LAND RESOURCE MAPPING USING MULTI-SOURCE DATA FOR MOUNTAINOUS AND FORESTRY AREAS.

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ABSTRACT:

In Norway the land area consists of approximately 44 percent mountain and 38 percent forest. Land resource and land use inventories of Norway's extensive rangeland and wilderness areas are important for developing appropriate management strategies and thus improving the profitability of enterprises based on the use of these areas. Today we have large areas where we have a gap in the land resource map. The gap areas are the mountainous area, above the forest limit. In the forest area we have maps that show the production capability and the type of forest that can grow. What we need is present situation of forest resources.

Technological development

The technological development has now made it possible to survey the missing areas in an economically justifiable way. The developments with the computer capacity, the software possibility and the availability of satellite images over the past few years makes it possible to produce resource maps in a almost automatically way.

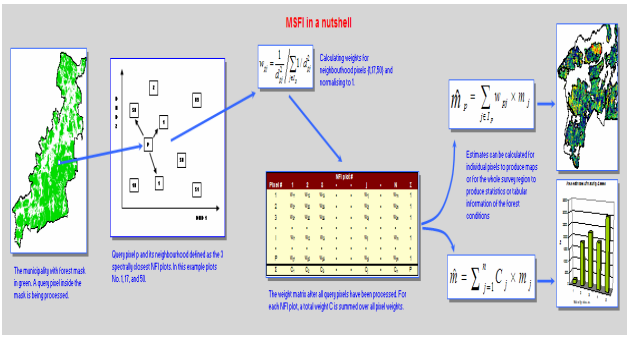
The Norwegian Forest and Landscape Institute is the national centre of expertise on land-based resources. To bring the unmapped areas into the land cover has high priority and is of great importance.

We want to use our existing data from the areas in the most effective way. Norway has the world oldest national forest inventory (NFI). The inventory started in 1919. Information from the NFI plots is used to classify the satellite image. In the mountainous areas we use very qualified interpreters to classify testing segments. All the existing or interpret data is needed to get the necessary accuracy to the maps.

SatForest map

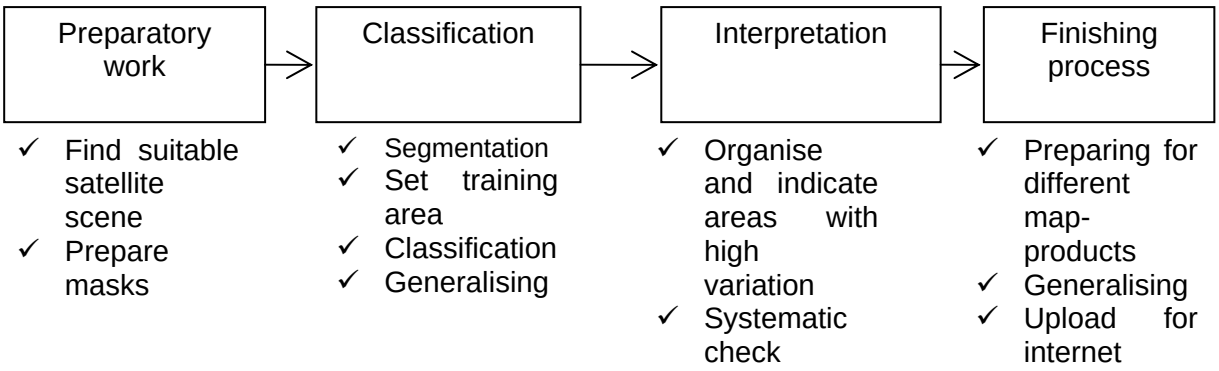
One of our products in forest areas is called SatForest map. The method uses NFI plot data together with remote sensed images and other ancillary datasets such as digital elevation models (DTM) and map of general land cover classes.

The national forest inventory (NFI) in Norway is based on a 3 km by 3 km network of permanent sample plots and supplemental temporary plots. Each year 1/5 of the permanent plots are visited, and in 5 years all permanent plots are measured. Each NFI plots is defined as a circle with a 250 m² area, and several forest variables are measured and calculated (e.g. tree species, age, volume) for each plot. The NFI delivers statistical reports for counties every 15 year and for the whole country each year. The system has limitations and is neither able to produce reliable statistics for small areas such as municipalities or wall-to-wall maps showing where exactly inside the inventory area forest resources are located. In Finland they have developed a multi-source forest inventory (MSFI) method as a solution (Tomppo and Siitonen, 1991) and we use a similar method. The SatForest product is important for the government officials, public administration and the private business.



Mapping mountainous areas

In the mountainous areas our new product will be implemented with the existing land resource map. We do not have the same plot information in the mountain areas as we have in the forests. But we do have good knowledge and great expertise about the land resource from persons who have accomplished lots of vegetation fieldwork where the aim is vegetation maps.



Our production line starts with automatically segmentation of the satellite image. We produce small, homogeneous polygons all over the image. The polygon is sampled in a few classes based on the growth condition in the field. For both the segmentation and the interpretation we use the NIR band in the satellite image.

For each class 50 figures is classified. This testing areas are being used as signature development in the automatically production. To make a readable map we have to merge the small figures. In this process there is a generalisation where we contemplate which growth condition is most important, and must be preferred as signature. In this operation we can also make mixed classes. Each class is produced on percent wise prescription.

Information about our land resources is fundamental for land-use planning and administration. Efficient, user-friendly solutions for digital production, management and transfer of land resource data are established. These data are stored in structured and well organized databases and can be accessed via the Internet.