FAO's LAND COVER AND LAND USE ACTIVITIES

- UPDATE OCTOBER 1997 -

Background

There is an increasing need to be able to precisely describe and classify land cover and land uses in order to define sustainable land use systems that are best suited for each place. Land needs to be better matched to its uses to increase production, while at the same time attempting to protect the environment, biodiversity, and global climate systems. It is therefore essential to have detailed and in-depth knowledge of potentials and limitations of the present uses. This information is required in many aspects of land use planning and policy development, as a prerequisite for monitoring, modelling and environmental change, and as a basis for land use statistics at all levels. A global agreement on the definition and classification of both land use and land cover does not exist. As a result many classification systems and innumerable map legends exist, and maps and statistics from different countries, and in many cases even from the same country, are incompatible with each other. Technological advances, such as the vast amount of remote sensing data having become available from earth observation satellites, make it increasingly possible to map, evaluate and monitor land cover and land use over wide areas.

FAO's *Soil Resources, Management and Conservation Service* (AGLS) and the *Environmental Information and Natural Resources Service* (SDRN), especially the *Africover Programme* preparing land cover information at a 1:250,000 scale for the whole of Africa, have developed harmonised approaches for concepts, definition and classification of land use and land cover. The overall objective of this initiative is to answer to the need for standardisation and to develop a common integrated approach to all aspects of land use and land cover. This implies a methodology which is applicable at any scale, and which is comprehensive in the sense that any identified land cover or land use anywhere in the world can be readily accommodated.

The common integrated approach led to the attempt to inform and involve the widest possible range of individuals, institutions and organisations in discussions with the objective to reach consensus on a basis of clear and concise definition of land cover and land use types. By involving such a wide range of people it is ensured that their requirements are met and that no competing systems evolve.

Who else is involved ?

In the early nineties *UNEP,* in collaboration with FAO, initiated a survey of existing land use and land cover classification methods (Young, 1993; Sims, 1995). This resulted in a study by three institutes namely the *Institute of Terrestrial Ecology* (ITE*),* the *International Institute for Aerospace Survey and Earth Sciences* (ITC) and the *World Conservation Monitoring Centre* (WCMC) to provide guidelines for description and classification of land use and land cover (in prep.).

The AFRICOVER *International Working Group on Classification and Legend*, responsible for developing a methodology for definition and classification of land cover applicable for the whole of Africa, approved the conceptual basis for quantitative and objective definition of land cover and its classification (Di Gregorio & Jansen, 1996 and 1997; FAO, 1997). The Working Group gave FAO the mandate to fully develop this classification system. The first

full operational version for implementation of this classification and its software program is being finalised by the *GCP/RAF/287/ITA Land Cover Mapping of East Africa Based on Satellite Remote Sensing* Project in co-operation with AGLS. The Project is based in Nairobi and it is responsible for mapping land cover in 12 East African countries (one third of the total surface of Africa). It is the first operational module of the AFRICOVER Programme.

Close relations were developed with the *U.S. Federal Geographic Data Committee* (FGDC), in particular with the *Vegetation Subcommittee* and the *Earth Cover Working Group*. These committees have the mandate to develop the U.S. standards for vegetation and earth cover. Both committees want, to the extent possible, to adhere to or support international standards. The co-operation between the *Vegetation Subcommittee* and FAO has been formalised in FAO becoming an official corresponding member.

Contacts with the European Union were developed, especially with the Joint Research Centre-Space Applications Institute (JRC-SAI), the CESD-Communautaire co-ordinated EC. *LANES concerted action* and the Eurostat Working Party on Land Use Statistics. Furthermore, contacts were developed with international research groups such as the *IGBP-DIS* (International Geosphere Biosphere Programme-Data and Information Systems) and *LUCC* (Land Use and Land Cover Change). These contacts facilitate exchange of ideas and aim at joint concept development.

The *Land-Based Classification Standards* (LBCS) Project of the American Planning Association is an initiative to update the 1965 U.S. Standard Land Use Coding Manual. This update will ensure that a broad variety of land-based data now being collected and stored at the different levels in a variety of formats and classification systems be standardised. This update will also provide the opportunity to accommodate land cover, land rights and land use information in one consistent format. FAO staff members have been appointed to the Technical Advisory Panel (TAP) of this project.

Ongoing projects with a land cover/land use component

In the Central African region the *Regional Environmental Information Management Project (REIMP)*, launched by the World Bank with FAO (SDRN) involvement in the definition of technical outputs, will develop an environmental information system in the Congo Basin which involves 7 countries. This project will contribute to a better circulation of environmental information between and in the countries, it will address the user needs at various levels and strengthen the technical and human capacities in order to produce, maintain and disseminate the information. Land cover and land use information will be key elements in such an environmental information system.

Several projects are ongoing such as the UNDP financed *Cambodia: Agricultural Development Options Review* where the land cover component will prepare a series of products which provide both an assessment of the actual land cover as a historical perspective on the nature of land utilisation. These products will assist in assessing the current status of the land, the rate of change and to facilitate effective decision-making concerning strategies for agricultural development.

In Afghanistan remote sensing techniques were used to undertake country-wide land cover mapping to satisfy the urgent need for base information on the present land use/land potential. This information will allow informed decision-making and comprehensive development planning in a country where the balance between the ecological system and the economic agricultural practices has been virtually destroyed. In a follow-up phase,

funded by UNDP under TSS-1 arrangement, assistance will be provided to set up an environmental information system and to assist in database development, management and maintenance.

The FAO *Enhancing the Effectiveness of the Monitoring Forecasting and Simulation of the Nile River* Project aims at building upon the established system for real-time monitoring, analysing, forecasting and simulation of the hydrological and meteorological processes occurring in the basin above the High Aswan Dam in Egypt. These processes are important for planning and implementation of optimal use of the Nile water resources in Egypt (e.g. use for irrigation vs. hydro power, storage and evaporation). This project uses land cover information as one of the components in the hydrologic models developed. The *Nile Basin Water Resources* Project aims at strengthening the regional co-ordination and capacity to negotiate joint management and equitable sharing and utilisation of water resources and protection of the environment (e.g. legislation at national level). Land cover is one of the base information layers to negotiate the water needs and uses of the different countries.

Various Land Use Planning projects, which take a participatory approach in order to negotiate with the stakeholders what they perceive as problems and how to solve them, and Land Resource Information Systems projects are ongoing (e.g. in Namibia, Saudi Arabia, Sierra Leone, Swaziland, Tanzania, Yemen and two regional projects in Latin America) in which land use/land cover information is used for improved planning of agricultural activities and/or evaluation of the land potential for crop production. FAO has, since its appointment as Task Manager for the implementation of Agenda 21 Chapter 10, promoted an approach which emphasises the integration of the physical, socio-economic and institutional aspects of land use, and stresses the need for active participation of all stakeholders in decision-making. This more integrated approach has the advantage that it better meets the needs of the stakeholders. Therefore, it has a better chance of implementation at the grassroots level (Kutter *et al.*, 1997).

A pilot study of FAO in Lebanon to transform the existing remotely sensed data derived Land Cover Map (scale 1:50,000) into a Land Use Map has been finalised in early 1997. The results show that derivation of land use from land cover is a procedure which requires substantial ancillary data and field information. Decision rules of how to derive land use from land cover, built up for one specific area, may not be applicable elsewhere. A second pilot study is under negotiation with Kenya to better identify which type of ancillary data and field data collection is needed to enable preparation of land use information based on the Africover Programme land cover product.

The *Land Cover Mapping of East Africa Based on Satellite Remote Sensing* Project, which covers 12 countries, is the first operational module of the AFRICOVER Programme and the first user of the Land Cover Classification System. This Project is being implemented by staff of national mapping agencies working through the *Regional Centre for Services in Surveying Mapping and Remote Sensing* (RCSSMRS) in Nairobi, Kenya. This Project will also provide the basis for an area frame in which statistics on both land cover and land use could be collected on a sample basis.

Progress in the Development of Computerised Applications

The DOS-based *Land Use Database*, in which land use information at various levels of detail can be stored, and the Windows-based *Land Cover Classification System* currently being finalised perform the following functions:

(1)   provide a glossary of pre-defined terms used to describe the types or classes in terms of classifiers and attributes.

(2)   provide a standardised approach for describing and classifying land use or land cover classes.

(3)   store field survey data or direct output of remote sensing interpretation in a structured way.

(4)   contain a set of rules through which one classification can be correlated with another through a reference classification (available only valid for the land cover system; under development for land use).

The Land Use Database will need to be updated to Windows compatible environment in late 1997/early 1998. Furthermore, close links between the land use and land cover software programs should be established to enable users to classify and analyse the two types of closely related information.

Future: short, medium and long term

Whereas progress on land cover mapping is well under way, little progress has been made so far on land use data collection. A serious consolidated effort is needed to collect this type of information in parallel with ongoing efforts on land cover. Linking these two activities would enhance the efficient use of the available limited human and financial resources.

For the short to medium term a reference classification system for land use should be developed and linked to the developed *Land Cover Classification System*. This system should enable a variety of end-users to use the results for their specific application (e.g. from rural planning to statistics). Creation of such a system would enable intercomparison of existing data and a harmonised approach of data collection in areas where this information is not available or obsolete. A land use product at a small scale (1:1,000,000 or 1:5,000,000 for instance) using this reference classification system should be made available to the international research community.

In the medium to long term a consolidated effort should be made to collect more detailed land use information and to use it in a variety of applications related to resources planning and management. This type of land use information to be used for national and local planning of sustainable land use systems will need to be much more detailed (for example at 1:100,000 to 1:250,000 scales) implying the need for financial resources. FAO is aware that data collection is not a "hot" topic but that the need to better match land to its uses is increasing. Awareness should be created internationally and nationally that one cannot attempt to effectively protect the environment, biodiversity and global climate systems if one of the key elements of information to do so is unavailable.

For any questions please contact:
Mr. Robert Brinkman, Director, Land and Water Development Division,
Viale delle Terme di Caracalla, 00100 Rome, Italy
tel.:   ++39 6 570 53068
fax: ++39 6 570 56275
email: AGL-Registry@FAO.ORG or   Robert.Brinkman@FAO.ORG

or

Ms. Louisa J.M. Jansen, Soil Resources, Management and Conservation Service,
Land and Water Development Division
tel.:   ++39 6 570 53192
fax: ++39 6 570 56275
email: Louisa.Jansen@FAO.ORG

References

Di Gregorio, A. and L.J.M. Jansen (1996) AFRICOVER Land Cover Classification Scheme: A Dichotomous, Modular-Hierarchical Approach. Paper prepared for the international working group on Legend and Classification meeting 29-31 July 1996 Dakar.

Di Gregorio, A. And L.J.M. Jansen (1997) Land Cover Classification Scheme: A Dichotomous, Modular-Hierarchical Reference System. GCP/RAF/287/ITA Project Doc. No.1/AGLS, Nairobi/Rome.

FAO (1997) Africover Land Cover Classification. Environment and Natural Resources Service (SDRN). 76pp.

Kutter, A. Nachtergaele, F. And W. Verheye (1997) The New FAO Approach To Land Use Planning and Management and Its Application in Sierra Leone. Paper prepared for ITC Conference, The Netherlands. 10pp.

Sims, D. (1995) Background Note on On-Going Activities Relating to Land Use and Land Cover Classification. Internal Document FAO.

Young, A. (1993) Towards International Classification Systems for Land Use and Land Cover. Annex V in: UNEP/FAO (1994) Report of the UNEP/FAO Expert Meeting on Harmonizing Land Cover and Land Use Classifications. Geneva 23-25 November 1993. GEMS Report Series, No. 25.