

## **Greenmanuring of Agro-Ecosystems through Ethno-Ecology: some Empirical Data from the Contraviesa (Spain)**

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### **Abstract - Introduction**

Local knowledge of the management of the natural resources, as embodied in traditional agriculture, is very relevant for the development of ecological agriculture, even in Europe. This has been one of the hypotheses for fieldwork in the mountainous area of the Contraviesa, a small cordillera within the Alpujarra region in Granada province (Southern Spain), of which the present paper discusses empirical evidence. This then is centred around *Vicia articulata* Hornem., a traditional legume of unacknowledged potential as a green manure. It supports the view that the current body of agronomic tools for the design of new sustainable agro-ecosystems could be enormously enlarged if the "marginal" qualification of a great deal of the local resources is reconsidered, and suggests ethno-ecology as a valuable technique to pursue this goal.

### **Methodology**

The research forms part of EU financed research on "Design Methods for Endogenous Development", and was framed methodologically in an agro-ecological approach, of which etho-ecology forms part (Sevilla Guzmán and Remmers, 1995). Etho-ecological data were gathered during fieldwork from 1991 to 1995 by means of various mixed sociological, anthropological and botanical techniques, such as participant observation, semi-structured and in-depth interviewing with selected farm families, discussion groups on local water and soil conservation techniques, transect walking and plant sampling. The concept of Styles of Farming was taken as a central notion, that, while covering history and strategy of farm development, situated local knowledge on natural resource management.

### **Farming systems in the Contraviesa**

The Contraviesa, part of the "Low Alpujarra", is a small hilly region reaching up to 1500 meters above sea level. It is blocked to the south by the Mediterranean Sea, and bordered to the north by the Guadalfeo river valley, which is at the same time the limit with the "High Alpujarra". Relief is abrupt, slopes exceed often 35%, urging in most cases for the use of animal traction. Annual precipitation varies over the region from 450 to 600 mm (concentrated in winter), soils are thin, mostly neutral, with scarce organic matter and comprise basically various types of regosols. The cordillera is intersected by numerous barrancos that generally run north-south. Diversity of agro-ecological sites is thus very high.

Historical aspects of landuse unfortunately cannot be dealt with in this paper. Main cash crops currently include woody perennials like almonds (more than 10 varieties), grapes (more than 25 varieties) and Figs (more than 5 varieties), in different spatial arrangements. The intercropping of these species with cereals and legume species was and is quite common. Most of these crops are meant as animal fodder. Interesting to note is that seed of most annual crops has been subject to continuous exchange between farmers, considered necessary to maintain the quality of the seed. In this paper we will discuss "la moruna", *Vicia articulata* Hornem. (see for details Remmers and Lora, 1995).

### "Moruna", a forgotten legume...

This legume is intercropped in rainfed (*secano*) agriculture with almonds, figs and wine, and forms usually (not when intercropped with vines) part of a rotation of annual crops, that, as a general rule, alternates *cultivos de raspa* (the cereals: wheat, barley, oats, rye) with *cultivos de semilla* (moruna, yero (*Vicia ervilia*), veza (*Vicia sativa*)), and with fallows. Moruna is locally highly valued as an animal fodder for especially goats and sheep, although, when not given too fresh, is said suitable for all animals, including mules and cows. The seeds are consumed by sheep, goats and pigeons; although pigs, chicken and rabbits do consume it, they are usually not fed with it. It is said to stimulate milk production in goats. It has as further advantages that it is relatively easy to harvest, as it does not, as is the case with *V. sativa*, dissect when seeds are formed. This means that it allows farmers more flexibility to organise their labour. It also does not sting when harvested (by hand). Of the three mentioned legumes, it is said to best resist drought. It is also the only legume species that is historically used as a greenmanure. Whenever a piece of land is considered "weak" ("débil"), moruna is sown and ploughed under. As such, it is considered a better fertilisation than animal manure, chemical fertiliser and also worm humus, that has recently been introduced in the area. Its value should not only be located in the amount of atmospheric nitrogen fixed, but also in the fragmentation of the soil through root growth, and the (modest) contribution to the organic matter content of the soil, mechanisms that increase water infiltration and absorption capacity, respectively. One year of greenmanuring with moruna is said to positively affect the production of the associated crop for another three years. Also in irrigated horticulture, e.g. in the High Alpujarra, moruna is sought after to fertilise the fields in all kinds of rotations with different horticultural crops.

There are two ways of using moruna as a greenmanure. One technique is called *hacer la cepa* ("make the vine"), and consists of pulling out some moruna plants around a vine and burying them at the roots of this vine, at some 10-25 cm. This technique is used when the crop is grown for a double purpose: fodder and greenmanure. After "making the vine" in March, the rest of the moruna is left to grow until May-June, when it is harvested. The other technique is called *por parejo* ("evenly over the parcel"), and is executed when the plant is entering the flowering stage, at the end of April. A furrow is ploughed, in which then some (3-5) men throw the moruna that they have just pulled out from the piece of land just above the ploughed furrow. The man with the mules then, on his turn, covers the plants with earth from his next furrow, just above his first one. It is worth to notice (see table 1) that green manuring with the help of a tractor apparently demands more seed than when mules are used. It is generally accepted that the quality of underploughing with a tractor is less than when this is done with a mule.

Table 1: Sowing densities according to purpose and seed production of moruna

Crop	Sowing density in kg/ha	Seed production in kg/ha
Moruna, for green manuring ( <i>para enterrar</i> )	60 (when ploughed in by mule)	
	150-160 (when ploughed in with a tractor)	
Moruna, grown for fodder purposes ( <i>para recoger</i> )	45 (most often commented quantity, sown in october)	1.500 - 1.800
	40 (sown in sept.)	
	60 (sown in december)	
	90 (exception)	

Sixty seven samples of moruna were taken on 12 different farms, comprising a wide range of agro-ecological conditions; all were identified botanical at the Botanical Garden of Córdoba as *Vicia articulata* Hornem.. This species is not a crop exclusively reported for the Contraviesa; under other scientific names (*Vicia monanthos* (L.) Desf. is the most widely used of the 9 synonyms found in botanical literature) and other popular names (algarroba is the most important one) it has been mentioned as a crop spread throughout the Mediterranean area, in Chile and in some parts of North-America. The name "moruna", however, is unique to the Alpujarra. Spanish agricultural statistics report 216.400 cultivated has of "algarroba" just before the Spanish Civil War (1930), basically located in the provinces of Castilla-La-Mancha; in 1990, however, only 4.000 has were left, and currently probably even less. Agronomic literature is extremely concise about the plant. It is said to adapt very well to poor soils and semi-arid climates. Its use as a fodder crop is repeatedly mentioned, and there are some data on its nutritional value, but only few sources report its use as a green manure (e.g. Bailey and Bailey, 1976). We can thus affirm that the crop has never been studied seriously. Its marginalisation in Spain must probably be attributed to a general ignorance of the importance of legume species, when in the late sixties, early seventies main Spanish research activities excluded legumes from their agenda, as their growth in rotation schemes with cereals became irrelevant due to pesticide use for improved cereals, that seriously affected yield results of the legumes; besides, the harvest of the plant was considered difficult to mechanise (pers. com. I. Delgado Enguita-SIA Aragón).

### ... on the road to extinction?

Although moruna seems to be a promising plant, unfortunately its use in the Alpujarra is declining for three reasons. In the first place, it is quite labour consuming to incorporate the moruna in the soil and will take between 12 and 18 persons per hectare once every four years. Current low precipitation is another reason, which affects, however, all annual crops, and to some extent even the perennial crops. In the third place, continued use is threatened by the "Plan for the Improvement of Almond growing", which comprises an EU subsidy available for those that comply with certain agronomic norms. The Plan promotes, for the whole of Spain and irrespective of local circumstances, the application of fixed monetary dosis of chemical fertiliser and does not allow for intercropping in more than 10%. This typical example of modernisation thinking makes many mixed almond-Figure groves not liable for subsidy, tri- to quadruplicate the traditional chemical fertilisation level and is not able to conceive moruna (instead its use is penalised) as a valuable means for almond grove

maintenance, which is all the more painful when costs of traditional greenmanuring with moruna are compared with the costs of crop maintenance following the prescriptions of the Almond Plan: 63.450 (moruna sown and ploughed with tractors) to 121.050 - 143.850 pts/ha/4 years (all done by a variable input of hand labour) on the one hand, and 165.000 pts/ha/4 years, on the other (Remmers et al, 1996). This subsidy policy is thus not only threatening a valuable local agronomic resource, but also threatens an economic resource for regional development, which is the almost ecological character of agricultural production (see for details Remmers y Haar, 1993).

### Greenmanuring of agro-ecosystems

*V. articulata* Hornem. could be a very important ecological tool in the maintenance of agro-ecosystems, both in dryland as well as in irrigated agriculture, in the Alpujarra and in other semi-arid regions. This study thus indicates that also in Europe, there still is an undiscovered potential of agro-ecological tools set in rural, and up till now as backward considered communities. Ethno-ecology is very important to, on the one hand, rescue them from falling into oblivion, and on the other hand, to convert them into building stones for endogenous development of the communities that have reproduced them for years. In Sierra Mágina (province of Jaen, Andalucía), other ethno-ecological work revealed e.g. the existence of a completely unacknowledged local dehesa system that centres around *Pistacio terebinthus*, and which is able to give a productive use to steep slopes (Mesa and Delgado, 1995). Both are examples of the silent marginalisation of local resources that are not marginal at all, if an agro-ecological perspective is adopted; on the contrary, they greatly enrich the existing body of agronomic techniques for sustainable agriculture. In other words, the ecological rationality (cf. Toledo, 1993) that is enclosed in these traditional farming systems offer possibilities to "greenmanure" conventional agro-ecosystems. However, these resources need a rapid revalorization.

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