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A Participatory Demonstration Project to Fight Desertification in Morocco and Tunisia

Abstract – A participatory demonstration project on desertification mitigation and rural development was launched in Northern Africa under the SMAP Programme (Short and Medium-term priority environmental Action Programme) financed by the European Union.

The project, whose title is "Demonstration Project on Strategies to Combat Desertification in Arid Lands with Direct Involvement of Local Agro-pastoral Communities in North Africa", was carried out in sensitive regions in Morocco and Tunisia and coordinated by NRD of the University of Sassari (Italy) with the partnership of the Ministries of Agriculture of Morocco and Tunisia.

The project involves restoration of vegetation cover with drought resistant perennial forage species (Opuntia, Atriplex, Acacia, etc.) in highly degraded rangelands, in order to mitigate desertification processes and to improve rangelands productivity. The areas are located in regions characterised by rural poverty, food dependency and land abandoning; here urgent measures are needed to promote optimisation of resource management in view of a sustainable development.

This has been a concrete demonstration project supported by direct involvement of local communities. Successful actions already carried out in this field by participants to the project as well as by other Mediterranean Countries, were taken into account, re-elaborated and exploited thus promoting South/South co-operation and exchange of knowledge. Such exchange was also favoured by promoting the use of Internet by all actors involved in the project (participants, Universities, NGOs, representatives of local communities) and by creating a network open to external observers from other Mediterranean Countries. Participation of all actors and especially of local communities is the key point in all phases of the project. It was strengthened through dissemination and sensitisation campaigns and training courses. At the end of the project, all actors owned/shared all choices made and technology used. Therefore the intervention has been "sustainable".

Key words: fighting desertification, participatory approach, forage shrubs

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Introduction

As stated in article 1 of the UNCCD (United Nation Convention to Combat Desertification) desertification is a process of "land degradation in arid, semi-arid and dry sub-humid areas resulting from various factors, including climatic variations and human activities" which affects almost 30% of the total land area of the world. Land degradation means reduction or loss of the biological or economic productivity and complexity of cropland, pastures, forest and woodlands, due mainly to climate variability and unsustainable human activities such as overcultivation, which exhausts soils, overgrazing, which removes the covering of vegetation that protect from erosion, deforestation and poor irrigation methods which damage soils by turning croplands salty. Causes and effects of desertification are tightly linked. The over-exploitation of natural resources producing land degradation is often due to poverty, while land degradation often causes migration of people from drylands towards urban areas. For these main reasons on 17th June 1994 the United Nations launched a Convention to Combat Desertification. It entered into force on 26th December 1996 and since then it has been ratified by 191 countries. It is the only legally binding treaty on matters of desertification. It aims at combating desertification in all affected regions of the world, particularly in Africa, through concrete actions of international cooperation. The UNCCD considers five Regional Annexes for its implementation in the affected areas: Annex I for Africa, Annex II for Asia, Annex III for Latin America and Caribbean, Annex IV for Northern Mediterranean and Annex V for Central and Easter Europe, which has been recently included.

The present contribution is devoted to the presentation of the approach and results achieved by a SMAP II (Short and Medium-Term Priority Environmental Action Programme) cooperation project. The project, whose title is "Demonstration Project on Strategies to Combat Desertification in Arid Lands with Direct Involvement of Local Agro-pastoral Communities in North Africa", was implemented in Annex I of the UNCCD and, in particular, in sensitive regions in Morocco and Tunisia. It was coordinated by the Nucleo Ricerca Desertificazione (NRD) of the University of Sassari (Italy) with the partnership of the Agriculture Ministries of Morocco and Tunisia. SMAP is part of the MEDA programme, set up by the European Union as a framework for the Euro-Mediterranean Cooperation. The project described here is the only SMAP II project dealing with direct interventions on the field to combat desertification. For this reason it represents an important pilot experience. It started in September 2002 and ended in June 2007.

The target areas identified by the project in Morocco (Marrakech area) and Tunisia (Kasserine area) show some of the main land degradation and desertification issues typical of the Mediterranean areas. They represent significant examples of the dramatic extent of land degradation reached by the Mediterranean rangelands in the last years. This issue is also highlighted in the National Action Plan



Fig. 1. Regional implementation Annexes of the UNCCD.

(NAP) to combat desertification of the two Countries. Here particular emphasis is laid on the recovery of production in wide degraded areas for the evident economic implications and because the traditional productive systems have a relevant social and cultural value.

Arid and semi-arid lands possess a fragile natural resource base and offer limited alternatives for sustainable increases in agricultural productivity under purely rain-fed conditions [5]. Agricultural activity in such areas is frequently dominated by range dependent small ruminant production systems [3]. However, during the past two or three decades, the increase in livestock stocking rates and the sedentarization of the population have raised fears of irreversible environmental degradation and increased poverty for the inhabitants of such areas [6].

As a result of political, economic and environmental factors, the dryland agropastoral systems of Northern Africa have experienced significant change in the past fifty years. National government attempts to sedentarize nomadic populations have led, in some cases, to a breakdown of traditional controls on the use of grazing lands. Together, these factors resulted in a major degradation of rangelands and a higher level of producers' dependency on linkages between these extensive production systems and often unstable imported or domestic feed sources from other higher rainfall or irrigated agricultural areas. There is an urgent need to move these production systems to a more sustainable basis, but caution in the design and implementation of development projects is required in this type of area in order not to exacerbate the situation. In the project areas of both countries, the main economic activity is livestock breeding. Livestock plays an important role in the economy of the areas and the livelihood of the majority of its rural communities. Poor feed quality and lack of water are the major constraints for livestock production under arid conditions in both Morocco and Tunisia. To solve these problems, there is a need to look for locally available potential feed resources during dry seasons so that herds and flocks are able to survive critical periods of short-fall and prolonged droughts.

The regions are characterised by rural poverty, food dependency and land abandoning, where urgent measures are needed to promote optimisation of resource management in view of a sustainable development. The land can grant only a very irregular forage production; therefore agricultural activities are often carried out by women because men are often obliged to migrate to look for a job in urban centres.



Fig. 2. Morocco: Overgrazing in degraded rangeland.



Fig. 3. Tunisia: Soil erosion and reduction ofsoil fertility.

In these contexts, the restoration of vegetation cover with drought resistant perennial forage species (Atriplex spp., Acacia spp., Opuntia spp., etc.) has proven to be a very good solution to mitigate desertification processes, improve rangelands productivity and reduce migration of local communities living in rural areas. With reference to forage shrubs, and Atriplex in particular, relevant researches have been carried out with the aim of verifying concrete possibilities of desertification mitigation in very degraded rangelands, in areas with Mediterranean type of climate all around the world. The planting of forage shrubs has demonstrated to be an efficient way to mitigate the effects of drought in animal production systems of various arid and semi-arid regions. It has been experimented since the first half of the last century in various subtropical and Mediterranean climate countries, but it is only in the 1960's that the concept has became widely accepted [12; 13; 1; 7; 8; 9; 17]. Studies on economic feasibility were carried out in the 1970's and the 1980's [15; 4; 10; 11]. These studies also highlight the multiple scope of fodder shrub planting:

- standing green fodder reserve for the dry season
- interannual buffer feed reserve of standing fodder for severe and prolonged droughts
- environmental protection
- fodder shrub fences
- wildlife shelter
- land rehabilitation and desertification control
- fuel wood production.



Fig. 4. Tunisia: Cactus plantation.

Fig. 5. Morocco: Atriplex plantation.

Objectives of the project

The overall objective of the Project is to contribute, through a participatory approach, to develop and disseminate across the Mediterranean mitigation actions and techniques for improving marginal agro-pastoral systems and contributing to the fight against desertification through restoration of degraded rangelands.

The specific objectives of the project are:

1. realisation of mitigation actions in Mediterranean arid rangelands affected by desertification and their rehabilitation to productivity by a participatory approach at rural community level;

2. development and dissemination of knowledge and innovation techniques in the field of combating desertification.

The above specific objectives were achieved through a series of activities that generated the following expected results:

1. setting up of *rehabilitation methods and techniques* to recover and increase productivity in degraded rangelands by using perennial drought-resistant species having high pastoral value or fruit species, also through the creation of *local GIS*-*remote sensing stations* to study the possible output deriving from the involvement of wider areas;

2. realization of *direct desertification mitigation actions* in the target areas, with particular reference to wind and water erosion, and increase of rangeland productivity. Increase of *rangelands productivity* through both forage shrub species and fruit species;

3. *development of technical capacities* of local land planners on topics directly related to plantations realization and management, through specific training on desertification phenomena, rehabilitation actions and land evaluation techniques;

4. *development of skills and capacities of local participants* through organization of *training and specialisation courses* related to different field activities of the project;

5. information circulation and dissemination about project activities and results through realization of demonstration, sensitization and information circulation activities at different levels, including international networking to improve the *South-South exchange of the acquired knowledge* and of *North-South know-how* exchange and also through the production of specific *illustrated didactic and dissemination material* to achieve a wide and effective dissemination at all sensible levels of society, with particular reference to schools and women.

These objectives are particularly relevant to the UNCCD priorities. It is worth highlighting that the above-mentioned specific objectives were proposed by the beneficiary partners who are directly responsible of some of the main national priorities of their UNCCD National Action Plans. These objectives also fully respect the approach adopted by the European Union SMAP Programme, Field of Action n. 5, Combating Desertification.

Approach of the project

Apart from technical approaches, it is widely recognised that actions programmes to combat degradation are now to be originated at the local level and be based on genuine local participation. Local communities have a greater stake than anyone else in managing and improving their agricultural production system while ensuring the long term ecological balance of their fragile lands [18]. It is recognised that effective management of agropastoral production systems takes place if the technology addresses production problems of producers and changes occur in the context of production governmental policies including those related to resource control and use.

Agriculture production activities must be viewed in the context of sustainable livelihood strategies of producers. Linkages between various elements of production and livelihood strategies need to be understood. Effective change cannot be legislated. It requires effective co-operative action between all parties: government, agricultural researches, community-based groups, and inhabitants.

Capacity and mechanisms should be developed to allow all stakeholders to work together, in a situation in which communities play a larger role in diagnosis and evaluation, design and implementation of development alternatives. This can be accomplished through 1) use of local knowledge and management systems in understanding the nature and dynamics of the situation, 2) involvement of the community in the identification of needs through participatory research techniques and 3) involvement of the community as partners (*interactive participation*)[16] in the development and implementation of appropriate solutions.

The approach adopted by the project tried to implement these principles. The target groups were breeders; they were actively involved not only in the project activities but also in the operational phases of the intervention. They were organised in cooperatives in Morocco (on common lands) and local farmer associations in Tunisia (on private lands). They had two main common characteristics: they had already been involved in participatory projects for rural development and they expressed the need for an intervention of the kind planned by this project. The strategy implemented can be seen through three levels of analysis:

1) Direct *restoration intervention* on land by using both perennial shrub forage species (*Atriplex nummularia* and *Acacia sp.*) and other species (*Opuntia ficus indica*, ecc.). In Morocco mainly Atriplex n. (2000 ha) was used and plants were produced in a local nursery which was directly managed by beneficiary people. In Tunisia the direct intervention on land included the plantation of 2000 ha of Prickly Pear and 500 ha of Acacia and Atriplex.

2) *Training* activities and specific *studies* to strengthen local capacities and knowledge on restoration techniques;

3) Complementary demonstration, sensitisation and information dissemination activities at local and national levels, as well as promotion of the international debate on desertification mitigation measures suitable for northern African countries, also through direct involvement of AMU (Arab Maghreb Union, Observer and member of the Steering Committee).

The first level of the methodology adopted constituted the main investment of the project, whereas major qualitative efforts have been concentrated at the second and third level as they mainly aimed at:

a) guaranteeing the project sustainability and demonstrative value (transfer potential);

b) favouring the know-how development at all levels, with particular reference to the local communities by, *inter alia*, stimulating their entrepreneurial capacities.

In Morocco the area of intervention was located in the rural municipality of Ouled Dlim (Wilaya of Marrakech). The area was characterized by arid climate, with high inter-annual fluctuations. Soil substrate was made of slate schist on which shallow soils had developed, with frequent rock outcrops and high stoniness. From an environmental point of view, the hilly area was fragile and highly degraded. Vegetation cover was scarce or absent, due to overgrazing and frequent agricultural tillages for cereal growing (barley and the harvesting left over are the main animals' feeding source), and to intense erosion by wind and rain, as witnessed by an evident denudation. The socio-economic data showed that land abandonment is one of the main features of the area, which resulted in a general increase in the average age of the inhabitants. Furthermore, the pressing food dependency was urging the government to adopt measures and interventions to support local populations. A breeders co-operative (Co-operative Ennur), which was the main beneficiary, participated actively in the operational phases of interventions.

In Tunisia the area of intervention was located in the Imada de Skhiret (Délégation de Fériana, Gouvernorat de Kasserine) in the south of the western ridge and in the piedmont of Chaambi. The area is characterised by arid and semi-arid climate with irregular and at times violent rainfall. Torrential rains combined with the winds regime caused water and wind erosive dynamics that urged a necessary action to reduce environmental degradation trends and the loss of resources like water and soil. The different degradation forces affected rangelands which could grant only a random forage production. According to some studies (OEP) forage production covered only about 30% of animals feeding requirements.

The species proposed in Morocco was *Atriplex nummularia*. This (chenopodiaceae) is an Australian shrub species characterised by its notable drought-resistance and salt-tolerance. Its leaves are edible and palatable and many Countries have recently utilised it to mitigate the effects of desertification and to increase productivity of severely degraded rangelands. As an example, since the '70s Morocco has carried out interventions with this species on over 30,000 ha of rangeland, thus acquiring a notable experience. In other Countries, like Chile (48,000 ha up to now, 90% of which with *Atriplex nummularia*) the number of this kind of interventions is rapidly growing. Other regions, characterised by Mediterranean climate, that extensively experimented this approach are located, among others, in South Africa and Australia.

The species mainly used in Tunisia was Prickly pear (*Opuntia ficus indica*) which is a member of the succulent plant family Cactaceae, native to the Americas. This species is a long-domesticated crop plant grown primarily as a fruit crop in arid and semiarid parts of the world where it plays an important role in agricultural economies. Cactus pear is an extremely drought tolerant, highly productive, multipurpose and succulent plant. It has incomparably high water and land use efficiency. In cactus pear producing regions of Tunisia, fruits play life-saving role during rainy seasons while livestock mainly depend on its cladodes during dry seasons and drought years [14].

Obtained Results

Project results occurred on two levels:

- 1) local level, on target groups;
- 2) national and international levels.

1. At local level relevant positive impacts have been obtained on target groups in the short term (project duration) and others achievements are expected in the medium term (decade). In the short term, concrete and measurable results have been reached as an immediate consequence of direct investment in field actions and capacity building.

On the field, positive impacts have been obtained on:

- land degradation processes;
- forage production, income, quality of life;
- degree of awareness, capacity, entrepreneurial attitude, partnership;
- multiplier effect/transfer potential to other communities.

Land degradation processes (mainly erosion) have been directly tackled since the first year, due to terrain preparation techniques (contour lines rippering, used for both Atriplex and Prickly pear). After plantations, the effect of the increasing vegetation cover progressively enhanced mitigation. Vegetation cover has become effective against water and wind erosion since the third year. In the same time the forage shrubs plantations provided increasing forage productions. Field experiences and studies elaborated by experts hired by the project [2; 19] showed that in Atriplex and Cactus controlled grazing plantations, the biomass production increased due to both high shrubs biomass production and very good renovation of herbaceous species, which were favoured by grazing exclusion and by the presence of shrubs providing shadow and reducing seed removal by wind. After the fifth year, an interesting forage production was obtained. Also Acacia provided feeding integration for animals and fuel wood.



Fig. 6. Morocco: Atriplex plantation carried out by local population.



Fig. 7. Morocco: Pasture exploitation.

Concerning prickly pears, fruit production was significant, also in terms of income, due to the current good market prices which is expected to increase in following years. The income (immediate and future) obtained through the integrative crops proposed to the communities reduced grazing pressure over all surfaces owned by the beneficiaries. This is a valuable contribution to stimulate production differentiation and entrepreneurial attitude.

These direct and immediate results were followed by positive impacts on the surrounding land. Training activity helped people to fully benefit of the new income sources, and to rationally exploit their resources in a sustainable way, by reducing real grazing pressure on land. Local co-operatives have been able to rationally manage nurseries to carry out plantations. Medium and long term effects were induced by training of local experts on land planning and agro-pastoral systems management through didactic activities in schools and innovative attempts to involve women in land management issues.





Fig. 8. Tunisia: Training session addressed to rural women.

Fig. 9. Morocco: Training sessions on plantation management.

A combination of elements will produce a strong positive impact on the surrounding areas and guarantee a high multiplier effect towards neighbouring communities:

- High visibility of results, both as impact on visual landscape (i.e. quick restoration of vegetation cover over thousands of hectares) and as effects on quality of life.
- Demonstrative and information activities, field visits etc. organised by local actors across the province; activities at national level reached interested stakeholders in other regions.
- Private and co-operative initiatives have been developed at the end of the project to exploit the facilities created (nursery, plantations), to keep them into production, to create a market for products and possibly for "mitigation actions".

2. At a broader level, thanks to a series of national and international dissemination and involvement activities and thanks to the role played by AMU (Arab Maghreb Union) and other observers, the international stakeholders community have been aware of the potential and limitations of the proposed mitigation techniques.

Conclusion

All activities planned by the project were set up and developed in due time. Apart from the physical results obtained on the field, it is worth highlighting that the participatory approach, one of the key elements of this project, was successfully implemented. The project adopted a participatory approach even during the definition of project activities, when the local communities were directly involved and took part to a first negotiation to define ways of interaction and of co-financing.

When the project proposal was discussed with local community's representatives, it was warmly welcomed. In particular, people agreed on the objectives of the proposal that, through introduction of perennial species, intends to create the conditions for breaking food dependence in the long term.

In Morocco the project was implemented through an established group of farmers (Cooperative Ennur) who signed a preliminary agreement and who took over the responsibilities for plantation management also after the end of the project. In a similar way in Tunisia the project was implemented through an association constituted by farmers who spontaneously adhered to the project. People placed their land at disposal and contributed to cover plantation and management costs. Furthermore, from the realisation of facilities (e.g. nursery in Morocco) and complementary activities such as integrative cash crops and training, the creation of entrepreneurial perspectives, an immediate positive impact on their income generation capacity and good bases for community development were obtained. As far as the nursery is concerned, all efforts were made to allow its start, after the end of the project. It represents a solid mean to disseminate the newly introduced mitigation techniques and an important element of the community economy. These conditions guarantee future maintenance and valorisation of field realisations, without further investments.



Fig. 10. Morocco: Fodder shrubs production in the local nursery.



Fig. 11. Tunisia: Training session on local cooperative management.

After the initial negotiations, local communities were involved in detailed project planning and scheduling, activity refinement and restructuring. They contributed to the amendment definition by proposing their changing needs and expectations.

It has to be reminded that the project hired a skilled international expert in participatory approach and gave her the task of defining the best ways to implement the participatory approach in the intervention areas. The aim was to give the project partners methodological guidelines to implement the participatory approach criteria and techniques, thus guaranteeing the coherence of this activity for the whole duration of the project. The consultant, with the support of local experts, analysed the local situations identified in the beneficiary Countries and produced a report to be discussed by the Steering Committee. She also organised and carried out specific training sessions for local extension personnel, local trainers and NGOs.

The main result coming from this specific activity is a greater coherence and homogeneity in the participatory approach implementation in the different Countries and in the elaboration of guidelines to train future local trainers.

Another interesting point is the production of specific didactic and dissemination material. The material was produced to support training and dissemination



Tunisia: Restoration of vegetation cover in degraded lands.

activities (brochures and illustrated posters on the general contents of the project and on the specific activities in each Country; information material for the extension services; didactic material for training and awareness raising in the schools on some of the selected topics).

A final consideration should be made about the need for flexibility in participatory projects. Early participatory evaluations allow for *in itinere* changes to better meet people needs. It is clear that people consciousness about the consequences of starting decisions could improve and change with time: though at the beginning of the project a good preparation is done through preliminary personal contacts (necessary to sign agreement with land owners), the possibility of changing specific activities or strategies should always been taken into account in participatory projects. This possibility should be seen as a potential and not as a risk, if actors are flexible and coherent.

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