the Forest Services overestimated the attractiveness of the new financial incentives and the initiative of NIPFOs;

- the Forest Services also easily forgot or were unable to carry on their responsibilities in the implementation of indirect measures to support the collective organization of NIPFOs.

Coming now to the last factor in the list, it is often credited as having been the main reason for the implementation failures which happened in the PAF, forgetting the role of the other factors that we have just mentioned. The government financial constraints contributed to the implementation failures because they prevented the country from supplying all the public money needed to match the EEC funds available. If this is true, it is probably also true that with weak forest policy planning and implementation structures, there was not enough strength on the side of the forest institutions to claim for the money needed to match all the EEC funds that were available.

Regulation (EEC) 2080/92 and the Forest Development Plan

Forest policy outputs: measures funded and beneficiaries

Regulation (EEC) 2080/92 is a EU policy measure not specific to Portugal. It supports the afforestation of agricultural lands with the initial purpose of reducing farm surpluses. The PDF, on the other hand, was a programme specific to Portugal, financed by the EU structural funds within the Common Support Framework for the period 1994/99.

One feature common to these two programmes is the fact that they pursued the orientation started with PAF towards a stronger reliance on the private sector for implementation and the provision of financial incentives taking the form of **grants**.

With Reg. 2080/92 cork oak in the south is getting much more support than in previous afforestation programmes. Reg. 2080/92 also introduced a very attractive financial incentive which did not exist before: a prime to compensate the loss of agricultural income for 20 years.

This PDF supported the following types of actions:

- afforestation;

- stand improvement and reafforestation, including the forests damaged by fires less than 5 years ago;

- maintenance costs of the plantations for 5 years after the first restocking;

- installation and amelioration of forest nurseries;

- selection and production of good quality seeds and seedlings;

- construction and amelioration of forest roads and water reservoirs;

- multiple use of forest lands (grazing, apiculture, gaming, aromatic and medicinal plants, etc.).

This programme also had the following features:

- it favoured grouped projects consisting of, at least, 5 contiguous, forest holdings;

- it did not support plantations with fast growing species.

PDF pursued the orientations initiated with PAF, taking new steps further:

- financial support for forest nurseries;

- stronger support for multiple use of forest lands;

- financial support for maintenance costs for 5 years after the first restocking;

- tighter restrictions for eucalyptus plantations and other fast growing species;

- more incentives for other broadleaves.

Starting with a positive tone, taking PDF together with Regulation 2080/92 and comparing with PAF, the annual average of afforestation and stand improvement supported by public incentives **rose from 36068 ha to 60905 ha**. Adding to this, we should say that by the end of the Second Common Support Framework, there was an overbooking of applications which could not be funded by the PDF and had to wait almost two years for the Third Common Support Framework started in 2001. In one hand, this overbooking denotes the implementation problems that can arise when public incentives rely so heavily in external sources of funds. On the other hand, this denotes an increasing capacity on the side of the NIPFOs and forest contractors to organise themselves in order to carry on forest investment and management plans, if public funds are available to support their own effort.

Concerning this **capacity building in private forestry**, there is an important event to point out about what happened in the 90s, even though the space is now to short to make a more extended analysis of this fact. We are referring to the emergence of the **forest owners' associations**. In 1977 there were 19 associations of this kind. In 1998 the number rose to 67 and by the end of 1999 there were 110. Their start up benefited from some EU co-funded programmes included in the Second Common Support Framework:

- financial support for most of the investment and operating costs was provided by one programme aimed at agricultural organizations, but not specifically tailored to forest owners' associations;

- convergence of NIPFOs to membership in these kind of associations was stimulated by the PDF and Regulation 2080/92 because forest owners need technical advice to apply for these programmes.

With few exceptions, these associations did not yet come to an age at which they can make a substantial difference in forest management in their territories. So, for now, what is safe to say is that they represent an important qualitative change in the right direction: in a country where 76,6% of the forest land is the hands of NIPFOs the majority of whom own small holdings, substantial improvements in forest management need some form of collective organization like this.

Searching now for the profiles of the main beneficiaries of PDF and Regulation 2080/92, we come to similar hypotheses as for PAF. More exactly, PDF and Regulation 2080/92 reinforced the policy shift initiated with PAF with much less support for eucalyptus and maritime pine plantations, and much more support for cork oak and other long rotation broadleaves. This shift had the same regional effects has the ones we mentioned about the PAF, that is, the Northern and Central regions lost ground in the public support compared to Alentejo.

Table 26: Regional distribution of the investment funded by PAF, PDF and Reg. 2080/92

Regions	PAF		PDF*		Reg. 2080/92	
	1000 esc.	%	1000 esc	%	1000 esc.	%
Northwest	5 102 294	15,6	3 493 807	12,5	509 349	1,5
Northeast	7 342 143	22,6	3 182 961	11,3	7 856 600	23,3
North	**12 444 437**	**38,2**	**6 676 768**	**23,8**	**8 365 949**	**24,8**
Central West	3 664 463	11,3	3 388 810	12,1	201 395	0,6
Central East	5 102 701	15,7	5 899 183	21,0	3 888 479	11,5
Ribatejo Oeste	3 004 529	9,2	5 146 932	18,3	2 063 833	6,1
Alentejo	4 349 086	13,4	4 176 548	14,9	14 582 730	43,3
Algarve	3 987 802	12,3	2 766 117	9,9	4 583 771	13,6
TOTAL	**32 553 020**	**100,0**	**28 054 358**	**100,0**	**33 686 157**	**100,0**

Sources: data collected from Instituto Florestal and IFADAP

* excludes the projects cancelled until 15/11/2001; includes all types of projects financed by PDF (afforestation, reafforestation, stand improvement, nurseries, forest research and planning)

Table 27: Tree species composition of the plantings and stand improvements funded by PAF, PDF and Reg. 2080/92

Tree species	PAF		PDF*		Reg. 2080***	
	ha	%	ha	%	ha	%

Maritime pine	46 938	41,3	97 970**	43,3	5 539	3,5
Pinus pinea	n.a.	n.a.	12 855	5,7	29 474	18,7
Eucalyptus	10 375	9,1	4 972	2,2	282	0,2
Cork oak	22 307	19,6	81 682**	36,1	65 596	41,6
Holm oak	n.a.	n.a.	6 950	3,1	26 061	16,5
Chestnut	4 625	4,1	2 875	1,2	8 130	5,2
Carob	n.a.	n.a.	309	0,1	2 141	1,3
Others	29 316	25,8	18 649	8,2	20 366	12,9
TOTAL	**113 561**	**100,0**	**226 262**	**100,0**	**157 589**	**100,0**

Sources: data collected from Instituto Florestal and IFADAP
* refers to all the projects approved for funding, including those that later have been cancelled
** includes monospecific and mixed stands
*** refers to the projects approved until 31/8/99.

Table 28: Area of the projects funded by Reg. 2080/92

Regions	Arable land afforested		Stand improvement	
	ha	%	ha	%
Northwest	1719,54	1,0	62,56	0,9
Northeast	31375,2	19,0	321,1	4,7
Central West	955,6	0,6	12,9	0,2
Central East	21378,4	13,0	642,8	9,4
Ribatejo Oeste	10190,9	6,2	3074,7	44,9
Alentejo	76997,2	46,7	2480,0	36,2
Algarve	22402,7	13,6	256,2	3,7
TOTAL	**165019,6**	**100,0**	**6850,3**	**100,0**

Source: data collected from IFADAP

Table 29: Area of the projects financed by PDF*

Regions	Afforestation		Reafforestation of burnt forests		Reafforestation of other land		Stand improvement	
	Ha	%	ha	%	ha	%	ha	%
Northwest	661	14,9	3112	17,3	754	6,5	10340	6,5
Northeast	344	7,7	1052	5,9	339	2,9	6612	4,1
Central West	672	15,1	3576	19,9	1067	9,2	21598	13,5
Central East	732	16,5	6509	36,2	2688	23,3	27752	17,4
Ribatejo Oeste	717	16,1	3093	17,2	3619	31,4	37389	23,4
Alentejo	758	17,1	267	1,5	2865	24,8	43628	27,3
Algarve	562	12,6	352	2,0	210	1,8	12386	7,8
TOTAL	**4445**	**100,0**	**17969**	**100,0**	**11541**	**100,0**	**159605**	**100,0**

Source: data collected from IFADAP
* does not include the projects cancelled until 15/11/2001

Public incentives for forest owners' organizations in the 90s

Situation during the 1st Common Support Framework (1989-93)

We have already talked about the major policy failure which was the public support to the collective organization of forest owners with the Portuguese Forest Project funded by the World Bank and the Forest Action Programme financed by the EEC pre-accession funds. It remains to deal with the public support to forest owners' organizations in the programmes of the three Common Support Framework (CSF) regulating the transfers of EU structural funds since Portugal's accession:

- the 1st CSF which ran from 1989 to 1993;

- the 2nd CSF which ran from 1993 to 1999;

- the 3rd CSF which started in the year 2000 to last until 2006.

In the 1s CSF there was a programme called PROAGRI supporting the installation of farmers' organizations, mainly through **matching grants** for investment and operating costs lasting for **5 years**. These grants supported the creation or development of 132 organizations (Pinto, 1994), but **only one of**

these was a forest owners' association (Costa, 2002). This association was located in the Ribatejo & Oeste region.

Situation during the 2nd Common Support Framework (1994-99)

The PROAGRI programme continued throughout the 2nd CSF, but with less favourable grants than in the previous CSF. In fact, after 1996, by imposition of the European Commission, a modulation was introduced in the **matching grants** supporting personnel costs going from 85% of those costs in the 1st year, to 35% in the 5th year.

Even though this programme, like the previous one, did not include any special provisions for forest owners' organizations, the demand for funds form this type of organizations finally got started with 39 new or existing organizations supported by the programme. As once can infer from the following table, one of the major players in this rise of the forest owners' organization movement in this period is FORESTIS. This organization was created in 1992, in Porto, with the mission of being the promoter and the federation of local forest owners' organizations mainly throughout the regions of small scale forestry in Northern and Central Portugal. As one can see in the following table, 24 out of the 39 forest organizations supported by PROAGRI during this period were from the Northern and Central West regions where FORESTIS has been more active. So, in brief, we can say that this 2nd CSF **played an important role in supporting the take off of forest owners' organizations in the regions of small scale forestry**.

Table 30: Forest owners' organizations supported by PROAGRI during the 2nd Common Support Framework (1994-99)

Regions	Cooperatives		Associations		Other forest organizations	TOTAL
	Forestry	Agriculture & Forestry	Forestry	Agriculture & Forestry		
Entre-Douro-e-Minho		1	9		2	**12**
Trás-os-Montes		1	5			**6**
Beira Litoral	1	1	3	1		**6**
Beira Interior		1	5	1		**7**
Ribatejo e Oeste			2		2	**4**
Alentejo			3			**3**
Algarve			1			**1**
TOTAL	**1**	**4**	**28**	**2**	**4**	**39**

Source. Costa (2002)

Situation during the 3rd Common Support Framework (2000-06)

In the 3rd CSF there is finally a special programme to support forest owners' organizations in two ways:

a) support for the creation of new organizations;

b) support for the creation of extensions of organizations existing for 2 years or more.

As in previous programmes, the support takes the form of **5 years modulated matching grants**:

- 100% of the personnel and operating costs in the 1st year declining gradually until 60% in the 5th year;

- 85% of the investment costs.

Until the month of May 2002, the number of applications approved for this programme reached 74 which shows a substantial increase compared to the previous programme. Again **the regions of small scale forestry have been the most active** in this process, in terms of number of applications.

One interesting conclusion we can infer from the table presented below with the purposes of the applications is the following:

- in the **Northwestern region**, the current generation of applications is mostly for **extensions** of the associations created during the 2nd CSF;

- in the **Central region**, the current programme is mostly for the **creation** of new organizations.

So the movement of creation of forest owners' organizations in the regions of small scale forestry originated in Northwestern Portugal during the period of the 2nd CSF, mostly through the action of FORESTIS and is now moving south, again partly through the action of FORESTIS.

Table 31: Applications approved or for approval for funding by the 3rd Common Support Framework in May 2002

Regions	Continuation of support from the PROAGRI programme	Creation of new organizations	Creation of a forestry section in an existing cooperative	Creation o an extension in an existing association	TOTAL
Entre-Douro-e-Minho	9	3	2	8	22
Trás-os-Montes	1	5	2	2	10
Beira Litoral	2	12	3		17
Beira Interior	2	10	2	1	15
Ribatejo e Oeste		2			2
Alentejo		2		3	5
Algarve	1	2			3
TOTAL	**15**	**36**	**9**	**14**	**74**

Source: Costa (2002)

Conclusions

The positive role of public financial incentives in the emergence of forest owners' organisations

As final remarks about all these programmes, we would like to point out the following facts:

- looking at **public support** to afforestation and stand improvement in Portugal in the long run, we see that it has **increased** throughout the XXth century (9235 ha per year from 1939 to 1965, 12085 ha per year from 1966 to 1980, 16489 ha per year with PFP, 36068 ha per year with PDF and 60905 ha per year with PDF and Regulation 2080/92);

- besides this quantitative trends, there is also a qualitative change in the right direction with an increasing focus in the improvement of **private forestry** which represents the large majority of Portuguese forests;

- these trends, however, **have not been enough** to compensate for the damage caused every year by forest fires (680677 ha of afforestation and reafforestation from 1966 to 1999 against 1263298 ha of forests burnt between 1968 and 1999) and for supplying the forest industries at levels they claim to be necessary to maintain and improve their competitiveness;

- it is only very recently that some specific public support for the establishment and development of forest owners' organizations was provided, even though 85% of Portuguese forest land is owned privately and individually;

- in spite of being late and insufficient, this public support seems to have been very important for the growth in the this kind of organizations observed in recent years.

The positive roles played by changes in belief systems and by catalyzing agents

Besides this **positive role of public financial incentives** in the emergence and development of forest owners' organizations, there are two other tentative hypotheses one can draw from the analysis presented in this chapter:

a) one is the positive role played by the **changes in the beliefs systems** about the desirable roles of public administration and forest owners in forest management, with a shift from direct interventionism to public facilitation of private initiative;

b) the other is the **catalyzing role** played by organizations like FORESTIS at the local level mobilizing the **initial resource mix** (financial and human) needed to get the associations started.

The fragile organizational equilibrium of forest owners' organizations

Another final remark is about one thing that the programmes covered here have in common: all of them relied very heavily on **external sources of funds** matched by public domestic funds subject to the annual bargaining about the government budget. This implies that financial incentives to forestry have been very **vulnerable** to external negotiations and internal political bargaining. It also implies that public financial incentives to forestry in Portugal have not been based, up to now, on **sustainable** sources of funds: loans from the World Bank could not continue forever and transfers of structural funds to Portugal will not continue forever at their current levels. Since, with very few exceptions, private investment in forestry will not happen without generous public support, the main challenge that lies ahead for the Portuguese forest sector, forest industries included[7], is to build up sustainable sources of funds for that kind of support which means, among other things, funds less reliant on external sources. This looks like an enormous challenge given the current problems in Portuguese public finances which call for less and not for more public expenditure. So if this challenge is to be seriously faced, a solution should be found without adding to the deficit in the government budget[8].

Since forest owners' organisations in Portugal currently rely a lot on the support from public incentive schemes the vulnerability of this source of funds is a threat to their survival. Besides this threat, there are others that should be mentioned:

a) besides the programmes managed by the central government, most of the forest owners' organizations have not been received substantial support from other sources like local public authorities or forest industries;

b) **forest owners' willingness to pay** for the management of their forests through the services provided by the forest owners' organisations exists but is very insufficient to make these organizations survive only on the basis of these contributions;

c) the **risk of forest fires** remains very high throughout the regions where the collective organization of forest owners is most needed.

These reasons are enough to qualify the current **organizational equilibrium** of forest owners' organizations in Portugal as **fragile**: they have a fragile ability to attract sufficient contributions to ensure their survival, from forest owners, forest industries and public authorities. Since public support is by far their main source of funds, if this support shrinks many of them will be in serious trouble. This possibility is on the horizon after 2006, if transfers of EU structural funds to the Portuguese forest sector are reduced.

[7] Increasing short supply of industrial forest products (roundwood, pulpwood and cork) is a problem affecting the competitiveness of the forest industries.

[8] In several occasions (Mendes, 1997, 1998, 2000a, 2000b) we contributed to the necessary discussion of this type of solutions, but the debate has not yet gained its momentum, in a context where the structural funds from the EU are still flowing to the country.

Chapter

5

The micro environment

Main issues

The purpose of this chapter is to analyze the forest owners' motivations towards their forests, since these are certainly important factors with an influence on their behaviours towards forest owners' organizations.

Value concepts and owners' motives for forest management

Value concepts[9]

What is value?

Let's start by defining a general concept for a valuation process. A valuation process of things or of others kinds of objects (human actions, acts of other beings, etc.) has three dimensions:

a) it is a **process of separation and objectivation**, that is, a process through which someone is socially established as a valuation "subject" and something is established as a valuated "object" ontologically distinct from the valuator;

b) the process establishes a **relation of signification** between the subject and the object, that is, the object will mean something to the subject;

c) that signification motivates **actions** from the subject, that is, the subject will not remain indifferent and exactly as it was before after valuating an object.

What this all implies is that valuation processes rely on **social norms** which regulate the following:

a) the modes of separation and access of persons to the objects of value;

b) the significations of objects and the communication of those significations;

c) the modes of action of people on the objects they valuate.

Dealing with private forestry, the main mode of separation and access of people to forests is regulated by the systems of **private property rights**. However, if ownership of forest land and some forest outputs like timber or cork can be the object of such type of rights, it is impossible to impose such rights in the public goods generated by forestry.

About the significations we will distinguish five different types which will be defined in the next section.

[9] This section is based in Mendes (2002c).

For the modes of action, we will distinguish two: conservation and development.

What are the different types of values of things?

Use value

The use value is the valuation of things according to the following dimensions:

- **functionality** (what is this thing for?)

- **comparability** (is thing as useful as that one for the purpose at stake?)

Exchange value

The exchange value is the valuation of things according to the following dimensions:

- **functionality** (what is this thing for?)

- **comparability** (is thing as useful as that one for the purpose at stake?)

- **permutability** (how much worth is this thing in terms of another thing?)

So exchange value requires use value, but requires something else: institutions (markets or others) that make possible the permutation of things for other things.

"Total economic value" of forests is an exchange value concept. So it implicitly relies on the **strong assumption** that all forest goods and services are or can be made permutable through appropriate institutions.

Are these all the values of forests?

Even if the strong assumption mentioned above holds, and even if there is enough data to valuate in monetary terms all forest goods and services, would that be a full valuation of forests? The answer is no. Things, including forest goods and services, may have other values besides use and exchange values. One is what I have called (Mendes, 2002c) **"discursive values"**: things can have meanings to people, and can be used to communicate those meanings from one person to another, so that the meaning is socially shared. So things can "talk". Or meaning is a kind of value which is not quantifiable. It can circulate among people, but not in the sense of an exchange value. Forests can have this kind of value. Nowadays this is something that is being recognized when there is talk about the "cultural values" of forests.

Things can also be transferred from one person to another, but not as an exchange value. The thing can be donated because the donator loves or respects the person to whom he is giving that thing, or because there are social norms that induce him to do so, without negotiating and expecting something in return. This is what I have called **"symbolic exchange value"** (Mendes, 2002c). In forest valuation one example of this kind is value is **bequest value**.

Finally things can also be valued by people because they generate emotions for them which are something personal and not transmissible. This is what I have called **"aesthetic value"** (Mendes, 2002c). Emotions are not something that can be quantified in money terms. Forests are clearly the object of this kind of valuation by many people.

Can't these other kinds of values be converted into exchange values?

Any kind of value may be transformed into another kind of value: a donation can be sold by the recipient, a beautiful forest with a high aesthetic value can be bought or sold, a forest with some kind of cultural value can also be bought or sold. However, there are two things to note about these transformations in the values of things. One is that the transformation of values of one same (in the material sense) thing is just another way of valuing it which does not necessarily suppress the original type of valuation: even if a forest with a cultural value for some people is turned into an exchange value by the person who owns it at a certain time, the cultural value remains for those who value it in this way.

The other thing is that social norms may prevent some types of transformations of values: law or community action may prevent the sale of a forest with a high cultural value if that sale endangers the preservation of this kind of value.

Owners' motives for forest management

The conservation motive

What Campos Palacin *et al.* (2001) call the "conservation value" of agro-forestry systems can be considered what forest owners are willing to pay to get in exchange the following types of values from their forests:

- **use value**;
- **symbolic exchange value**;
- **aesthetic value**.

Even though it is an empirical issue to know where and by how forest owners carry on this motive for keeping their forests, it may be far from negligible.

The development motive

What is called here the "development motive" corresponds to the motivation of forest owners who are willing to invest in their forests with the purpose of getting an **exchange value** out of that investment, if possible, high enough to make the investment profitable.

The asset motive

Even if forest owners don't invest in the upgrading of their forest in order to get a better monetary income out of them, they remain as an asset which can be converted into exchange value in case they have unexpected needs for cash. Given the imperfections in financial markets which many forest owners have to face, forest may be a quicker and easier source of funds than established financial institutions.

Some bits of empirical evidence

Towards an estimation of the total value of Portuguese forest production[10]

Scope of the estimates

In this section we will present our preliminary estimations of the total value of Portuguese forest production. This intention is to give an idea about the direct and indirect use value of forest production, separating in this value the one which can have an exchange value and the one for which there are no markets.

So the scope of this forest accounting work is the measurement the annual **outputs** of Portuguese forests. Some of these outputs contribute positively to the society's well being and therefore are counted as **social benefits**, others contribute negatively and therefore are counted as **social costs**. Except for some outputs which are social costs, we will not estimate any other costs, namely intermediate consumption from outside forestry. So there will be no estimate for the **value added**. We will also not attempt to analyse whether or not society uses of forest outputs are above or below **sustainable** levels. So we leave out **capital gains,** with a few exceptions which will be mentioned later on.

[10] This section is taken from Mendes (2002b).

In Portuguese forests, especially in those with a more Mediterranean nature, but also in the other forest ecosystems, forestry has strong **technical interdependencies** with livestock and farming. Here are just no name a few of them:

- forests produce grass and acorns which may be used to feed animals;

- animal dung and shrubs may be used for the fertilisation of farmland;

- farm use of shrubs and other forest vegetation may reduce the risk of forest fire;

- farming and livestock rearing in cork oak systems, if appropriately done, may be beneficial to cork production.

We will not attempt to deal with all the outputs of these agro-forestry systems, but simply with the outputs of their **forest component**. This does not mean that we will restrict our attention to timber production only. Besides timber production we will also look at non wood forest goods and services (marketed, marketable and non marketable), including those that are intermediate consumptions for the livestock and farming activities technically and economically integrated with forestry, like grazing in forest lands and acorn production, as well as services provided by forests due to the action of the public sector, and some environmental services which are public goods.

The estimates presented here should be taken with care because of their limitations on three counts, at least:

- in some cases, the estimates are based on very fragmentary, shaky data and bold assumptions which we tried always to make as explicit as possible;

- in other cases, there are forest outputs and values which are missing because of a total lack of basic data even for valuations based on bold assumptions.

These limitations are due to the fact that, given the constraints and the resources available for this project, no new field work could be undertaken to fill in the gaps in the very scarce empirical literature available. So the estimates presented here should be seen as not much more than a current sate of the art in the country, contributing to set the ground for so much work that remains to be done.

Direct use values

Timber production

In 1998, the value of the timber harvested plus the net growth of timber stock was 86159 millions escudos, that is, about **430 millions of euros**, as shown in Table 32.

Table 32: Direct use value (timber production) in 1998

	Physical production	Stumpage market price (escudos)	Value of production (10^3 escudos)	Sources
Timber harvested			**76 021 842**	
Pulpwood			39 839 074	
Conifers	962 000 m^3 u.b.	7 162/m^3 u.b.	6 889 844	(1)
Broadleaved (eucalyptus)	3 434 000 m^3 u.b.	9 595/m^3 u.b.	32 949 230	(1)
Sawnwood			29 126 568	
Conifers	3 072 000 m^3 u.b.	8 569/m^3 u.b.	26 323 968	(1)
Broadleaved	300 000 m^3 u.b.	9 342/m^3 u.b.	2 802 600	(1)
Other industrial wood	180 000 m^3 u.b.	9 000/m^3 u.b.	1 620 000	(2)
Firewood			5 436 200	
Conifers	270 000 tons u.b.	7 060/ tons u.b.	1 906 200	(3)
Broadleaves	500 000 tons u.b.	7 060/ tons u.b.	3 530 000	(3)
Net growth of the standing timber stock	1 183 000 m^3 u.b.	8 569/m^3 u.b.	**10 137 127**	(4)
Value of timber production			**86 158 969**	

Sources and methodology

(1): INE (2001a)

(2): The source for production is INE (2001a). The price is our own estimation.

(3): The data for price and production come from INE (2001a). Data for production were converted from m^3 u.b. into tons u.b. using the following coefficients:

- conifers: 1 m^3 u.b. = 1,25 tons u.b.

- broadleaves: 1 m^3 u.b. = (1,46/1,06) tons u.b.

(4): The net growth of standing timber stock was calculated by subtracting the timber harvested from the total net increment reported in Table 10, after converting the data on timber harvested from m^3 u.b. or tons into m^3 o.b., using the following conversion factors:
- conifers: 1 m^3 o.b. = 0,7 m^3 u.b.
- broadleaves: 1 m^3 o.b. = 0,82 m^3 u.b.

For this calculation we also assumed that the 180 000 m^3 u.b. were all made of broadleaves. Since this calculation led to a total volume of broadleaves' timber not very different from the total net increment of theses species, we consider the net growth of this type of timber to be zero. So the net growth reported in the table corresponds only to conifers.

The appropriate price to value this stock change is the stumpage price less marginal cost (Vincent, 1999a; Vincent, 199b; Vincent & Hartwick, 1997). Here we use, as a rough approximation, half of the value of the stumpage price.

Non wood forest products

The estimated values of cork and other non wood forest goods harvested and of some forest services directly consumed are presented in Table 33. They amount to 135458 millions of escudos at 1998 prices, that is about **676 millions euros**. No attempt has been made to estimate the real net annual change in the corresponding production capacity.

Table 33: Direct use value (non wood forest products) in 1998

	Physical production (intermediate or final)	Valuation method	Unit value (escudos)	Value of production (10^3escudos)	Sources
Cork harvested				60265000	
- Reproduction cork	163000 tons	market price	355/kg	57865000	(1)
- Virgin cork	30000 tons	market price	80/kg	2400000	(2)
Resin extracted	26000 tons	market price	101/kg	2626000	(3)
Honey	3703 tons	market price	300/kg	1110900	(4)
Fruits collected				16843126	
- Pine-nuts	70000000 cones	market price	25/cone	1750000	(5)
- Chestnuts	22022 tons	market price	180$45/kg	3973870	(1)
- Carob	41400 tons	market price	46$94/kg	1943316	(6)
- Arbutus-berries	15130 ha X 600 kg/ha	market price	980/kg	8896440	(7)
- Elderberries	650 tons	market price	430/kg	279500	(8)
Edible commercial mushrooms picked	6500 tons	market price	1000/kg	6500000	(9)
Plants collected				375980	
- thyme, laurel and other cooking plants	80 tons	market price	1056/kg	84480	(10)
- Aromatic and medicinal plants	1100 tons	market price	265/kg	291500	(10)
Hunting				7863400	
a) Value of the game					
- Touristic zones	40% X 851000 ha	market price	5500/ha	1872200	(11)
- Associative zones	40% X 1 534000 ha	surrogate price	5500/ha	3374800	
- Other zones under special regime	40% X 122000 ha	surrogate price	5500/ha	268400	
- Other zones (open access)	40% X 5870000 ha X 0,5 partridges or rabbits	surrogate price	2000/partridge or rabbit	2348000	(12)
b) Hunting permits	not estimated				
Grazing	1525606 tons DM/year	surrogate price	16$419/kg DM	25048925	(12)
Acorns				13775151	
- from cork oaks	412975 tons X (730 FU/ton)/year	surrogate price	26/FU	7838266	(13)
- from holm oaks	307324 tons X (743 FU/ton)/year	surrogate price	26/FU	5936885	(13)
Recreation	2000000 day-visits/year	CVM	525/day-visit	1050000	(14)
Annual change in the production capacity of non-wood forest products	no estimate				

Sources and methodology

(1): INE (2001a)

(2): The source for production is INE (2001a). The price is our own estimate.

(3): The source for production and price is INE (2001a). The price is quoted at factory gate.

(4): The source for production is INE (2001a). The price is data we collected.

(5): The source for production and price is Alpuim *et al.* (1998). The volume of production is an estimated average.

(6): The production is the average for the period 1969/88, according to Droste *et al.* (1988). The price refers to 1998 and the source is INE (2001a).

(7): The data for the area are old because they come«s from forest inventories of the beginning of the 1970s, but are the only one available. The source is DGOGF (1979). It refers to the districts of Beja and Faro where there is a regular activity of commercial utilization of this fruit. The source for the utilizable production per hectare is INE (1964). The prices are those we collected from producers for the CESE report (CESE, 1996; Mendes, 1997) referring to the year 1995, inflated by the implicit producer price index for fruits in 1998 (basis 1995) calculated from the agricultural national accounts (INE, 2002).

(8): The production is our own estimation made for the CESE report (CESE, 1996; Mendes, 1997). The price is the one we collected from producers for the CESE report (CESE, 1996; Mendes, 1997) referring to the year 1995, inflated by the implicit producer price index for fruits in 1998 (basis 1995), calculated from the agricultural national accounts (INE, 2002).

(9): *Mushrooms*

In the current situation of Portuguese forests, recreational motives are not a significant motivation for mushroom picking. This is mainly an activity for some rural people who profit from an "open access" type of property rights with regard to this forest product in order to get a complementary revenue by selling to middlemen or food companies the mushrooms they pick.
The production is our own estimate for the average quantity of mushrooms picked and sold in the period 1997/99, based on information provided in the report prepared by ICN *et al.* (2001). The price is also our own estimate for 1998 based on information from that same report.
(10): *Plants*
The production is our own conservative estimation based on the quantities exported in the period 1988-92, under positions 0910 and 1211 of the Nomenclature of Foreign Trade Statistics. The averages for this period were 60,58 tons for cooking plants (with a maximum of 75,3 tons in 1992) and 822,58 tons for the aromatic and medicinal plants (with a maximum of 1027,5 tins in 1992). The market prices are our own estimation based on the export prices in 1992 taken from the official foreign trade statistics, inflated to 1998 levels using the forest production price index presented in **Erreur ! Source du renvoi introuvable.**.
(11): *Hunting*
Recreational value is probably the major motivation for hunting, exceeding, by far, the value of the game meat. Since we could not find any travel cost or CVM empirical study estimating the value of hunting we tried a different method. We assume that the potential hunting territory is the total area of the country, except the uncultivated land unfit for cultivation. So it is equal to the sum of the area of forest and other wooded land, agricultural land and uncultivated land fit for cultivation that is 8376781 ha in 1995/98 according to the last Forest inventory as reported in

Table 8. Some of this land is organised in special hunting zones (touristic and associative). The rest is in open access regime. We assumed as basis for imputing to forest the value of hunting the structure of land use. We also assumed that this structure is the same in the whole potential hunting territory, in the zones under special hunting regimes and in the open access hunting zones. Based on the data about land use for 1995/98 reported in

Table 8, that assumption implies that 40% of the areas under special and open access regimes are forest or other wooded land. The valuation of the benefits from the special hunting regimes is based on the work of ERENA (Bugalho *et al.*, 1996) for the extensive farms of Alentejo, the main hunting region in the country. According to this consulting company, gaming appropriately managed in those farms can generate an income for the landowner of 10,98 thousands of escudos per hectare. Inflating this income to 1998 prices using the consumer price index for "recreation, leisure and cultural services", we get 11,12 thousands of escudos per hectare. Since not all of the areas under special hunting regimes are managed for gaming with the same best available technology as proposed in the ERENA study, we used for our estimate a benefit per hectare equal to 50% of 11,12 thousands escudos and we applied this value to the entire territory under special hunting regimes. For the zones under open access we assumed an average of 1 partridge or 1 rabbit per 2 hectares. The price for these species is our own estimate.
(12): *Grazing*
The valuation of grazing was based on the surrogate price method:
a) from the last forest inventory (DGF, 2001) we obtained the areas of natural and artificial pasture under forest cover for each type of forest defined by its dominant tree species;
b) from available research on agro-forestry in Portugal (Moreira, 1980; Santos, 1992), we used as a conservativ estimate the lower bound values for fodder production from grazing lands (natural and artificially improved) in forest, for each tree species, expressed in tonnes of dry matter;
c) each unit of fodder production from the forest grazing lands expressed in dry matter was valued at a surrogate price equal to the market price of one unit of dry matter of cereal straw, assuming that 1 kg of straw contains 0,9 kg of dry matter.
This unit price per kg of cereal straw is the price used in the farm accounts of the basic microeconomic policy planning model of the Ministry of Agriculture (MADRP, 2001). The years of reference for the areas of grazing lands and for the price per kg of DM of cereal straw are respectively 1995 and 1997. This valuation is reported in Table 34 with a 5% increase in the price of cereal straw.

Table 34: Value of grazing in forest areas in 1997

Dominant tree species	Natural grazing lands			Artificial grazing lands			TOTAL tons DM/year	Unit price (euros/kg DM)	Total gross value (10^3 euros)
	ha	tons DM/ha.year	tons DM/year	ha	tons DM/ha.year	tons DM/year			
Maritime pine	0		0	9761	3	29283	29283	0,078	2284
Cork oak	46282	1	46282	257715	2,5	644287,5	690569,5	0,078	53864
Holm oak	22336	1	22336	249252	2,5	623130	645466	0,078	50346
Eucalyptus	0		0	13443	2,5	33607,5	33607,5	0,078	2621
Other oaks	4690	2	9380	8945	4	35780	45160	0,078	3523
Pinus pinea	4101	1,5	6151,5	6956	3	20868	27019,5	0,078	2108
Chestnut	0		0	6670	4	26680	26680	0,078	2081
Other broadleaves	0		0	6955	4	27820	27820	0,078	2170
Other conifers	0		0	0	3	0	0	0,078	0
TOTAL			84149,5			1441456	1525606	0,078	118997

On one side, this valuation of grazing overestimates this intermediate forest product. This is due to the fact that the total quantity of DM that we considered is meant to be the potential physical production of forest grasslands which is not all necessarily consumed by animals. On the other side this estimate understates the value of production because we didn't attempt to value the animal products generated by this grazing.
(13): *Acorns*
The source for the yearly production of acorns is the last forest inventory (DGF, 2001). The equivalent in forage units (FU) per ton was calculated based on the work of Natividade (1950, p. 317). The surrogate price is the producer market price per kg of barley for cattle feeding in 1998 (MADRP, 2000), assuming that 1 kg of barley is equivalent to 1 FU.
(14): Recreation

The number of day-visits to forest and other wooded lands in 1998 is our own very conservative estimate based on the following data obtained from INE (1999):
- the number of campers (1635963);
- the number of stays in rural guest houses (160814).
This number of day-visits is probably an underestimation of the visits to forests because it does not take into account other forest activities with a forest recreational component like hunting.
The willingness to pay per day visit is based on the only empirical study we could find for the recreational value of a Portuguese forest area. This study estimated that value for a forest reserve in the Terceira Island of Azores (Loureiro *et al.*, 1996), in 1995, using a CVM method. We assumed that the willingness to pay for recreation in forest and other wooded lands in Continental Portugal is the same as the one estimated in that study and we updated it for 1998 using the consumer price index for "recreation, leisure and cultural services" published by INE.
Except for the fact that, like many of the CVM studies which estimate total values and not marginal, this results obtained by Loureiro *et al.* are considerably below the results obtained in many studies done in various countries which arrive at a value of US$20 per recreation day, on average (Wibe, 1994).

Indirect use values

Watershed management

The total value of water management services provided by Portuguese forests is estimated at 3000 millions of escudos per year, that is about **14,964 million euros**. This estimate is an evaluation of some **watershed management costs avoided by the existence of forests**. These costs should be viewed only as lower bound value of the benefits that can be imputed to forests because of their role in the conservation of soil and water resources.

The watershed management operations considered here are the following:

- protection of ecosystems;

- flood prevention;

- fish and wildlife management;

- water management.

The value of the costs avoided was estimated as follows:

1. We started with the annual average costs of these operations for the current forest cover as they were estimated in the watershed management plans for the international rivers (Minho, Lima, Douro, Tejo e Guadiana) prepared by the National Water Institute (INAG, 2000).

2. For these five river basins we estimated what those costs would have been without forest cover assuming that the proportion between those two costs is **the same as the proportion between the erosion with the current forest cover and the erosion without forest cover**. With these calculations we arrived at the total value of the watershed management costs avoided by the existence of forests in those five river basins.

3. From this total value we calculated the value of costs avoided per km^2.

4. This value of costs avoided per km^2 was used to estimate the watershed management costs avoided in the rest of the country.

5. The value reported in Looking now at the breakdown of the total value of forest production by types of property rights presented in Table 36, as expected in a country where private forestry is very important, **private goods and services benefiting mostly to forest owners are the major component of forest gross benefits (87,1%), with timber production being the main component of this type of output.** In interpreting this result we should bear in mind that there are important social costs to private forestry that are externalised (forest fires), so they are not fully borne by forest owners. Also our estimates of the value of forest public goods are very incomplete.

Table 36 is the sum of the values we got in step 2 and in step 4.

For the corrective factors applied to the potential erosion in order to obtain the actual erosion due to the existence of forests in the different river basins, we used the following ones adapted from the work of Rocha *et al.* (1986):

- Minho, Lima : 1/3;
- Douro e Tejo: 2/3;
- Guadiana: 0.1.

Carbon storage

According to the TBFRA-2000, taking into account net annual increment, minus annual fellings, plus annual fellings due to natural losses, the net annual increment of carbon storage in woody biomass of Portuguese forests amounts to 1450000 ton C/year. If we value this at the mean social cost of carbon emissions of 20,3 US$ / ton C estimated by Fankhauser[11] (1995, p. 64) for the decade 1991-2000, at 1994 prices, converted into 1998 escudos by using the average exchange rate of 1 US$ = 180,237 esc. (Ministério das Finanças, 1999), we get a value of 5305,26 millions of escudos, that is about **26,5 million euros**.

An alternative way to value carbon sequestration is to calculate the revenue foregone for not cutting timber. This is equal to the value of the net growth in timber stock which was calculated before as being equal to 10137,127 millions of escudos, that is about **50,564 million euros**. This is the estimate we picked in Table 36.

Other indirect use values

No attempt was made to estimate other indirect use values, namely the contribution of forests to air quality and microclimate regulation due to the total lack of basic data for this purpose.

Option, bequest and existence values: conservation value

Since it is not easy to distinguish among option, bequest and existence value, we follow other authors who don't separate them, preferring the global concept of conservation value. Instead of the separation among those three types of values, what we tried to estimate was not only the conservation value of forests for the general public, but also for the forest owners themselves (Campos *et al.*, 2001).

Conservation value for the visitors of forests located in areas under a special protection status

The only study available in Portugal estimating the willingness to pay for forest landscape conservation is Santos's PhD dissertation (Santos, 1997). Using CVM methods, he estimated the willingness to pay per household and per year visiting the Peneda-Gerês National Park, according to three different programmes for rural landscape conservation. One of the programmes deals specifically with forestry, more precisely it is a programme of oak woodland conservation. The best point estimate he got for the year 1996 was 6634 escudos per household and per year (Santos, 1997, p. 587). Based on the total number of households visiting the park between September 1995 and August 1996, he arrived at an aggregated willingness to pay of 397,377 millions of escudos per year (Santos, 1997, p. 590).

Unfortunately we have no studies of this quality for the other forests under protection status or without this type of status. So the national figure we will calculate starting form this case study should be taken very cautiously.

For the whole country we have data on the forest area under special protection status, including the Peneda Gerês National Park and other parks. These data is presented in Table 13. Considering these forests only, we can get an aggregate benefit of forest conservation schemes based on Santos's case study for Peneda-Gerês if we convert his result into an willingness to pay per hectare and multiply the result by the

[11] This value estimated by Fankhauser is in the upper range of the interval presented in the second IPCC assessment report (US$5-125).

total area of forest under special protection status in Continental Portugal. This is obviously a bold hypothesis since what we are assuming is that, for the protected forests outside the Peneda Gerês National Park, the characteristics of the visitors, the frequency of their visits and the characteristics of the areas are such that the benefit of forest landscape conservation schemes converted into a per hectare basis is the same as in the Peneda Gerês National Park.

To proceed in this manner, we need data on the area of forest and other wooded land in the Peneda-Gerês National which are not available. We estimate this area at about 60000 ha, pasturelands included. Taking a conservative approach and dividing the aggregate willingness to pay by this whole area, we get 6623 escudos per hectare. Multiplying by the 594509 ha of forest and other wooded land in the Nature 2000 sites, the aggregate willingness to pay for their conservation is 3937,433 millions of escudos for 1996. Updating this valuation by the consumer price index for "recreation, leisure and cultural services" published by INE, from the time of the field survey for the CVM work of Santos (28th July-8th August 1996) to December 1998, we get an aggregate willingness to pay of 4020 millions of escudos, that is about **20,052 million euros**.

Conservation value for the forest owners in all types of forests

Besides the conservation value for visitors to forests and for non vistors, there is also the conservation value for the forest owners themselves. This type of value has been recognised by several authors for almost 35 years (Torrel *et al.*, 2001), but, with a few exceptions (Mariscal & Campos, 2001; Campos *et al.*, 2001), it has not been taken into account very often in forest accounting. A possible way to get a rough estimate of a lower bound for this conservation value adapted to the institutional situation of Portuguese forests is to follow a **cost based approach** and look at the amount the forest owners pay for the services provided to them by their forest owners' associations which exist already in all the regions. At least for the associations in Northern and Central Portugal, it is fair to say that almost all the services they provide are valued by the forest owners under one or more of the items included in the concept of conservation value:

- the associations provide services to reduce the risk of forest fire (fire brigades);

- they assist the owners in the preparation and implementation of stand improvement, afforestation and reafforestation investment projects, the benefits of which are very unlike to accrue to the current generation of owners, given their current age.

We will base our estimate on the case of one of the oldest a more performant association which provides those types of services, representative of the type of forest typical of the Northwestern and Central Western Portugal (maritime pine and eucalyptus). Considering the membership fees and the services provided by the association which have to be paid by the forest owners, we get a value of around 2 thousands of escudos per hectare of forest. Making the bold assumption that this value can be transferred to the rest of the forests and other wooded land in the country, we arrive at a total value of 6698,654 millions of escudos, that is about **33,413 million euros**.

Other conservation values

Forests might also have a conservation value for those who are neither visitors to forest areas, nor forest owners. We could not find any empirical study quantifying this value for Portuguese forests. No attempt was made here to estimate this value.

Negative forest externalities

Negative forest externalities are outputs from forests having the nature of **social <u>costs</u>**. The only negative forest externality estimated here and in a partial way is the damage caused by forest fires. In 1998, It amounted to 18236 millions of escudos, that is about **90,961 million euros.**

We have not tried to estimate other negative forest externalities like the following:

- erosion, floods, avalanches and landslides due to poor forest management;

- loss of landscape quality and recreational opportunities due to poor forest management;

- loss of biodiversity and landscape quality and other losses due to intensive forestry;

- damages due to pest infections.

Table 35: Negative forest externalities, 1998

Types of externalities	Quantitative basis for valuation	Unit value (10^3escudos)	Total value (10^3escudos)	Sources
Damages caused by forest fires			18236000	
- State and forest industries outlays with fire fighting and prevention			8500000	(1)
- Opportunity cost of working days lost for fire fighting	30000 forest fires X 10 fire fighters X 1 day per fire fighter	4,453/working day	1336000	(2)
- Reforestation costs of burnt areas	40000 ha/year	210/ha	8400 000	(3)
- Wood and other forest production definitely destroyed by forest fires	no estimate			
Other negative forest externalities	no estimate			

Sources and methodology

1) Own estimation with the following breakdown:
- state budget outlays with fire fighting: 5200000 thousands of escudos;
- state budget outlays with fire prevention (annual average of the funding provided by CNEFF to fire prevention projects in 1996/99): 2250000 thousands of escudos;
- forest industries outlays with fire prevention (annual average of the co-funding from the forest industries in the fire prevention projects supported by CNEFF): 750000 thousands of escudos;
- cost of Reg. 2158 projects in 1998: 281576 thousands of escudos (MADRP, 1999).

2) The number of forest fires is the average of the number of fires for the period 1996/2000 according to DGF data. We conservatively assumed a number of 10 fire fighters per fire and one day of work lost per fire, since most of the fire fighters are volunteers who have other jobs. The value per working day is the base monthly salary for a worker with elementary school instruction, in October 1998, divided by 20, according to data from the Ministry of Labour and Social Solidarity ("Quadros de Pessoal").

3) Forest area burnt: annual average for the period 1996/2000 (from Table 16). Restoration cost per ha: own estimation.

Summary of the results

Distribution of the total value of forest production by types of uses

The total value of forest production in Continental Portugal net of forest fire damages, at 1998 prices, is estimated at **1132,166 million euros**, with the following breakdown by uses:

- **direct use values** net of forest fire damages: 1013,124 million euros (89,5%);

- **indirect use values**: 65,528 million euros (5,8%);

- **conservation values**: 53,464 million euros (4,7%).

By netting out the social cost of forest fire damages from the value of the wood forest products, we are making the assumption that many of the fire starts and of their easiness to propagate are more related to the poor management of the wood supply functions of forests than to their other functions. These results show that, even in a western mediterranean country like Portugal where part of the territory has an atlantic influence, **non wood forest products (cork excluded) are the main component** of the value of total forest production (33,0%). The two next more important components are the **timber production** (timber harvested plus the net growth in timber stock) net of fire damages (29,9%), and the **cork harvested** (26,6%).

In interpreting the estimates for the indirect use values and for the conservation values we should bear in mind that many components of these values could not been estimated. So the percentages of 5,8%

for the indirect use value and 4,7% for the conservation value are lower bounds for their shares in the total value of forest production.

Distribution of the total value of forest production by types of property rights

Looking now at the breakdown of the total value of forest production by types of property rights presented in Table 36, as expected in a country where private forestry is very important, **private goods and services benefiting mostly to forest owners are the major component of forest gross benefits (87,1%), with timber production being the main component of this type of output.** In interpreting this result we should bear in mind that there are important social costs to private forestry that are externalised (forest fires), so they are not fully borne by forest owners. Also our estimates of the value of forest public goods are very incomplete.

Table 36: Summary of the estimated production values of Portuguese forests at 1998 prices (thousands of euros)

Classification of forest products by types of property rights	DIRECT USE VALUES			INDIRECT USE VALUES	CONSER-VATION VALUES	TOTAL	%
	Wood forest products	Cork	Other non wood forest products				
Gross benefits accruing mostly to forest owners	**429 759**	**300 601**	**301 979**		**33 413**	**1 065 752**	**87,1**
Private goods	**429 759**	**300 601**	**301 979**		**0**	**1 032 339**	**84,4**
- wood	429 759					429 759	35,1
- cork		300 601				300 601	24,6
- resin, fruits, plants, hunting (touristic zones), grazing, acorns			301 979			301 979	24,7
Public goods						**33 413**	**2,7**
- conservation value to forest owners					33 413	33 413	**2,7**
Gross benefits accruing mostly to non forest owners	**0**	**0**	**71 746**	**65 528**	**20 052**	**157 325**	**12,9**
Club goods			**16 833**			**16 833**	**1,4**
- hunting (associative zones)	0	0	16 833	0	0	16 833	1,4
Open access goods	**0**	**0**	**49 675**	**0**	**0**	**49 675**	**4,1**
- honey	0	0	5 541	0	0	5 541	0,5
- mushrooms	0	0	32 422	0	0	32 422	2,7
- hunting (open access)	0	0	11 712	0	0	11 712	1,0
Public goods	**0**	**0**	**5 237**	**65 528**	**20 052**	**90 817**	**7,4**
- recreation	0	0	5 237	0	0	5 237	0,4
- watershed management	0	0	0	14 964	0	14 964	1,2
- carbon storage	0	0	0	50 564	0	50 564	4,1
- conservation value to non forest owners					20 052	20 052	1,6
TOTAL VALUE OF BENEFITS	**429 759**	**300 601**	**373 725**	**65 528**	**53 464**	**1 223 077**	**100**
Social costs	**-90 961**					**-90 961**	
- negative externalities (forest fires)	-90 961	0	0	0	0	-90 961	
- other social costs						no estimate	
TOTAL VALUE OF PRODUCTION	**338 798**	**300 601**	**373 725**	**65 528**	**53 464**	**1 132 116**	
%	**29,9**	**26,6**	**33,0**	**5,8**	**4,7**	**100**	

Conversion rate: 1 euro = 200,482 escudos

Distributional issues

In Table 37 and Table 38 we present a rough approximation to the social distribution of the value of total forest production among **non industrial private forest owners**. In interpreting this distribution we should bear in mind that we are not dealing with the distribution of social **income,** but simply with the distribution of gross benefits, since costs have not been estimated yet. Another very important limitation is that the distribution of the value of total forest production was done simply according to the distribution of the forest area by the size of the holdings, as it was determined by agricultural censuses. To improve the distribution, we assumed that the value of cork and acorns which is generated mostly in the extensive farms of Southern Portugal correspond to holding sizes above 50 ha.

To have a reference point for the values of forest production per holding, we can take into account the fact that, in 1998, the monthly salary of a worker with an educational background at the elementary school level was around 89060 escudos. Multiplying by 14, this corresponds to an annual salary of 1247

thousands of escudos. Taking into account that our estimates correspond only to gross benefits, and assuming that they are not far away from the reality, we can conclude that **it is only for the size classes above 50 ha that forest might generate an income equal or above the salary of a worker with an elementary school educational level**. This corresponds to **1% of the number of NIPFO, 61% of the total forest area of NIPFO and 80,3% of the value of total forest production imputed to this type of owners.** So, we can state as an hypothesis for further research, that the social distribution of commercial forest income is **very concentrated** in Portugal.

Table 37: Estimation of the total value of forest production benefiting to non industrial private forest owners (thousands of escudos)

Products	Value of total production	Coefficients of imputation to NIPFO	Value of production benefiting to NIPFO
Pulpwood (eucalyptus)	32 949 230	0,603	19868386
Industrial wood from conifers	33 213 812	0,661	21954330
Industrial wood from broadleaves	4 422 600	0,978	4325302,8
Firewood (conifers)	1 906 200	0,661	1259998,2
Firewood (broadleaves)	3 530 000	0,978	3452340
Net growth in timber stock	10 137 127	0,661	6700640,9
Cork	60 265 000	0,904	54479560
Resin	2 626 000	0,661	1735786
Fruits	16 843 126	1	16843126
Plants	375 980	1	375980
Grazing	25 048 925	0,9	22544033
Acorns	13 775 151	0,9	12397636
Conservation	6 698 654	1	6698654
TOTAL (without cork and acorns)			**105 758 576**
TOTAL			**172 635 772**

Sources: The values of total production come from Table 32 and Table 33.
The coefficients of imputation were constructed based on the estimates presented in Table 2.

Table 38: Distribution of the estimated value of total forest production benefiting to non industrial private forest owners (thousands of escudos)

Size of the holding	N.º of forest holdings	Forest area (ha)	Value of forest production (except cork and acorns)	Value of forest production (cork and acorns)	Total value of forest production	Value of forest production per holding
less than 10ha	360 493	652 397	28 617 410		28 617 411	**79**
11-50 ha	9 551	286 530	12 568 646		12 568 646	**1 316**
51-100 ha	1 400	105 000	4 605 828	5 281 135	9 886 962	**7 062**
more than 100 ha	2 225	1 367 073	59 966 692	68 759 016	128 725 708	**57 854**
TOTAL	**373 669**	**2 411 000**	**105 758 576**	**74 040 151**	**172 635 772**	

Sources: The area and number of holdings of NIPFO per size class comes from unpublished data of INE reported by BFE (1996).

Conclusions

As a tentative hypothesis drawn form this section, one can say that the development motive for forest management in Portugal may be weak for the very large majority of forest owners since the income they can get from this activity is very low and subject to high risk of forest fire. This does not mean that they have no interest in forestry. Besides the development motive there are also the conservation and the asset motives.

Conclusions from an econometric model of pulpwood supply

In his Master Thesis, Rafael Dias of the Faculty of Economics and Management of the Portuguese Catholic University (Dias, 2001) estimated an econometric model for the eucalyptus pulpwood market in

Portugal for the period 1970-99. The results for the supply function are reported in Table 39. These results can be interpreted in the following way:

a) the positive sign for the coefficient of the price of eucalyptus pulpwood shows that the supply of this kind of timber is positively influenced by that variable, as expected;

b) the positive sign for the coefficient of the interest rate says that forest owners increase timber supply when the cost of borrowing money increases which means that **net growth in the owner's timber stock is a substitute for credit from financial institutions**;

c) the meaning of the positive sign for the coefficient of the variation in household disposable income can be that forest income is not needed to finance regular consumption needs of the forest owners by covering up for decline in disposable income, but instead may be positively related to **financing owner's investments** made possible when disposable income is rising, which is consistent with the interpretation of the sign of the interest rate coefficient;

d) as expected the area of eucalyptus plantations is positively related to the supply of this kind of timber.

If these interpretations are correct, this means that even for the "most commercial" of the tree species in Portuguese forests, the **"asset motive"** may be the major driving force behind forest owners' behaviours.

Table 39: Supply function of eucalyptus pulpwood in Portugal in 1970-99

Variables	Coefficient	t statistics	p-value
Constant	-2112238	-3,5520	0,0007
$PMEUC_t$	121102,0	3,2341	0,0018
$TXJACT_{t-1}$	71149,90	7,6740	0,0000
Δ RNFL	0,000345	2,6099	0,0109
$AREUC_t$	5,380483	11,2448	0,0000
R^2	0,9318		
$\overline{R}^2$	0,9205		
DW statistics	1,7344		
White test	14,3104		
Chow test	1,3714		

$PMEUC_t$: price of eucalyptus pulpwood, off bark, at factory gate at the end of year t
$TXJACT_{t-1}$: nominal interest rate (lending rate by financial institutions) in year t-1
Δ RNFL: variation in household disposable income
$AREUC_t$: area of eucalyptus plantations in year y

Conclusions from an econometric model of forest owners' participation in forest programmes

Taking the members of the biggest forest owners' association in Portugal in terms of membership (Forest Owners' Association of the Sousa Valley), Mendes (1999) estimated a multinomial logit model for the probability of a forest owner to apply for public financial incentives to carry on an afforestation investment plan. The independent variables for which data could be obtained were the following:

A: total size of the forest holdings in hectares;

H: number of forest holdings belonging to the owner;

D: distance between the permanent residence of the forest owner and his main forest holding measured in kilometers.

The mutually exclusive alternatives which were considered to be available to the forest owners were the following:

a) conserve forests as they are without any investment plan (with probability P0);

b) carry on an individual investment plan only (with probability P1);

c) join with neighbours to carry on a grouped investment plan (with probability P2);

d) carry on individual and grouped investment plans (with probability P3).

Before reporting the results of the econometric estimation, there is important observation to consider: 179 out of the 383 members of the association included in this study chose the first of these four options. This means that even for the minority of forest owners who join a forest owners' association, the **"development motive" may not be the major driving factor** behind the behaviour of a large percentage of them. From the association they may demand more simply technical advice and sylvicultural services to preserve their forests as they are, with lower exposure to forest fires and other risks.

The coefficients of the number of forest holdings per owner are not statistically significant by usual standards. The same happens with the coefficient of the distance, in the case the forest owner implements individual and grouped projects. In spite of this lack of statistical significance for the number of forest holdings, it is interesting to retain the signs of its coefficients: negative in the case of the probabilities of individual or grouped plans only, and positive in the case of the probability of individual and grouped plans together. One way to interpret these results is as follows:

- in the case of individual plans the dispersion of the forest lands through more than one holding increases the transaction costs and other costs to implement a plan, so that the more geographically concentrated the forest lands are the more likely the forest owner is to carry out an individual investment plan;

- the grouped plans are more likely to happen among small owners who rarely have more than one holding;

- the owners are more likely to implement to implement not only individual plans but also grouped plans are among those who have more than one holding where they can carry on these different types of plans.

The coefficients for the total size of the forest holdings and the distance between the permanent residence and the main forest holding are statistically significant by usual standards, with the exception mentioned before for the distance, in the case of individual and grouped plans together.

The signs of these coefficients are intuitively plausible:

- the total size of the forest holdings has a positive effect on the probability of individual plans and on individual and grouped plans together, and has a negative effect on the probability of individual and grouped projects;

- the distance between the permanent residence and the main forest holding has a negative effect on the probability of individual and grouped projects.

The larger the total size of the forest holdings, the more likely a owner is to carry out a plan on his own. Big owners are more likely to have enough land to make carry on an individual plan, without having to cope with the transaction costs of organizing a grouped plan with their neighbours. For small owners grouped projects are the only alternative to carry out viable plans.

Proximity to the forest holdings increases the probability of both types of plans. This proximity is sometimes associated with a farming activity for which forestry is still a useful complement. In this case and for other kinds of occupations proximity to the forest holdings makes the owner more aware about what can or should be done to improve his forests. Also proximity reduces the travel costs of forest management.

These results show that the individual characteristics of the forest owners, namely the total size of their holdings and their proximity to those holdings, matter as predictors of their likelihood to carry on forest investment plans. Considering the **"size effect"** (effect of the size of the holdings), in a region of small scale forestry like the one covered by this econometric study, there is some demand for grouped afforestation plans by small owners, if generous public financial incentives are available. Forest owners with larger holdings have more tendency to work on their own, carrying on individual plans. Some if one wants to promote

grouped plans intensive extension work, as provided by forest owners' associations, is needed to bring together forest owners with holdings of different sizes located next to each other.

The need for this extension work is also important if we consider the **"distance effect"** which reduces the propensity for forest owners to adopt investment plans. Extensionists can help the organization of grouped plans by bridging the gap between local owners and those who live away from their holdings.

General conclusion

If there is a general conclusion one can draw from this chapter, it can be the following tentative hypothesis relevant for the Portuguese case:

- the main motives for forest owners to keep their forests are the conservation and the asset motives;

- the development motive is weak and concentrated in a very small number of owners;

- even though they are predominant, the conservation and the asset motives may generate some willingness to pay from the forest owners for **preventive sylvicultural services** capable of preserving the productive capacity of their forests and reducing the risk of forest fires;

- this willingness to pay may not be enough to pay those services at their market prices.

If these conclusions are true they contribute to the thesis of an **"organizational fragile equilibrium"** of the forest owners' organizations in Portugal.

Chapter

6

Internal organization of forest owners' associations and changes in owners' behaviours

Main issues

The main issues to be addressed in this chapter are the following:

- **how to motivate** forest onwers' to join a forest owners' organization?

- what are the **changes in forest owners' behaviours** towards their forest that are likely to happen when they join a forest owners' organization?

The free rider problem and the selective incentives model

To see why the first of the two issues we have stated is a non trivial problem we first have to consider the economic characteristics of the outputs of a forest owners' organization. These outputs are of two main types:

a) **public goods** like the following:

- **pure public goods** for the society at large which are all the positive externalities generated by forests;

- **collective goods**, namely the promotion of the interests of forest stakeholders, either they are members of the association or not;

- **public goods with exclusion**, or "club goods" which are non rival goods and services provided to their members only;

b) **private services** (rival and with exclusion) such as individualised technical assistance to forest owners in the management of their forests.

Between these two types of goods and services there is an **order in time**:

- an association can provide private services only after it exists as an association;

- this requires that before that a group of forest owners recognised that they have some common interests.

So the public goods nature of the association comes first, even though the provision of private services may already be in the minds of the founding members from the outset. This priority on time of the public goods provision creates a problem for the emergence of associations. It is the well known **"free**

rider" problem typical of public goods: since this type of goods once they are produced are accessible to those who didn't contribute for that production (absence of mechanisms of exclusion) and its consumption by anyone does not reduce the amount available for consumption by others (non rivalry), there is no incentive for egoistic people to contribute voluntarily for the production of these goods. So the big issue is, how to cope with this problem without resorting to coercive methods for supporting the production of public goods?

Mancur Olson (1965, 1982) proposed an influential theory called the **"selective incentives model"**. The main propositions derived from this model are the following:

a) potential members to an organization providing a collective good to its members may contribute voluntarily to the production of this good if their share of the benefit from this good is greater than the cost of their contributions;

b) since that share diminishes as the group size increases, large groups are less able to act in their common interests than small ones;

c) when the type of incentive mentioned above is not enough to stimulate voluntary contributions for collective, these contributions may be induced by the existence of positive or negative "selective incentives" which are incentives applying selectively in a positive or negative way to the members depending on whether they do or do not contribute to the provision of the collective good.

Within the framework of this theory, one can view the private services provided by the forest owners' associations as positive selective incentives inducing the members to contribute voluntarily to the public goods provided by these organizations.

Effects of the forest owners' associations policies on the owners' behaviours[12]

The issues

With a forest ownership structure like the one existing n Portugal, the challenge is how to motivate for active forest management private forest owners often absentee, with fragmented land holdings, in rural areas where labour supply for forest management is short and the benefits from forestry are not regular and multifunctional like in the past, but sparse and subject to risks (wildfires, soil degradation, etc.). Given this absenteeism of the forest owners, the attention will be focused on the question of how the services provided by the associations can motivate the members to be more active in the management of their forests, in the sense of spending more of their time in this kind of activity. We will consider that these associations provide club goods to their members. In line with Olson's model they may also provide some private services to the members who contribute for the club goods (**selective incentives**). In this case there are three issues to be discussed:

- amount of club goods to be provided by the association;

- price to be charged by the association for their private services;

- interdependences between the services provided by the association and the owners' absenteeism.

This chapter proposes a series of theoretical models for different types of internal organization of forest owners' association showing how this matters for the issues at stake here.

[12] This section is taken from Mendes (1998, 2001).

Basic features of the models

The models to be presented here have in common the fact that they represent the association as an organization made up of two groups of strategically interacting players: the owners who joined the association ("the members") and the board of directors they elected. The directors decide on the amount of services provided by the association. At the present stage of the forest owners' associations in Northern Portugal most of these services have a "public goods" nature. It is the case of services such as the collective representation of the members, promotion of their common interests, diffusion of general information about forest programmes and best forest management practices, etc.

Being non profit organizations, there are no monetary rewards for the directors. So their motivation is assumed to come from the positive utility (good reputation, personal satisfaction) they get from the amount of services provided by the association.

Directors and forest owners are assumed to have other activities besides managing the association and their forest lands. So in allocating their time they have to take into account the costs and benefits (monetary and non monetary) they get from these different activities. In taking these time allocation decisions members and directors are strategically interdependent in the following sense:

- the benefits of the time devoted to forest management by the owners depend on the services they get from the association whose level is decided by the board of directors;

- depending on the regime of membership contributions, the level of services set by the directors might also have to take into account the owners' forest management decisions.

Given the fact that this strategic interdependence depends on the regime of membership contributions, three different situations will be examined here. The first one is the "Portuguese" type of associations described in the first section where members contribute with fixed fees to the costs of the organization. The second one is a development of this first "Portuguese" model where besides producing public goods, the associations also provide private services to the members for which they charge a price. The third model describes the "Scandinavian" type of associations where the members contribute with a share of the gross value of their timber sales. Since these contributions might not be enough to run the association, one major task of the board of directors is fund raising.

The models presented here focus on the issue of interdependence between the amount of services provided by the association and the amount of time devoted by the members to forest management. We leave aside the issues of membership decisions and the variations in the number of members.

Common assumptions

Assumption 1.1

In the internal organization of the associations there are two types of players: the members and the board of directors they have elected for some fixed term.

Assumption 1.2

The directors are considered as a single player and the fact that they are forest owners is ignored.

Assumption 1.3

For the time frame of this model, the number of registered members is fixed.

Assumption 1.4

Directors and members behave non co-operatively.

Assumption 1.5

The directors don't get any monetary reward from their work for the association. Their incentive for this job comes from the fact that their utility W depends positively on the amount of services provided by the association to their members. Utility also depends positively on the following variables:

- Y , the amount of consumer goods and services used for their personal consumption;
- X , leisure.

Assumption 1.6

The utility U_i of each member i depends on the following variables:

- Y_i , the amount of consumer goods and services used for their personal consumption;
- X_i , leisure.

Assumption 1.7

The behaviour of the directors has to meet three economic constraints:

- their personal budget constraint;
- the association's budget constraint;
- a time constraint.

Assumption 1.8

The behaviour of each member has to meet two economic constraints:

- a personal budget constraint;
- a time constraint.

Assumption 1.9

The directors' personal budget constraint is the following:

(1.1) $pY \leq wH + V$ where:

- p is the price of the consumer goods and services;
- w is the income per unit of paid labour time;
- H is paid labour time;
- V is the non labour income.

Assumption 1.10

The directors' time constraint is the following:

(1.2) $T = X + H + Z$ where:

- T is the total time available;
- X is leisure;
- Z is time devoted to the association.

Assumption 1.11

Each members' time constraint is the following:

(1.3) $T = X_i + H_i + Z_i$ where:

- X_i is leisure;

- H_i is paid labour time;

- Z_i is time devoted to forest management.

The "Portuguese" model N.º 1: associations with fixed mandatory contributions to the club good and no private services provision

Assumptions

In the forest owners' associations of Northern Portugal what the members pay is a fixed membership fee independent from the benefit they get from the association. This case is described here.

Assumption 2.1

The entire output of the association is a club good produced in a quantity Q.

Assumption 2.2

Each member's budget constraint is the following:

(2.1) $pY_i + m \leq wH_i + V_i + F_i(Z_i, Q, B_i)$ where:

- m is the annual membership fee assumed to be the same for all the members;

- F_i is a forest production function with positive first-order partial derivatives and negative second-order own-partial derivatives;

- B_i denotes other inputs of forest production supposed to be fixed.

Assumption 2.3

The association's budget constraint is:

(2.2) $C(Q) \leq n(Z)m + S(Z)$

with the following properties:

(2.3) $\frac{\partial n}{\partial Z} > 0, \quad \frac{\partial S}{\partial Z} > 0$ where:

- C is the total production cost of the club good;

- n is the number of members who actually pay the membership fees;

- S represents other sources of funding besides membership fees, namely public grants and other financial support obtained by the fund raising effort of the directors.

The directors' equilibrium strategies

The directors' decision problem is the following:

(2.4) $\underset{X,Y,Z,Q}{Max} \quad W(X, Y, Q)$

$s.t. \quad pY \leq wH + V$

$$T = X + H + Z$$
$$C(Q) \le n(Z)m + S(Z) \qquad X, Y, Z, Q \ge 0$$

The Kuhn-Tucker conditions for this problem are the following where α is the Lagrange multiplier:

(2.5) $$\frac{\partial L}{\partial X} = \frac{\partial W}{\partial X} - \alpha w \le 0, \quad X \ge 0, \quad X\frac{\partial L}{\partial X} = 0$$

(2.6) $$\frac{\partial L}{\partial Y} = \frac{\partial W}{\partial Y} - \alpha p \le 0, \quad Y \ge 0, \quad Y\frac{\partial L}{\partial Y} = 0$$

(2.7) $$\frac{\partial L}{\partial Q} = \frac{\partial W}{\partial Q} - \beta\frac{\partial C}{\partial Q} \le 0, \quad Q \ge 0, \quad Q\frac{\partial L}{\partial Q} = 0$$

(2.8) $$\frac{\partial L}{\partial Z} = -\alpha w + \beta m\frac{\partial n}{\partial Z} + \beta\frac{\partial S}{\partial Z} \le 0, \quad Z \ge 0, \quad Z\frac{\partial L}{\partial Z} = 0$$

For an interior solution, from these conditions we get:

(2.9) $$MRS_{QX} = \frac{C'}{mn' + S'}$$ where:

- MRS_{QX} is the marginal rate of substitution between leisure and the club good;

- n' and S' are the first derivatives of n and S with respect to Z;

- C' is the marginal cost of the club good.

(2.9) shows that the leisure time the directors are willing to sacrifice in order to increase the services provided by the association is equal to the ratio between the marginal cost of these services and the marginal benefit of the directors' fund raising time. An important feature of this result is that the directors' equilibrium strategies are dominant strategies because they don't depend on the amount of time the members devote to their forest lands. The amount of services provided by the association depends only on their marginal costs, on the marginal productivity of the directors' fund raising efforts and on their preferences towards the club good supplied by the association and the other goods and services they use for their own consumption. So there is no incentive for the directors to care about two things:

- the productivity of the services provided by the association,

- and the productivity of the owners´ forest management time.

The members' equilibrium strategies

Each member faces the following decision problem:

(2.10) $$\underset{X_i, Y_i, Z_i}{Max} \quad U_i(X_i, Y_i)$$

$$s.t. \quad pY_i + m \le w(H_i + V_i + F_i(Z_i, Q, B_i))$$
$$T = X_i + H_i + Z_i \qquad X_i, Y_i, Z_i, Q \ge 0$$

The Kuhn-Tucker conditions for this problem are the following where α_i is the Lagrange multiplier:

(2.11) $$\frac{\partial L_i}{\partial X_i} = \frac{\partial U_i}{\partial X_i} - \alpha_i w \le 0, \quad X_i \ge 0, \quad X_i\frac{\partial L_i}{\partial X_i} = 0$$

$$(2.12)\quad \frac{\partial L_i}{\partial Y_i} = \frac{\partial U_i}{\partial Y_i} - \alpha_i p \le 0, \quad Y_i \ge 0, \quad Y_i \frac{\partial L_i}{\partial Y_i} = 0$$

$$(2.13)\quad \frac{\partial L_i}{\partial Z_i} = -\alpha_i w + \alpha_i \frac{\partial F_i}{\partial Z_i} \le 0, \quad Z_i \ge 0, \quad Z_i \frac{\partial L_i}{\partial Z_i} = 0$$

For an interior solution, from these conditions we get:

$$(2.14)\quad MRS_{X_i Y_i} = \frac{\partial F_i / \partial Z_i}{p}$$

Since $\partial F_i / \partial Z_i$ depends on Q, the members' equilibrium strategies don't have the "dominant strategy" feature: in allocating their time to forest management, the owners have to take into account the amount of services provided by the association and set by the board of directors. The sign of the members' Nash reaction curve shows how the amount of time they devote to forest management depends on the amount of club good provided by the association. Taking into account that MRS_{X_i, Y_i} is a function of X_i and some utility level u_i, from (2.14) we get for this slope:

$$(2.15)\quad \frac{dZ_i}{dQ} = -\frac{(F_i)_{Z_i Q}}{(F_i)_{Z_i Z_i}}$$

where the numerator and the denominator in right hand side are the first-order partial derivatives of $\partial F_i / \partial Z_i$ with respect to Q and Z_i. Since according to assumption A2.2. there are diminishing marginal returns, this shows that the sign of the response of the members' forest management time to variations in the amount of services provided by the association changes with the type the technical interdependence between these variables:

- Z_i varies positively with Q if these two factors are technically complementary (Ferguson, 1969), that is, the cross-acceleration coefficient $(F_i)_{Z_i Q}$ is positive;

- Z_i varies negatively with Q if they are technically competitive (Ferguson, 1969), that is the cross-acceleration coefficient $(F_i)_{Z_i Q}$ is negative.

The "Portuguese" model N.º 2: associations with fixed mandatory contributions to the club good and private services provision

Assumptions

We now introduce in the "Portuguese" model the provision of private services to the members for which a price is charged.

Assumption 3.1

Besides the provision of club goods, the association also provides a quantity R of private services.

Assumption 3.2

The utility of the directors depends positively on R.

Assumption 3.3

The directors set the price r of the private services and let the demand determine the quantity R.

Assumption 3.4

The demand function for the association's private services is monotonically negative $\frac{\partial R}{\partial r} < 0$.

Given these assumptions the association's budget constraint takes the following form:

(3.1) $C[Q, R(r)] \leq n(Z)m + S(Z) + rR(r)$

The directors' equilibrium strategies

The Kuhn-Tucker conditions for the directors' decision problem in this case are the same as in the previous model with the following additional condition for the price of the private services:

(3.2) $$\frac{\partial L}{\partial r} = \frac{\partial W}{\partial R}\frac{\partial R}{\partial r} + \beta\left[R(r) + r\frac{\partial R}{\partial r} - \frac{\partial C}{\partial R}\frac{\partial R}{\partial r}\right] \leq 0, \quad r \geq 0, \quad r\frac{\partial L}{\partial r} = 0$$

For an interior solution, from these conditions we get:

(3.3) $$MRS_{QX} = \frac{C'}{mn' + S'}$$

This result looks similar to the one in (2.9), but there is an important difference. Now since the association provides both club and private goods the marginal cost C' depends on the quantity of these private services demanded by the members. So the directors' equilibrium strategies loose the dominant strategies' feature they had in the previous model.

Looking now at the private services' price policy set by the directors we have to work with condition (3.2) to get the following result in the case of an interior solution:

(3.4) $$\beta\left[R(r) + r\frac{\partial R}{\partial r} - \frac{\partial C}{\partial R}\frac{\partial R}{\partial r}\right] = -\frac{\partial W}{\partial R}\frac{\partial R}{\partial r} \Rightarrow \beta\left[\frac{R(r)}{\frac{\partial R}{\partial r}} + r - \frac{\partial C}{\partial R}\right] = -\frac{\partial W}{\partial R} \Rightarrow$$
$$\Rightarrow \beta\left\{r\left[\frac{\frac{R(r)}{r}}{\frac{\partial R}{\partial r}} + 1\right] - \frac{\partial C}{\partial R}\right\} = -\frac{\partial W}{\partial R} \Rightarrow \beta\left[r\left(1 + \frac{1}{\varepsilon_r}\right) - \frac{\partial C}{\partial R}\right] = -\frac{\partial W}{\partial R}$$

where ε_r is the price elasticity of the demand for private services.

Dividing this condition by the one for the club good we get:

(3.5) $$\frac{r\left(1 + \frac{1}{\varepsilon_r}\right) - \frac{\partial C}{\partial R}}{-\frac{\partial C}{\partial Q}} = \frac{\frac{\partial W}{\partial R}}{\frac{\partial W}{\partial Q}} \Leftrightarrow \frac{\pi_R}{\pi_Q} = MRS_{RQ}$$

where π_i is the marginal benefit of service i. What this result shows is that the optimal price for the private services is the one for which the marginal rate at which the directors are willing to substitute the private for the club goods is equal to the ratio of the marginal benefits of these services.

The members' equilibrium strategies

Nothing is substantially changed in the features of the members' equilibrium strategies compared with the previous model except for the fact that now there is the usual marginal productivity condition to characterise the demand for private services. Including this demand R_i as new argument in the production function and its cost rR_i as new component in the members' budget constraint we get the following Khun-Tucker condition in addition to the ones in the previous model:

$$(3.6) \qquad \frac{\partial L_i}{\partial R_i} = \alpha_i \left(\frac{\partial F_i}{\partial R_i} - r \right) \leq 0, \quad R_i \geq 0, \quad R_i \frac{\partial L_i}{\partial R_i} = 0$$

For an interior solution the marginal productivity condition immediately comes up:

$$(3.7) \qquad \alpha_i \left(\frac{\partial F_i}{\partial R_i} - r \right) = 0 \Rightarrow \frac{\partial F_i}{\partial r} = r$$

The "Scandinavian" model

Assumptions

We are now going to examine the behaviour of associations where, besides a fixed membership fee, the forest owners pay a variable fee equal to some share of the gross value of their timber sales. This regime is similar to the one existing in the Scandinavian countries.

Assumption 4.1

Besides the membership fee, each forest owner contributes to the association with a variable fee calculated as a share θ of his forest income so that his individual budget constraint becomes:

$$(4.1) \qquad pY_i + m \leq wH_i + V_i + (1-\theta) F_i(Z_i, Q, B_i)$$

Assumption 4.2

All the members pay in due time their contributions to the association.

Assumption 4.3

The association's budget constraint is the following:

$$(4.2) \qquad C(Q) \leq nm + S(Z) + \theta \sum_{i=1}^{n} F_i(Z_i, Q, B_i)$$

The directors' Nash equilibrium strategies

The directors' decision problem is the following:

$$(4.3) \qquad \underset{X,Y,Z,Q}{Max} \quad W(X, Y, Q)$$

$$s.t. \quad pY \leq wH + V$$

$$T = X + H + Z$$

$$C(Q) \leq nm + S(Z) + \theta \sum_{i=1}^{n} F_i(Z_i, Q, B_i) \qquad X, Y, Z, Q \geq 0$$

The Kuhn-Tucker conditions for this problem are the following where α and β are Lagrange multipliers:

$$(4.4) \qquad \frac{\partial L}{\partial X} = \frac{\partial W}{\partial X} - \alpha w \leq 0, \quad X \geq 0, \quad X\frac{\partial L}{\partial X} = 0$$

$$(4.5) \qquad \frac{\partial L}{\partial Y} = \frac{\partial W}{\partial Y} - \alpha p \leq 0, \quad Y \geq 0, \quad Y\frac{\partial L}{\partial Y} = 0$$

$$(4.6) \qquad \frac{\partial L}{\partial Q} = \frac{\partial W}{\partial Q} + [\beta\theta \sum_{i=1}^{n} (\partial F_i / \partial Q)] - \beta\frac{\partial C}{\partial Q} \leq 0, \quad Q \geq 0, \quad Q\frac{\partial L}{\partial Q} = 0$$

$$(4.7) \qquad \frac{\partial L}{\partial Z} = -\alpha w + \beta\frac{\partial S}{\partial Z} \leq 0, \quad Z \geq 0, \quad Z\frac{\partial L}{\partial Z} = 0$$

For an interior solution, from these conditions we get:

$$(4.8) \qquad MRS_{QX} = \frac{C' - \theta\sum_{i=1}^{n} (\partial F_i / \partial Q)}{S'}$$

This result shows that in the "Scandinavian" model, like in the "Portuguese" models, the leisure time the directors are willing to sacrifice in order to increase the services provided by the association depends on the comparison between the marginal cost of these services and the marginal benefit of the directors' fund raising efforts, with the following differences:

- the marginal cost of the club good is net of the share of its aggregate marginal benefits contributed by the members to the association;

- because these marginal benefits of the services provided by the association are taken into account by the board of directors, their strategies loose the "dominant strategy" feature they had in the "Portuguese" model without private services provision.

In this type of association the leisure time the directors are willing to sacrifice in order to increase the services provided by the association takes into account the marginal productivity of these services which depends on the time the owners devote to forest management. So the time the directors devote to the association and the time the owners devote to forest management are interdependent and responsive to each other. To determine the direction of this interdependence expression (4.8) can be used to calculate the slope of the directors' Nash reaction curve which is as follows:

$$(4.9) \qquad \frac{dQ}{dZ_i} = -\frac{\frac{1}{S'}[-\theta(F_i)_{QZ_i}]}{\frac{\partial MRS_{QX}}{\partial Q} - \frac{1}{S'}[C'' - \theta(F_i)_{QQ}]}$$

Like in the "Portuguese" model, the sign of the slope of the directors' Nash reaction curve in this model also changes according to the type of technical interdependence between the club good and the members' forest management time. For $\frac{\partial MRS_{QX}}{\partial Q} < 0$, increasing marginal costs ($C'' > 0$) and diminishing marginal returns [$(F_i)_{QQ} < 0$] for the club good, from (4.9) we can says this:

- the amount of services Q set by the directors varies positively with the time Z_i each member devotes to forest management if Q and Z_i are technically complementary;

- the opposite happens when Q and Z_i are technically competitive.

The members' Nash equilibrium strategies

Each member faces the following decision problem:

$$(4.10)\quad \underset{X_i,Y_i,Z_i}{Max}\ U_i(X_i,Y_i)$$

$$s.t.\quad pY_i + m \le wH_i + V_i + (1-q)F_i(Z_i,Q,B_i)$$

$$T = X_i + H_i + Z_i \qquad X_i,Y_i,Z_i,Q \ge 0$$

The Kuhn-Tucker conditions for this problem are the following where a_i is the Lagrange multiplier:

$$(4.11)\quad \frac{\partial L_i}{\partial X_i} = \frac{\partial U_i}{\partial X_i} - a_i w \le 0, \quad X_i \ge 0, \quad X_i \frac{\partial L_i}{\partial X_i} = 0$$

$$(4.12)\quad \frac{\partial L_i}{\partial Y_i} = \frac{\partial U_i}{\partial Y_i} - a_i p \le 0, \quad Y_i \ge 0, \quad Y_i \frac{\partial L_i}{\partial Y_i} = 0$$

$$(4.13)\quad \frac{\partial L_i}{\partial Z_i} = -a_i w + a_i (1-q)\frac{\partial F_i}{\partial Z_i} \le 0, \quad Z_i \ge 0, \quad Z_i \frac{\partial L_i}{\partial Z_i} = 0$$

For an interior solution, from these conditions we get:

$$(4.14)\quad MRS_{X_iY_i} = \frac{(1-q)\partial F_i / \partial Z_i}{p}$$

Again, like in the "Portuguese" models, the members' equilibrium strategies don't have a "dominant strategy" feature: in allocating their time to forest management, the members have to take into account the amount of services provided by the association and decided by the board of directors. So by computing the slope of their Nash reaction curves we can determine the sign of this interdependence. This slope has the following expression:

$$(4.15)\quad \frac{dZ_i}{dQ} = -\frac{(F_i)_{Z_iQ}}{(F_i)_{Z_iZ_i}}$$

which leads to the same conclusions as in the "Portuguese" models.

The "Portuguese" model N.º 2 with risk of forest fires

Assumptions

Here we will pick up the second "Portuguese" model and extend it in the following directions:

- there is a risk for the forest owners due to exogenous hazards (forest fires or others);
- forest owners can buy private services from the owners which contribute to reduce the losses resulting from those hazards.

The main focus here is to derive the comparative static results about the demand of these private services by the forest owners.

Assumption 5.1

Each forest owner faces an exogenous risk of loss in his forest production, the probability of loss being p_i. In this case he gets a fraction $a(R_i)$ of his forest production $F_i(Z_i,Q,B_i)$ where:

- F_i is a forest production function with positive first-order partial derivatives and negative second-order own-partial derivatives;

- R_i is the amount of forest private services bought by the forest owners from the association;

- B_i denotes other inputs of forest production supposed to be fixed.

Assumption 5.2

Each member's budget constraint is the following:

(1) $pY_i + m \le wH_i + V_i + \alpha(R_i)F_i(Z_i, Q, B_i)$ in case an exogenous hazard happens

or

$pY_i + m + rR_i \le wH_i + V_i + F_i(Z_i, Q, B_i)$ in the other case

where m is the annual membership fee assumed to be the same for all the members and r is the price of the private services provided by the association.

The directors' equilibrium strategies

The directors' decision problem is the following:

$$(5.1)\quad \underset{X,Y,Q,Z,r}{Max}\ W(X,Y,Q,R)$$
$$s.t.\quad pY \le wH + V$$
$$T = X + H + Z$$
$$C(Q) \le n(Z)m + S(Z) + rR(r) \qquad X, Y, Z, Q \ge 0$$

The Kuhn-Tucker conditions for this problem are the following where λ and β are the Lagrange multipliers:

$$(5.2)\quad \frac{\partial L}{\partial X} = \frac{\partial W}{\partial X} - \lambda w \le 0,\ X \ge 0,\ X\frac{\partial L}{\partial X} = 0$$

$$(5.3)\quad \frac{\partial L}{\partial Y} = \frac{\partial W}{\partial Y} - \lambda p \le 0,\ Y \ge 0,\ Y\frac{\partial L}{\partial Y} = 0$$

$$(5.4)\quad \frac{\partial L}{\partial Q} = \frac{\partial W}{\partial Q} - \beta\frac{\partial C}{\partial Q} \le 0,\ Q \ge 0,\ Q\frac{\partial L}{\partial Q} = 0$$

$$(5.5)\quad \frac{\partial L}{\partial Z} = -\alpha w + \beta m\frac{\partial n}{\partial Z} + \beta\frac{\partial S}{\partial Z} \le 0,\ Z \ge 0,\ Z\frac{\partial L}{\partial Z} = 0$$

$$(5.6)\quad \frac{\partial L}{\partial r} = \frac{\partial W}{\partial R}\frac{\partial R}{\partial r} + \beta\left[R(r) + r\frac{\partial R}{\partial r} - \frac{\partial C}{\partial R}\frac{\partial R}{\partial r}\right] \le 0, \quad r \ge 0, \quad r\frac{\partial L}{\partial r} = 0$$

For an interior solution, from these conditions we get:

$$(5.7)\quad MRS_{QX} = \frac{C'}{mn' + S'}$$

Since the association provides both club and private goods the marginal cost C' depends on the quantity of these private services demanded by the members. So the directors' equilibrium strategies **loose the dominant strategies' feature** they would have if only club goods were provided to the members.

Looking now at the private services' price policy set by the directors we have to work with condition (5.6) to get the following result in the case of an interior solution:

$$\beta\left[R(r)+r\frac{\partial R}{\partial r}-\frac{\partial C}{\partial R}\frac{\partial R}{\partial r}\right]=-\frac{\partial W}{\partial R}\frac{\partial R}{\partial r}\Rightarrow\beta\left[\frac{R(r)}{\frac{\partial R}{\partial r}}+r-\frac{\partial C}{\partial R}\right]=-\frac{\partial W}{\partial R}\Rightarrow$$

(5. 8)

$$\Rightarrow\beta\left\{r\left[\frac{\frac{R(r)}{r}}{\frac{\partial R}{\partial r}}+1\right]-\frac{\partial C}{\partial R}\right\}=-\frac{\partial W}{\partial R}\Rightarrow\beta\left[r\left(1+\frac{1}{\varepsilon_r}\right)-\frac{\partial C}{\partial R}\right]=-\frac{\partial W}{\partial R}$$

where ε_r is the price elasticity of the demand for private services.

Dividing this condition by the one for the club good we get:

$$\text{(5. 9)}\qquad\frac{r\left(1+\frac{1}{\varepsilon_r}\right)-\frac{\partial C}{\partial R}}{-\frac{\partial C}{\partial Q}}=\frac{\frac{\partial W}{\partial R}}{\frac{\partial W}{\partial Q}}\Leftrightarrow\frac{B_R}{B_Q}=MRS_{RQ}$$

where B_i is the marginal benefit of service *i*. What this result shows is that the optimal price for the private services is the one for which the marginal rate at which the directors are willing to substitute the private for the club goods is equal to the ratio of the marginal benefits of these services.

The members' equilibrium strategies

Each member faces the following decision problem:

$$\text{(5. 10)}\qquad\begin{aligned}&\underset{X_i,Y_i,Z_i,R_i}{Max}\ EU_i=\pi U_i\left[\frac{\omega}{p}(T-X_i-Z_i)+\frac{\alpha(R_i)}{p}F_i(Z_i,Q,B_i)-\frac{m}{p}-\frac{w}{p}R_i;X_i\right]+\\&+(1-\pi)U_i\left[\frac{\omega}{p}(T-X_i-Z_i)+\frac{\alpha(R_i)}{p}F_i(Z_i,Q,B_i)-\frac{m}{p}-\frac{w}{p}R_i;X_i\right]\\&s.t.\qquad X_i,Y_i,Z_i,R_i\geq 0\end{aligned}$$

The first order conditions for this problem after simplifications are the following:

$$\text{(5. 11)}\qquad\pi\frac{\partial\alpha}{\partial R_I}F_i(Z_i,Q,B_i)=w$$

$$\text{(5. 12)}\qquad\{1-[1-\alpha(R_i)\pi]\}\frac{\partial F}{\partial Z_i}=\omega$$

$$\text{(5. 13)}\qquad\frac{\frac{\partial U_i}{\partial X_i}}{\frac{\partial U_i}{\partial Y_i}}=\frac{\omega}{p}$$

The first two equations uniquely determine the optimal values of the production endogenous variables: Z_i and R_i. So as usual in consumer-producer models where prices are exogenous to the decision maker, there is **separability** between the production decisions and the consumption and labour supply decisions. Besides separability, there is also **recursivity** in the sense that the production decisions determine the consumption and labour supply decisions but not vice-versa. The first two equations above characterize the production decisions. The third one characterizes the labour supply and the consumption decisions by

the usual condition of equality between the marginal rate of substitution between leisure ant the consumer goods and the real wage rate.

To get the sign of the partial derivatives of the forest owner's demand for private services from the association contributing to reduce the loss due to exogenous hazards we have to differentiate the system of the two equations (5.11) e (5.12) with respect to the variables which are exogenous to the forest owner. Here we will focus on the influence of the price of the private services supplied by the association and set by the board of directors. We get the following system:

$$(5.\ 14)\ \begin{cases} p\dfrac{\partial a^2}{\partial^2 R_i}F_i(.)\dfrac{\partial R_i}{\partial w}+p\dfrac{\partial a}{\partial R_i}\dfrac{\partial F_i}{\partial Z_i}\dfrac{\partial Z_i}{\partial w}=1 \\ p\dfrac{\partial a}{\partial R_i}\dfrac{\partial F_i}{\partial Z_i}\dfrac{\partial R_i}{\partial w}+\{1-[1-a(R_i)p]\}\dfrac{\partial F_i}{\partial Z_i}\dfrac{\partial Z_i}{\partial w}=0 \end{cases}$$

Solving for $\dfrac{\partial R_i}{\partial w}$ we get:

$$(5.\ 15)\ \frac{\partial R_i}{\partial w}=\frac{\{1-[1-a(R_i)p]\}\dfrac{\partial F_i}{\partial Z_i}}{\Delta}<0$$

where Δ is the determinant of the system considered to be negative under the assumption of **decreasing marginal returns to the private services** provided by the association:

$$(5.\ 16)\ \frac{\partial a^2}{\partial^2 R_i}<0$$

From the system above we also get the value for the partial derivative of the labour supplied his forest farm by the forest owner with respect to the price of the private services supplied by the association:

$$(5.\ 17)\frac{\partial Z_i}{\partial w}=\frac{-p\dfrac{\partial a}{\partial R_i}\dfrac{\partial F_i}{\partial Z_i}}{\Delta}>0$$

So under the assumption of this model raising the price of the private services supplied by the association would lower the demand of those services b the forest owners and raise the amount of time they supply to their forest farm.

Testable hypotheses

From these models we derived the following testable hypotheses about the effects the forest owners' organizations may have on the behaviours of the owners:

- **hypothesis 1**: the types of services (private services and/or club goods) provided by the association to the members and the form of financial contributions received from the members (related or unrelated to the amount of services consumed) are relevant for the behaviour of the directors and the members;

- **hypothesis 2**: if the forest owners' association doesn't provide private services to the members the behaviour the directors don't care very much about the effects of the services on the forest management behaviours of the members;

- **hypothesis 3**: the effects of the services provided by the association on the forest management behaviour of the members depend on their relationship with respect to the time they devote to their forest holdings;

- **hypothesis 4**: the demand for private services provide by the forest owners' associations depends negatively on their price and therefore, the board of directors has to take into account this negative price elasticity of demand in setting the price for these services;

- **hypothesis 5**: this price should depend positively on the marginal costs of the services.

Chapter 7

Proposal for a comparative research project

The issues

A large portion of Europe's forest and shrublands, especially in Sub-Atlantic and Mediterranean Europe, is private land, held in fragmented ownership, not actively managed, resulting in underutilization or improper use of these areas with subsequent symptoms such as wildfires and soil degradation. These areas are still increasing due to the current processes of abandonment of marginal agricultural areas.

Lack of management can be explained by the economic and social changes that rural areas have been undergoing namely emigration and the technological changes in the farm and domestic production systems. In the past, there was enough and cheap labour supply in the rural areas to provide for the forest management operations. Also the forest lands were the source of many goods and services (fuelwood, non-wood products, etc.) which were basic inputs in the traditional farm and domestic production systems. So besides the benefits from logging, the forest lands provided a regular flow of benefits, at very low cost for the forest owners.

Nowadays rural labour supply is short and its cost has risen considerably relatively to the benefits of forest management. Also the modern farm and domestic production systems don't need the type of inputs that they used to get regularly from the forest lands in the past. Finally, forest ownership often went through a process of fragmentation, and most of the forest owners emigrated and are living far from their lands.

This situation needs to be studied and modified, as all international initiatives for sustainable forest management will fail if there is no active management.

So the challenge today is how to motivate and organise for active forest management a population of private forest owners often absentee, with fragmented land holdings, in rural areas where labour supply for forest management is short and the benefits from forestry are not regular and multifunctional like in the past, but sparse and subject to risks (wildfires, soil degradation, etc.).

Through field studies this project will investigate the influence in forest owners' behaviours of the following tentative list of factors.

F1-Microeconomic factors: socio-economic characteristics of the forest owners

- age
- existence of a successor
- composition of the forest owner's household
- occupations of the forest owner and his family members
- profitability of forestry and importance of the forest income in the total family income

- place of residence with respect to the location of the forest land holdings

- size and degree of fragmentation of the forest land holdings

- tree species composition of the forest land holdings

- type of ownership: private property, with or without tenancy, common property.

F2-Regional factors

- importance of forestry in the regional economy

- degree of risk of wildfires

- importance of forestry in the culture of the local communities

- existence and performance of forest owners' associations

- existence and performance of forest extension services

- existence and performance of forest industries in the regional economy and their interdependencies with local forestry

- existence and performance of forestry supporting services

- policies of local and regional governments towards forestry

F3-Sectoral factors

- place of forestry in the national economic policies

- programmes financed by national budgets and foreign sources (European Union, World Bank, etc.) to promote afforestation and to protect and improve existing stands;

- structure and trends in markets for timber and non timber forest products;

- forest education and research.

F4-Macroeconomic factors: macroeconomic policies especially with regard to interest rates and taxation.

Since in our study area most of the afforestation, reforestation and improvement of existing stands are being carried with the support of programmes financed by national budgets and foreign sources, this study will focus the attention on this type of factors and examine the role of the other factors mentioned above in the design and implementation of these programmes and their effectiveness in promoting active forest management.

This study will also give a special attention to the role of the forest owners' associations and the forest supporting services in promoting that kind of management.

So with this study we intend to provide contributions to answer the following questions:

a) are the financial incentives lowering the cost of the capital invested in forestry a necessary condition for the active management of private forests, or are they simply a facilitating condition less relevant than the structure and performance of the forest markets or other factors (microeconomic, regional or macroeconomic)?

b) what type of activities should be subsidised and at what level to make forestry attractive to private owners?

c) do the current programmes provide these incentives with the appropriate form and at the appropriate levels?

d) are they actually motivating the forest owners to become actively involved in the management of their forests or do owners apply for grants just because it is "cheap money" with no long run commitment to sustainable forestry?

e) what are and what should be the appropriate sources of funds for these programmes? Regular transfers from national and European budgets, taxes on forestry and forest industries, consignation of other taxes, or something else?

f) are there "government failures" in the implementation of these programmes of what type and for what reasons?

g) what types of forest owners apply for the grants? what are their motivations? is there a new generation of forest owners being helped to emerge with this kind of incentives?

h) are forest owners' associations a necessary or simply a facilitating condition to promote active management in private forests?

i) how do forest owners' associations cope with the free-rider, the agency and the horizon problems?

j) what types of services do they provide and how do they combine the provision of club goods and the provision of private services to their members?

k) what are and what should be their means of financing to ensure stability and development of their activities?

l) what is and what should be the structure of these associations at the local and regional level?

m) are they actually succeeding in motivating private forest owners to become actively involved in the management of their forests and through what means?

Objectives

With the overall goal of defining the conditions for "active multipurpose forest management of underutilized private forest lands" the following objectives are defined:

a) Review past history in countries/or regions where active forest management took/takes place in previously underutilized lands.

b) Define minimal requirements (economical, technical, institutional sociological) for active management to take place.

c) Characterise typical situations where these requirements are not met.

d) Define organizational alternatives for the active management of lands in the context of fragmented ownership.

e) Devise instruments (legal or economic incentives) to allow typical "passive management" situations to be changed into adequate management.

General design, methods and sources of data

Core study and sister studies

The study will have two components:

a) **the core study**;

b) **sister studies**.

The **core study** can be carried out in **North Portugal**. In this region forest land more than 90% of the forest land belong to private owners, the average size of forest land holdings is 3 ha, and there is a recent movement of private forest owner associations whose aim is to promote active forest management.

The **sister studies** will be carried out in other countries where small private forest land ownership is relevant and where there are IEFC affiliates willing to join this project. This project proposal deals only with the core study.

Given the issues and the objectives stated above, the core study will be anchored on the following components:

a) **village studies** in representative areas of the core region to examine the microeconomic behaviours of forest owners toward forestry;

b) **study of the implementation in the region of the forest programmes** financed by the national budget and forest sources since 1981;

c) analysis of the **structure, conduct and performance of the forest owners' associations** existing in the core region.

Village studies

These studies will take care of the F1 factors and most of the F2 factors. Their data sources will be the following:

a) **field surveys**;

b) **applications of the forest owners for public grants**;

c) **other data collected from local and regional institutions and from official statistical sources.**

These surveys will be **concentrated in villages representative** of the different types of socio-economic environments which can be found in the core region forestry. A tentative list of these types of villages which will be straightened up in the first stage of the study is the following:

a) village type V1 (**agricultural village without absentee forest owners**): farming is the major occupation of the local population, forestry is less important than farming, forest lands are owned mostly by local people, there are no communal forests, the village is outside the influence of a major urban area, the population is declining;

b) village type V2 (**agricultural village with absentee forest owners**): farming is the major occupation of the local population, forestry is less important than farming, forest lands are owned mostly by non residents, there are no communal forests, the village is outside the influence of a major urban area, the population is declining:

c) village type V3 (**rural village with active forestry**): farming is the major occupation of the local population but forestry also has an important role in the local economy, forest lands are owned mostly by local people, there are no communal forests, the village is outside the influence of a major urban area, the population is declining;

d) village type V4 (**rural village with communal forests**): farming is the major occupation of the local population but forestry also has an important role in the local economy, most of the forests are communal, the village is outside the influence of a major urban area, the population is declining;

e) village type V5 (**rural village with urban influence and fragmented forests**): farming is active bit it is not the major occupation of the local population, forestry is less important than farming, forest ownership is fragmented, and mostly in the hands of local people, forest lands are spatially scattered, there are no communal forests, the village is under some influence of an urban and industrial area, the population is stable or is growing;

f) village type V6 (**rural village with urban influence and contiguous forest lands**): farming is active but it is not the major occupation of the local population, forestry is less important than farming, forest ownership is fragmented but there large tracts of contiguous forest lands, there are no communal forests, the village is under some influence of an urban and industrial area, the population is stable or is growing;

g) village type V7 (**forestry at the urban fringe**): the village is under strong influence of a major urban area, the population is growing.

These data will have the following treatment:

a) **descriptive village reports** presenting aggregated data at this spatial level and highlighting the regional factors influencing the microeconomic behaviour of the forest owners;

b) a **microeconometric analysis of the individual data** examining the influence of the F1, F2, F3 and F4 factors in the behaviour of the forest owners.

This analysis will use discrete dependent variable models, namely **multinomial logit models** where the dependent variables are the types of forest management practices and the independent variables area from the list of F1, F2, F3 and F4 factors.

Implementation of forest programmes

Through access to the application forms the forest owners filled for public grants, this component of the study do the following:

- collect and present the basic data aggregate about the implementation of the forest programmes in the core region since 1981;

- carry some longitudinal analysis of a sample of these projects to examine, at the microeconomic level, the effectiveness of these programmes;

- examine the types and sources of "government failure".

This component of the project will require desk studies in the agencies in charge of the financing of the programmes as well as a field survey of a sample of forest owners who applied for funds to get longitudinal data about the life story of their projects and the reasons of their success or failure.

Structure, conduct and performance of the forest owners' organizations

Through interviews with the forest owners' associations existing in the core region, this collect data to describe their internal organization, their conduct and their performance, especially with regard to their effectiveness in changing the behaviours of forest owners to a less passive forest management.

This work will be guided by the theoretical models presented in the previous chapter with the testable hypotheses that can be drawn from them.

Project timetable

The project should last 3 years. The indicative timing for the core study is the following:

Year 1

1. Village studies

- Selection of the locations

- Design of the field surveys

- Recruitment and training of the surveyors

- Beginning of the field surveys to collect individual data about the forest owners

- Collection of data from official sources and local and regional institutions about the socio-economic structure and forestry in the villages studied

- First draft of the descriptive village reports based on this institutional data.

2. Implementation of the forest programmes

- Inventory of published and unpublished reports and existing data files about the programmes;

- First draft of the forest programme implementation report based on the treatment of the available reports and published data;

- Beginning of extraction of individual data from the accessible data files;

- Design of the sample and the survey of forest owners who applied for funds.

3. Structure, conduct and performance of the forest owners' associations

- Exhaustive survey, by mail and by phone, of the forest owners associations in North Portugal associated or not with FORESTIS to collect general descriptive data.

- First draft of the report about the forest owners' associations based on the information received by mail or by phone, or available from other sources.

Year 2

1. First Workshop

- one day workshop in North Portugal with about 50 participants, having the following agenda:

- presentation and discussion of the first drafts of the three components of the core study;

- co-ordination of the core study with the sister projects.

2. Village studies

- Conclusion of the field surveys

- Collection of additional data at the village and regional level;

- Codification of the data;

- First microeconometric analysis of the forest owners' behaviours;

- Second draft of the village reports with additional village and regional data and the first results of the microeconometric analysis of the forest owners' behaviours.

3. Implementation of the forest programmes

- Survey of a sample of forest owners who applied for grants to collect longitudinal data about their projects;

- Collection of additional aggregate data about the implementation of the forest programmes;

- Second draft of the forest programme implementation report with additional aggregate data and the first results of the forest owners' survey.

4. Structure, conduct and performance of the forest owners' associations

- Direct interviews and additional data collection about the forest owners' associations more focused on the interactions between the structure, conduct and performance;

- Second draft of the report about the associations including these new data.

Year 3

1. Village studies

- Collection of final complementary data at the village and regional level;

- Conclusion of the microeconometric analysis;

- Final draft of the village reports including not only the final results of the microeconometric analysis and the final complementary data, but also the policy recommendations that can be drawn from this research.

2. Implementation of the forest programmes

- Conclusion of the treatment of the individual longitudinal data;

- Collection of complementary data;

- Final draft of the forest programme implementation report including not only the results of the longitudinal study and complementary aggregate data, but also the policy recommendations that can be drawn from this research.

3. Structure, conduct and performance of the forest owners' associations

- Collection of complementary data and additional direct interviews with the forest owners' associations;

- Final draft of the report about the associations including not only these new data, but also the policy recommendations that can be drawn from this research.

4. Comprehensive report

- Draft of the comprehensive report based on the reports for each of the three components of the project and focused on policy recommendations.

5. Final Workshop

Final workshop in North Portugal open to the interested public with about 150 participants, for presentation and discussion of the final drafts.

References

Alpuim, Margarida; Maria Manuela Carneiro; Maria Augusta Vacas de Carvalho; Maria Eugénia Rocha. 1998. Pinheiro Manso. 1.ª parte - O pinheiro manso e a produção de pinhão. UTAD, Vila Real, 28-29 September. (mimeo)

Banco de Fomento e Exterior. 1996. Plano Estratégico para o Sector Florestal - 1.ª Fase. (unpublished manuscript).

Banco Português de Investimento; Agro-Ges; Jaakko Pöyry. 1996. Proposta para o Desenvolvimento Sustentável da Floresta Portuguesa. Lisbon. (mimeo)

Bergen, V. 2001. Forest Public Goods in National Accounts. Investigación Agraria - Sistemas y Recursos Forestales, Fuera de Serie, N.º 1, pp. 27-42.

Bugalho, João F. F.; Carlos Rio de Carvalho; Rui Alves. 1996. Cinegética, economia e conservação (Um exemplo a partir da região de Castro Verde). Revista Florestal, 9(1), pp. 19-32.

Campos Palacín, Pablo. 1996. Análisis técnico y económico de sistemas de dehesas y de montados. Informe final. Madrid: CSIC/UTL (Lisboa)/SDIT (Badajoz)/UNEX(Cáceres).

Campos Palacín, Pablo. 2000. An agroforestry economic accounting system. Towards the Measurement of Social Income. In Proceedings of the International Symposium on Institutional Aspects of Managerial Economics and Accounting in Forestry, ed. by Hans Jöbstl; Maurizio Merlo & Lorenzo Venzi. 15-18 April, 1998, Roma, Ostia. Viterbo: Stabilimento Tipolitografico Agnesotti. pp. 9-19.

Campos Palacín, P.; Y. Rodríguez; A. Caparrós. 2001. Towards the *dehesa* total income accounting: theory and operative Monfragüe study cases. Investigación Agraria - Sistemas y Recursos Forestales, Fuera de Serie, N.º 1, pp. 43-67.

CESE. 1996. O Sector Florestal Português. [Lisbon]: CESE-Conselho Para a Cooperação Ensino Superior-Empresa. (mimeo).

CESE. 1998. Livro Verde da Cooperação Ensino Superior-Empresa. Sector Florestal. Lisboa: Conselho para a Cooperação Ensino Superior-Empresa.

Costa, Zita. 2002. Instrumentos Financeiros de apoio às organizações florestais: passado e presente. Paper presented at the Seminar "Associativismo e Cooperativismo Florestal" organized by FORESTIS and FENAFLORESTA, Viseu, 24 May 2002.

Dasgupta, P.; B. Kriström; K.-G. Mäler. 1995. Current issues in resource accounting. In P.-O. Johansson, B. Kriström & K.-G. Mäler, Current Issues in Environmental Economics. Manchester: Manchester University Press.

Dias, Rafael Álvaro Reis da. 2001. Os mercados de produtos florestais em Portugal e no Resto do Mundo: Análise econométrica do mercado português de madeira de eucalipto para pasta de papel no período 1970-1999. Master thesis in Economics submitted to the Faculty of Economics of the University of Oporto.

Direcção Geral das Florestas - Divisão de Estudos. 1991. Perfil Florestal - Portugal (mimeo).

Direcção Geral das Florestas. 1998a. Plano de Desenvolvimento Sustentável da Floresta Portuguesa. Base para a Discussão Pública. Lisboa: Direcção Geral das Florestas.

Direcção Geral das Florestas - Divisão de Inventário e Estatísticas Florestais. 1998b. Distribuição da Floresta em Portugal Continental (http://www.dg-florestas.pt/divinven.html)

Direcção Geral das Florestas. 1998c. The Portuguese Forest by Numbers. Lisboa: Direcção Geral das Florestas.

-1998. Relatório Final. Lisbon: Direcção Geral das Florestas.

Direcção Geral de Ordenamento e Gestão Florestal. 1979. Distribuição da Floresta em Portugal Continental, Áreas florestais por concelhos 1978. DGOGF-Estudos e Informação N.º 284. Lisboa: DGOGF.

Droste, R. W.; R. Cabrita; J. H. Brito de Carvalho. 1988. La situation actual de los frutos secos en el Algarve. Orientación para el futuro. Paper presented to the III Congreso Nacional de la SECH, Tenerife.

EUROSTAT. 1999a. The European framework for integrated environmental and economic accounting for forests: Results of pilot applications.

EUROSTAT. 1999b. The European framework for integrated environmental and economic accounting for forests - IEEAF.

EUROSTAT. 2000a. Valuation of european forests- Results of IEEAF test applications.

EUROSTAT. 2000b. Manual of Economic Accounts for Agriculture and Forestry - EAA/EAF 97 (Rev. 1.1). Luxembourg: European Communities.

Fankhauser, Samuel. 1995. Valuing Climate Change. The Economics of the Greenhouse. London: Earthscan.

FAO. 1998. Economic and environmental accounting for forestry: status and current efforts, draft 20/08/98, http://www.fao.org/forestry/fon/fonp/fao-eeac.pdf.

Ferguson, C. E..1969. The Neo-Classical Theory of Production and Distribution. Cambridge: Cambridge University Press.

Heal, G.; B. Kriström. 2001. National income and the environment. In K.-G. Mäler & J. Vincent (eds.), Handbook of Environmental Economics. Amsterdam: North Holland.

Hultkrantz, L. 1991. National accounts of timber and forest environmental resources in Sweden. Environmental and Resource Economics, 2(1), pp. 283-305.

Instituto da Conservação da Natureza; Centro de Micologia da Universidade de Lisboa; Direcção-Geral das Florestas; Direcção-Geral de Fiscalização e Qualidade Alimentar; Universidade de Trás-os-Montes e Alto Douro; Universidade de Évora; Forestis. 2001. Conservação, Valorização e Comercialização de Cogumelos Silvestres. Relatório. (mimeo).

Instituto Nacional da Água. 2000. Planos das bacias hidrográficas dos rios luso-espanhóis - síntese. (mimeo) [referred in the text as INAG].

Instituto Nacional de Estatística. 1947. Estatística Agrícola 1946. Lisboa: Tipografia Portuguesa.

Instituto Nacional de Estatística. 1964. Estimativa do Produto Florestal Bruto do Continente (1938, 1947 a 1963). Estudos N.º 39. Lisboa: Instituto Nacional de Estatística.

Instituto Nacional de Estatística. 1992. Recenseamento Geral Agrícola 1989. Resultados Definitivos. Dados Gerais. Lisboa: Instituto Nacional de Estatística.

Instituto Nacional de Estatística. 1995a. Inquérito à Estrutura das Explorações Agrícolas 1993. Lisboa: Instituto Nacional de Estatística.

Instituto Nacional de Estatística. 1995b. Estatísticas do Comércio Internacional 1994. Lisboa: Instituto Nacional de Estatística.

Instituto Nacional de Estatística. 1995c. Estatísticas Agrícolas 1994. Lisboa: Instituto Nacional de Estatística.

Instituto Nacional de Estatística. 1996. Estatísticas Agrícolas 1995. Lisboa: Instituto Nacional de Estatística.

Instituto Nacional de Estatística. 1997a. A floresta nas explorações agrícolas 1995. Lisbon: Instituto Nacional de Estatística.

Instituto National de Estatística. 1997b. Estatísticas Agrícolas 1996. Lisboa: Instituto Nacional de Estatística.

Instituto Nacional de Estatística. 1998. Estatísticas Agrícolas 1997. Lisbon: Instituto Nacional de Estatística.

Instituto National de Estatística. 2001a. Estatísticas Agrícolas 2000. Lisboa: Instituto Nacional de Estatística.

Instituto National de Estatística. 2001b. A agricultura em números. Lisboa: Instituto Nacional de Estatística.

Instituto National de Estatística. 2002. Contas Económicas da Agricultura 2001. Lisboa: Instituto Nacional de Estatística.

Kriström, B. 2001. Valuing forests. In V. G. Holliwell & P. Raven, Managing Human-Dominated Ecosystems. St. Louis: MGB Press.

Kriström, B.; K. Skanberg. 2001. Monetary forestry accounting including environmental goods and services. Investigación Agraria - Sistemas y Recursos Forestales, Fuera de Serie, N.º 1, pp. 7-26.

Leite, António; Lucílio Martins. 2000a. Recursos florestais. In Florestas de Portugal. Forests of Portugal. Lisboa: Direcção-Geral das Florestas. pp. 139-143.

Leite, António; Lucílio Martins. 2000b. Funções produtivas. In Florestas de Portugal. Forests of Portugal. Lisboa: Direcção-Geral das Florestas. pp. 157-159.

Loureiro, Manuel Castro; José Albiac. 1996. Aplicação da metodologia de valorização contingente para determinação do valor de uso recreativo anual da Reserva Florestal de recreio do Monte Brasil. (mimeo)

Louro, Victor. 1988. Projecto Florestal Português Banco Mundial. Relatório Final de Execução (Referido a 87.12.31). Lisbon: Direcção Geral das Florestas-Direcção de Serviços de Fomento Florestal e Silvopastorícia.

Mariscal, P.; P. Campos. 2001. Demandas sociales, interés de los proprietarios e intervención pública en los espacios naturales: el caso de la dehesa de la comarca de Monfragüe. Madrid: Instituto de Economia y Geografia - CSIC (unpublished).

Mendes, Américo M. S. Carvalho. 1997. Uma sugestão para a regulamentação do fundo financeiro permanente previsto na Lei de Bases da Política Florestal. Forestis, Ano 2, N.º 4, Março, pp. 4-5.

Mendes, Américo M. S. Carvalho. 1998a. Forest Policy in Portugal: main issues at stake. In: Tikkanen, Ilpo; Pajari, Brita (eds.). Future Forest Policies in Europe - Balancing Economic and Ecological Demands, EFI Proceedings N.º 22. Joensuu: European Forest Institute. pp. 351-390.

Mendes, Américo M. S. Carvalho. 1998b. Forest owners' associations as a case of joint production of public goods and private services: a game theoretical approach. In FORESEA Miyazaki 1998. Proceedings of the International Symposium on Global Concerns for Forest Resource Utilization - Sustainable Use and Management, October 5-8, 1998, Seagaia, Miyakaki, Japan. Vol I. Atsushi Yoshimoto & Kiyoshi Yukutake (eds.). Miyazaki: Department of Agricultural & Forest Economics, Myazaki University. pp. 186-196.

Mendes, Américo M. S. Carvalho. 1999a. Portugal. In Forestry in Changing Societies in Europe. Information for teaching module. Study Book. Part II: Country Reports. P. Pelkonen, A. Pitkänen. P. Schmidt, G. Oesten, P. Piussi & E. Rojas (eds.). Joensuu (Finland): University of Joensuu Press. 1999. pp. 295-322.

Mendes, Américo M. S. Carvalho. 1999b. Participation of non-industrial private forest owners in National Forest Programmes: a discrete choice model for Northern Portugal. Paper presented at the EFI Forest Policy Research Forum "The role of National Forest Programs to ensure sustainable forest management", Joensuu, Finland, 14-17 June 1999.

Mendes, Américo M. S. Carvalho. 2000a. O sector florestal português: necessidades de organização colectiva do sector privado e medidas de política pública que é urgente tomar. Keynote speech made at the invitation of the President of Republic at opening of the Round Table on Forest Policy held during the "Open Presidency Week" about the Forest Sector, in the Technological Centre for the Wood Industries, Lordelo, April 3rd.

Mendes, Américo M. S. Carvalho. 2000b. Financiamento do desenvolvimento florestal: é preciso uma reforma estrutural. A Folha-Jornal de Notícias da Floresta, Ano 3, N.º 9, Setembro/Outubro, p. 5.

Mendes, Américo M. S. Carvalho. 2000c. National Forest Programmes and policy planning: An Economic Outlook at the Normative Approaches. In: Glück, Peter; Solano López, José Maria; Rojas-Briales, Eduardo; Schanz, Heiner; Zimmerman, Willi (eds.). COST Action E19. National Forest Programmes. Social and Political Context. Madrid, 18-21 October, 2000. Proceedings. pp. 71-81.

Mendes, Américo M. S. Carvalho. 2001. Forest owners' collective action against the risk of forest fire: a game theoretical approach. In The Economics of Natural Hazards in Forestry, 7-10, June, 2001, CTFC-EFI, Solsona, Catalonia, Spain. IUFRO Division 4. 4.04.02 - Managerial Economics in Forestry, 4.13.00 - Managerial, Social and Environmental Accounting. Padua: Padua University Press. 2001. pp. 137-141.

Mendes, Américo M. S. Carvalho. 2002a. O sector da cortiça em Portugal. Notas económicas sobre o seu passado, presente e futuro. Porto: Universidade Católica Portuguesa - Faculdade de Economia e Gestão (mimeo).

Mendes, Américo M. S. Carvalho. 2002b. The Portuguese Forests. Preliminary draft for a chapter of a collective book on the total economic value of Mediterranean forests in preparation at the MEDFOREX Regional Center of the European Forest Institute, in Solsona.

Mendes, Américo M. S. Carvalho. 2002c. A pessoa, os outros e as coisas. Porto: Faculdade de Economia e Gestão, Universidade Católica Portuguesa (mimeo).

Mendes, Américo M. S. Carvalho & Rafael A. R. da Silva Dias. 2002. Financial Instruments of Forest Policy in Portugal in the 1980s and 1990s. In Financial Instruments of Forest Policy. Andreas Ottitsch, Ilpo Tikkanen & Pere Riera (eds.). EFI Proceedings N.º 42. Joensuu: European Forest Institute. 2002. pp. 95-116.

Ministério da Agricultura, do Desenvolvimento Rural e das Pescas - Gabinete de Planeamento e Política Agro-Alimentar. 1999. Apoios à Agricultura 1998. Lisboa: Ministério da Agricultura, do Desenvolvimento Rural e das Pescas.

Ministério da Agricultura, do Desenvolvimento Rural e das Pescas - Gabinete de Planeamento e Política Agro-Alimentar. 2000. Panorama Agricultura 1999. Lisboa: Ministério da Agricultura, Pescas e Alimentação.

Ministério da Agricultura, do Desenvolvimento Rural e das Pescas - Gabinete de Planeamento e Política Agro-Alimentar. 2001. Contas de Cultura das Actividades Vegetais. 1997. Modelo de Base Microeconómica. Lisboa: Ministério da Agricultura, do Desenvolvimento Rural e das Pescas.

Ministério das Finanças - Gabinete do Ministro. 1999. A Economia Portuguesa. Estabilidade e Crescimento. Lisboa: Ministério das Finanças.

Moreira, Nuno. 1980. Cultura de forragens e pastagens. Vila Real: Instituto Universitário de Trás-os-Montes e Alto Douro.

Natividade, J. Vieira. 1950. Subericultura. Lisboa: Imprensa Nacional.

Nordhaus, W. D.; E. C. Kokkelenberg. 1999. Nature's numbers: expanding the national economic accounts to include the environment. Washington D. C.: National Academy Press.

Nunes, Jorge. 2000. Cogumelos: um património a preservar. _____. Setembro. pp. 22-26.

Rocha, João; Orlando Botelho; Teresa Maló; Noémia Nunes; Clotilde Monteiro. 1986. A floresta e a erosão do solo. Comunicações - 1.º Congresso Florestal Nacional, Fundação Calouste Gulbenkian, Lisboa, 2 a 6 de Dezembro de 1986. pp. 374-378.

Roper, C. S.; A. Park (eds.). 1999. The living forest: non-market benefits of forestry. London: Forestry Commission.

Santos, José Manuel Lima. 1992. Mercado, economias e ecossistemas no Alto Barroso. Montalegre: Câmara Municipal de Montalegre.

Santos, José Manuel Lima. 1997. Valuation and cost-benefit analysis of multi-attribute environmental changes. Upland agricultural landscapes in England and Portugal. Thesis submitted in fulfillment of the degree of Doctor of Philosophy. Department of Town and Country Planning, University of Newcastle upon Tyne (mimeo).

Third Ministerial Conference on the Protection of Forests in Europe. 1998. Follow-up Reports on the Ministerial Conferences on the Protection of Forests in Europe. Vol. II. Sustainable Forest Management in Europe. Special Report on the Follow-up on the implementation of Resolutions H1 and H2 of the Helsinki Ministerial Conference. Lisbon: Ministry of Agriculture, Rural Development and Fisheries [referred in the text as MCFPFE].

Torrel, L. A.; N. R. Rimbey; J. A. Tanaka; S. A. Bailey. 2001. The Lack of Profit Motive for Ranching: Implications for Policy Analysis. In L. A. Torrel, E. T. Bartlett & R. Larrañaga (eds.), Current Issues in Rangeland Resource Economics. New Mexico State University. pp. 47-58.

Vincent, J. 1999a. Net accumulation of timber reserves. The Review of Income and Wealth, 45, pp. 251-262.

Vincent, J. 1999b. A framework for forest accounting. Forest Science, 45(4), pp. 552-561.

Vincent, J.; M. Hartwick. 1997. Forest resources and the national income accounts: concepts and experience. Rome: FAO.

Weitzman, M. L.; K.-G. Löfgren. 1997. On the welfare significance of green accounting as taught by Parable. Journal of Environmental Economics and Management, 32(2), pp. 139-153.

Wibe, S. 1994. Non-wood benefits in forestry - survey of valuation studies. Working paper 199, Department of Forest Economics, SLU-Umea, Sweden.

Wolf, Jr., Charles. 1993. Markets or Governments. Choosing between Imperfect Alternatives. Cambridge, MA: The MIT Press.

United Nations Economic Commission for Europe & FAO. 2000. Forest Resources of Europe, CIS, North America, Australia, Japan and New Zealand (Industrialized temperate/boreal countries). UN-ECE/FAO Contribution for the Global Forest Resources Assessment 2000. Main Report. Geneva Timber and Forest Study Papers, N.º 17. Geneva and New York: United Nations [referred in the text as TBFRA-2000]