



LONG TERM ECOLOGICAL MONITORING
OBSERVATORIES NETWORK

ROSELT/OSS

**A COMMON DEVICE FOR THE MONITORING
OF DESERTIFICATION
IN CIRCUM-SAHARAN AFRICA**

ACHIEVEMENTS AND RESTROSPECTIVE OVERVIEW



SAHARA AND SAHEL OBSERVATORY

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- Mr. **Klaus MUELLER-HOHENSTEIN**, Professor at the University of Bayreuth (Germany) and member of the Scientific and Technical Committee (STC) -ROSELT/OSS;
- Mr. **Jesse Theuri NJOKA**, Professor at the University of Nairobi (Kenya), member of the STC-ROSELT/OSS and Regional ROSELT/OSS Coordinator for East Africa.

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- Mr. **Bernard TOUTAIN**, ROSELT/OSS Sub-regional Coordinator for East Africa (Nairobi, Kenya), Mr. **Joseph DOMENECH**, Director of Stock-breeding and Veterinary Medicine Department (Elevage et Médecine Vétérinaire EMVT), Mr. François MONICAT, Programme Manager;
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- Mr. **Koudier MEDJOUNI**, the late Scientific Coordinator of the Observatory of the Steppes of the Upper Plains of the South West of Oran, URBT, Algiers (Algeria) ;
- Mrs. **Dalila NEDJRAOUI**, Scientific Coordinator of the Observatory of the Steppes of the Upper Plains of the South West of Oran, URBT, Algiers (Algeria) ;
- Mr. **Mohamed ABDELRAZIK**, Professor at the University of Alexandria, National and Scientific Coordinator of the Observatory of El Omayed (Egypt) ;
- Mr. **Abderrahmane KABBAJ**, Director of DREF, Rabat (Morocco) ;
- Mr. **Mohamed YASSIN**, National and Scientific Coordinator of the Observatory of Oued Mird, DREF, Rabat (Morocco) ;
- Mr. **Abdelouahed EL GHARBAOUI**, Director of ORMVAO (Morocco) ;
- Mr. **Ahmed RAMDANE**, Scientific Coordinator of the Observatory of Issougui, ORMVAO (Morocco) ;
- Mr. **Houcine KHATTELI**, National Coordinator, Director General of IRA, Medenine (Tunisia) ;
- Mr. **Mongi SGHAIER**, Scientific Coordinator of the Observatory of Menzel Habib, IRA, Medenine (Tunisia) ;
- Mr. **Rachid BOUKCHINA**, Scientific Coordinator of the Observatory of Haddej Bou Hedma, IRA, Gabes (Tunisia) ;
- Mr. **Antonio EVORA FERREIRA QUERIDO**, National ROSELT Coordinator, President of INIDA, Praia (Cape Verde) ;
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- Mr. **Fadiala DEMBELE**, National and Scientific Coordinator of the Observatory of Bamba (Bourem Circle), IER, Gao (Mali) ;
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- Mr. **Maxime BANOIN**, Scientific Coordinator of the Observatory of Torodi (Torodi-Tondikandia-Dandiantou observatories set), University of Niamey (Niger) ;
- Mr. **Aboubacar ICHAOU**, Scientific Coordinator of the Observatory of Dandiantou (Torodi-Tondikandia-Dandiantou observatories set), MHELCD, Niamey (Niger) ;
- Mr. **Moktar NIANG**, Director General of CSE, Dakar (Senegal) ;

- *Mr. **Magatte BA**, National and Scientific Coordinator of the Observatory of Ferlo, CSE, Dakar (Senegal) ;*
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OSS finally acknowledges the highly beneficial decision for this project consisting in setting up, within IRD, of a « Desertification » Service Unit, and expresses warmest thanks to IRD General Director.

A special tribute is due to Marc BIED CHARRETON, former Executive Director of OSS and President of the French Scientific Committee on Desertification – France, to have initiated this great African programme.



The Executive Secretary

Dr. Chedli FEZZANI

SYNTHESIS

CONTEXT AND ORIGIN OF THE CONCEPT OF LONG TERM ECOLOGICAL MONITORING

Following the intense and recurrent droughts that had prevailed in sub-Saharan Africa in the mid-1960s, political awareness and the mobilisation of the scientific community toward checking the desertification processes and mitigating drought effects have brought about the need to monitor and evaluate the natural resources in order to ensure their sustainable management. This has led to conducting several studies and research works on droughts and aridity, as well as on their ecological implications (**soil degradation, desertification**) and socio-economic impacts (**migration, rural exodus, pauperisation**). This period was characterised by the adoption of the action plan to combat desertification which was developed during the United Nations Conference on Desertification (Nairobi, Kenya, August/September 1977) and the coming into force of the United Nations Convention to Combat Desertification (CCD). This convention—a strategy in its own right—strongly emphasises the development of scientific and technical cooperation among the relevant institutions at national, sub-regional, regional and international level.

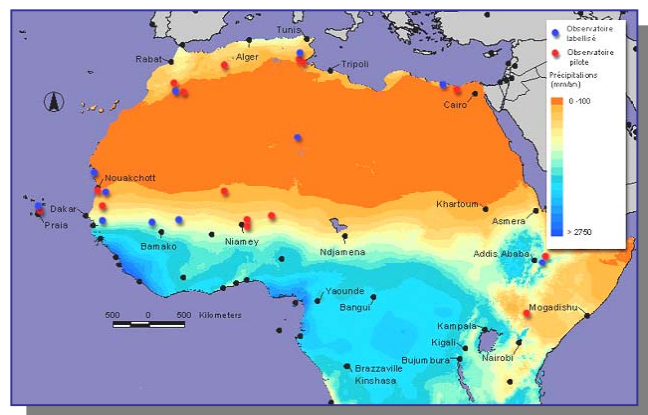
In this regard, the establishment of the Sahara and Sahel Observatory (OSS) in 1992, has favoured the emergence of a new North-South-South partnership and solidarity spirit, as well as the development of new synergies between the various partners, thus allowing the **capitalisation of acquired knowledge and experience, the harmonisation of data collection and analysis methods, information sharing and the design of new tools to help in decision making**.

In view of these considerations, and based on the conclusions and recommendations of a workshop organised jointly with UNESCO and the International Geosphere-Biosphere Programme (IGBP) in July 1992 in Fontainebleau (France) on continuous monitoring of terrestrial ecosystems, OSS proposed the set up of a **Long Term Ecological Monitoring Observatories Network (ROSELT/OSS)** whose objective would be to better apprehend the causes and effects of desertification in the circum-Saharan African region.

This initiative constitutes a response to the need expressed by the Southern member countries to access reliable data on the state of the environment, and more particularly in circum-Saharan arid and semi-arid zones that are severely hit and/or endangered by desertification. Ecological monitoring is understood in its broadest sense, namely the study of the dynamics of the natural, physical and biological environment, of the human environment, including social organisation, the dynamics of land use systems, as well as the dynamics of the interactions that exist between these various sets.

FROM DESIGN TO AN OPERATIONAL IMPLEMENTATION OF THE ROSELT/OSS PROGRAMME

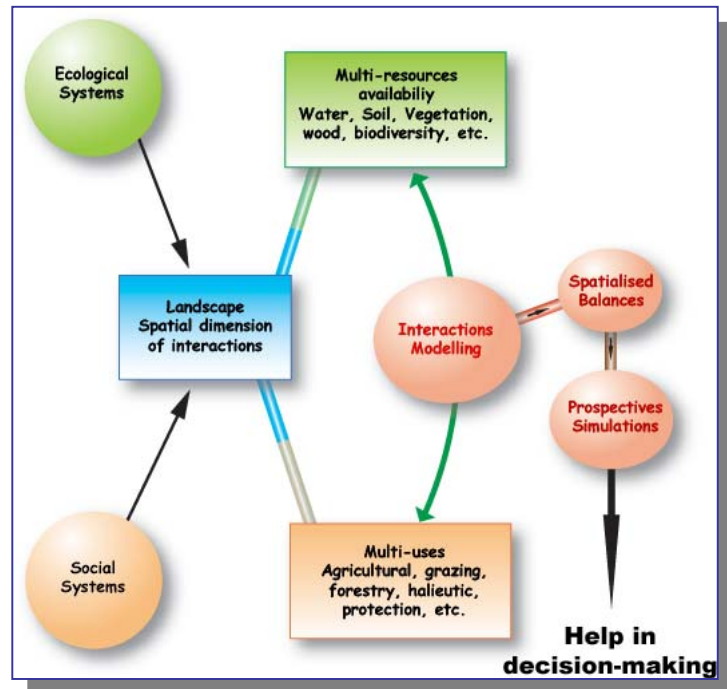
Between 1992 and 1994, the inventory of Potential Candidate Territories (TCP)—which had been conducted by the countries—allowed an ad hoc Scientific Committee to select, based on labellisation criteria, **25 observatories or observatory clusters**, distributed over 11 countries. Among these 25 ROSELT/OSS observatories, 12 were further selected as **pilot-observatories**, intended to serve—within a first phase—as a basis for refining the concept, finalising the techniques and methodologies of data collection and processing, and developing reliable, relevant and reproducible tools to help in decision-making (maps, indicators, information systems . . .).



In the light of these works, the **founding document of the ROSELT/OSS was drafted in 1995** and synthesis studies providing « a reference state » in three North-African pilot-observatories (1996-1997) were conducted. A **first operational phase was subsequently launched in 1998** in order to perform in situ testing of the data collection and processing methods.

The insufficient integration between the devices used for the sampling of biophysical and socio-economic parameters based on the sectorial approach adopted during this phase did not allow the development of the expected tools to help in decision making.

The launch of the ROSELT/OSS in West Africa in June 2000 during the Bamako workshop led to updating the concepts used within the network and to adopting a comprehensive conceptual outline for the study of environmental changes within the ROSELT/OSS. The « landscape » thus developed allows the integration of the whole set of biophysical and socio-economic data and the study of the impact of uses on the natural resources, and this with a view to developing products that help in decision making, such as reliable data on soil degradation in arid zones, biophysical and socio-economic indicators, state of the environment of the OSS region, spatialised resources/uses balances, prospective scenarios . . .

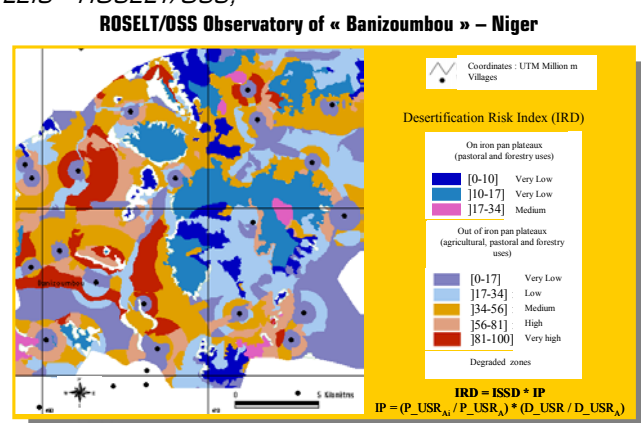


Particular effort was made in order to define a **minimum data set**, to be collected **at lower cost**, and which would allow the spatialisation of data, their possible extrapolation to larger zones and their integration within models of use of both space and resources.

THE ROSELT/OSS PRODUCTS : DEVELOPMENT, USE AND DISSEMINATION

The ROSELT/OSS products may be distributed as follows :

- Previous achievements : development of reference states under the form of thematic maps, such as « land use » maps, and « physical features » maps (pedology, geomorphology . . .);
- The scientific and technical documents which are gradually issued as part of the « **ROSELT/OSS Scientific and Technical Collection** », such as the methodological guidebook and its thematic leaflets (including Vegetation, Socio-economic Features, Fauna...), the national scientific and technical reports;
- The Local Environment Information System LEIS - ROSELT/OSS;
- The metadata base;
- The Charter on the management and dissemination of data and products within ROSELT/OSS;
- The indicators at local and regional levels;
- The prospective simulations and desertification risk index maps.



The relevance of the concept of ecological monitoring and of the products developed by the network have persuaded a large number of the countries involved in the network as to the need to boost the development of environmental monitoring on the level of the countries. Indeed, the ROSELT/OSS has already been integrated in the NAP/CCD of several countries (Algeria, Mali, Morocco, Niger, Tunisia) and is in process of integration in the NAP/CCD of Egypt and of Kenya. The ROSELT/OSS methodologies are adapted and replicated in the framework of implementation of the national environmental monitoring devices (Niger, Mali) which are either based on, or which integrate, environmental monitoring observatories, such as the ROSELT/OSS observatories.

Besides, Morocco and Tunisia¹ have undertaken to conduct two studies in order to assess the state of the art in the field of monitoring-evaluation of desertification (research projects, development projects...) and to use the results acquired for purposes of proposing an overall framework for an operational implementation of the NAP/CCD monitoring-evaluation systems. The substantial contribution of the ROSELT/OSS has been largely underscored, particularly with regard to control over the desertification process and to the promotion of development support actions. The results already obtained by the ROSELT/OSS in Tunisia (indicators, prospective simulations deriving from the LEIS-ROSELT/OSS and desertification risk index map) will be gradually displayed on the Tunisian site of the System of Information Sharing on Desertification and the Environment (SCIDE, updated in the framework of the SMAP project). More specific studies on the national environmental monitoring devices have been conducted in Algeria², Egypt³ and Morocco⁴; they are in process of validation by the National Coordination Institutions (ONC) in these countries.

It is worth pointing out that the data and metadata bases in process of establishment in each of the member countries of the network represent a major asset for the countries in the field of management and dissemination of data that help in decision making.

Finally, the whole set of the products developed and of the results obtained are regularly presented during international events (colloquia, seminars . . .) and on the occasion of the Conferences of the Parties to the United Nations Convention to Combat Desertification (UNCCD). The information dissemination tools (web sites, brochures, posters...) are regularly updated in order to provide updated information to the various categories of stakeholders concerned by combating desertification.

ROSELT/OSS : AN ASSET FOR THE SET UP OF NATIONAL ENVIRONMENTAL MONITORING DEVICES

*The **ROSELT/OSS** programme **is a complex, ambitious and exacting programme**. It is **complex**, since it sets out to study not only the state of the dynamics of the ecological and socio-economic systems and their interactions, but also the causes and consequences of soil degradation. It is **ambitious**, since it seeks to bring concrete and practical answers to issues of development and of environmental protection in areas where the scarce resources are vulnerable. And it is **exacting**, since it requires several scientific specialities, team work within multi-disciplinary and inter-disciplinary teams, calling upon the contribution of the whole range of the stakeholders involved in combating desertification (planners, developers and development officials in general, including the populations concerned), and this within the framework of a participatory approach. Yet the ROSELT/OSS remains for all that an absolutely **necessary** programme to address the concern for monitoring and evaluation of the phenomena of degradation and, where necessary, to provide the countries with reliable and relevant data that can be generalised and/or extrapolated, and which are generated by the close interdependence between environment and sustainable development. To address this concern, only the **set up of long term ecological monitoring devices would help to provide an answer**.*

¹ On the occasion of the launch workshops of the SMAP project for « Setting up a monitoring-evaluation system in the Maghreb » held in Rabat (on 28 and 29 November 2002) and in Tunis (on 22 and 23 April 2003).

² Les mécanismes de suivi de la désertification en Algérie. Proposition d'un dispositif national de surveillance écologique à long terme en Algérie (Mechanisms for the monitoring of desertification in Algeria : Proposal for a National Long Term Ecological Monitoring device in Algeria), Pr. Dalila Nedjraoui.

³ Mechanisms for Monitoring the Desertification at the National Level of Egypt, Pr. Mohamed Abdelrazik

⁴ Projet de conception d'un dispositif national de surveillance écologique au Maroc, (Conceptual project of ecological monitoring national device in Morocco), Mohamed Yassin.

However, while the long term vision of land use planning and the management of resources represents an attractive conceptual framework, its implementation needs to overcome several obstacles which the ROSELT/OSS has not been spared. Indeed, ecological monitoring requires fairly considerable human and material means, as well as stable and sound institutions. However, such conditions are often difficult to find in developing countries, particularly in Africa. The lack of synergy between the national institutions has often proved to be an impediment to a proper progress of the programme and has induced, at its inception, a slackening of the pace of the implementation of its activities. Much effort had to be invested in order to get the message across to the institutions concerned that the OSS is not a funding agency and that the means that they provide need, on the one hand, to incept a **national effort** in this regard and, on the other hand, to **build up the teams and the institutions involved**. The implementation of this unusual approach has been arduous, resulting in certain cases in delays due to the insufficiency of the means provided in view of the efforts required.

Yet, in spite of such handicaps, which seem a priori to be difficult to overcome, the ROSELT/OSS programme was launched and it became established in several OSS member countries. This inception phase has been, above all, a phase of training, set up of teams and finalisation from a conceptual and methodological point of view. The active work of the network, the exchanges between the members, not to forget the strengthening of the North-South partnership and the building of national capacities have made it possible to extend, to the countries of the South, the methodological and technological developments indispensable for a mastery over the dissemination of information that help in decision making. Concrete results have thus been achieved in the past 4 years. The tools (data and metadata bases, Local Environment Information Systems (LEIS) and products developed by the network already contribute in :

- the harmonisation of the data collection and processing methods (methodological guidebooks) ;
- the development of a diagnosis of the state of desertification in the circum-Saharan zones of the OSS region ;
- the definition of a specific minimum data set for each « observatory » and the minimum set of data common to the « network » which need to be collected at lower cost with a view to developing specific and necessary indicators on the local and regional levels.

The dynamics that has developed within the network, the appropriation of the ROSELT/OSS methodologies and of long term environmental monitoring by the national institutions, the drafting of a charter on the management and dissemination of data within the network, and the gradual implementation of computer tools constitute a major step toward the strengthening of the network and its integration within the national environmental monitoring devices.

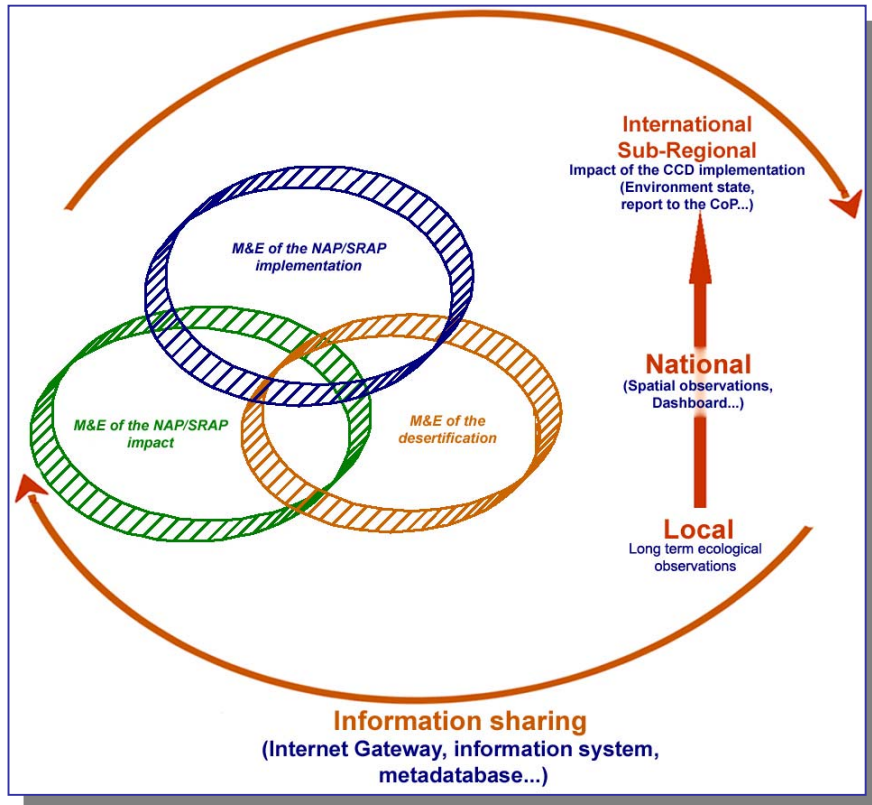
The ROSELT/OSS programme constitutes **an additional asset for African countries** and for the sub-regional and regional institutions in combating desertification and in mitigating drought effects, and in particular as a **key component of the national environmental monitoring devices**, which themselves constitute the major pillars of the monitoring-evaluation of the NAP/CCD.⁵ Accordingly, the OSS does not spare any effort to clarify and further the debate on the concept of monitoring evaluation and to make visible the contribution of the ROSELT/OSS in the implementation of development and environmental protection programmes. The products that help in decision making which are gradually developed in the framework of the ROSELT/OSS programme will be made available to the NAP/CCD Monitoring-Evaluation Systems that are gradually set up, particularly in Tunisia and in Morocco, in the context of the implementation of the conventions on combating desertification and on biological diversity.

On the international and European level, the ROSELT/OSS now emerges as **an indispensable African network in the field of ecological monitoring**. The North-South scientific rooting of the network has been considerably strengthened, particularly thanks to the set up of a ROSELT/OSS specific « Desertification » Service Unit within the Research Institute for Development (IRD, formerly ORSTOM)

⁵ Such as recommended by the CCD, and designed by the OSS and its partners : The CILSS, UMA and 7 African pilot countries, which have been joined by GRULAC and China in the framework of a working group that was set up following a recommendation by the CoP4.

and to the involvement of the ROSELT/OSS programme in the draft applications eligible to the European Commission. These initiatives are likely to promote scientific cooperation on desertification among the specialised institutions from both North and South and will help toward the sustainability of the network and the mobilisation of the means allotted to this complex issue.

Monitoring-Evaluation (M&E) of NAP and SRAP to combat desertification



LIST OF ROSELT/OSS PRODUCTS

Beside all publications mentioned in references, the ROSELT/OSS products may be distributed as follows :

- Previous achievements : development of reference conditions under the form of thematic maps, such as « land use » maps, and « physical features » maps;
- The scientific documents which are gradually issued as part of the « ROSELT/OSS Scientific and Technical Collection », such as :
 - the methodological guidebook and its thematic leaflets (such as flora and vegetation, socio-economic features, fauna, . . .);
 - technical and concept-related documents;
 - national scientific and technical reports;
- Local Environment Information System LEIS - ROSELT/OSS;
- The metadata base;
- The Charter on the management and dissemination of data and products within ROSELT/OSS;
- Indicators at local and regional levels;
- Prospective simulations and desertification risk index maps.

The products are proposed in more detail in § 4.

ROSELT/OSS SCIENTIFIC AND TECHNICAL COLLECTION

SCIENTIFIC DOCUMENTS

ROSELT/OSS 1995. Document Scientifique 1 : Conception, organisation et mise en oeuvre de ROSELT. Collection ROSELT/OSS, première parution en 1995, nouvelle édition 2004.

ROSELT/OSS 1995. Scientific Document 1: Conceptual, organizational and operational framework of ROSELT/OSS. Collection ROSELT/OSS, first edition in 1995, new edition 2004.

ROSELT/OSS, 2004. Document Scientifique 2 : ROSELT/OSS : Organisation, Fonctionnement et Méthodes de ROSELT/OSS. Édition 2001, révisée 2004.

ROSELT/OSS, 2004. Scientific Document 2 : ROSELT/OSS : Organisation, Operation and Methods, Edition 2001, revised in 2004.

ROSELT/OSS, 2004. Document Scientifique 3 : Concepts et méthodes du SIEL – ROSELT (Système d'Information sur l'Environnement à l'Échelle Locale).

ROSELT/OSS, 2004. Scientific document 3 : Concepts and methods of ROSELT LEIS (Local Environment Information System).

ROSELT/OSS, 2004. Document Scientifique 4 : Indicateurs écologiques ROSELT/OSS. Une première approche méthodologique pour la surveillance de la biodiversité et des changements environnementaux. (Scientific Document 4 : ROSELT/OSS ecological indicators. A first methodological approach for the monitoring of biodiversity and environmental changes).

TECHNICAL CONTRIBUTIONS

ROSELT/OSS, 2004. Contribution Technique n°13 : Etat comparé de l'environnement dans les observatoires ROSELT/OSS du Maghreb. (Technical Contribution n°13 : Comparative State of the Environment in the ROSELT/OSS Observatories of the Maghreb).

ROSELT/OSS, 2004. Contribution Technique 1 : Guide ROSELT/OSS pour l'évaluation et la surveillance de la végétation. (ROSELT/OSS Guidebook for the Assessment and Monitoring of Vegetation).

ROSELT/OSS, 2004. Contribution Technique 2 : Guide ROSELT/OSS pour l'évaluation et le suivi des pratiques d'exploitation des ressources naturelles. (Technical Contribution 2 : ROSELT/OSS Guidebook for the Assessment and Monitoring of uses of natural resources).

ROSELT/OSS, 2004. Contribution Technique 3 : Manuel d'utilisation de l'outil SIEL - ROSELT (version 1.3). (Technical Contribution 3 : Instructions Manual for LEIS in ROSELT/OSS (version 1.3)).

ROSELT/OSS, 2004. Contribution technique 4 : Application des indicateurs écologiques de la dégradation des terres à l'observatoire de Menzel Habib (TUNISIE). (Technical Contribution 4 : Application of Ecological Indicators of Land Degradation in the Observatory of Menzel Habib (Tunisia)).

ROSELT/OSS, 2004. Technical contribution 5 : Surveillance of ecological changes in the ROSELT/OSS observatory of El Omayed (EGYPT) : first results.

ROSELT/OSS, 2004. Contribution Technique 6 : Recherche des indicateurs de changement écologique et de la biodiversité dans l'observatoire de Oued Mird (MAROC) / : premiers résultats. (Technical contribution 6 : Research of ecological indicators changes and of biodiversity in the Oued Mird Observatory (MOROCCO) : first results).

ROSELT/OSS, 2004. Contribution Technique 7 : Surveillance des changements écologiques dans l'observatoire ROSELT/OSS de Haddej – Bou Hedma (TUNISIE) : premiers résultats. (Technical contribution 7 : Monitoring of ecological changes in the ROSELT/OSS Observatory of Haddej Bou Hedma (TUNISIA) : first results).

ROSELT/OSS, 2004. Contribution Technique 8 : Espaces-ressources-usages : première application du Système d'Information sur l'Environnement à l'échelle Locale sur l'observatoire ROSELT/OSS de Banizoumbou (NIGER). (Technical Contribution 8 : Space – resources – uses : first application of the Local Environment Information System in the ROSELT/OSS Observatory of Banizoumbou (NIGER)).

ROSELT/OSS, 2004. Contribution Technique 9 : Recherche d'indicateurs de désertification par analyse comparative de quelques observatoires ROSELT/OSS. (Technical contribution 9 : Development of Desertification Indicators by Comparative Analysis of a Few ROSELT/OSS Observatories).

ROSELT/OSS, 2004. Contribution Technique 10 : Une approche spatiale pour la surveillance de la faune - Etude de cas au Sud du Maroc : la vallée de l'oued Mird. (Technical Contribution 10 : A spatial approach for the Monitoring of the Fauna. Case Study in Southern Morocco : The Valley of Oued Mird).

ROSELT/OSS, 2004. Contribution Technique 11 : Guide ROSELT/OSS pour l'évaluation et la surveillance des États de surface et des sols. (Technical Contribution 11 : ROSELT/OSS Guidebook for the Assessment and Monitoring of the Surface State and Soils).

ROSELT/OSS, 2004. Contribution Technique 12 : Système de circulation de l'information ROSELT/OSS : Définition des métadonnées et élaboration des catalogues de référence. . (Technical Contribution 12 : ROSELT/OSS Information Circulation System : definition of metadata and development of reference catalogue).

ROSELT/OSS, 2004. Contribution Technique 13 : Guide ROSELT/OSS pour la cartographie dynamique de la végétation et des paysages. (Technical Contribution 13 : ROSELT/OSS Guidebook for the dynamic cartography of vegetation and of landscape).

ROSELT/OSS, 2004. Contribution Technique 14 : Fiches Techniques pour la construction des indicateurs écologiques ROSELT/OSS. (Technical Contribution 14 : Technical Cards for the development of ROSELT/OSS ecological indicators).

ROSELT/OSS, 2004. Contribution Technique 15 : Synthèse comparative de quatre années de surveillance environnementale sur trois observatoires ROSELT/OSS du Nord de l'Afrique : El Omayed, Haddej Bou Hedma et Oued Mird. (Technical Contribution 15 : Comparative synthesis of four years of environmental monitoring within three ROSELT/OSS observatories of North Africa : El Omayed, Haddej Bou Hedma and Oued Mird).

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LIST OF ABBREVIATIONS

AFD	Agence Française de Développement (French Development Agency)
CILSS	Comité Inter-Etats de Lutte contre la Sécheresse au Sahel (Permanent Inter-State Committee for Drought Control in the Sahel)
CIRAD	Centre International de Recherche Agronomique pour le Développement (International Centre of Agronomic Research for Development)
CoP	Conference of the Parties
COT	Land Cover Map
CRSTRA	Centre de Recherche Scientifique et Technique des Régions Arides (Centre for Scientific and Technical Research on Arid Areas)
CSE	Centre de Suivi Ecologique (Ecological Monitoring Centre)
DDC	Direction du Développement et de la Coopération du département Fédéral suisse des Affaires Etrangères (Directorate of Development and Cooperation of the Swiss Federal Department of Foreign Affairs)
DREF	Division de Recherches et Expérimentations Forestières (Department of Forestry Experimental Research)
FFEM	Fonds Français pour l'Environnement Mondial (French Fund for World Environment)
GEMS	Global Environment Monitoring System
GRULAC	Groupe des Etats d'Amérique Latine et des Caraïbes (Latin American and Caribbean States Group)
GTOS	Global Terrestrial Observing System
IARE	Institut des Aménagements Régionaux et de l'Environnement (Regional Land Planning and Environment Institute)
IER	Institut d'Economie Rurale (Rural Economy Institute)
IGADD	Intergovernmental Authority on Drylands and Development
IGBP	International Geosphere – Biosphere Programme
INIDA	Instituto Nacional de Investigacao et Desenvolvimento Agrario (National Institute for Research and Agricultural Development)
INSAH	Institut du Sahel (Sahel Institute)
IRA	Institut des Régions Arides (Institute of Arid Zones)
IRD	Institut de Recherche pour le Développement (Research Institute for Development)
LEIS	Local Environment Information System
LTER	Long Term Ecological Research
MAB/UNESCO	UNESCO's « Man and the Biosphere » Programme
MAE	Ministère français des Affaires Etrangères (French Ministry of Foreign Affairs)
MEDD	Ministère de l'Ecologie et du Développement Durable (Ministry of Ecology and Sustainable Development)

MHELCD	Ministère de l'Hydraulique, de l'Environnement et de la Lutte contre la Désertification (Ministry of Water, Environment and Combating Desertification)
MWRMD	Ministry of Water Resources Management and Development
NAP/CCD	National Action Programme to Combat Desertification
ORMVAO	Office de Mise en Valeur Agricole de Ouarzazate (Ouarzazate Agricultural Development Board)
OSS	Observatoire du Sahara et du Sahel (Sahara and Sahel Observatory)
RAP	Regional Action Programme to Combat Desertification
ROSELT	Réseau d'Observatoires de Surveillance Ecologique à Long Terme (Long Term Ecological Monitoring Observatories Network)
SMAP	Small and Medium Term Action Programme (European Commission Financial Office)
SRAP	Sub-Regional Action Programme to Combat Desertification
UMA	Union du Maghreb Arabe (Union of Arab Maghreb)
UNCCD or CCD	United Nations Convention to Combat Desertification
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organisation
URBT	Unité de Recherche sur les Ressources Biologiques Terrestres (Research Unit on Biological Terrestrial Resources)

NOTE: « Oued » means “Wadi”.

1- CONTEXT AND ORIGIN OF THE CONCEPT OF LONG TERM ECOLOGICAL MONITORING

The circum-Saharan zone has undergone in the past five decades far-reaching changes, with regard to the ecological and agro-sylvo-pastoral aspects. The most salient features of these changes are :

- A high degradation of natural resources (soils and plant cover) ;
- A significant development in land use and space planning systems.

These changes are the outcome of several factors :

- The human and animal pressure on natural resources, especially those which are vulnerable and scarce ;
- The low level and irregular character of rainfall, as well as the drying winds, which both represent the major climatic factors limiting the biological productivity of this zone.

Added to a high demographic growth, the intense and recurrent droughts that have prevailed in the various regions of Africa since the mid 1960s, have alerted the international community, calling its attention to the vulnerability of the ecosystems and the serious consequences of a disruption of ecological balances. Becoming aware of the seriousness of the situation, this community has joined efforts to offer support to the most drought-stricken countries, among which in particular the countries of the African Sahel. Accordingly, since the early 1970s, various study and research programmes have been developed on droughts and aridity, as well as on their ecological impacts (**soil degradation, desertification**) and socio-economic impacts (**migration, rural exodus, pauperisation**).

This awareness has translated more particularly in the adoption of an action plan for combating desertification which was developed during the United Nations Conference on Desertification held in Nairobi (Kenya) in August/September 1977 and in the finalisation, in 1994, of the Convention to Combat Desertification (CCD) which had been decided at the Rio Summit (1992).

More particularly, the CCD underscores the development of scientific and technical cooperation in the area of combating desertification and of mitigation of the droughts impacts through the relevant institutions at the national, sub-regional, regional and international levels (art.16, 17 and 18). It especially highlights the need for :

- Collecting, analysing and exchanging relevant short term and long term data and information to ensure systematic observation of land degradation in affected areas and to better understand and assess the processes and effects of droughts and desertification ;
- Promoting the transfer, acquisition, adaptation and development of technology.

The set up, in 1992, of the Sahara and Sahel Observatory (OSS) belongs in this dynamic of mobilisation of the international community towards combating desertification and the mitigation of drought impacts with a view to mitigating their ecological and socio-economic effects. The originality of this initiative lies mainly in the fact that it aims not only at better tailoring research and its findings to the service of development but also, and above all, to start a new dynamic of a cooperation based on a new partnership and solidarity spirit. Indeed, the task is first of all to make best use of the achievements of the various research works already conducted or in progress, then to define new actions, by mainly favouring the harmonisation of data collection methods and analysis, as well as of the dissemination of information, by initiating new synergies between the various partners and by designing new tools that help in decision-making.

Based on such considerations and drawing upon the conclusions and recommendations of a workshop held in July 1992 in Fontainebleau (France), and organised jointly by UNESCO and IGBP, on the monitoring of terrestrial ecosystems, OSS envisaged the set up of a **Long Term Ecological Monitoring Observatories Network (ROSELT/OSS) whose objective is to better understand the causes and effects of desertification in the circum-Saharan zone.**

2- THE LONG TERM ECOLOGICAL MONITORING OBSERVATORIES NETWORK (ROSELT/OSS)

Among the major programmes launched by OSS since its establishment, one may mention the **ROSELT/OSS (Long Term Ecological Monitoring Observatories Network)**. Such as designed in the founding documents developed in 1995 following the Rabat meeting (1994), ROSELT/OSS aims at meeting the need to have reliable data on the state of the environment and, more particularly, in the circum-Saharan arid or semi-arid zones which are highly affected and/or endangered by desertification.

The key objectives of ROSELT/OSS in the field of environmental monitoring and research relate to :

- enhancing the state of knowledge of the mechanisms, causes and consequences of desertification;
- monitoring of the state and long term evolution of the ecological systems and of the resources that they contain;
- understanding the functioning of these systems and the interactive effects between the populations and their environment at local level, particularly with a view to identifying the respective and/or synergetic part of the climatic causes (climate change) and human causes of land degradation.

The objectives of ROSELT/OSS in the field of support for development are :

- to provide reliable and useful decision-making products;
- to develop training in the use of environmental data and information in development plans and projects.

Ecological monitoring is understood in its broadest sense, that is as the study of the dynamics of the natural, physical and biological milieu of the human environment, including social organisation and land use systems, as well as the systems governing the interactions which exist between these various sets or compartments.

The ultimate objective is not only to analyse and to appreciate the functioning of these systems and their various interactions, but also, and above all, to seek to identify optimal solutions both with regard to the use of the natural resources and to meet the needs of the populations, as well as the prevention and compensation of environmental damages.

It should be pointed out that long term ecological monitoring programmes throughout the world are numerous and varied. One may mention, inter alia : the GEMS (Global Environment Monitoring System) programme of UNEP⁶, the GTOS (Global Terrestrial Observing System) programme which is one of the projects of the International Geosphere-Biosphere Programme (IGBP) that brings together various international governmental organisations and NGOs and the various LTER (Long Term Ecological Research) networks of American universities.

It is also worth pointing out that the ROSELT/OSS programme has considerably drawn upon the recommendations of the meeting organised jointly by IGBP, MAB/UNESCO and OSS in July 1992 in Fontainebleau (France) and which has, in addition, served to give birth to the GTOS⁷ programme.

From a conceptual point of view, the ROSELT/OSS programme is quite close to the « Man And Biosphere » programme (MAB) of UNESCO and, more especially, to its « core concern » which revolves around the concept of « Biosphere Reserves ». Indeed, it shares with this concept several objectives and functions, especially that of « continuous surveillance » (monitoring), which is equally a core concern for the GTOS programme.

⁶ United Nations Environment Programme

⁷ Global Terrestrial Observing System, founding document ROSELT/OSS, 1995.

Several ROSELT/OSS sites are part of the global network of Biosphere Reserves (such as the National Park of « Boucle du Baoulé » in Mali, the National Park of Haddej Bou Hedma in Tunisia , the National Park of the Tassili N'Ajjer in Algeria, and the Reserve of El Omayed in Egypt).

Photo n° 1 : National Park of Haddej Bou Hedma - Tunisia



Such convergences are likely to firmly establish the ROSELT/OSS programme from a scientific point of view, though the latter remains specific in view of its practical and operational calling, as well as by virtue of its mandate which is confined to a well defined geographic area, i.e. the circum-Saharan zone. This has led the programme to focus, as much as possible, on development support actions in the areas affected or endangered by desertification, as well as on the interactions existing between development and the protection of the environment in these areas. Indeed, does not the key objective of OSS consist in providing **help towards decision making for the development actors** entrusted with implementing the solutions intended to break the « **desertification/poverty** » vicious circle which traps the needy populations and leads them to overexploit the natural resources to which they have access?

3- GENERAL PRINCIPLES OF ORGANISATION AND OPERATING OF ROSELT/OSS

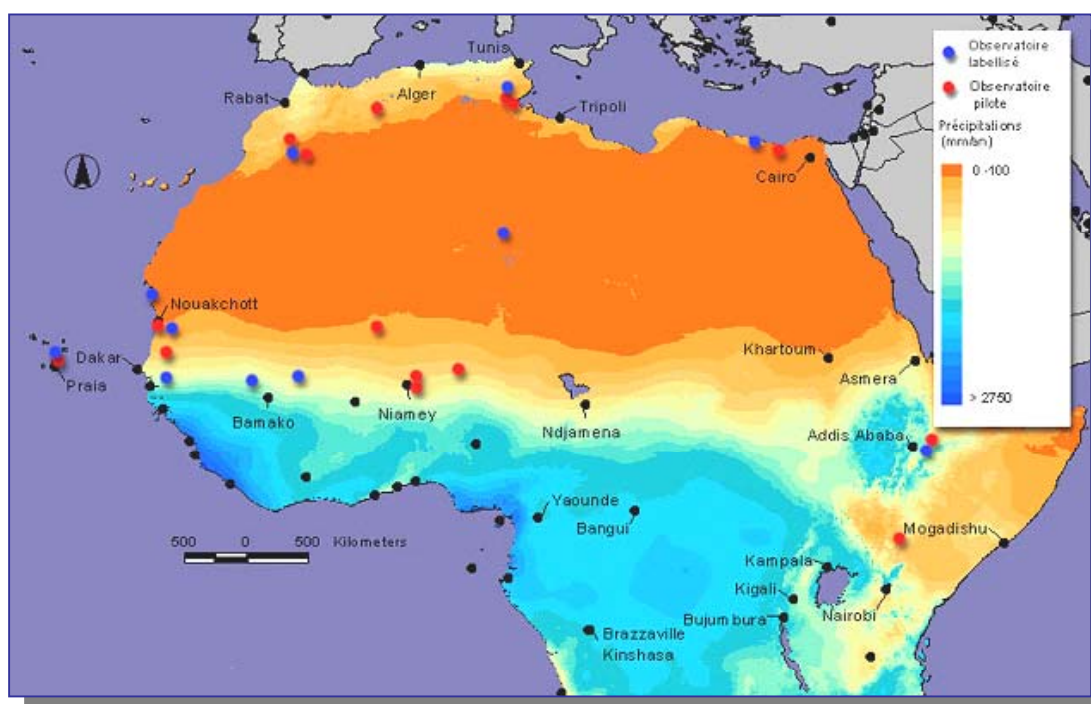
3.1- The choice of sites

In order to enlighten the choice of the long term observation sites, OSS conducted, from 1992 to 1993, a series of studies and consultations on the problematics of desertification, its causes and its effects, as well as on the need for long term monitoring within observatories distributed in the circum-Saharan zone.

The inventory of Potential Area Candidates (Territoires Candidats Potentiels : (TCP)) carried out by the countries concerned has led to the choice of **25 observatories or clusters of observatories, labelled ROSELT/OSS**, distributed over 11 countries (cf. Map 1 and Table 1) out of which 12 were selected as **pilot - observatories**, that is ones that are intended to serve, within a first phase, as a basis for :

- refining the concept and finalising the data collection and processing techniques and methodologies;
- test the working hypotheses in light of the knowledge acquired on the processes of desertification with a view to producing, at lower cost, reliable, relevant and replicable tools for assistance in decision making (maps, indicators, information systems...).

Map n° 1 : Location of the ROSELT/OSS Observatories in Africa



This choice and this selection have been made by an *ad hoc* Scientific Committee and based on a scientific audit, according to criteria that are directly connected to the objectives sought, namely a study of the dynamics of ecological systems, the land use systems and the social systems.

Among the selection criteria, the following ones are worth mentioning:

- ⇒ the quality of the scientific and technical achievements gathered on the site;
- ⇒ its representativeness from a phytogeographic or bioclimatic point of view;

- ⇒ the land use systems and the resources management methods practiced in the site;
- ⇒ the state of conservation, or else the state of degradation, of the resources that are characteristic of it.

Two further criteria are worth mentioning, as they are systematically taken into consideration:

- ⇒ the inclusion of the site concerned in the national system of monitoring – evaluation of desertification (NAP/CCD) (National Action Programme to Combat Desertification);
- ⇒ the availability of an operational team capable of carrying out to a successful conclusion the main activities envisaged.

Thus, a site selected as an observatory may be a protected zone, such as, for instance, the National Park of the « Boucle du Baoulé » in Mali, or the National Park of Haddej - Bou Hedma in Tunisia) or else areas where high agricultural and/ or pastoral pressure is exerted, such as the steppes of the upper plains in Algeria, the Menzel Habib region in Tunisia, the Site of Biological and Ecological Interest (SIBE) of Oued Mird in Morocco, the “Bourem Circle” in Mali or the “Ferlo region” in Senegal.

Table n° 1 : Features of the twelve Pilot - Observatories ROSELT/OSS

	Denomination of the ROSELT/OSS Observatories	Land area of the Observatory	Bioclimate	Type of prevailing ecosystem	Prevailing uses
NORTH AFRICA					
ALGERIA	Steppes of the Upper Plains of Southern Oran	4 x 100 000 ha	Mediterranean : from lower semi-arid to per-arid	Steppic ecosystems Agrosystems	Rain-fed cereal cropping, pastoral systems
EGYPT	El Omayed	100 000 ha	Mediterranean arid	Steppic ecosystems	Dryland farming, orchards, irrigated cropping and pastoral systems
MOROCCO	Oued Mird Issougui	60 000 ha 123 000 ha	Mediterranean lower arid	Steppic ecosystems Sparse <i>Acacia raddiana</i> dominated Savannah ecosystems	Rain-fed cereal cropping, irrigated cropping in the wadis, pastoral systems
TUNISIA	Haddej – Bou Hedma Menzel Habib	16 488 ha 190 000 ha	Mediterranean arid	Steppic ecosystems Sparse <i>Acacia raddiana</i> dominated Savannah ecosystems Agrosystems	Rain-fed cropping, Dryland farming, pastoral systems
WEST AFRICA					
CAPE VERDE	Ribeira Seca	22 000 ha	Tropical, semi-arid to arid, monomodal with a coastal oceanic variant	Agro-forestry systems	Rain-fed cropping, irrigated cropping
MALI	Cercle de Bourem : Test – zone of Bamba	50 000 ha	Tropical, arid monomodal	Very sparse Savannah ecosystems and Sahel agrosystems	Pastoral systems, flood recession crops, irrigated cropping, fishery
MAURITANIA	Nouakchott	40 000 ha	Tropical, arid monomodal with a coastal oceanic variant	Degraded sub-urban ecosystems Coastal ecosystems	Pastoral systems
NIGER	Torodi – Tondikandia – Dandiantou Keita	69 800 ha 40 000 ha 486 000 ha	Tropical, semi-arid monomodal	Sparse Savannah ecosystems and Sahel agrosystems	Rain-fed cropping, irrigated cropping, pastoral systems
SENEGAL	Ferlo Cluster, 3 sites : Souilène, Widou, Linguère	2 600 000 ha	Tropical, semi-arid monomodal	Sparse Savannah ecosystems and Sahel agrosystems	Rain-fed cropping, pastoral systems
EAST AFRICA					
ETHIOPIA	Melka Werer	67 000 ha	Tropical, semi-arid, bimodal	Savannah ecosystems and agrosystems	Irrigated cropping, pastoral systems
KENYA	Kibwesi – Kiboko : 4 stations	250 000 ha 800 000 ha 300 000 ha 30 000 ha	Tropical, semi-arid, bimodal	Savannah ecosystem and agrosystems	Pastoral systems, Rain-fed cropping

The presence of highly contrasting situations within the same observatory, or between observatories located in quite different zones, lends itself perfectly to in-depth analyses of the dynamics of the environments, such as induced by driving forces of a climatic or human origin. It also allows an objective appreciation of the phenomena of environment degradation or, otherwise, the process of its rehabilitation.

It is worth pointing out that the areas selected for the observatories are often vast enough to confer on the results a real ecological significance. Most of the sites have, in addition, a quality that makes them serve as « **field evidence** » for studies involving remote sensing or more comprehensive survey methods allowing spatialisation of the data and scale changes.

The network-based structure should ultimately make it possible to provide a state of the circum-Saharan environment resting on an evaluation of desertification based on the whole body of the information available in the network, which could be further extrapolated to regional sub-sets, as well as to set up, in the shorter term, a joint local environmental monitoring system, ranging from data collection, processing and storage, all the way through to the dissemination of useful information for purposes of helping towards decision making.

3.2- The network effect

Most of the ROSELT/OSS labelled sites constitute the backbone of environmental monitoring networks or systems (e. g. : Mali, Niger ...). Their inclusion in this programme aims at developing this network effect at sub-regional level (North Africa, East Africa, Sahel Africa) and at regional level (circum-Saharan zone), in conformity with the mechanisms provided in the framework of the Convention to Combat Desertification or in that relating to the convention on biological diversity. These mechanisms thereby constitute major support pillars for the national action programmes (NAP), sub-regional action programmes (SRAP) and regional action programme (RAP) to combat desertification.

The networking of the activities of the regional ROSELT/OSS programme aims in particular to :

- ⇒ ensure, with regard to the conceptual and methodological aspects, consistency of the programme components, by favouring harmonisation, in a concerted (mutually agreed) way, of approaches and techniques concerning the various topics addressed;
- ⇒ create synergies between the various teams working on common interest issues, thus allowing at the same time complementarity and comparability of the results;
- ⇒ promote exchanges of information and of expertise by setting up appropriate information dissemination and circulation mechanisms, and by facilitating contacts between specialists.

3.3- Activities Programme and Objectives

3.3.1. A model activities programme since 1998

Soon upon starting the operating programme in 1998 in the ROSELT/OSS Pilot-Observatories in North Africa (Egypt, Morocco, Tunisia), a model activities programme was proposed by OSS based on the founding document (ROSELT/OSS 1995) for purposes of defining the implementation of the diagnosis and monitoring activities :

- **long term environmental monitoring activities;**
- **analysis, interpretation and synthesis of information, including the study of mechanisms;**
- **development of tools for assistance in decision making and for development backup.**

The **environmental monitoring** activities are based on the collection of data on meteorological, climatic and water related phenomena, on land use, soil and water

resources, on the plant cover state, on wildlife, on the monitoring of land uses, as well as on socio-economic parameters. Such activities allow a characterisation of the environments at a given moment and a monitoring of their evolution over time.

The **data analysis, interpretation and synthesis** aim at elucidating the interactions that exist between the various factors involved and, hence, providing a better understanding of the dynamics and functioning of the ecosystems and agrosystems, which leads to a more accurate appreciation of the impacts of human activities on the environments.

The **products that assist in decision making**, and which represent the outcome of these various types of activities, may be of different types, of which we may mention : environmental data bases, thematic maps, process or impact indicators, or technical documents likely to serve as extension and outreach tools.

3.3.2. A new conceptual model for programming activities as from the year 2000

During the first two years of the ROSELT/ OSS programme in North Africa, the sector-based activities, as per scientific and technical speciality, were focused, within a first phase, on the establishment of special sampling devices for each subject in order to study the evolution of the parameters to be monitored, such as these are described in the agreements signed between OSS and the national observatories, which did not allow for developing decision making tools.

The launch of the ROSELT/OSS programme in West Africa in June 2000 at the Bamako meeting allowed an updating of the concepts used within the network and for adopting a global conceptual scheme (Figure 1), developed by the Regional Operator, together with OSS, for the study of environmental changes within ROSELT/OSS with a particular focus on a conceptual development of the « landscape » approach, while the founding document actually proposed a list of data to be collected for the exclusive purpose of characterising desertification from an ecological standpoint.

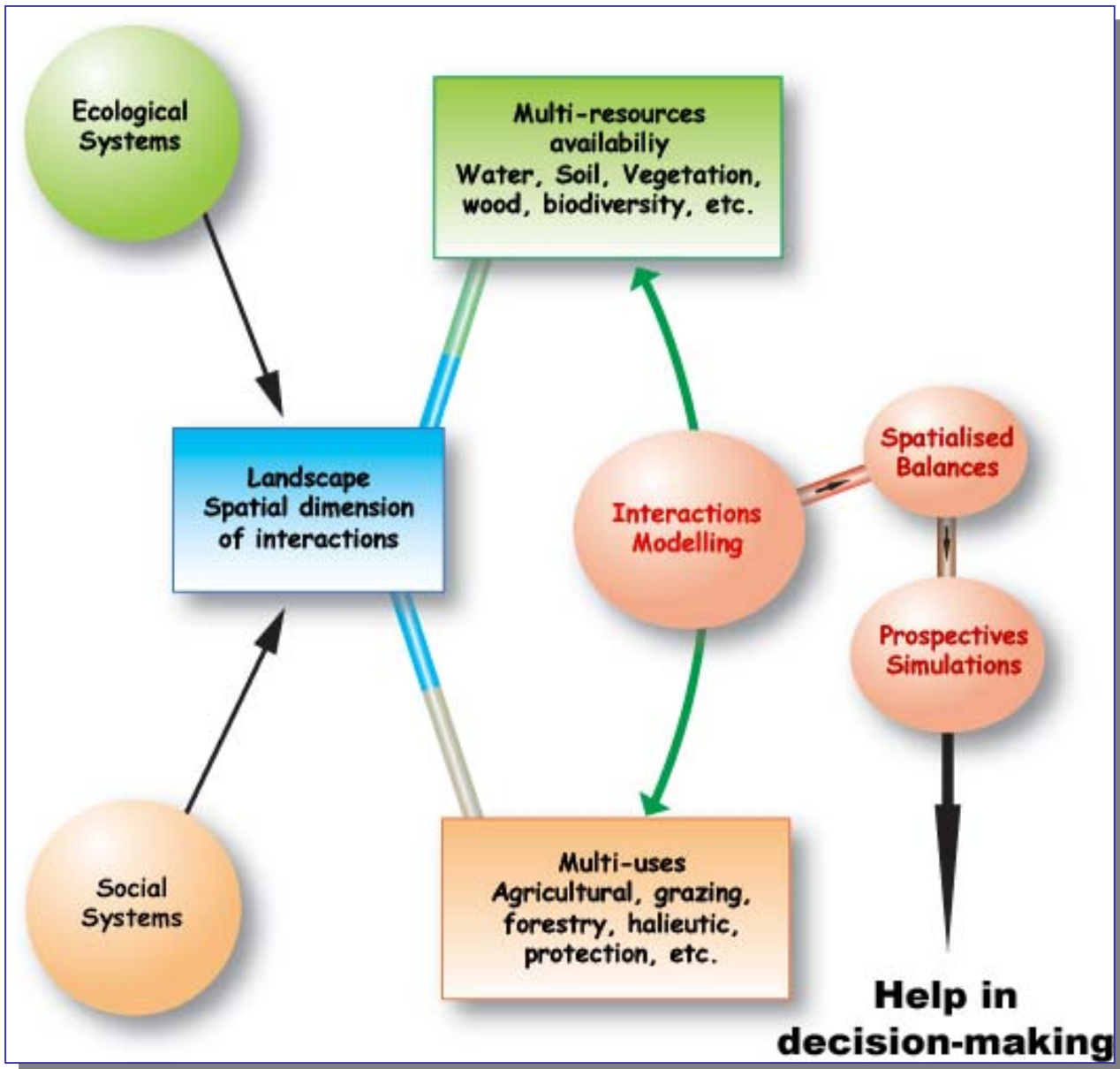
This spatial approach allows to include the set of biophysical and socio-economic data, as well as to study the impact of uses on natural resources, with a view to developing the decision making aids expected : reliable data on land degradation in arid zones, relevant biophysical and socio-economic indicators on desertification, a state of the environment of the OSS zone, space-related uses/ resources balance, prospective scenarios, etc . . .

The mid-term audit, conducted towards the end of the year 2000 by OSS in the countries of North Africa (Egypt, Morocco and Tunisia) has highlighted a lack of scientific coordination in these countries and the need to direct or plan the activities of the North Africa observatories according to the new conceptual model recalled below, and this in order to :

- harmonise the collection and processing of the biophysical and socio-economic data with a view to favouring the cross-referencing of the whole set of data based, in particular, on a Local Environment Information System (LEIS-ROSELT/OSS);
- complement the inventories of work done (lists of bibliographical references) in order to establish “zero reference state” diagnoses based on a true valuation of the historical data, as well to construct and test the indicators;
- implement data storage and cataloguing tools (data and metadata bases).

Figure n° 1 : Conceptual model for understanding the mechanisms, causes and impacts of desertification and for assistance in decision making

Local Environment Information System



Thus, for the two years following the mid-term audit, effort was focused on activities likely to **build multi-disciplinary cohesion among the national teams** serving in the observatories, and on a further valuation of the historical data for the construction of a « zero » reference state. The currently collected data gradually supply a **Local Environment Information System** (LEIS-ROSELT/OSS) allowing, in particular, the establishment of practical balances (tapping vs. availability) of the resources under space-related models (cf. Figure 1).

Special effort has been made with a view to defining a **minimum data set**, to be collected at lower cost, which would allow for a spatialisation of the data, their possible extrapolation to larger zones and their integration within models of space and resources use. The final objective of such operations was in fact to :

- provide a characterisation of the state of the environment at the various stages of its evolution;

- offer the possibility of conducting prospective studies on the dynamics of the environments based on simulations and modelling techniques;
- undertake an in-depth analysis of specific topics (desertification, biodiversity, sand encroachment, pastoralism, farming activities, etc . . .).

Within the framework of the ROSELT/OSS programme, the "data sets" thus defined correspond to the following set up :

➤ **Bio-physical data set :**

- **climate** : rainfalls (quantity and spatial and temporal distribution), meteorological data;
- **soil and water** : quality and spatial distribution (soil surface conditions, pedology, surface hydrology and hydro-geology);
- **vegetation** : production, structure, quality, spatial distribution and floral diversity;
- **fauna** : structure and spatial distribution of livestock and wild fauna;

➤ **Socio-economic data set :**

- **human population** : number and location;
- **micro-economic parameters** : households micro-economy;

➤ **Interface data set :**

- **land tenure rules** for access to resources;
- production/ exploitation systems for **a characterisation of uses/ activities**;
- **production and extraction of resources** (agricultural, pastoral and forestry).

The extrapolation and use of field data for refine the existing maps relating to the environment and to monitor the environment dynamics are based on the **use of satellite images and aerial photographs**.

The "**networked thematic data series**" are data that have been adapted specifically for the problematics proper to one or several observatories (biodiversity, sand encroachment . . .); part of these data contributes in the « network and/or observatory data set », while the other part comprises data that are specifically intended for understanding the mechanisms connected with the topic. The topics identified in connection with the Rio conventions on biodiversity, sustainable development and climate changes are as follows : biodiversity (fauna and flora), erosion, sand encroachment (wind dynamics), climate change, hydrogeology, pastoralism in dry zone, Sahel forestry, production systems/ exploitation systems/ land use systems, land tenure/ social organisation system.

Photo n° 2 : Measurement Station of Climatic Parameters in the Sahel

In addition to all that, various conceptual and methodological documents, as well as activities reports issued by the observatories have been produced (Cf. Bibliographical References) in order to report on monitoring activities and harmonised methodologies of data collection and processing defined and used by the ROSELT/OSS network. The tools developed (LEIS-ROSELT/OSS and metadata base) are gradually implemented in the observatories thanks to a close consultation work not only between the Regional Operator, with OSS mandate, and the national teams, but also between the various members of the network which may, via an Internet discussion forum relating to information systems, share their points of view and experiences.

At present, the ROSELT/OSS programme is in full operational phase. It has just been launched in East Africa, while several countries that have not yet been provided with ROSELT/OSS labelled observatories have expressed their interest in joining the network (Uganda, Djibouti...).

Since the development of the conceptual and organisational model of the programme, and more exactly after five years of active and operational life of the network, the assessment of the latter is very positive. Indeed, a real dynamism has been incepted within ROSELT/OSS and the scientific and technical results obtained are quite encouraging, and this in spite of the difficulties encountered at the beginning and which are inherent in the complex nature of the large scope of its activities.

4- PRODUCTS

4.1- Summary overview of past achievements

The **labelling** of territories that constitute potential candidates for the ROSELT/OSS network is made based on a file comprising the data necessary for their characterisation and detailed information on the work already done there. As these data were often scattered or insufficiently exploited, part of the task was directed to undertaking their inventory and their synthesis. Accordingly, the chosen activities programme, particularly for the pilot-observatories, provided—in terms of preliminary activities—the drafting of a **synthesis report** on the work already done or in progress, as well as the making of a **land cover map**. This allows, to a certain extent, the establishment of a reference base for the use of past data, on the one hand, and for monitoring future developments, on the other hand.

In 1994, and so as to provide guidance to countries toward the implementation of ROSELT/OSS activities, including the preliminary activities of valuation and capitalisation of past achievements, the methodologies recommended for ROSELT/OSS were set out in a founding document (**ROSELT/OSS, 1995**) relating to the design, organisation and implementation of the ROSELT/OSS programme.

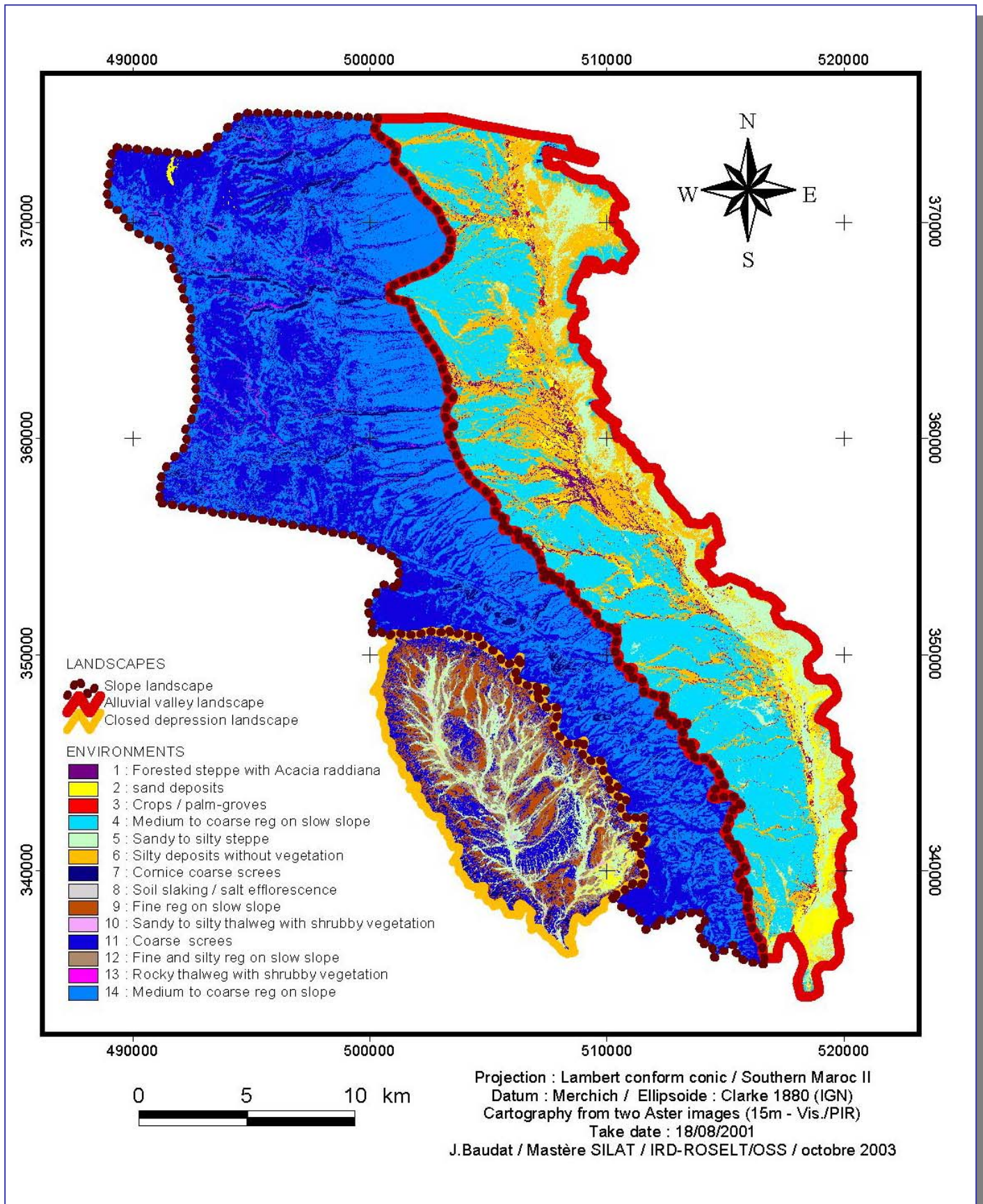
Based on the recommendations of this document, the preliminary diagnosis activities, conducted since 1996, have thus led to an overview of the state of knowledge relating to the whole set of observatories at the time of inception of the ROSELT/OSS activities. They involve, on the whole, two main fields : **the biophysical data** (climate, soil and water, vegetation and fauna) and the socio-economic data (socio-economic features, uses and practices). The volume and quality of the data collected vary from one observatory to the other.

The reference state (zero state) of an observatory is represented by :

- the land cover maps (COT) which give the features and location of the vegetation units (physionomic units defined by dominant species, their stratum, their cover and their density), as well as the vegetation forms that translate the uses;
- the maps related to the physical features of the territory concerned and which inform on the major topographic, pedological and geomorphological sets...

The national teams entrusted with the collection and processing of the data now focus on a **valuation of the whole body of existing record data**. The purpose is to make these data accessible and usable for performing diachronic analyses, and thus identify the relevant indicators that reveal the evolution of the biophysical and socio-economic systems, and their interactions in both time and space (at “landscape” level).

Carte n° 2 : Land Cover map of the ROSELT/OSS Observatory of Oued Mird, MOROCCO (Baudat, ROSELT/OSS Morocco, 2003)



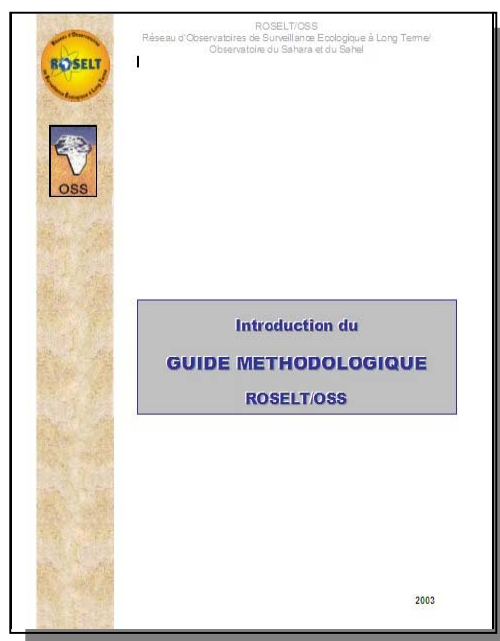
4.2- Methodological tools and bases

4.2.1. The methodological Guidebook

Soon after the inception of activities in the various pilot-observatories, relevant methodologies of data collection and processing were applied by the national teams entrusted with the programme. It then proved useful, on the one hand, to **capitalise this know-how** and, on the other hand, to **harmonise the methodologies within the network** in order to allow monitoring of the long term evolution of the environmental parameters (regardless of the field operator undertaking this task), as well as to allow comparison of the results among the various observatories of the network.

The **harmonisation of the data collection and processing methods** was made possible thanks to the set up of inter-observatory topic-focused working groups, composed of experts from the various countries. **Sub-regional technical workshops** (Bamako in June 2000, Ouarzazate in November 2001, Dakar in February 2002 and Montpellier in October 2002 and in June 2003) were organised in order to bring these experts together and to thus finalise the **ROSELT/OSS Methodological Guidebook** for North Africa, as well as to initiate the drafting of the methodological guidebook for sub-Saharan Africa. These workshops offered the opportunity to strengthen consultation and communication between the Regional Operator, the national coordinators and the officials in charge of ROSELT/OSS activities in the observatories.

Figure n° 2 : The ROSELT/OSS Methodological Guidebook



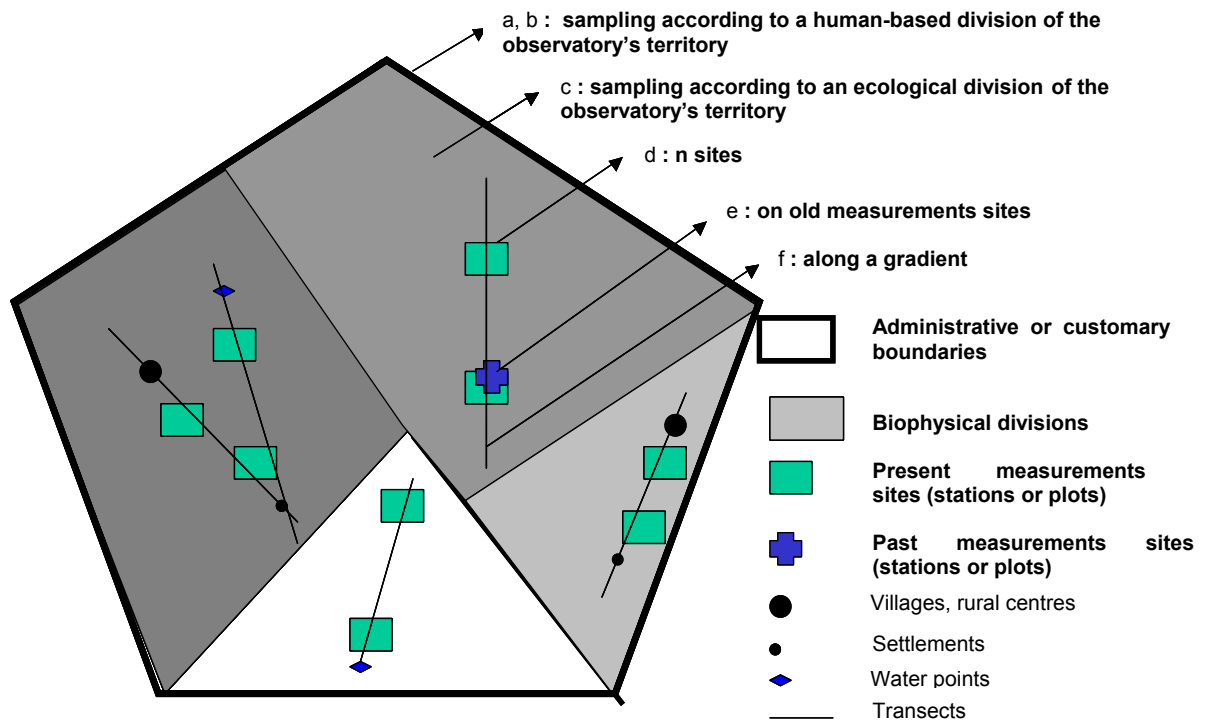
At present, the **Methodological Guidebook for North Africa**, whose main objective is to define the **minimum data set** to be collected for purposes of long term monitoring, is being circulated to the parties concerned. It comprises a common introduction to all the topics, in addition to **leaflets** relating to the various issues addressed in the programme. Four leaflets have now been finalised :

- Evaluation and monitoring of flora and vegetation;
- Evaluation and monitoring of the rural populations and their resources exploitation practices;
- Evaluation and monitoring of soils (edaphic parameters and surface condition);
- Cartography and monitoring of « landscape » units.

Three other leaflets are being developed :

- Evaluation and monitoring of the climatic parameters;
- Evaluation and monitoring of the water resources (both groundwater and surface water);
- Evaluation and monitoring of the fauna.

Figure n° 3 : Principles of common sampling of the long term monitoring mechanism (ROSELT/OSS 2003)

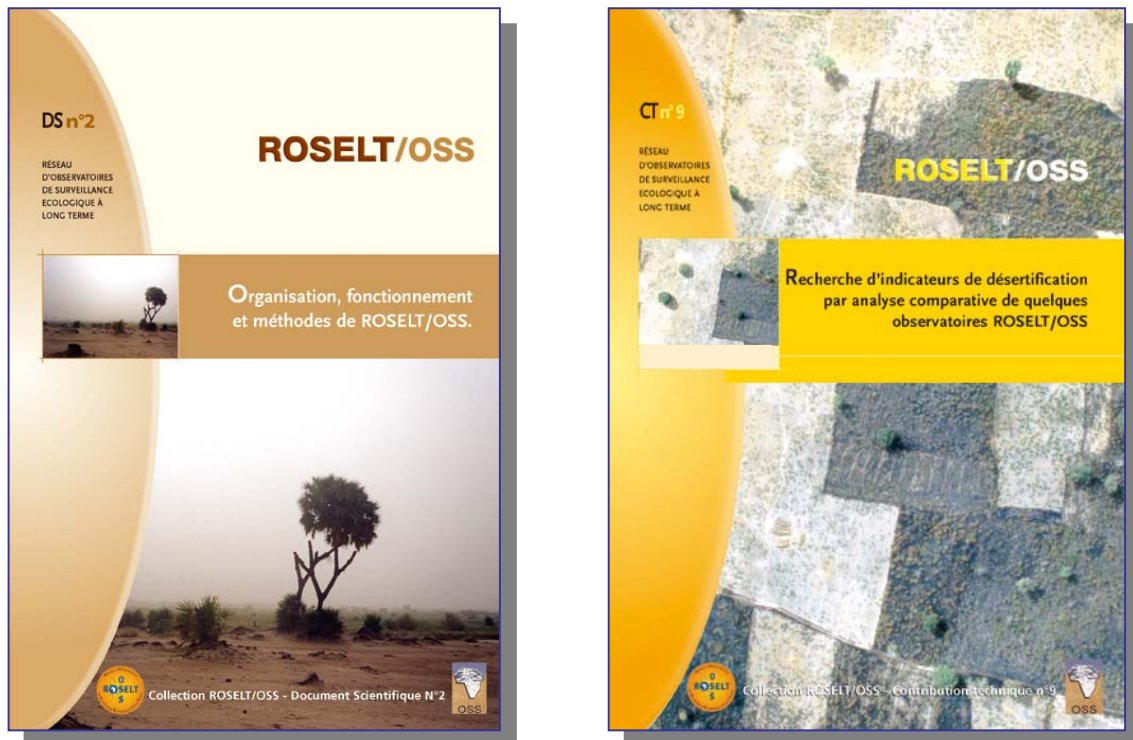


The ROSELT/OSS Methodological Guidebook for West Africa will be gradually drafted in 2004.

4.2.2. The conceptual and technical documents

The conceptual and technical documents have been developed with a view to capitalising the experiences already acquired in the pilot-observatories selected. Of these texts, it is worth mentioning the document on biodiversity (ROSELT/OSS 2004, SD n°5) drafted by a group of specialists working in the pilot-observatories, the series of documents relating to « Indicators », developed based on the works conducted in the ROSELT/OSS Observatory of Menzel Habib in Tunisia and the technical files on ecological descriptors/indicators (ROSELT/OSS 2004 SD n°4 and TC n°4), the Charter on the management and dissemination of data and products within ROSELT/OSS, the document relating to the Local Environment Information System (ROSELT/OSS 2004 TC n°3)...

Figure n° 4 : Examples of Conceptual and Technical Documents

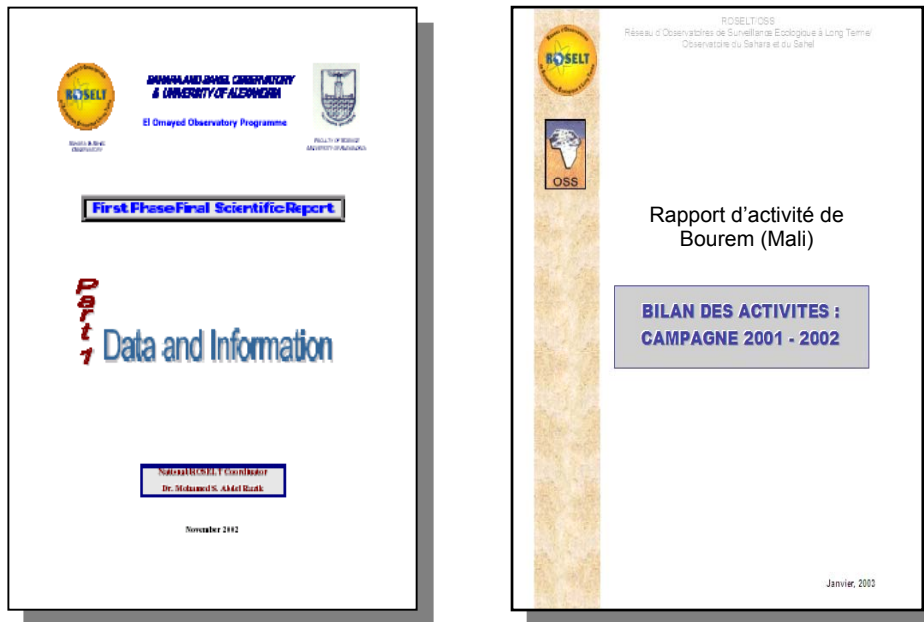


4.2.3. The scientific and technical reports

Developed by the countries, based on a plan validated by the whole network, the scientific reports were made by the whole observatories. Their objective is to offer a synthesis of the data collected during the observation years and to propose the broad lines of interpretation of these data, focused on the definition of a minimum set of parameters to be adopted, as well as of indicators to be produced, in the long term, and at lower cost. More in-depth scientific studies, related to the dynamics of the ecosystems, the agrosystems and the social systems, may also be undertaken with a view to enhancing the understanding of certain phenomena. Among such works, it is worth mentioning (Cf. Bibliographical References) :

- the scientific synthesis drafted by the Moroccan, Tunisian and Egyptian teams, issued in 2002 and 2003 after 4 years of field work ;
- the activities reports produced by Mali, Mauritania, Niger, Senegal and Algeria, in 2002, and Cape Verde, in 2003, which report on the outcomes achieved after 2 years of operational implementation of the ROSELT/OSS programme in these countries.

Figure n° 5: Example of Scientific Report and Activities Report developed by the countries

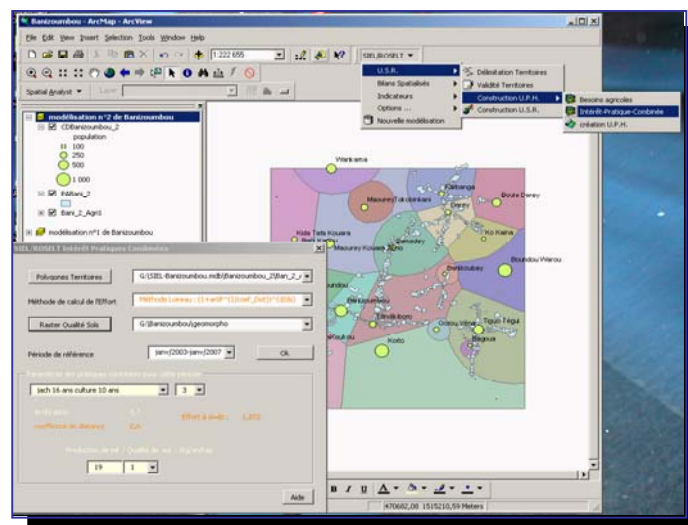


4.2.4. The LEIS-ROSELT/OSS

The LEIS-ROSELT/OSS (Local Environment Information System – ROSELT/OSS) is a conceptual and computer tool that is gradually developed in each observatories of the network. The objective of the LEIS-ROSELT/OSS is to collect data of a varied character, ranging from the biophysical to the socio-economic (spatialised or not), and to focus their processing on the development of products that are useful for understanding the causes, mechanisms and consequences of desertification, as well as for monitoring environmental changes on a local level.

This computer tool makes it possible to generate, based on data collected on the field and integrated within the LEIS-ROSELT/OSS, **spatialised uses/resources balances** and to make thematic maps, such as “**extractions per type of use**” index maps (of a forest, pastoral, agricultural nature) and the Desertification Risk Index map.

Figure n° 6 : The LEIS-ROSELT/OSS



4.2.5. The metadata base

One of the ROSELT/OSS objectives is the merging and sharing of the data and of the expertise gathered by all the observatories in order to promote common interest work, particularly in the field of prevention and combating of desertification.

A metadata service—a tool for the storage and sharing of information, achievements made and data produced within the network—is intended to meet this goal. It allows referencing the whole body of information relating to the data produced and facilitates their dissemination among the members of the network and, more generally, among the scientific community, decision makers and various other categories of users. The objective of this service is :

- to propose a targeted access, *via Internet*, to the information collected and produced, in order to know about the data available (types of observation and of measurements, types of map or of textual documentation . . .) collected or produced by the observatories;
- to provide possibility of access to this information according to rules defined by the network.

The members of the network may connect to it under *intranet* for purposes of retrieving information related to the metadata and updating them. The metadata base has been installed in each member country and the cataloguing of the metadata is in progress. Access to the whole set of metadata will be made subsequently *via « Internet »*.



Figure n° 7 : Web page of the ROSELT/OSS metadata base ROSELT/OSS

Access to the metadata base is made *via* the web site of the programme :

www.roselt-oss.teledetection.fr

4.2.6. The Charter on to the management and dissemination of data and products

The particular effort invested in the development of tools for the management and dissemination of the ROSELT/OSS data and products (LEIS-ROSELT/OSS, metadata base) is accompanied by the gradual implementation of a **Charter on the management and dissemination of data and products within the framework of the ROSELT/OSS programme** (ROSELT/OSS 2003).

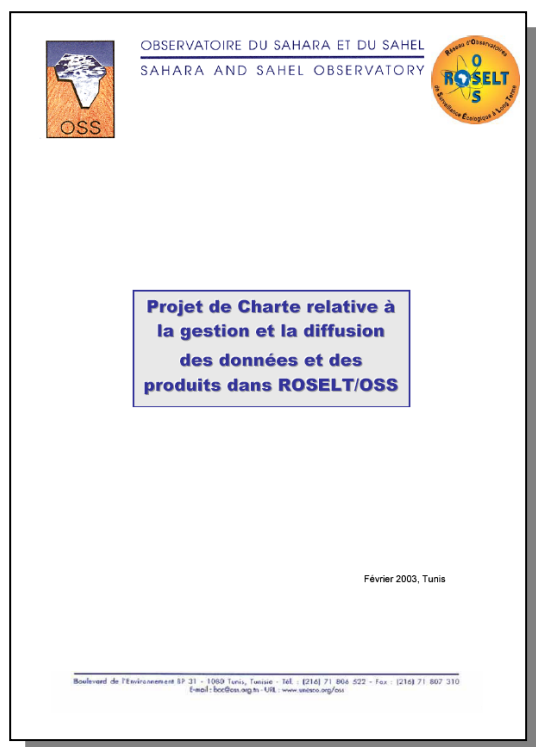


Figure n° 8 : Draft Charter on the management and dissemination of data and products within the framework of the ROSELT/OSS programme

Tunisia and Morocco have been chosen, after consultation with the network members, to test and validate this Charter prior to submitting it, for adoption, to the rest of the network by 2004. These two countries were proposed to conduct this test in view of the advanced state of implementation of the ROSELT/OSS programme in the observatories of which they are in charge, as well as due to the set up of monitoring-evaluation systems for their respective National Action Programme to Combat Desertification (NAP/CCD).

4.3- Methodological bases and training

Alongside with the development of computer tools, and in order to **build national capacities in matter of management and dissemination of data and information**, the network organises training sessions relating to NICTs (New Information and Communication Technologies), developed in such a way as to specifically meet the objectives of the ROSELT/OSS programme: **data bases, metadata base and Local Environment Information Systems (LEIS-ROSELT/OSS)**.

Accordingly, training and exchange sessions relating to the « Practice of Environmental Information Systems within ROSELT/OSS » and technical backup missions have been, and will continue to be, organised each time the need is felt (Montpellier (France) 16-27 June 2003, 6-15 October 2003 ; Médenine (Tunisia) 7-31 October 2003 ; Dakar (Senegal) 5-12 November 2003 . . .). These sessions are offered in both French and English so that Anglophone country members (Egypt, Kenya, Ethiopia) could get acquainted with the developments taking place in the countries of North and West Africa. Training will continue to be offered in English in 2004 in Egypt where all the mainly Anglophone officials in charge of the Information Systems will hold a meeting.

4.4- The indicators

4.4.1. Indicators of environmental changes and desertification on the local scale

The definition of ROSELT/OSS indicators of long term ecological changes requires the implementation of a methodology that is tailored to long term monitoring of the biophysical systems and their interaction with the socio-economic systems.

Two types of studies were conducted :

- diachronic studies;
- synchronic studies.

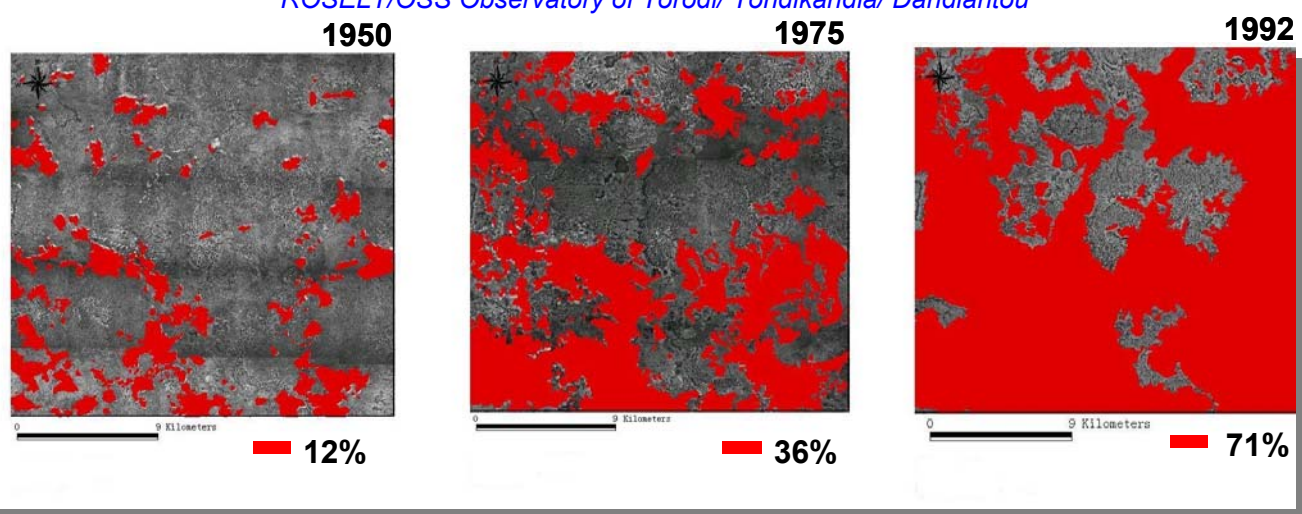
A. Diachronic studies and valuation of the achievements

In a **diachronic** study, the key variable to be considered is time. This approach applies to identified and validated series of historical data (time-series) relating to a well-defined space or to an environmental parameter . . . Data identification constitutes the first phase of this work : the task is to gather the whole body of data of any type having been collected in the past (untreated or developed data, documents, studies) in order to lay down the foundations for a comparison with identical data collected at a more recent time (ROSELT/OSS 2003 b). The “past” diachronic approach makes it possible to rapidly identify relevant indicators and to define the series of data to be measured in the framework of the long term ROSELT/OSS monitoring (ROSELT/OSS 2001 a).

In the framework of implementation of the ROSELT/OSS programme in the observatories, the past data, as well as the data collected since 1998, are gradually collected within data bases and described in the metadata bases. The cartographic data are geo-referenced and integrated within Geographical Information Systems (GIS) . . . The building of such data bases and the establishment of reference states « t_0 » allow for comparisons in time and in space.

Thus, the preliminary works related to a comparison of the thematic maps (past and/ or present) have already led to the identification of indicators at local level (posters presented at the 4th session of the Executive Board, Bonn 2003) :

Figure n° 9 : Evolution of land use
ROSELT/OSS Observatory of Torodi/ Tondikandia/ Dandiantou

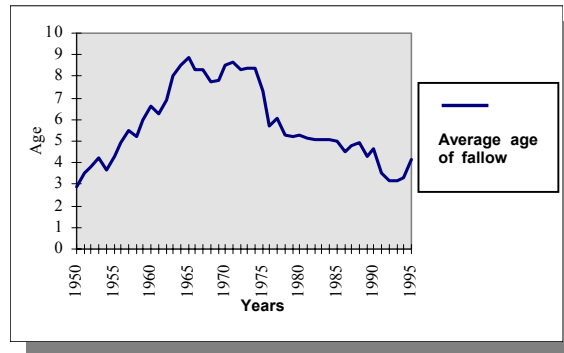


■ Significant extension of cultivated areas and fallows

(Reference : DE / Faculty of Agronomy, Niger)

The comparison of **evolution of land use in Niger** has led to highlighting an indicator related to an increase in cereal cropping (cereal cropping and fallow) at the expense of rangelands. It emerges from the comparison that the cereal cropping areas passed from **12 to 71% between 1950 and 1992** (Loireau, 1998). This diachronic comparison may be carried out in more depth thanks to the detailed study of practices, particularly **the duration of fallow and its evolution over time**.

Figure n° 10 : Evolution of the age-classes of fallow from 1950 to 1995 (Loireau, 1998)

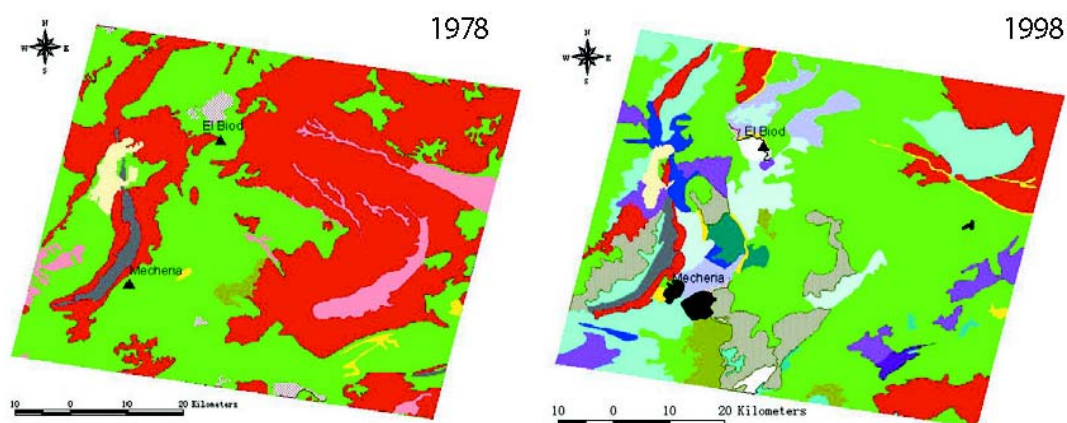


Three evolution phases of duration of fallow may be described :

- first phase (1950 - 1965) : increase of the average age of fallow (from 3 years to 9 years) ; in response to demographic growth, and thanks to the availability of land, the **traditional system** based on perennial crops and short-duration fallow has been replaced by a marked extensification of long-duration fallow;
- second phase (1965 - 1973) : **stabilisation** of a new, more complex crop system based on short-duration and long-duration fallow (average age of about 8 years);
- third phase (1973 - 1995) : saturation of the « easily » cultivable space, **intensification** and reduction of the average age of fallow and return to the situation of 1950.

Figure n° 11 : Evolution of land cover

ROSELT/OSS Observatory of the Steppes of the Upper Plains of the Oran South-West (Sud-ouest oranais), Algeria

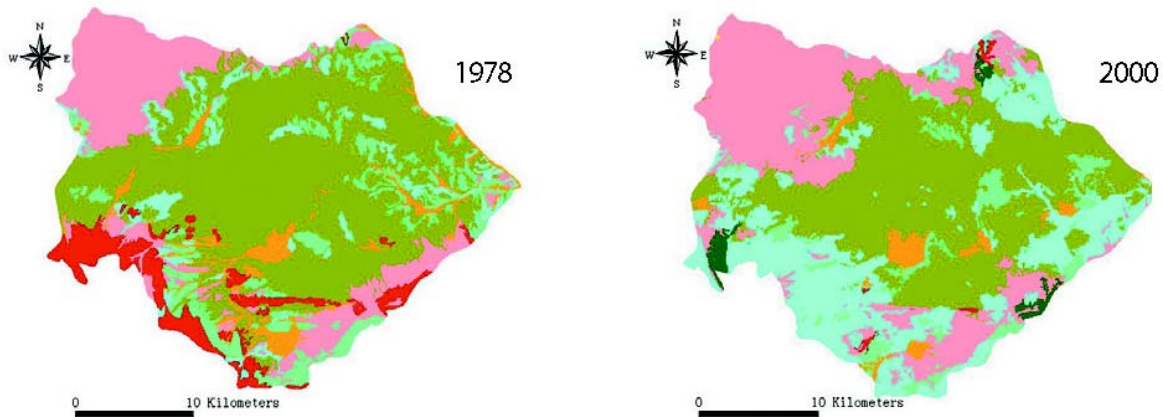


Evolution of the plant cover between 1978 and 1998

- Disappearance of the *Artemisia herba alba* steppes
- Important decrease of the *Stipa tenacissima* steppes

(Reference : URBT/CRSTRA, Algiers)

ROSELT/OSS Observatory of Menzel Habib, Tunisia



Evolution of the plant cover between 1978 and 2000

- Reduction of *Rhanterium suaveolens* dominated rangelands
- Quasi-disappearance of *Stipa tenacissima* steppes

(Reference : IRA, Tunisia)

The comparison of the **evolution of land cover in Algeria and in Tunisia** reveals the same phenomena, namely :

- a degradation of pastoral areas (*Stipa tenacissima* or « Alfa » dominated steppes in Algeria, and *Rhanterium suaveolens* dominated steppes in Tunisia) whose area has been receding in the two observatories ;
- the change in physiognomy of the steppes and the decrease in their pastoral quality : modification of the flora composition (in particular, by species replacement) ; disappearance (or extreme rarefaction) of high grazing value species (perennial grasses) or high-economic value species (Alfa in plains, in the Algerian observatory, and in mountains, in the Tunisian observatory, used for the production of paper); replacement by species of lower grazing value (e. g. : *Lygeum spartum* in Algeria, and *Astragalus armatus* in Tunisia).

The far-reaching changes, which, today, affect the two observatories, are mainly due to overgrazing. The indicators identified on the local scale allow for better highlighting similar trends of the evolution of the plant cover at the level of the North-African steppes.

Photo n° 3 : ROSELT/OSS Observatory of Menzel Habib – Tunisia

**Impact of overgrazing : Decrease in the quality of rangelands
Dominance of a very spiny variety of little appeal to cattle (*Astragalus armatus*)**

**B. Synchronic studies**

Synchronic studies aim at comparing, at a given time, certain spaces selected according to the variation of a well identified desertification factor, while making sure that most of the other factors remain comparable. These studies allow a comparison of one parameter (plant cover, or sand rate, for instance) along an environmental gradient (rainfall gradient, uses gradient, edaphic gradient indicating erosion or sand encroachment phenomena . . .).

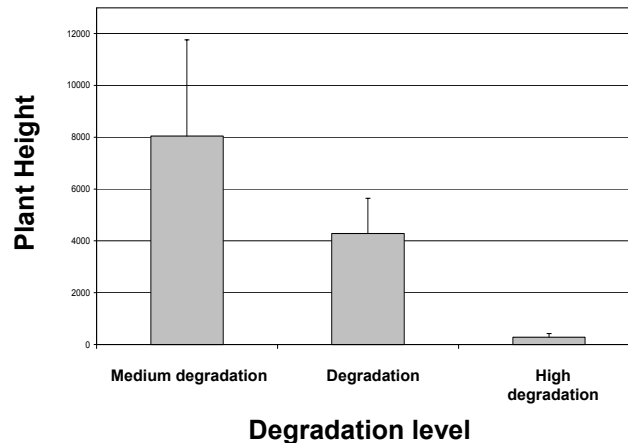
This approach, applied on observatory scale, leads to the development of indicators of a local value ; it may, however, be used for purposes of comparing different observatories on sub-regional scale, if not regional scale, within the ROSELT/OSS network.

Two examples will illustrate the results obtained in different observatories.

The ROSELT/OSS Observatory of Menzel Habib (Tunisia) has formed the subject of a synchronic study (Jauffret 2001, ROSELT/OSS 2003 c). Of this, one may mention, for the sake of illustration, the study on the evolution of the height of perennial species along the gradient of degradation of soils and vegetation.

The study revealed, based on a statistical analysis, that the height of these species significantly decreases as degradation increases. The measured height of the species *in situ* reveals the considerable plasticity of the species, of certain dwarf shrubs in particular, which varies simultaneously according to environmental factors : grazing pressure, and climatic and edaphic conditions, as shown by the figure below :

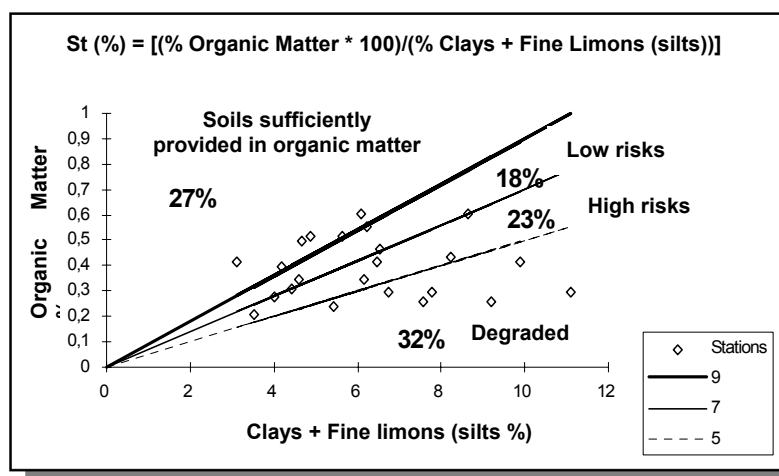
Figure n° 12 : Decrease in plant height. Result of the statistical test : Highly significant (Jauffret 2001, ROSELT/OSS 2003c)



The whole set of results obtained in the ROSELT/OSS Observatory of Menzel Habib has been published under the form of a Scientific Document entitled SD N° 4 : “Ecological Indicators of Land Degradation Applied in Mediterranean Zones” (ROSELT/OSS 2004).

The ROSELT/OSS Observatory of Banizoumbou (Niger) has formed the subject of, among others, a synchronic study related to the classification of measurement stations according to their sensitivity to the physical degradation of soils (Delabre, 1998). This sensitivity was determined by using the Piéri relation (1991) which allows a definition of the structural stability of soils (St) by considering the organic matter and fine elements contents (clays + fine limons (silts)) in the Sahel. Thresholds were established by this author for purposes of defining the states of the soils and their degradation risks. The results of the study reveal that over 50% of the stations studied are degraded (32%) or present high degradation risk (23%).

Figure n° 13 : Situation of the stations sampled in the ROSELT/OSS Observatory of Banizoumbou (Niger) according to Piéri classification. The curves 9, 7 and 5 represent the thresholds of sensitivity to the physical degradation of the soils (Delabre, 1998)



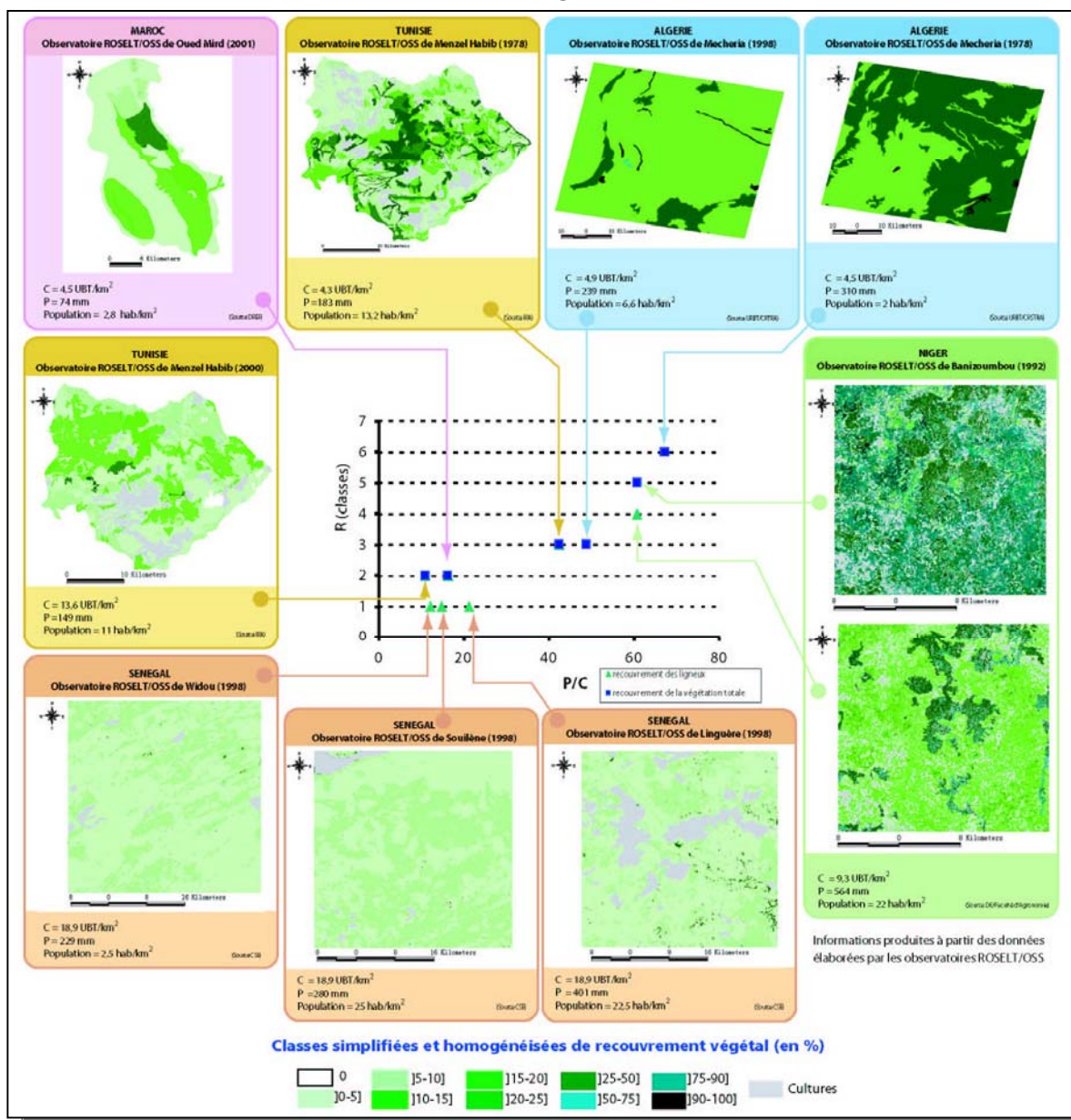
4.4.2. Synthetic indicator on regional scale

The harmonisation of data processing based on the vegetation maps of certain observatories has made it possible to identify a first indicator at regional level : an indicator of relative degradation related to the total plant cover or woody cover according to rainfall and to pastoral load (or stocking rate).

The network structure of ROSELT/OSS and the synchronic and diachronic approaches that it allows lead to the development of synthetic indicators based on simple data.

This work has formed the subject of a report (Damman 2002) and a poster issued on the occasion of the 4th Session of the OSS Executive Board, held in Bonn (Germany, March 2003).

**Figure n° 14 : Indicator of relative degradation.
Total plant cover (R) depending on Rainfall (P) and Pastoral load
(or Stocking rate) (C)**



$$R = f(P / C)$$

N.B : Cover classes (R) which appear in the graph correspond to simplified and homogenised plant cover classes (in %) as follows :

Class 0 = 0%	Class 2 = 5-10 %	Class 4 = 15-20 %	Class 6 = 25-50 %	Class 8 = 75-90%
Class 1 = 0-5%	Class 3 = 10-15%	Class 5 = 20-25%	Class 7 = 50-75%	Class 9 = 90-100%

This study has evolved according to two phases :

- the **first phase** has led to a characterisation of the vegetation based on the use of **Land Cover Maps** ("Cartes d'Occupation des Terres" (COT)).

Based on a harmonisation of the data relating to the plant cover of the Land Cover Maps (COT) developed by the countries, the calculation of the mean cover of the total natural vegetation, woody plants and herbaceous species was carried out over the whole territory and for each cartographic unit (as defined on the field and using satellite images). These mean covers were then related to vegetation classes in order to allow comparison between the various observatories.

- The **second phase** consists in comparing the previously defined **state indicators** (mean covers) with the climatic data (rainfall) and with the parameters relating to human activities (for instance, the pastoral load).

Thus, one can notice a positive correlation between rainfall and the plant cover which is weighted by the pastoral load. This means that the less the rainfall, the more the plant cover decreases. The plant cover decreases all the more as the pastoral load increases.

The details of the methodology used are given in the Master's dissertation of G. Damman (Damman 2002). This dissertation is under print as a ROSELT/OSS Technical Contribution (Cf . ROSELT/OSS, 2004 – Technical Contribution N° 9).

4.4.3. Prospective simulations and desertification risk index

An approach by module of space and resources use and balances of resources/spatialised uses has been developed under the LEIS-ROSELT/OSS.

A varied use of the space and of the resources is the rule in most circum-Saharan arid and semi-arid zones. In order to analyse the state and the evolution of the Reference Spatial Units according to the various modes of use, themselves associated with as many management modes, an analytic approach, by module, has been favoured prior to establishing a balance that makes up the synthesis of the interventions and of the extractions. Each use is related to resources, while considering their relations in time and in space which are specific to them (Loireau, 1998).

For the time being, the LEIS-ROSELT/OSS has been developed for the ROSELT/OSS Observatory of Torodi –Tondikandia – Dandiantou « Banizoumbou ») in Niger. A desertification risk index map has been made according to the following methodology :

- **for each type of use identified, a model of use of space and resources** is developed, but only the model on the human activity that is considered as the key activity from which the "landscape" derives its structure is used for identifying homogeneous practice units. The other models are related to the reference spatial units;
- **the spatialisation of the models of use of space and resources**, based on the reference spatial units, makes it possible to establish, on the one hand, a resources availability map and, on the other hand, an extraction map for each type of use;
- the comparison of the two variables, based on the reference spatial units, allows for the establishment of a **spatialised balance** (detailed with regard to space and time) **for each type of use**. The latter balances, called « **modular** », allow the locating of zones of balance or misbalance between extractions and resources, and this by going back the construction chain, and identifying the causes of the case of balance or misbalance;

Figure n° 15 : Development of a spatialised annual fodder balance based on the fodder availability and the fodder extraction maps (Loireau 1998, ROSELT/OSS Niger 2003)

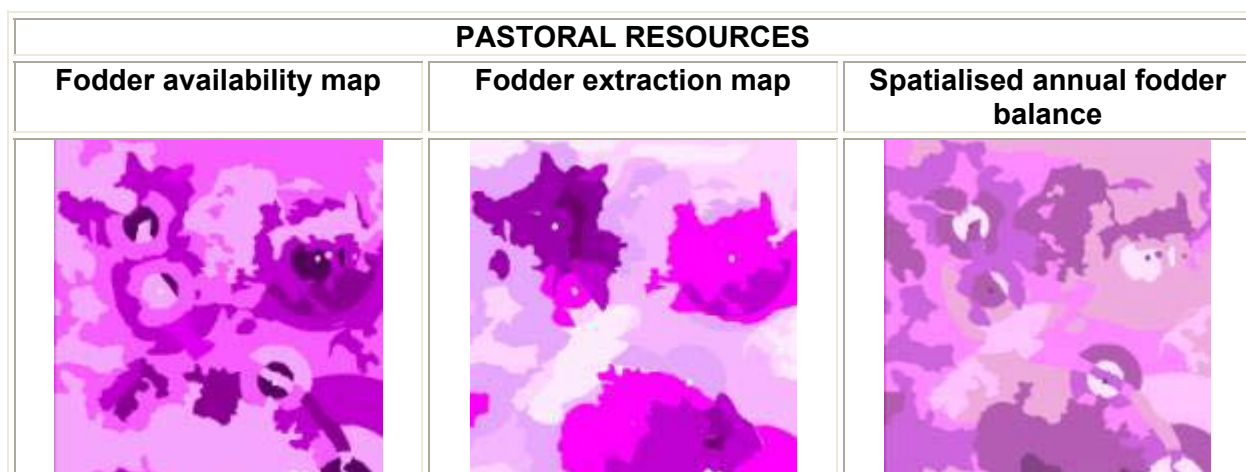


Figure n° 16 : Development of a spatialised annual wood-energy balance based on the wood-energy availability and the wood-energy extraction maps (Loireau 1998, ROSELT/OSS Niger 2003)

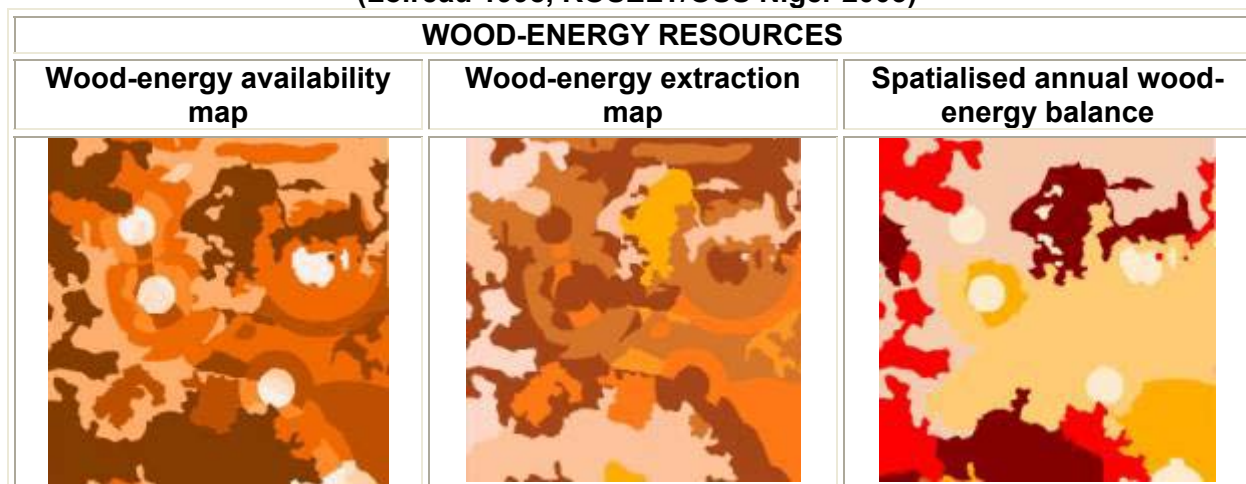
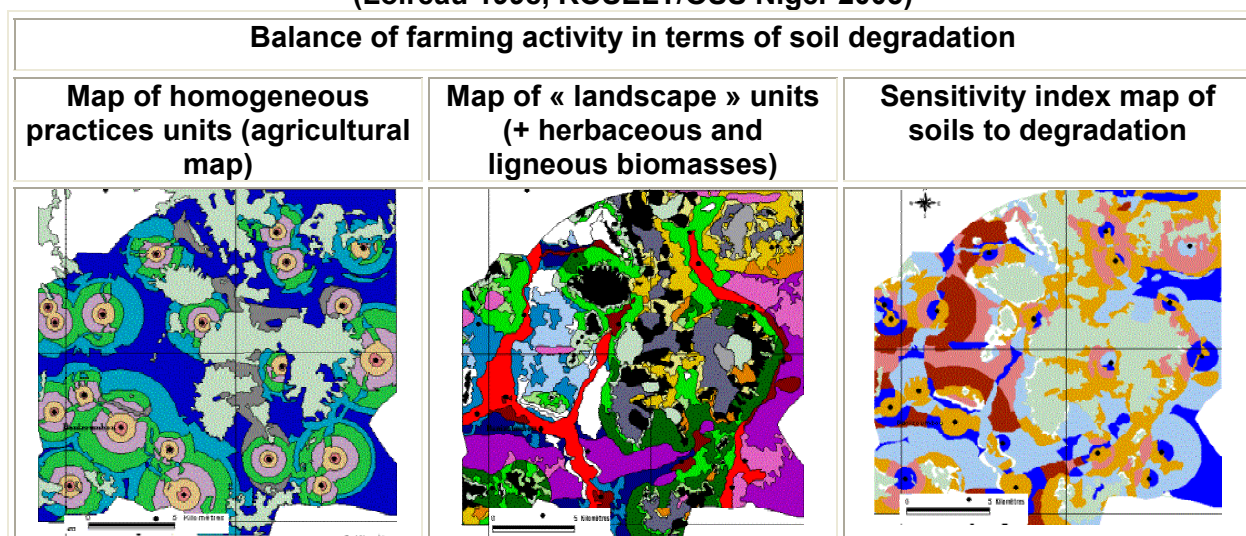
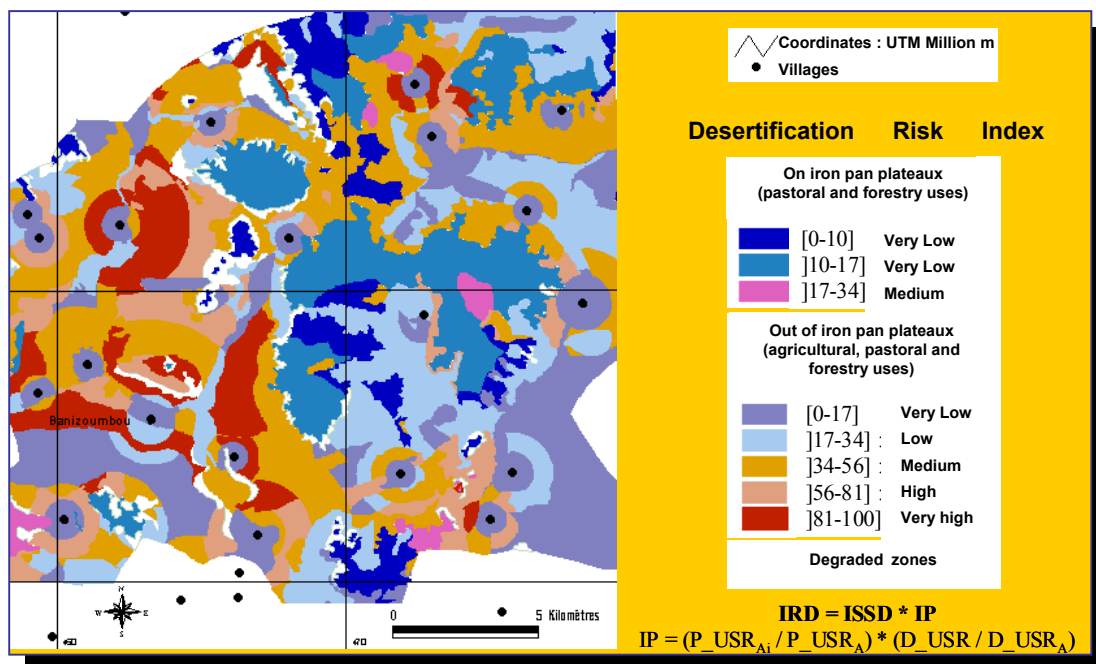


Figure n° 17 : Development of a sensitivity index map of soils to degradation, based on homogeneous practices units maps and landscape units maps (Loireau 1998, ROSELT/OSS Niger 2003)



- the **comparison of the spatialised balances** (modular balances) (annual fodder balance, annual wood-energy balance and sensitivity index of soils to degradation), based on the spatial reference units, allows the establishment of a **global multi-use balance** for the whole observatory's territory. This balance makes it possible, not only to report on the state of the landscape at a given time, but also to appreciate, by going up the whole construction chain, the respective part of the biophysical and the socio-economic factors, and hence to interpret this state. This leads us also to develop a map of desertification risk index for the whole observatory.

Figure n° 18 : Desertification risk index for the ROSELT/OSS Observatory of Torodi – Tondikandia – Dandiantou « Banizoumbou » – Niger (Loireau 1998, ROSELT/OSS Niger 2003)



The LEIS-ROSELT/OSS is in process of development in the other ROSELT/OSS observatories of the network, and the early results on Tunisia and on Senegal are due to be available during the first quarter of 2004.

5- INTEGRATION OF ROSELT/OSS IN THE NAP/CCD (NATIONAL ACTION PROGRAMME TO COMBAT DESERTIFICATION) AND USE OF ITS PRODUCTS BY THE NETWORK MEMBER COUNTRIES

The relevance of the concept of ecological monitoring and the products developed by the network have persuaded a good number of countries involved in the network as to the need to foster the development of environmental monitoring at national level.

In fact, the ROSELT/OSS is integrated in the NAP/CCD of several countries (in Algeria, in Tunisia, in Morocco, in Mali, in Niger), while it is in process of being integrated in the NAP/CCD of Egypt and of Kenya. The ROSELT/OSS methodologies are adapted and replicated in these countries in the framework of national environmental monitoring mechanisms which are based on, or which integrate, environmental monitoring observatories, such as the ROSELT/OSS observatories.

Niger, for instance, has used the ROSELT/OSS conceptual and technical documents relating to the indicators, as well as the draft Charter on data management and dissemination, for purposes of implementing a national mechanism for environmental monitoring based on the achievements of the ROSELT/OSS network.

In Mali, the ROSELT/OSS methodologies in matter of collection and processing of data towards the development of the Local Environment Information System are applied at observatories level of the national device for environmental monitoring.

Morocco and Tunisia have undertaken to conduct, on the occasion of the Launch Workshop of the project related to the « Set up of a Monitoring – Evaluation System in the Maghreb » in Rabat⁸ and in Tunis⁹, two studies aimed at an overview of the state of knowledge about monitoring – evaluation of desertification (research, development projects . . .) and at using the results achieved to propose a general framework for an operational set up of the system of monitoring – evaluation of the NAP/CCD (National Action Programme to Combat Desertification). The substantial contribution of the ROSELT/OSS to such an undertaking was underscored, especially with regard to mastery of the desertification process and to the promotion of development support actions. The results already obtained by ROSELT/OSS in Tunisia (indicators, prospective simulations issuing from the LEIS-ROSELT/OSS and desertification risk index map) will be gradually displayed on the Information Circulation System on Desertification and Environment (« Système de Circulation de l'Information sur la Désertification et l'Environnement (SCIDE)) of Tunisia, a system that was developed under the SMAP project mentioned above.

Finally, the data and metadata bases in process of development in each member country of the network constitute a major asset in matter of management and dissemination of data that are useful for decision making.

⁸ Launch Workshop the SMAP project in Morocco, Rabat, on 28 and 29 November 2002.

⁹ Launch Workshop of the SMAP (Monitoring – Evaluation System in the Maghreb) project in Tunis, Tunisia, on 22 and 23 April 2003.

6- COMMUNICATION AND DISSEMINATION OF ROSELT/OSS PRODUCTS

OSS grants special attention to the mastery of information that is useful in combating desertification by its member organisations and countries ; it grants particular importance to valuing the results of its programmes and their dissemination among the largest number of actors in the field of combating desertification in circum-Saharan Africa.

A brochure presenting the ROSELT/OSS programme was issued in the year 2001, later updated in 2003, in two versions (French and English). Two posters presenting the programme were developed for CoP4¹⁰ (Bonn, december 2000), and one poster for CoP5 (Geneva, October 2001) which has been, ever since, part of the itinerant exhibition prepared by OSS on the whole of its activities. In addition, OSS organised a side-event during CoP5 on the topic : « **Observation and Monitoring Devices on Local, Regional and National Level : Inputs for the Monitoring-Evaluation of the NAP/CCD** ». ¹¹ Conducted by specialists in the subject from both the North and the South, this side-event was an opportunity to present, to some sixty delegates from the North and the South, the preliminary results of the ROSELT/OSS programme, namely in Egypt (El Omayed Observatory), and their integration within the monitoring – evaluation system of the NAP/CCD.

Besides, a set of transparencies presenting the objectives and the organisation of the ROSELT/OSS network was developed for purposes of being circulated to the ROSELT/OSS national representatives for appropriation and harmonised use.

The preliminary results presented above formed the subject of an exhibition of posters during the 4th Session of the OSS Executive Board in Bonn (March 2003), as well as of a presentation during the Launch Workshop of the project relating to the set up of a ROSELT national environmental monitoring device in Niger in April 2003.

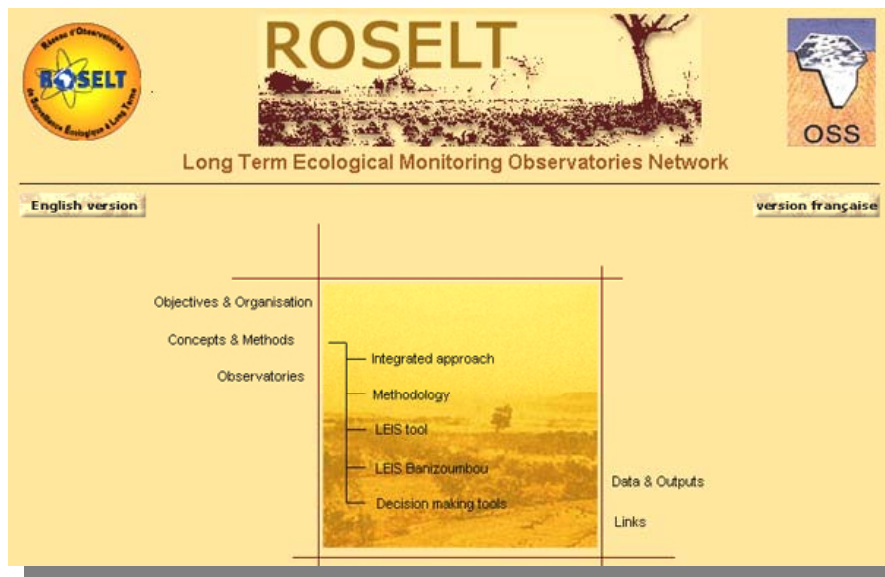
Finally, the ROSELT/OSS programme and related methodologies (LEIS-ROSELT/OSS, in particular) have formed the subject of several presentations on the occasion of scientific and technical gatherings :

- Workshop on UNCCD indicators (November 1998, Marrakech, Morocco);
- International symposium entitled « Planetary Garden (Jardin Planétaire) » (First International Symposium on Sustainable Ecosystem Management, March 1999, Chambéry, France);
- International workshop on fallow in West Africa (April 1999, Dakar, Senegal);
- Workshop on OSS/CCD indicators (October 1999, Paris, France);
- International symposium on « Environment and Population in the Mediterranean MEDENPOP » (October 2000, Djerba, Tunisia);
- FAO colloquium « Land Degradation Assessment in Drylands LADA » (November 2002, Rome, Italy);
- International seminar on Information Systems (March 2003, Orléans, France);
- International seminar « Changes in the Sahel » (October 2003, Nairobi, Kenya);
- « AfricasGIS 2003 », Sixth Conference/ International Exhibition : GIS in Africa (4-8 November 2003, Dakar, Senegal);
- Regional forum « Rural Land Tenure and Sustainable Development in the Sahel and in West Africa » (17-21 November 2003, Bamako, Mali)...

In addition to that, the main activities of the network and the main documents (conceptual documents, proceedings of the Launch Workshop of the second operational phase, reports on sub-regional workshops . . .) are regularly updated *via* the **OSS web site** (<http://www.unesco.org/oss/v-fr/programmes.html>). Further, more detailed information, particularly on the products, may be directly obtained from the **ROSELT/OSS programme web site** in French and in English (<http://www.roselt-oss.teledetection>).

¹⁰ CoP : Conference of the Parties.

¹¹ PAN/LCD : National Action Plan to Combat Desertification.

Figure n° 19 : Home page of the ROSELT/OSS web site

The recent set up of a discussion forum on Information Systems (ISs) in the ROSELT/OSS network is a laudable initiative favouring exchanges between the various network members : officials in charge of the information systems, scientific coordinators, national coordinators... This initiative will be further encouraged by the set up of new ROSELT/OSS forums relating to the other topics studied in the network.

7- CONCLUSIONS

The **ROSELT/OSS** programme is a **complex, ambitious and exacting** programme but a necessary one :

- it is **complex**, since it sets to study phenomena that are themselves multi-dimensional and highly complex. The purpose is in fact to analyse the state and dynamics of ecological systems, of land use systems and of social systems, as well as the interactions that exist between these various systems, including their causes and their effects.
- it is **ambitious**, since it seeks to bring concrete and practical answers to issues of development and of environmental protection in areas that are characterised by the rigorous character of their climate, the scarcity of their resources, as well as by the human pressure exerted upon such resources. It has, in sum, to meet the expectations of the populations and, above all, those of the decision-makers who see to the protection of the vulnerable environments of the circum-Saharan zone.
- it is **exacting**, since it involves several scientific specialities, team work within multi-disciplinary and inter-disciplinary groups, calling upon the contribution not only of researchers but also of planners, developers and development officials in general, including the populations concerned, and this within the framework of a participatory approach that needs to take into consideration at once the ecological, socio-economic and cultural conditions. However, the lack of synergy between national institutions has often proved to be a hindrance to a proper progress of the programme and had resulted, at the programme inception, in slackening the pace of the implementation of its activities.

Furthermore, ecological monitoring—which needs to belong in the framework of a long term vision of land use planning and the management of resources—requires fairly considerable human and material means, as well as stable and sound institutions. However, such conditions are often difficult to find in developing countries, in particular.

Much effort had to be invested in order to get the message across to the institutions concerned that the OSS is not a funding agency and that the means that they provide need, on the one hand, **to incept a national effort** in this regard and, on the other hand, **to build up the teams and the institutions involved**. This unusual approach—which is different from that adopted by the various funding agencies—was not obvious in its implementation, and has resulted, in certain cases, in delays due to the insufficiency of the means provided in respect of the efforts required, which caused delays in the validation of the scientific and financial reports submitted by the national institutions.

Yet, in spite of such handicaps, which seem *a priori* to be difficult to overcome, the ROSELT/OSS programme was launched and it became established in several OSS member countries. This inception phase has been, above all, a phase of training, set up of teams and finalisation from a conceptual and methodological point of view ; however, certain tangible results were obtained and a preliminary assessment was made.

The tools and products for help towards decision making—which were obtained due to the network—can already contribute efficiently in the development of a diagnosis of the state of desertification in the circum-Saharan arid lands of the OSS zone, as well as towards a definition of the minimum data set of the « observatory » and of the « network » to be collected, at lower cost, with a view to the development of a minimum set of indicators.

The sub-regional workshops offered an opportunity for strengthening consultation and communication between the Regional Operator, the national coordinators and the officials in charge of ROSELT/OSS activities in the observatories. These mutually beneficial exchanges constitute the bases for a veritable North-South-South scientific partnership and a major achievement for the network ; the dynamics incepted between the various institutions is quite encouraging. The Methodological Guidebook is one of the key products of the network and

its design under the form of a team exercise is likely to favour the exchange of experiences and the harmonisation of approaches.

Besides, the network grants particular attention to the **building of national capacities to manage and disseminate data and information**. A number of Doctoral dissertations, Post-graduate Studies Degrees, Master's Dissertations have been supported and encouraged by OSS and the Regional Operator, and the findings of these works (Loireau 1998, Hanafi 2000, Jauffret 2001, Damman 2002, Ghram 2003) are presented in international symposia and are, in certain cases, published (Jauffret & Visser 2003, Jauffret & Lavorel 2003 . . .).

The network also organises training sessions on NICTs (New Information and Communication Technologies) in order to achieve the specific objectives of the ROSELT/OSS programme : **data base, metadata base, and Local Environment Information Systems** (LEIS-ROSELT/OSS). Technical backup missions by the Regional Operator accompany the countries in the establishment of their data base and metadata base, as well as in the development of their LEIS-ROSELT/OSS programme, thus making it possible to adapt, in consultation with the country specialists, the tools to their needs and the characteristics proper to each observatory.

A « **Desertification** » Service Unit specific to the ROSELT/OSS network has been set up within the Research Development Institute (Institut de Recherche pour le Développement: IRD, formerly ORSTOM). This initiative will allow the promoting of scientific cooperation on desertification between specialised institutions from the North and the South. It is also a favourable factor for ensuring the sustainability of the network and the mobilisation of means assigned to this complex issue.

Finally, on the technical level, pursuing the present activities will make it possible to finalise the metadata base, develop the indicators expected and establish prospective scenarios thanks to the Local Environment Information System of the various observatories. The products for help towards decision making will be extended to the Monitoring – Evaluation Systems of the NAP/CCD (National Action Programme to Combat Desertification) which are gradually established, especially in Tunisia and Morocco, in the framework of implementation of the conventions relating in particular to combating against desertification, as well as to biological diversity.

It is worth mentioning that the effort invested by OSS to mobilise the countries concerned and their scientific and technical institutions, as well as to integrate the ROSELT/OSS programme in the environmental strategies, has led to the introduction of the ROSELT/OSS programme in the NAP of Tunisia, Morocco, Niger, Senegal, Mali and Algeria. The same approach has been conducted with Egypt and with Kenya whose respective NAPs are in progress.

The ROSELT/OSS observation sites, which are actually field « laboratories » allowing an elucidation of the functioning of the ecological and socio-economic systems, as well as the population/environment interactions, provide a set of useful indicators for environmental monitoring. **The ROSELT/OSS observatories thus participate in the national environmental monitoring devices**. They need to make up the strong points of a national network composed of “lighter” sites. These sites need to be, preferably, located according to the ecological and socio-economic gradients in order to take into consideration the spatial variation of environmental changes. These national environmental monitoring mechanisms constitute one of the key pillars of the NAP/CCD, such as recommended by the CCD, and such as designed by the OSS and its partners¹².

Accordingly, the OSS does not spare any effort to clarify this concept of monitoring – evaluation and to highlight the contribution of the ROSELT/OSS network in the implementation of development and environmental protection programmes. The participation by the members of the Executive Secretariat in the scientific and technical events organised

¹² The CILSS, the UMA and 7 African pilot-countries, which were joined by the GRULAC and China in the framework of a working group set up pursuant to a recommendation by CoP4.

at national or regional level (UMA, CILSS, IGAD) stems from the wish to seize these opportunities offered for a more in-depth consideration, jointly with the national partners, of these major topics.

Moreover, and in order to foster the integration of these programmes in the monitoring – evaluation systems of the NAP/CCD of its member countries, the OSS has implemented, in Tunisia, in Morocco and at UMA level, the SMAP project (Monitoring – Evaluation System in the Maghreb) based on European Commission funding. This project aims at developing the mechanisms of monitoring – evaluation of the NAP/CCD in the two countries concerned, as well as a regional system for the circulation of information on the level of the five UMA countries.¹³ The Launch Workshops of this project organised in Rabat¹⁴ and in Tunis¹⁵ were an opportunity to highlight the substantial contribution of the ROSELT/OSS programme in mastering the process of desertification and in the promotion of development support actions through the two studies relating to the integration of the activities and the results of the various programmes of monitoring – evaluation of desertification in the two countries concerned.

More specific studies on the national devices of environmental monitoring were conducted in Egypt¹⁶, in Algeria¹⁷ and in Morocco¹⁸; they are in process of validation by the National Coordination Units (Organes Nationaux de Coordination : ONC) in these two countries.

Thus, the dynamics that has been developed within the network, the appropriation of the ROSELT/OSS methodologies and of the concept of long term environmental monitoring by the national institutions, the development of a Charter for data management and dissemination within the network and the gradual implementation of the computer tools represent a major step towards the strengthening of this network and towards its integration within the national environmental monitoring mechanisms.

Finally, on the international and European level, the ROSELT/OSS network has earned itself recognition as an indispensable African network in matter of ecological monitoring. The North-South scientific foundation has been considerably reinforced, particularly by involving the ROSELT/OSS programme in eligible applications to the European Commission.

¹³ Algeria, Libya, Mauritania, Morocco and Tunisia.

¹⁴ Launch Workshop of the SMAP project, organised in Rabat, Morocco, on 28 and 29 November 2002.

¹⁵ Launch Workshop of the SMAP project, organised in Tunis, Tunisia, on 22 and 23 April 2003.

¹⁶ Mechanisms for monitoring the desertification at the national level of Egypt, Pr. Mohamed Abdelrazik.

¹⁷ Les mécanismes de suivi de la désertification en Algérie. Proposition d'un dispositif national de surveillance écologique à long terme en Algérie, (*Mechanism for monitoring desertification in Algeria : Proposal for a National Mechanism of Long Term Ecological Monitoring in Algeria*), Pr. Dalila Nedjraoui.

¹⁸ Projet de conception d'un dispositif national de surveillance écologique au Maroc, (*Conceptual project of ecological monitoring national device in Morocco*), Mohamed Yassin.

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