Strategies for the utilization of Atriplex plantations in a cereal-sheep pastoral zone of NW Murcia (Spain)

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Strategies for the utilization of Atriplex plantations in a cereal-sheep pastoral zone of NW Murcia (Spain)

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SUMMARY - The balance of fodder resources versus feed requirements of 19 sheep-cereal farms in NW Murcia was analysed. The average farm - 282 sheep and 319 ha - presents a feeding gap period in winter (3-4 months) during which sheep are supplemented with barley, straw and subproducts from the canning industries, at an average cost of 15-20$ ewe^{-1}. Atriplex plantations already exist in the zone, promoted by the Administration to control soil erosion and create fodder banks for scarcity periods. From mean data on saltbush fodder production (3 t DM ha^{1} year^{-1}) and browse intake by sheep (1,5 kg DM ewe^{-1} day^{1}), it was estimated for the average farm that planting saltbushes on 4-6% of its surface would cover the maintenance requirement of the sheep herd during the winter period.

Key words: Atriplex, fodder banks, cereal-sheep farming, Murcia.

RESUME *- "Stratégies pour l'utilisation de plantations d'Atriplex dans une zone pastorale ovins-céréales du Nord-Ouest de Murcie (Espagne)". On a analysé l'équilibre entre les ressources fourragère et les besoins alimentaires de 19 fermes "ovins-céréales" dans le Nord-Ouest de Murcie. La ferme moyenne (282 ovins et 319 ha) présente une période de soudure alimentaire en hiver (3-4 mois) pendant laquelle les ovins reçoivent une supplémentation d'orge, paille et sous-produits des industries de la mise en conserve, à un coût moyen de 15-20$ brebis^{1} . Des plantations d'Atriplex existent déjà dans la zone, encouragées par l'administration afin de contrôler l'érosion du sol et de créer des réserves fourragères pour les périodes d'insuffisance. En utilisant des données moyennes sur la production fourragère d'Atriplex (3 t MS ha^{-1} an^{-1}) et sur l'ingestion d'arbustes fourragers par ovin (1,5 kg MS brebis^{1} jour^{-1}), on a estimé pour une ferme moyenne qu'en implantant de l'Atriplex sur 4-6% de sa surface on couvrirait les besoins d'entretien du troupeau pendant la période hivernale.*

Mots-clés *: Atriplex, réserves de fourrage, agriculture ovins-céréales, Murcie.*

Characteristics of NW Murcia pastoral zone

The north-west of Murcia (230,000 ha) (Fig. 1) is a high altitude area (800 m on average, ranging from 600-1200 m a.s.l.) with a semi-arid Mediterranean climate (T = 14°C, R = 400 mm) and alkaline soils.

About 50% of the land is under cereal cultivation (barley), and the other 50% is occupied by degraded rangelands (shrublands and steppes) where its dominant species (*Rosmarinus officinalis* and *Stipa tenacissima*) are of very low quality, and only 25-45% of the soil surface is covered by vegetation, the rest being bare soil exposed to soil erosion.

The majority of farmers in the zone practice a sheep-cereal mixed farming in a two year cereal-fallow rotation where livestock graze the cereal byproducts (stubble in summer and fallow weeds during autumn and winter) and graze rangelands during winter. Part of the grain and straw harvested is kept to supplement sheep, and during very dry years, failed cereal crops are also grazed (Ríos *et al.*, 1992).

The sheep-cereal farms of this zone are representative of many others present in similar dry and cold winter areas of south-east Spain (provinces of Albacete, Jaen, Almería, Granada, etc.), a territory belonging to the Segura basin where the dominant sheep breed is the *Segureña,* which is medium-fine-wooled, and whose chief product is meat.

Because of the natural fluctuations, feed management varies accordingly with grazing resources and animal feed requirements, but in all sheep enterprises, there are periods of feed scarcity that have to be

covered with feed supplements. The purpose of this paper is to present saltbush plantations as an alternative fodder bank to cover the annual feeding gaps.

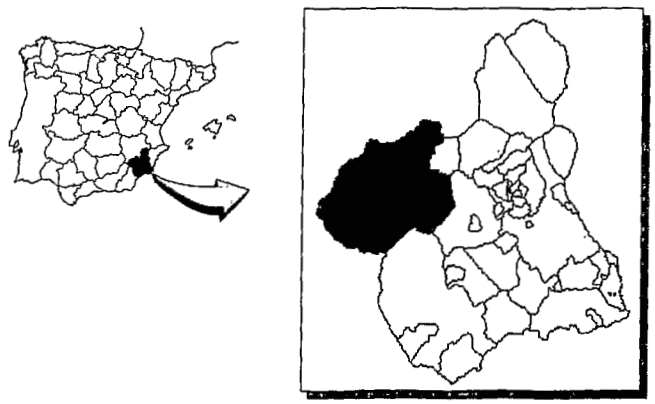

Fig. 1. Localization of the study area (north-west Murcia, Spain).

Determination of annual feed scarcity periods

An opinion-poll was conducted between 19 sheep farmers of the area: 9 from El Sabinar (Moratalla) and 10 from El Moralejo (Caravaca). The objective of the inquiry was to determine for the average sheep enterprise of NW Murcia: (i) flock size; (ii) farm size; (iii) stocking rate; (iv) length of the annual feed scarcity period; and (v) cost per ewe of supplementary feeding during such period. The results (see Table 1) indicate there is a 3-4 months fed gap in winter time - from December to January - during which livestock have to be supplemented, at an average cost of 15-20$ per ewe.

Table 1. Mean results of inquiries in 19 sheep enterprises of NW Murcia

	Flock size (ewes)	Farm size (ha)	Stocking rate (ewes ha^{-1})	Feed scarcity period	
				No. months	Season
Totals	5,364	6,053			
Mean	282	319	0.88	3 - 4	D-J-F-M
Interval	38 - 820	20 - 1200	0.41 - 5.40	3 - 5	N-D-J-F-M
Cost of supplementing per ewe†: 2.140 - 2.850 Pts. ≈ 15-20 USA$					

†Mean composition of supplement: 62% barley grain, 18% barley straw and 20% subproducts from canning industries (oranges, artichokes, almonds, etc.)

Availability of fodder resources to feed sheep flocks

During the spring, sheep flocks graze on rangeland pastures; cultivated lands are then occupied by barley crops, and fallow lands have been already ploughed to control weeds. In summer, flocks graze on cereal stubble. During autumn, if rains come soon, flocks graze on fallow weeds (Fig. 2).

During winter, cold temperatures restrict pasture growth (the area studied has an altitude between 1000-1200 m) and sheep flocks are fed in pens with supplements bought from canning industries. All the farmers enquired responded that winter time was the period in which forage resources - either from rangelands or croplands - were most limiting.

Season	Spring	Summer	Autumn	Winter
ewes stage of production	Lambing Lactation	Maintenance	Maintenance Breeding time	Gestation
❶ Cultivation of cereals	Growth season	Harvest Stubble	Fallow Rain ⇨ Weeds	Cold hampers weeds' growth
❷ Rangeland resources	Plentiful	Scarce Dry pastures	Rain ⇨ Plentiful	Poor pasture growth
❸ *Atriplex*	Fodder resources available during all the year			
Fodder management	Rangelands + Supplement	Cereal stubble	Fallow weeds	*Atriplex* + grain suppl. at the end

Fig. 2. Seasonal fluctuations and balance of fodder resources and animal feed requirements, and strategy to use saltbush plantations during winter feed scarcity periods.

Atriplex shrubs like *A. halimus* and *A. nummularia* have been successfully established in the area, maintaining a "green fodder bank" that if not grazed previously, can supply the maintenance fodder units needed by ewes; however, at the end of winter, pregnant ewes (about 75% of the flock) will need also a 200-300 g grain supplement.

Estimation of the Atriplex plantation size to cover the winter feed scarcity period

Data from fodder production and sheep intake studies

Assuming an average yield per shrub of 2,5 kg DM (Correal *et al.*, 1990; Aouissat *et al.*, 1993), and planting at a density of 1,250 shrubs ha^{-1} (4 m x 2 m), a fodder yield of 3 t DM ha^{-1} $year^{-1}$ (1) can be expected [yields in accordance with the 5-10 kg DM mm^{-1} ha^{-1} $year^{-1}$ given by Le Houerou (1991a)].

Assuming an average intake of 1.5 kg DM ewe^{-1} day^{-1} (2) [data from Correal and Sotomayor (1994); higher values - 2 kg DM ewe^{-1} day^{-1} - are given by Otal *et al.* (1993), and Le Houerou (1991b), and lower values - 1,3 kg DM ewe^{-1} day^{-1} - by Valderrabano (1996)], and from (1):(2), 2,000 grazing days ha^{-1} $year^{-1}$ (3) from Atriplex plantations equivalent to a stocking rate of 5.5 ewes ha^{-1} $year^{-1}$.

Saltbush plantation required to cover the winter feed gap

Assuming an average flock size of 280 ewes, and a 3-4 months winter feed scarcity period, the average sheep enterprise will need a fodder bank equivalent to 25,220-33,600 grazing days $year^{-1}$ (4). From (4):(3), 12.6-16.8 ha of Atriplex will be needed, which represents about 5% of an average farm surface (319 ha).

Management of saltbush plantations

According with the experience of Atriplex plantations in Murcia (Spain), saltbushes should be grazed rotationally along the year, leaving a long resting period after the shrubs have been fully grazed (e.g. 1-3 months grazing followed by a 9-11 months resting period). When shrubs are continuously grazed, they become less productive.

In a seven month saltbush grazing experiment run in Murcia, dry ewes maintained their weight and body condition, but breeding ewes lost 10% of body condition, which indicates that an energy supplement was needed (Otal *et al.*, 1991).

According to such data, and because most sheep flocks in the area have a mixture of gestating and dry ewes (75% and 25% respectively in winter time), we propose for the winter feed scarcity period to keep sheep flocks in fenced Atriplex plantations (see Fig. 3), with a separation between: (i) dry ewes -that will get their maintenance requirements from saltbush browse; and (ii) gestating ewes - that will need an energy supplement, like barley grain, to complement Atriplex fodder to cover their reproductive demands. A common water point will also be needed.

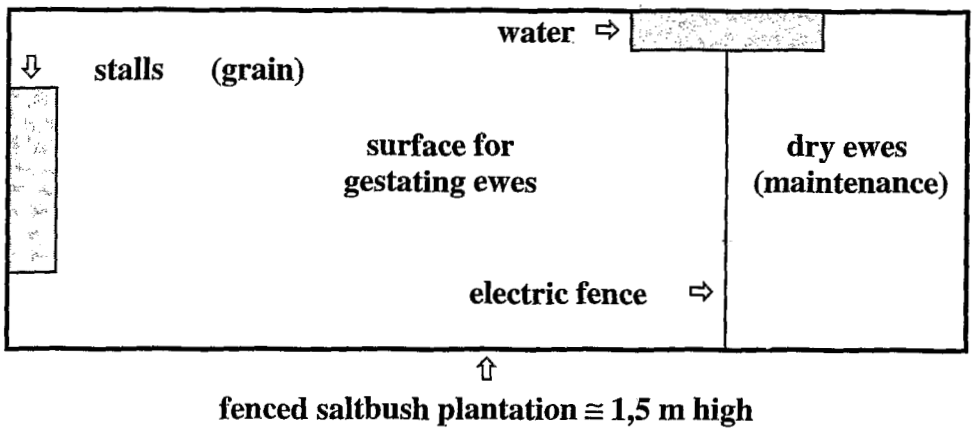

Fig. 3. Plan of a fodder shrub plantation (*Atriplex nummularia*), to be grazed in winter by a mixed sheep flock (75% gestating ewes and 25% dry ewes).

References

Aouissat, M., Sotomayor, J.A. and Correal, E. (1993). Production fourragère d'une plantation d'*Atriplex halimus* exploitée deux fois par an (hiver-été). In *7th Meeting FAO-subnetwork on Mediterranean pastures and fodder crops*. Chania (Crete), Greece. FAO-REUR Technical Series, pp. 12-15

Correal, E., Otal, J. and Sotomayor, J.A. (1990). Effect of grazing frequency and cutting height on the production of browsing biomass of oldman saltbush (*Atriplex nummularia*) in SE Spain. In *Proc. 6th meeting FAO-subnetwork on Mediterranean pastures and fodder crops*. Bari, Italy. pp. 153-156

Correal, E., and Sotomayor, J.A. (1994). Efecto de la suplementación con paja sobre el consumo ovino de *Atriplex nummularia* en estabulación y pastoreo libre. In *Producción ovina y caprina*. Gallego, L. and Pérez, J. (eds). Albacete, 1993. *XVIII Jornadas de la S.E.O.C.* Ed. Universidad Castilla-La Mancha, pp. 27-44.

Le Houerou, H.N. (1991a). The role of saltbushes (*Atriplex spp.*) in arid land rehabilitation in the Mediterranean Basin: A review. *Agroforestry Systems*, 18: 107-148.

Le Houerou, H.N. (1991b). Feeding shrubs to sheep in the Mediterranean arid zone: Intake, performance and feed value. In *IVe Congrès International des Terres de Parcours.* Montpellier, France. pp. 623-628.

Otal, J., Barba, R.M., Pérez, J.I. and Gómez, V. (1993). Valoración nutritiva de *Atriplex halimus* mediante su aprovechamiento con ovejas de raza Manchega. In *XXXIII Reunión Científica de la S.E.E.P.* Ciudad Real, Spain. pp. 433-439.

Otal, J., Belmonte, C., Correal, E, and Sotomayor, J.A. (1991). Evaluation of sheep production under continuous rotational grazing of a saltbush plantation (*Atriplex* sp.pl) in south-east Spain. In *4th Int. rangeland Congress*, Vol.1. Montpellier, France. pp. 422-425.

Rios, S., Robledo, A. and Correal, E. (1992). Fodder resources for livestock in a cereal-sheep mixed farming area of Murcia (Spain). In *Livestock in the Mediterranean cereal production system.* EAAP Publication No. 49, pp. 239-241.

Valderrábano, J. (1996). Browsing ability and utilization by sheep and goats of *Atriplex halimus* L. shrubs. *Small Ruminant Research*, 19: 131-136.