

Training course on
Land Cover Mapping in Support of Area Frame Statistical Analysis.
Case study of West Showa (Ethiopia).
Project GCP/ETH/071/EC
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Summary

The Central Statistic Agency (CSA) of Ethiopia, in collaboration with the European Union (EU) and FAO, is carrying out an area frame survey study in the West Showa region for agricultural statistics purposes. Detailed and accurate land cover information contributes at improving analysis result. FAO-NRCE has organized and conducted a training course to present its experience, "know how", procedures, standards and tools on land cover mapping. Experts from several national institutions were first exposed to concepts and approaches on which FAO bases its methodology, and then carried out the land cover mapping and relative field validation of West Showa. FAO methodology produces a land cover database capable not only to improve the area frame statistical analysis, but also to provide national institutions with a standardized, multi-purpose product useful for several environmental and agricultural purposes. Hence, it is strongly recommended the realization of a national database, for which FAO could provide more extensive training and mapping support.

Background and Objectives



The Central Statistic Agency (CSA) of Ethiopia, in collaboration with the European Union (EU) and FAO is carrying out an area frame survey study in the West Showa area (see figure) for agricultural statistics purposes. An important information for such analysis is the land cover.

Land cover is critical for many purposes: sustainable management of natural resources, environmental protection, food security and humanitarian programmes as well as core data for monitoring and modelling. However, the development of a detailed land cover database is an expensive, complex and time-consuming process that must follow precise cartographic and mapping standards. FAO-NRCE has organized and conducted a training course in Ethiopia to develop the national capacity and assist project staff on land cover mapping according to FAO procedures.

The objectives of the training are summarized as follows:

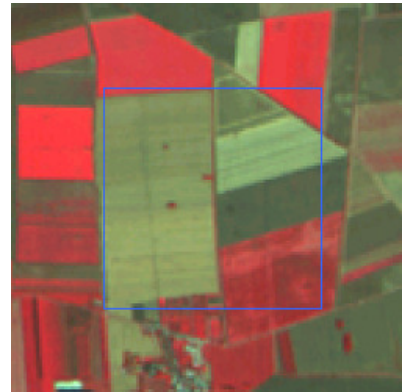
- Build/enhance the remote sensing/cartographic capacity of a large number of national technicians;
- Show the benefits and the importance of a reliable, detailed and updated land cover data;
- Convey Ethiopia in the FAO-LCCS scientific community transmitting methodologies and know-how;
- Standardize the land cover baseline dataset and harmonize the land cover definition and classification system according with the FAO-LCCS methodology;
- Describe the different steps of a national mapping production chain.

Experts from the Central Statistic Agency, Ministry of Agriculture and Rural Development (MoARD), Information Network Security Agency (I.N.S.A.) and Ethiopian Mapping Agency (E.M.A.) attended the training.

Methodological Approach

Since 1974, Ethiopia has been conducting statistical surveys through programs that have implemented more and more advanced technologies and techniques. This year, the Central Statistic Agency is carrying out the **Area Frame Statistical Analysis (AF)** in the West Showa area to collect statistical data on agriculture. The area frame is a special cluster sampling where farm fields are the clusters.

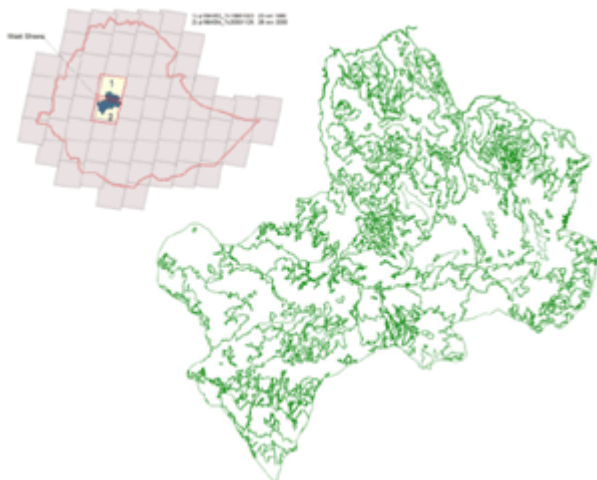
Inside the frames, land is stratified with the purpose of identifying where agriculture is present more extensively (*figure on the right shows crop land from satellite imagery*). Hence, it is clear that land cover estimation is an important part of this analysis.



For the West Showa study, the working group has carried out a fast visual estimation of the cover inside the frames, which has delayed the analysis and generated a subjective, biased result. A standardized and accurate land cover database is critical to improve the analysis outputs.

Activities

- FAO-NRCE staff introduced land cover concepts, standards, methodology and tools for image processing, image interpretation and database management:
 - **GeoVIS-MAP**-Geographical Vector Interpretation System – Mapping Accuracy Program,
 - **Mad-CAT** –Mapping Device and Change Analysis Tool, which is devoted at the optimization of vector based maps,
 - **ADG** - Advanced Database Gateway, and
 - **LCCS** – Land Cover Classification System.
- In addition to the FAO tools set, a professional software for segmentation of satellite imagery was described and used to extract, from the imagery covering West Showa, a preliminary vector based interpretation.
- After an initial analysis of the images, the preliminary legend was prepared using LCCS methodology. Detailed information about the area was collected in collaboration with participants based on their knowledge of the area.



- Several data sets were collected from different sources to conduct the land cover mapping on the West Showa area: SPOT5 satellite images, 5 m resolution, dated 2006; GLS2005 Landsat imagery; GLOBCOVER-2008 land cover database (based on ENVISAT – Meris imagery, 300m pixel size, dated 2005-2006).
- The interpretation was carried out by 20 experts in 10 working teams using SPOT

images. Each team could rely on imagery and relative segmentation. The work was conducted with FAO staff assistance. The result was a preliminary land cover database.

- In order to validate the preliminary interpretation (*see figure above*) and train the participants on using satellite imagery, a 2-day field survey was organized. Land cover classes were verified on the ground and GPS points were collected.
- A meeting with a final discussion was undertaken to reinforce scope and objectives of the field survey and resolve issues raised during the work.

Results

Main outcomes of the training are listed below:

- Consensus among all participants and representatives of the Ethiopian institutions on the importance of producing a new thematic and updated land cover database.
- Capacity development on remote sensing processing, digital map production and GIS. National experts participating at the training were able to apply FAO methodologies and tools for land cover mapping. In 4/5 working days, participants successfully carried out photo interpretation and post-processing.
- Improvement of participants skills in using GPS technology and satellite imagery for field surveys. By practicing fieldwork, their ability to recognize land cover units in the field was significantly enhanced.

Conclusion and Recommendations

Testing FAO procedures and standards in land cover mapping over the West Showa region has demonstrated to the participants at the training that the resulted database fully support the area frame statistical analysis and significantly contributes to improve the process. If extended countrywide, the same methodology provides the Country with a standardized, multi-purpose product useful for several environmental and agricultural purposes. Given the availability of a complete national coverage of SPOT imagery at 5m resolution, it is strongly recommended the realization of the national land cover database, for which FAO could provide more extensive training and mapping support.