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# Enhancement of agro-pastoral productions in the rural community of M’Nahba (Wilaya of Marrakech – Morocco)

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**Abstract.** Livelihood in rural communities of Morocco is based primarily on breeding of meat sheep in agro-pastoral systems where forage resources are scarce and mainly represented by cereal residuals and fallow. Intensive sheep grazing and frequent agricultural tillage on cereals, practiced by rural population as a consequence of the abandonment of nomadic life, have progressively contributed to serious soil degradation and erosion. This degradation of the ecosystem has been leading a rural exodus towards urban areas within and outside the country. The present contribution is devoted to illustrate the holistic approach and activities carried out by a bilateral cooperation project Sardinia-Morocco aimed at the rehabilitation of degraded pastures by means of alley cropping, the enhancement of socio-economic conditions and the exchange of knowledge and know-how between Sardinian and Moroccan stakeholders.

**Keywords.** Mediterranean pasturelands – Self-reseeding forage species – Rehabilitation of degraded soil – Rural development.

## **Valorisation des productions agro-pastorales dans la commune rurale de M’Nahba (Wilaya de Marrakech – Maroc)**

**Résumé.** L’économie rurale dans les communautés rurales du Maroc est basée traditionnellement sur l’élevage de moutons pour la production de viande effectué dans des systèmes agro-pastoraux dynamiques et très fragiles. Les ressources fourragères sont rares et essentiellement représentées par les résidus des céréales ou des mauvaises herbes sur la jachère: intense et irrationnel pâturage des animaux et fréquents travaux du sol pratiqués sur les céréales contribuent à la dégradation des sols et à l’érosion. En ce contexte, les conditions de vie des populations locales résultent difficiles et l’exode rural est en cours. La présente contribution est consacrée à illustrer l’approche holistique et les activités menées par le projet de coopération internationale "Valorisation des productions agro-pastorales dans la commune rurale de M’Nahba (Wilaya de Marrakech - Maroc), à travers la réhabilitation des pâturages dégradés et l’échange de connaissances et de savoir-faire entre les stakeholders de Sardaigne et Maroc".

**Mots-clés.** Pâturages méditerranéens – Plantes fourragères à ressemis naturelle – Réhabilitation des sols dégradés – Développement rural.

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## **I – Introduction**

The rural area of *M’Nahba* features a Mediterranean climate, characterized by an alternation of hot and dry weather during spring and summer and mild temperatures during the winter months. The annual rainfall is scarce, with an average of 150-200 mm, and concentrated between November and March. The landscape is characterised by a highly-degraded and fragile hilly profile, exposed to water and wind erosion which led to progressive desertification processes seriously compromising soil fertility (UNCCD, 2008).

The primary agricultural activity in the area is the breeding of meat-sheep and the production of heavy lamb, highly demanded by local communities during the Eid al-Adha, the Muslim festivity celebrated at the end of Ramadan. Considering the scarcity and the poor quality of forage resources, mostly represented by cereal residuals and fallow, there is a considerable gap between the flock feed demand and the actual availability of forage production in the area. At present farmers are increasing the stocking rate and extending crop cultivations in marginal lands, often with unsuitable species, varieties and crop management practices. In order to stimulate re-vegetation and enhance the scarcity of fodder production, the EU cooperation project SMAP II (<http://www.uniss.it/nrd/smap/>) promoted the use of drought-resistant forage shrubs, such as *Atriplex nummularia* and *Opuntia ficus-indica*, in highly degraded extensive pasturelands, positively impacting in the status of the ecosystem and partially fulfilling the feed requirements of the flocks. Nevertheless, the surface between rows of the shrubs planted in the framework of SMAP II project is yet nearly unproductive, recording a low grass coverage (<20%), a low plant diversity and a scarce nutritive value of the herbaceous species grazed by flocks. Consequently, a deficit in forage production still exists, remarkably during drought years (DPA, 2009). In similar conditions, the "alley cropping" with understorey species planted among shrubs showed to be a profitable practice in bettering animal performances, economic return for farmers and in offering environmental benefits (Norman *et al.*, 2008).

At present, rural population involved in agricultural activities lacks technical knowledge concerning dietary requirements of sheep and feed nutritional properties. Sheep diets are rather unbalanced in terms of both energy and protein intakes, so that local farmers purchase expensive concentrates from external markets to feed fattening lambs during the last stage before selling. Moreover, the lack of genetic selection and the high inbreeding level within sheep flocks cause a decreasing fertility and a low vitality of lambs (ICARDA, 2007). With reference to the social life within this rural community, a high rate of illiteracy and a low level of professional knowledge and skills occur among women, who at present do not perceive any salary for their work inside and outside their homes. This lack of skills and opportunities urge people, especially the young ones, to emigrate from these rural areas towards cities, especially the nearby Marrakech, and also abroad, particularly to Europe, causing a gradual abandonment of rural environments (UNCCD, 2005).

The present contribution is devoted to illustrate the approach and activities carried out so far by the cooperation project "Enhancement of agro-pastoral productions in the rural community of M'Nahba (Wilaya of Marrakech – Morocco) through the rehabilitation of degraded pastures and the exchange of knowledge and know-how between Sardinian and Moroccan stakeholders".

## **II – The Project "PROAGRO - Enhancement of Agro-Pastoral Productions in the Rural Community of M'Nahba (Wilaya of Marrakech – Morocco)"**

The general objective of the project aims at decreasing the highly advanced desertification processes and soil degradation while enhancing social and economic conditions of local communities. In particular, the project aims at restoring degraded rangelands, diversifying the agro-pastoral production and developing income-generating activities for the local population, thus enhancing natural and human resources. The project actions are also expected to promote the sustainable management of agro-pastoral resources through an active participation of local stakeholders.

The specific objectives of the project are:

- Increasing the quantity and quality of fodder resources available in local pastures;
- Transferring knowledge and know-how to Moroccan stakeholders concerning both

- exploitation of diversified plant resources, such as shrubs and pastures, and requalification of the local sheep meat chain;
- Promoting the social and economic role of women in the rural society;
  - Creating a network among Sardinian and Moroccan stakeholders with the aim of identifying market opportunities to stimulate socio-economic development of the area mainly within the agro-pastoral sector, addressed to the outcast groups of the rural society, such as women and young people.

Started in October 2011, the project is characterized by a multidisciplinary approach, as the project *consortium* is formed by agronomists, animal scientists, ecologists, agricultural extension services and rural communities populations, belonging to several institutions, namely: Institute for Animal Production System in Mediterranean Environment (ISPAAM-CNR, Sassari), as project coordinator; Desertification Research Group of the University of Sassari (NRD-UNISS); Municipality of Seneghe (Sardinia); Municipality of Santulussurgiu (Sardinia); Sardinian Organisation of Christian International Volunteers (OSVIC); Sardinian Regional Agency in Agriculture Research (AGRIS); Sardinian Regional Agency for the Implementation of Regional Programs in Agriculture and Rural Development (LAORE); and last but not least, the Agricultural Provincial Direction of Marrakech (DPA), belonging to the Moroccan Ministry of Agriculture and Fisheries.

### III – Structure of the project

The project is being implemented with four workpackages:

#### *WP1: Enhancement of local plant genetic resources*

- 1.1 Inclusion of native self-reseeding forage species between the rows of *A. nummularia* (alley cropping).
- 1.2 Renewal pruning and management of existing plantations of *A. nummularia*

#### *WP2: Empowering technical knowledge of rural population*

- 2.1 Sharing of successful initiatives experienced in Sardinia in the field of pasture improvement and enhancement of the meat chain. This activity will involve Moroccan stakeholders and immigrants living in Sardinia and small Sardinian associations and cooperatives operating in the agro-pastoral sector.
- 2.2 Strengthening skills and knowledge of Moroccan farmers and technicians through training sessions concerning feed rationing and meat production techniques, addressed to rural farmers and local extension service agents, carried out by Moroccan and Italian trainers.
- 2.3 Genetic improvement of livestock in the local community through the introduction of new selected rams, in order to improve the fertility of the flock and to increase the meat production, impacting positively on farmers' income.

*WP3: Improving social condition of rural women.* The project will strengthen the knowledge of women in craft techniques, such as weaving, knitting, sewing and embroidery, along with the promotion of female literacy and basic accounting. In this manner, women will learn the management of family budget and will generate additional income by alternative activities.

*WP4: Transfer of successful entrepreneurship cases.* The project will stimulate a series of exchange meetings involving Project partners and Moroccan actors (institutions, cooperatives, Moroccan immigrants in Sardinia, local community representatives) to identify successful entrepreneurship experiences carried out in the Sardinian agro-pastoral communities which could be replicated in the project area, giving a concrete and immediate response to the needs of the Moroccan communities.

The experimental trial designed for the enhancement of forage resources and planned in the action 1.1 of WP1 began in November 2011. The inter-rows of two fields of *A. nummularia*, planted at 3.5 m x 3.5 m, located in the *douar* of Ouled Ayyachi and in the *douar* of Ouled Aliate respectively, were sown with different mixtures of native self-reseeding forage species. These species were locally produced at the "Centre de Production des Semences Pastorales Khemiss Mtouh" (CPSP) of El Jadida (Morocco).

In each field, seven different plots were identified and seven mixtures (T) were tested:

T1: *Medicago scutellata* (25 kg ha<sup>-1</sup>) + *Lolium rigidum* (4 kg ha<sup>-1</sup>) cultivated in 3 ha;

T2: *Medicago polymorpha* (25 kg ha<sup>-1</sup>) + *Lolium rigidum* (4 kg ha<sup>-1</sup>): 3 ha;

T3: *Medicago scutellata* (12.5 kg ha<sup>-1</sup>) + *Medicago polymorpha* (12.5 kg ha<sup>-1</sup>) + *Lolium rigidum* (4 kg ha<sup>-1</sup>): 3 ha;

T4: *Medicago scutellata* (8 kg ha<sup>-1</sup>) + *Medicago polymorpha* (8 kg ha<sup>-1</sup>) + *Medicago truncatula* (8 kg ha<sup>-1</sup>) + *Lolium rigidum* (4 kg ha<sup>-1</sup>): 1 ha;

T5: *Lolium rigidum* (35.5 kg ha<sup>-1</sup>): 2 ha;

T6: Control (natural vegetation covering): 1 ha;

T7: no seeding and phosphate fertilization: 1.5 ha.

Fertilization was applied in all plots, except for the control, and consisted in the distribution of diammonium-phosphate 18-46-0 (100 kg ha<sup>-1</sup>) scattered on the soil after the passage of a chisel plow. Broadcast seeding was executed by hand by local farmers in absence of a precision seeding machine in the area. Seeds were covered with branches of *Zizyphus vulgaris* dragged by a tractor.

The measurements to be done are: seedling establishment, inter-row soil covering, forage dry matter production, phenology and seed yield.

## IV – Preliminary results and discussion

Because of the irregular and scarce precipitation (104 mm), much below the average of last thirty years (250 mm), and an extraordinary frost during the month of February 2012, the establishment and performances of the self-reseeding species was low. However, some differences were shown among the four tested species with *M. polymorpha* and *M. scutellata* showing a better adaptation to the climate conditions of the area. Some differences were found between the experimental fields, too, and it is likely that the earlier sowing carried out in the *douar* of Ouled Ayyachi favoured a higher seedling establishment than in *douar* of Ouled Aliate, thanks to a higher rainwater availability. Further investigations are needed and the effective contribution of our field research is expected to be reached in next project years, testing alternative techniques (i.e. summer sowing) to introduce the legumes into the pastures (Loi and Nutt, 2010).

The actions promoted by the project are working synergically to lay the basis for an immediate social and economical development of the community and assure a long-term sustainability that will last long after the project's completion. It is worth highlighting that one of the peculiar aspects of this project is the promotion and the creation of entrepreneurial perspectives in the agro-pastoral sector.

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