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RECONSTRUCTİON OF THE FOREST ROAD NETWORK MODEL WİTH LİNEER FUZZY MODELLİNG IN THE CONVERSION OF THE COPPICE COMPANIES TO HIGH FOREST ENTERPRISES

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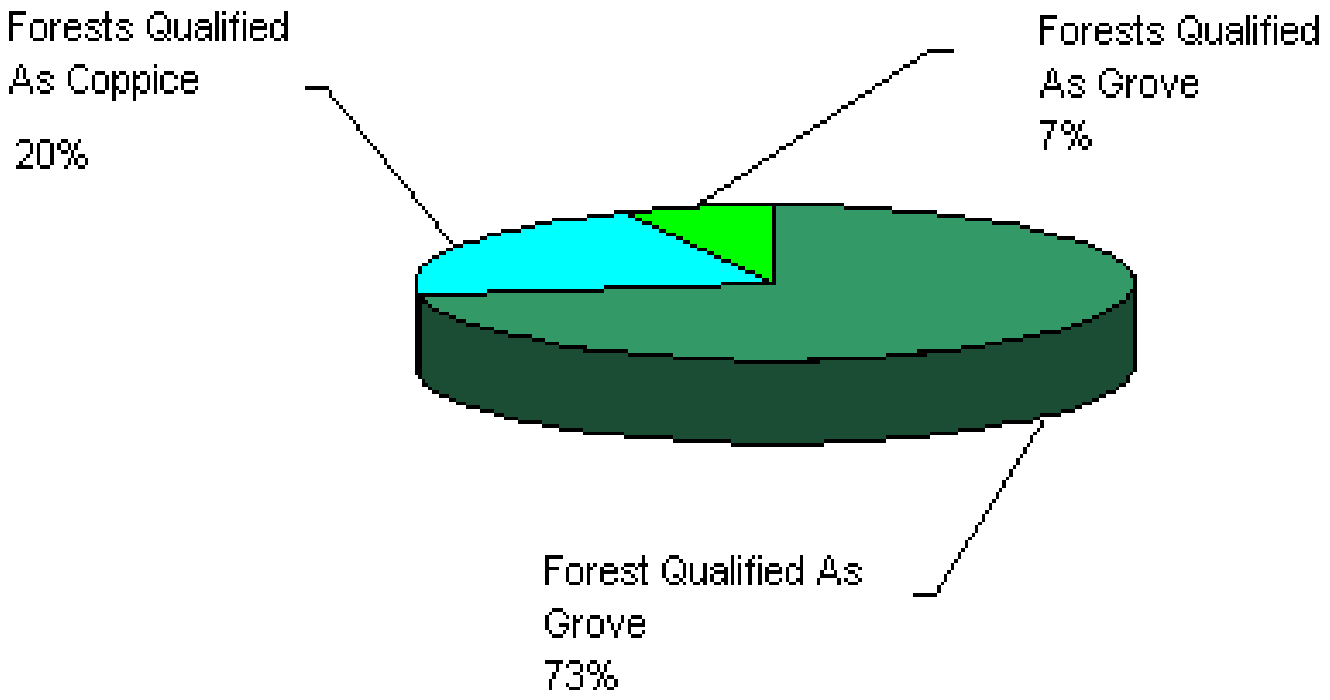
Introduction

In our country, forestry activities are carried out over forest land which is about 21.2 million hectare. Operating such large, scattered and mainly mountainous forest areas requires a good road network. 5.7 million hectare of this forested area is covered by coppice forests caused by offshoot. 1.7 million hectare of the forested area is productive coppice forest and 4 million hectare consists of unproductive coppice. 625 thousand hectare unproductive coppice area has been turned to productive coppice to create energy forest since 1978.

Figure 1. General Forest Forms and Rates



Forest Roads

Forest roads are high-cost infrastructures. They make up one of the most important infrastructures in forestry activities; however their construction and maintenance costs are relatively high, too. Approximately TL 50 million is spent each year on works of art on the forest roads, construction and maintenance. This amount covers as much as 20 – 25 % of the annual budget of General Directorate of Forestry.

In recent years, 1000 km/year forest road construction and 1000 km/year forest road major maintenance was planned (OÖİKR, 2001). When the total amount of targeted forest roads in our country is reached, the road density in forests with over 250 m^3/ha asset will be 20 m/ha. However, the road density per ha is expected to be more when the conversion of coppice companies to high forest enterprises have been achieved. Considering the state of forest road construction in recent years, it can be said that about 50000 km forest road construction is required in the coming years to achieve the desired road length.

As of 2010, the total length of forest roads reached 163072 km. 143005 of this total is production route; 17474 km fire emergency path; 832 km watchtower path; and 1761 km store path. 77.6 % of the planned forest roads have already been completed. Relating to the degree of compliance of forest roads with existing standards, it has been reported that 9 % of the roads is poor, 25 % good, and 66 % moderate (OGM, 2010). The upper structure of about 17 % of the forest roads in our country has been completed (Acar and Eker, 2001). Almost all of the remaining forest roads are earth road (dirt road). Besides, national parks, recreation areas, and some rural roads have asphalt pavement.

Forest roads combine to make up forest road network and road system. Primary and secondary interconnected roads, such as stream paths, hillside roads and link roads, appropriate for transporting any product obtained from forests, implementing forestry activities and realizing the multi-faceted benefits, are all called forest road network (OGM, 2008). Forests should have roads of enough length and density so that forest products can be transported (skidding, transportation, etc.) to forest roadside from cutting area and then to main stores with minimum cost.

Material and Method

The study area was limited to Yaylacık Forestry Planning Unit of Tokat Forestry Management Department, situated within the boundaries of Amasya Regional Directorate of Forestry

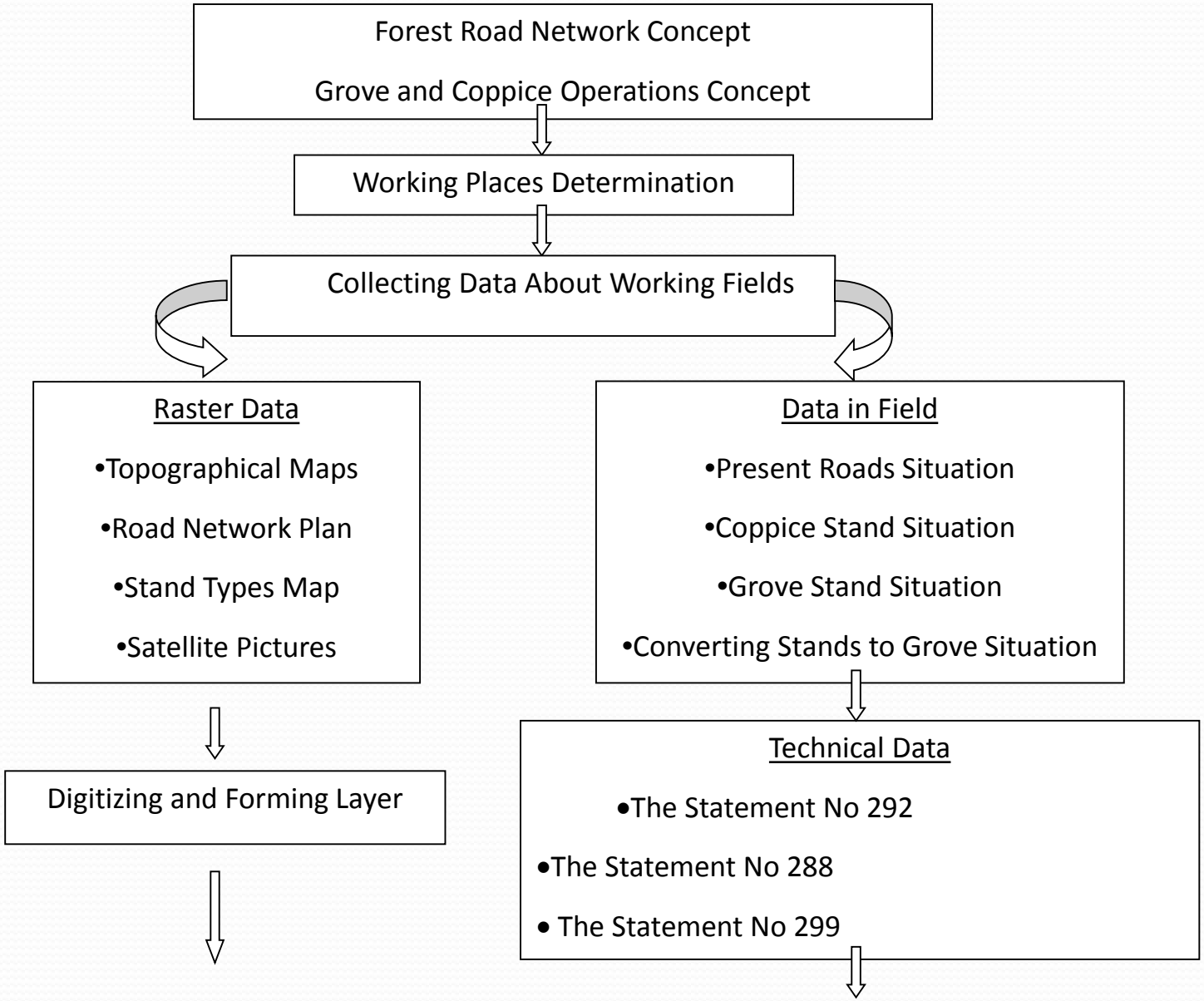
Table 1. Yaylacık Forestry Unit Area Distribution Table

Normal Forest Area	**11573,5 ha**
Degraded Forest Area	8799,5 ha
Forested Area	20373,5 ha
Non-forested Area	15435,0 ha
Total Area	**35808,5 ha**

The study area consists of several tree species such as larch, pine, birch, juniper, beech, poplar and oak. Completed in 1992, the new road network project was planned multifaceted to make every kind of forestry activities possible. The 1992 planning included 322+4 km of road. 158+8 km of the total was existing roads. 163+6 km was planned as new construction.

Today, the available plan for the study area is still the 1992 forest road network plan. According to this forest roads network plan, a total of 756 km road was schemed. 322+4 km of the total was forest road, 135+0 rural road, and 3+0 motorway. Of the planned total road, 420+650 km forest road, 42+250 km rural road and 66+550 km motorway was expected to pass through the forested area. The road density was determined to be 15.6 m/h

Figure 2. The Flow Cart of Forest Road Network Planning Model Applied for Converting Coppice to Grove



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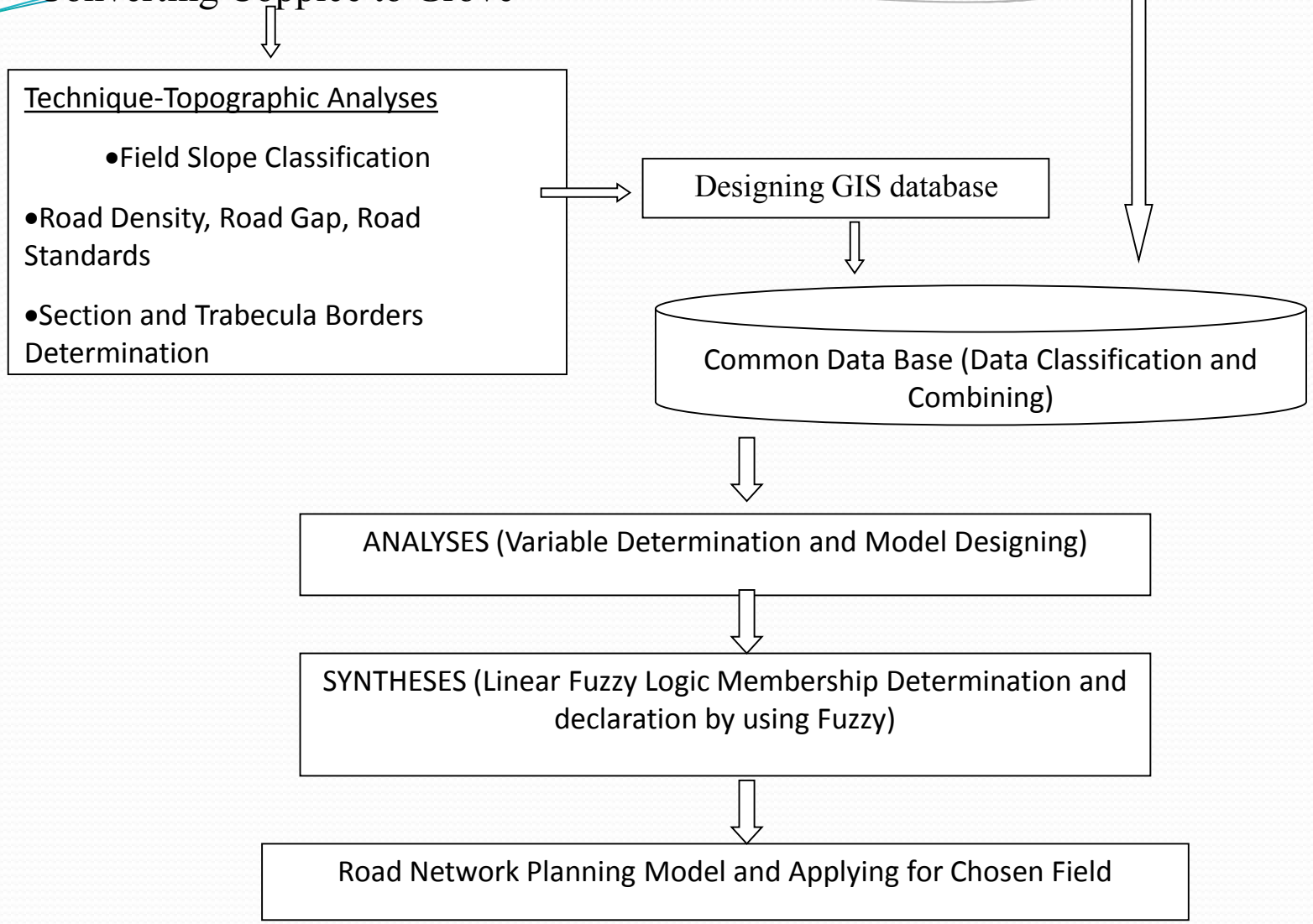

Establishment of Optimal Forest Road Network Plan

After the road network plan and the current situation was incorporated into the map, low and high road slope values, reverse slopes, various road density values, the areas opened to management and the technical details in existing and planned roads were presented. After the existing forest road network plan and completed forest roads were studied technically and with respect to forest transportation, a nearly 100 % conversion rate was targeted (20 m/ha optimum road density and 500 m optimum road spacing). With this aim, apart from the existing forest road network, the optimal forest road network plan was established by giving new road codes.

Results and Discussion

An optimal road network map was created considering the assessments in the field and the studies carried out in GIS medium (figure 2). The current forest road network in this forest road network plan having a total of 332 km road was evaluated and an additional 90 km road was planned. As a result of this, the management rate was increased to 88 %. 390 km of the existing and planned roads go through the forest. Accordingly, the nominal road density and the overall road density were found 20.71 m/ha and 12.34 m/ha respectively (Table 10). Consequently, the forest road density was increased to 20.71 m/ha with the optimal forest road network plan. As a result, this met the 20 m/ha forest road density rate, which is the criterion for forest road density in our country.

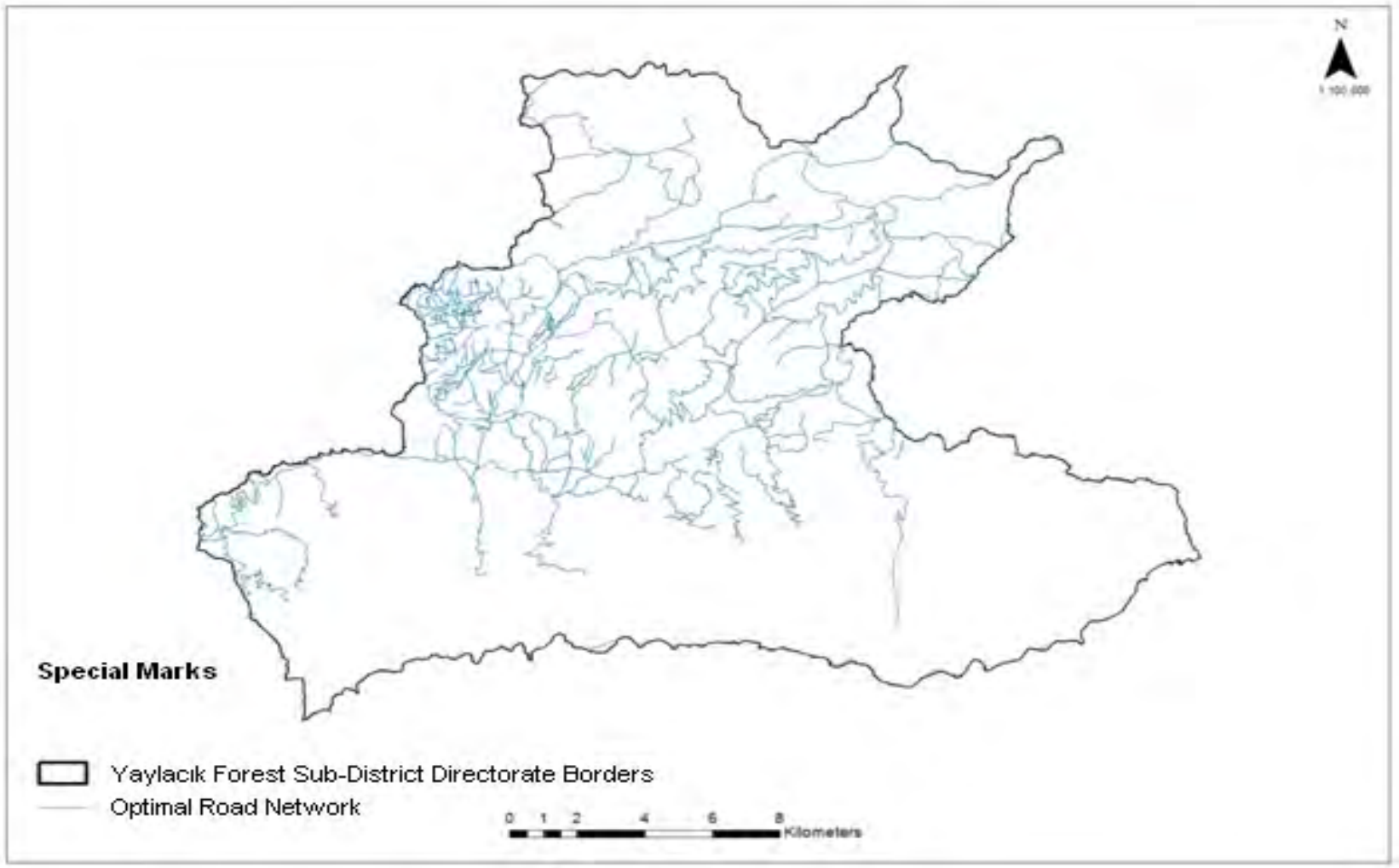

Figure . The Optimal Road Network Plan of Yaylacık Forestry Unit

Conclusions

As a result of the study, it was determined that there were totally 52 forest roads in the study area, including the existing and planned ones. It was also found that all of these roads were in class B type forest road standards. The existing forest road network in Yaylacık Forestry Unit is 332 km, and an additional 90 km road was planned.

An optimal road network map was created by considering the field assessments and GIS studies. The existing 332 km road network in this network plan was assessed and an additional 90 km road was planned. As a result of this, the management rate was increased to 88 %. 390 km of the existing and planned roads go through the forest. Accordingly, the nominal road density and the overall road density were determined to be 20.71 m/ha and 12.34 m/ha respectively.

THANK YOU FOR YOUR ATTENTION