KOSOVO FOREST INVENTORY PROJECT 2002-2003

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ABSTRACT

Following the 1999 war, returning foresters compiled available information on forest resources in Kosovo. These data stemmed from the period before and during first half of 1990. The total forest area was estimated at about 430, 000 ha, or approximately 40% of the total land area. Of this area, low forest originating from stool-shoots (coppice) constituted the major part, covering more than 60%. High forest was estimated at about 25%. The growing stock in high forest was estimated at about 17 – 18 million m³, and total standing volume at approximately 30 million m³ for all types of forests, 62% of all forest was considered state owned, while the remaining 38% was classified as private or community owned. By the Kosovo Forest Agency, the annual allowable cut was initially estimated at 70, 000 m³ from coppice forests.

The previous assessments were carried out by the state forest company Serbia Forest. Since available information was scarce and referred to the situation before the conflict, validation of the data with regard to the present situation could only be done through a new Kosovo – wide forest inventory. Previous assessments were also mainly focusing on State forest, while inventory results from private forests have been negligible or non – existing. In this way, e new Kosova – wide inventory would be the first one ever or for a very long time that assessed and compiled the data from public and private forests, using the same methodology. Previous assessments were based on the aggregation of data from stand – wise management plans. The new NFI project has been based on a different concept, namely the systematic sample plot inventory. The main objective is to promote a sustainable forest management by assessing the total forest resources and the annual sustainable harvest level.

The project was started in February 2002 and finalized in December 2003. After a short test period in the autumn of 2002, the major part of the fieldwork took place from March – November 2003

Key word: INSPPIRE, NSDI, GIS portal, Forest Inventory

1. INTRODUCTION

Forest information in Kosovo has existed before and during 1990s, since then all the plans have been described only for the public properties. After the year 1999, one of the urgent identified actions has been the verification of the data and reinstallment of the capacities of the leading measurement of the forest resources in entire Kosovo. This kind of information is crucial for different strategic decisions in an environment, the sector of forest policies and for monitoring and managing forests. Considering this as an

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immediate need, the government of Norway has accepted to finance the forest resources measurement together with the main objective of the building forest information system in Kosovo.
Specified objectives of the project have been reviewing of existing forest system and ensuring compatibility with international definitions, calculation of the area and the volume in feet according to the determined classes and property category as well as building capable organization to lead national stocktaking of the forests. Existing orthophotos and cartographic maps are used for initial classification of the surfaces. The aim of the previous classification was identifying forest areas that require measures and creation of orientation maps. Another issue was to make possible previous classification of the land usage class and a rapid classification of the forests and other forest areas in a limited number of classes. All forest areas classified as" forests" or as ''Other Forest Areas'' should have been visited in the terrain for detailed measures and classifications. Since the beginning it was expected that it would be impossible for all the areas to be visited, thus the interpretation of the aerial photographs of the non visited areas makes possible calculations according to the classes of the total used area of Kosovo, as well as securing test areas in the specific type of forest which would increase the evaluation of the volume expansion for the non visited areas of the terrain.

2. PROJECT OBJECTIVES

With the support of FAO for the forest sector in Kosovo and from a study done by the Norwegian Foresters Group (NFG), installing measurement capacities and forest resources monitoring in Kosovo level. .
These two elements have included: The interpretation and classification of the area from photogrametry in general, accompanied with the system of forest monitoring, building the net of the permanent test areas in the line of National Forest Stocktaking.

Detailed measurements of the terrain for gathering information of the terrain specifications utilized for the managing operative plans.
The main objective of the project has been building the forest information system in Kosovo level for the Kosovo forest resources. Main objectives are:

- Relevant training for staff
- Creating a new capable structure to lead National Stocktaking of forests including results monitoring and presentation
- Review of the existing system of classification as to the system of classification of the region countries compatible with the international definitions (UN-ECE/FAO);
- The calculation of the area according to the determined classes and category of the property;
- The calculation of volume for 1 acre and the total for the property categories and the determined classes;
- The calculation of the main part and position of the wastelands and degraded land that after the investments could convert to plantations

- The potential for cutting the existing forest in the future as well as investing for the rehabilitation of the forestry ;

Indirectly the sector of forests, including the forest owners, the government and the industry of wood processing, will benefit from the possession of the more accurate information of planning and decision taking. Except this, the project objective is the contribution in the sustainable development of the forest resources and economy in general.

2.1 **Existing data for the forests**

In the terms of forest land, some autochthonal species of leaves dominate, European beech (Fagus Silvatica) is broadly expanded and it has a considering economic importance. European silver fir (Abies Alba), European spruce (Picea Abies) and The scots pine (Pinus Silvestris) are conifer species grown in a natural way in great elevation. European Black Pine/Austrian Pine (Pinus Nigra) is an important species that is dominant in low altitudes.
After the 1999 war, foresters have gained available information of forest resources. This information dates from the early period and during the first half year of 1990. The total forest area was approximately 430 000 ha, or circa 40% of the total area. In this area, low regenerated forests cover the vast part or more than 60% of the total forest area. High forests are estimated to be 25%. The volume of the forests in cubic meters in the woods has been estimated to be 17-18 million m^3 and the total volume in cubic meters approximately 30 million m^3 for all kinds of forests. 62% of the total forests is considered to be as public property, while the remaining 38% is classified as private property forests. Kosovo Forest Agency (KFA) allows 70 000 m^3 of the public high forests to be cut and 130 000 m^3 from low forests.

2.2 Compiling of the existing information, barriers in the usage of information

The project has ensured seven sets of equipment for the stocktaking form the Swedish supplier Skogma AB (the project was selected for the GPS). The digjital aerial photos (2D) and topographic maps are basic data used for the classification of the area. The project has obtained the aerial photos form Kosovo Cadastral Agency (KCA) which covers approximately 80% of the total area. This was developed from aerial photos with a resolution of the terrain 40cm taken during 2000 and 2001. Each photo covers an area of $1km^2$. Digital orthophotos were form the Gauss-Krüger system used in former Yugoslavia. The copies of topographic maps of the scale 1:25,000 (Dy sets) consisting of 100 seperate maps. These maps were produced in former Yugoslavia in the 1970s. The Eastern EU, satelite center fpr Kosovo offers geo-cod digital geographic information in there bands which offer analyse and visualisation of Kosovo in the variable scale from 1:1 000 000 till 1:5 000. The civil defence directorate has offered digjital data provided by UN mine action coordination centre. Some areas have been identified as dangerous areas as for unidentified mines and explosive.
Kosovo Forest Agency has enabled forests maps of scale 1:50 000 in the managing

forest plans. Maps offer information for the forests classes, the quality of location, and other publik forests. A vast majorit of the maps are invalid. For instance in the forbidden flying area along the Serbia border in the northeast and northwest, for which orthophotos are missing (20% of the total area), and the images taken from India satelite IRS LISS were tested but they were useless due to the small resolution.
Eighty-seven areas interpreted as forests and forest land have been classified in forests during work in the terrain. We can clearly see that there is an existing reasonable state in terms of comparing covering information about forests in the old topographic maps and current situation. This shows that usage of the land has been relatively konstant during the period. Orthophotos are aplicable for the period 6-8 years, However their usage has been limited only for the project.

3 THE STOCKTAKING RESULTS

The distribution of forest area according to the origin, species classes, their age and the handling possibility. The project has estimated the total forest area 464 800 (ha), which is approximately 35 000 ha bigger than the previous. The reason for this deviation might be different factors used during the classification of the land as the transformation of the arable land into forest land. Stocktaking has also classified 28 200 ha as other forest land. This category or other similar categories have not been used in the other stocktaking in Kosovo. Wasteland on the other hand some which may be suitable for forestry consist of 23400 ha. Pastures are the other classes which cover 153 200ha. Some of the area has been eroded as a result they have only a thin soil layer. Despite to their poor quality, some of these areas might be suitable for forestry or other ways of usage.

Table 1. The total area of Kosovo in accordance with the usage classes

Area usage	**Area (ha)**
Forest land	464 800
Other foerts land	28 200
Wasteland	23 400
Agricultural land	342 400
Pastures and meadows	153 200
Urban areas and buildings	40 000
Water	4 600
Unclassified	41 600
Total	**1 098 200**

The total area corresponds approximately same with the existing official figures. This is an excuse that the system is distributed in a good way. According to the above chart out of the overall area 464 800 ha, 278 880 ha or 60% has been classified as publik forest land. The rest 40% (185 920 ha) is a private property. These figures differ from the old statistical data and the cadastral data.

Data source		Public forets	Private forest	Total
Old statistics		266 000	162 000	428 000
Cadastral data 2004		196 000	198 000	394 000
Stocktaking data:	Visited area	202 800	176 400	379 200
	Non visited area	76 080	9 520	85 600
	Total	278 880	185 920	464 800

The figures from the cadastral data (198 000) are much higher than the old statistical data from 162 000 ha, and therefore should be checked. Taking into consideration the distributing result of the test area which they show a total area of 176 400 ha as private forest property of the total forest of 464 800 ha where we have the expansion of 40% private forest land and 60% public forest land, the total area of private forest land has been estimated of 185 920 ha and public forest property of 278 880 ha. All this is a consequence of 88% of the non visited area in the terrain which is in public property. The vast area of non visited land is the mined area in North Mitrovica in the border area where it is impossible to penetrate. This fact supports the assumption that the non visited area is a public property.

Table 2. Forest area according to the origin and property class (ha).

The pile origin	**Public**	**Private**	**Total**
Without trees	22 200	10 000	32 200
Natural seeding	89 200	82 000	171 200
Forestry or artificial seeding	1 800	400	2 200
Stumps, forestry	17 600	19 000	36 600
Stumpy area	62 000	53 800	115 800
Stumps	10 000	11 200	21 200
Total forestlands surveyed	202 800	176 400	379 200
Non visited Forest area (no information)	76 080	9 520	85 600

Total forest area visited and non visited	**278 880**	**185 920**	**464 800**
Total area in percentage	60	40	(100)

Comments:

- 32 200 ha is classified as „woodless". This area may include a high productivity forests, suitable for artificial regeneration;
- 171 200 ha is a forest created through natural seeds and therefore classified as a high wood with >16 m;
- 115 800 ha is classified as stumpy forest. The main area is in the central part of Kosovo;
- Stumpy forest with standards are low forests, however there are with high woods (21 200 ha);
- Only 2 200 ha is registered as forested wood are. This figure does not correspond well to the forested data, that show a total forested area between 15 000 – 20 000 ha. Some forested woods might be registered under the class "Mixed stumpy area/seedy or forested'', nevertheless it is clear that a vast forested area is missing.

The majority of public forests is situated in the elevation between 600-800 m.
Table 3 shows the public forestry area according to its origin and elevation.

Table 3. Public forest area according to its origin and elevation (ha)

Pile origin	**Elevation**								No records	TOTAL
	200-400	400-600	600-800	800-1000	1000-1200	1200-1400	1400-1600	>1600		
Without trees	400	6 000	9 800	4 400	800	600	200			22 200
Natural seeding	1 400	4 400	16 800	22 600	10 200	13 000	9 400	11 400		89 200
Forestry or artificial seeding		1 600				200				1 800
	200	4 000	3 000	2 000	4 800	2 000	1 000	600		17 600

Stumps	800	7 600	21400	25000	2 800	2 600	1 400	400		62 000
Cungishte me standarde			3 000	5 000	2 000					10 000
No information									76 080	76 080
Total	**2 800**	**23 600**	**54 000**	**59 000**	**20 600**	**18 400**	**12 000**	**12 400**	**76 080**	**278 880**
Total area in percent	1	8	19	22	8	7	4	4	27	100

Comments:

- Classified area as "without trees" is expanded in low altitudes. It may be assumed that this area is more possible to be penetrated and this is the reason that it has been a subject of many illegal cutting
- More than 60% of the piles created by natural regeneration are expanded in the altitude between 600 – 1 000 meters. These forests in many cases have a good growth , have high quality and are used for technical logs;
- 50% of the total forest area is expanded in the altitude lower than 1 000 m;
- Non visited area is classified through the photo interpretation. The kinds of trees have been classified as leafy unclassified (see table 4).

Public forests in general are expanded in a higher altitude comparing to private forests that are expanded in lower altitudes.

Table 4 represents the distribution according to origin and elevation in private forests

Table 4. Private forest area according to the origin and elevation (ha)

Pile origin	**Elevation**								No records	TOTAL
	200-400	400-600	600-800	800-1000	1000-1200	1200-1400	1400-1600	>1600		
Without trees	1 000	3 000	5 000	800		200				9 000
Natural seeding	800	5 200	41 400	23 400	6 000	2 400	2 200	600		82 000

Forestation or artificial seeding				400						400
Stumps, seeding or forestry (mixed)	1 000	10 400	2 800	3 400	800	200	400			19 000
Stumps	5 000	10 200	22 000	13 600	1 800	1 000	200			53 800
Standard stumps		600	3 000	5 600	1 200	800				11 200
No records									9 520	9 520
Total	**7 800**	**29 400**	**74 200**	**47 200**	**9 800**	**4 600**	**2 800**	**600**	**9 520**	**185 920**
The percentage of total area	4	16	40	26	5	3	1	-	5	100

Comments:

- Stumpy forests and piles created by natural seeding dominate
- There is only a small forestation area, this is justified through forestation programmes which have been concentrated in the public forest lands;
- A small part of stumpy forest with standards is higher than the public forests. This shows us that management of private forests is better than the management of public forests thus unlike public forests, private forests are not aimed to be cut
- 86% of private forests is expanded in the elevation lower than 1 000 m.

Table 5. Public forest area according to species classes and forest structures (ha)

Class of species	**Forest structures**				No records	Total
	Under regeneration	Annual	high trees	Annually duration		
Without woods	1 600	400				2 000 (1%)

Coniferous		5 000	1 400	8 400		14 800 (5%)
Leafy	2 600	117 400	11 200	52 800		184 000 (66%)
Mix		200		1 800		2 000 (1%)
No information					76 080	76 080 (27%)
Total	**4 200**	**123 000**	**12 600**	**63 000**	**76 080**	**278 880**

Table 5 shows public forests according to the classes of species and the structure of the forests. Coniferous forests include pine and fir tree while leafy forests are dominated by the leaves and the types of beech.

Comments:

- Leafy forests cover (defined and undefined) more than 90 % of the forest area.
- Leafy forests cover more than 90% of the forest area
- 5% is defined as coniferous forest. These forests mainly are expanded in the west of Kosovo
- A considerate area of the forest has been classified as annual duration forest or taller woods.
- More 50% of annual duration is coniferous forests.

4. CONCLUSIONS

The main conclusions elicited across the project course are:

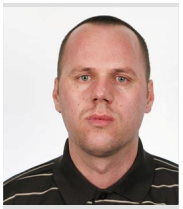
- 379 200 ha is classified as forest area through the interpretation of the aerial photography and terrain studies. 85 600 ha has been classified as forested area through interpretation of aerial photography, but they have not been visited due to the mine areas and their logistics difficulties. The total area which was calculated from the visited area and non visited area there have been 278 880 ha of public forests and 185 9920 ha private forests. This total area of (464 800 ha) is bigger (6-8%) than the earlier measures;
- Leafy forests created form natural seeds cover more than 90%. Dominant species of the leafy forests are Beeches and Oak trees. Coniferious forests cover 7% of the total forest area and are dominated by Abies alba, Picea abies and Pinus sp.;

- The total volume in m³ in the public forests is estimated approximately 33.5 million $m^{3.}$ Out of this volume 25.9 m^3 is wood with a diameter of >7 cm. In the private forests the total volume in m^3 is estimated to be approximately 19.5 million m^3 out of which 14.5 million m^3 is wood with a diameter of >7 cm;
- Annual growth of the woods in the visited area and the woods with a diameter >7 cm, is estimated to be 1.165 million m^3. None visited forest areas 85 600 ha are expanded in the locations near mined and inaccessible areas so it has been foreseen that these areas should not be included in the area that could be used.
- Based on the actual status of the forests, the annual possibility of the usage has been estimated 900 000 m^3 that corresponds to 77% of the growth of the forest in the visited areas. Circa 700 000 m^3 can be cut in high forests (> 16 m) and approximately 200 000 m^3 in low forests. These calculations are in gross thus they include the peak of the trees, tree branches and thickness. To achieve this utility of volume requires modification in the management and so far usage.
- 40% of public forest area and 29% of private forest area are subjected to illegal uncontrolled cutting although with all standards these figures are very high. The situation is very critical in the coniferous forests where the overall existing surface will be in risk if immediate actions are not taken. Stocktaking results also confirm the expert's opinion that the stumpy forests especially public forests are exposed to cutting.

5. REFERENCES

Kosovo Forest Agency (2010), Forest stocktaking 2002/2003; Pristine, Kosovo

6. BIOGRAPHICAL NOTES OF THE AUTHORS



Mr. Ferim Gashi holds a MSc in European Spatial Planning and Regional Development (Blekinge Institute of Technology, Sweden). He is Acting Director of the Coordinating Acting Director of the Coordination Directorate at the Kosovo Forest Agency in Prishtina, Kosovo (www. http://www.ks-gov.net/mbpzhr/).

Kosovo Forest Agency is responsible for matters related to forests and forest land, public land forests administration and management as well as National Parks in Kosovo except those issues which in a special way, law determines other authority than the Government. Mr Ferim Gashi is responsible for executing general policies of development and strategic intentions on the sustainable management basis of the wood and non wood resources and wild fauna in the level of the KFA office. Coordinating activities and plan supervision and maintenance of the infrastructure, equipment, tools

and objects for the efficient protection of forest resources from fire, illnesses and forest deleterious.

Presently Mr. Ferim Gashi has enrolled a PhD at the University of Tirana in Albania with the research theme "GIS role in Spatial and Urban Planning, development challenges that directly impact in Spatial Planning."