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in

Porqueddu C. (ed.), Tavares de Sousa M.M. (ed.).  
Sustainable Mediterranean grasslands and their multi-functions

Zaragoza : CIHEAM / FAO / ENMP / SPPF

Options Méditerranéennes : Série A. Séminaires Méditerranéens; n. 79

2008

pages 187-191

Article available on line / Article disponible en ligne à l'adresse :

<http://om.ciheam.org/article.php?IDPDF=800643>

To cite this article / Pour citer cet article

Abbas K., Madani T., Laouar M., M'Hammedi Bouzina M., Abdelguerfi A. **Evaluation of a multi-species fodder surface area replacing a cereal crop in semi-arid areas of Algeria.** In : Porqueddu C. (ed.), Tavares de Sousa M.M. (ed.). *Sustainable Mediterranean grasslands and their multi-functions* . Zaragoza : CIHEAM / FAO / ENMP / SPPF, 2008. p. 187-191 (Options Méditerranéennes : Série A. Séminaires Méditerranéens; n. 79)



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# Evaluation of a multi-species fodder surface area replacing a cereal crop in semi-arid areas of Algeria<sup>1</sup>

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**SUMMARY** – Within the framework of the PERMED project and in order to reduce soil erosion and to improve the animal foddering system, a mixture of 9 varieties of annual and perennial species prepared by *Fertiprado*® were sown in November 2005 on a 1 ha surface area, replacing a cereal crop, on a farm located in the semi-arid area of Algeria, province of Sétif. 990 plants/m<sup>2</sup> emerged, of which 53% were sown, including 33% grasses. Vegetative biomass prior to grazing was 3.2 t DM/ha. Grasses account for 57% of them, legumes for 21% and the others for 21.5%. As an indication, the biomass produced by the sown mixture is twice as much as the quantity produced by a grazed fallow. The average biomass collected at the stage of cut in 8 enclosed cages corresponds to 3.8 t MS/ha. Its composition is 43% grasses, 22.5% legumes and 26.3% others.

**Keywords:** Multi species pasture, cereal system, performances, semi-arid area.

**RESUME** – "Evaluation d'une surface fourragère multi-espèces remplaçant une culture céréalière dans les conditions semi-arides de l'Algérie". Dans le cadre du projet PERMED et afin de réduire l'érosion du sol et d'améliorer le système d'affouragement animal, un mélange de fourrages composé de 9 variétés d'espèces annuelles et pérennes a été élaboré par *Fertiprado*® et a été semé en novembre 2005 sur 1 ha, remplaçant une culture de céréales dans une ferme située dans la région semi-aride d'Algérie, province de Sétif. 990 plants/m<sup>2</sup> ont émergé, parmi lesquels 53% sont semés dont 33% de graminées. La biomasse végétative avant le pâturage était de 3,2 t MS/ha. Les graminées en représentent 57%, les légumineuses 21% et les autres 21,5%. A titre indicatif, la biomasse produite par le mélange semé correspond au double de la quantité produite par une jachère pâturée. La biomasse moyenne récoltée au stade de coupe dans 8 cages clôturées correspond à 3,8 t MS/ha. Sa composition est de 43% de graminées, 22,5% de légumineuses et 26,3% autres.

**Mots-clés :** Pâturage multi-espèces, système céréalier, performances, région semi-aride.

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## Introduction

The objective of this work is to define technologies of low cost sowing and preserving the environment. It also aims to optimize the introduction and the establishment of modern cultivars developed in various rain agricultural systems. Algerian semi arid agricultural system is characterized by importance of annual uncultivated areas (fallow), which could favour soil erosion and animal underfeeding (Jaritz, 1997; Abbas and Abdelguerfi, 2005). This work tries to replace a part of fallow surface by using annual and perennial species mixture to create a temporary sown pasture. This poster presents performance evaluation of this pasture obtained at the time of the first year of installation. It compares two types of exploitations: grazing and mowing. The results obtained are discussed by the use as an indication of certain measurements obtained on preexistent fallow located in the same experimental farm.

## Materials and methods

### General conditions and protocol of evaluation

- (i) Delimitation of the pieces: A piece of 1 ha usually assigned to the cereal culture and having

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<sup>1</sup> This work is a part of "PERMED" project Contract n° : INCO-CT-2004-509140.

been carried out in fallow grazed in 2005-2006 was retained and delimited for the installation of "Fertiprado®" pasture. It is on this surface that the 8 randomized samples of 1 m<sup>2</sup> will be collected before the grazing, then after the pasture as well as the 8 other samples protected by latticed cages.

(ii) Fallow: A piece of about 1 ha located at interior of a piece of 4 ha left in grazed fallow (preceding oats), was used only as an indication considering the heterogeneity of the vegetable cover on this type of pastoral space. Eight randomized samples of 1 m<sup>2</sup> each was mowed before the beginning of grazing and at the beginning of legumes flowering stage (2<sup>nd</sup> half of April) for dry matter yield estimation.

(iii) Seed: The seed was a mixture of annual and perennial grasses and legumes carried out by "Fertiprado®" (Table 1). They include in weight more than 68% of legumes species of which 75% are annual.

(iv) Fertilization: 200 kg/ha superphosphate (0.46 P<sub>2</sub>O<sub>5</sub>) were spread per ha on the "Fertiprado®" pasture. This corresponds to 92 kg P<sub>2</sub>O<sub>5</sub>/ha.

(v) Fodder dry matter and quality: These parameters are obtained drying the harvested grasses at 80°C during 48 h in oven of mark "memmert" and components of fiber by Van Soest method.

(vi) Climate trends: Fig. 1 resumes temperature and precipitation registered in last 2005 and the first six months of 2006.

Table 1. "Fertiprado" seed mixture components

Component	Weight (Kg/ha)	%
<i>Medicago sativa</i> cv. Genesis	2	5.71
<i>Onobrychis viciifolia</i>	4	11.43
<i>Trifolium michelianum</i> cv. Frontier-	3	8.57
<i>Trifolium resupinatum</i> cvs. Prolific, resal-	5	14.29
<i>Medicago polymorpha</i> cvs. Santiago, Scimitar-	2	5.71
<i>Medicago truncatula</i> cvs. Parabinga, Jester-	4	11.43
<i>Vicia villosa</i> cvs. Amoreiras, Nanoi-	5	14.29
Total legumes	25	68.42
<i>Avena strigosa</i> cv. Saia-	5	14.29
<i>Lolium multiflorum</i> cv. Polanum	5	14.29
Total grasses	10	28.58
Total	35	100

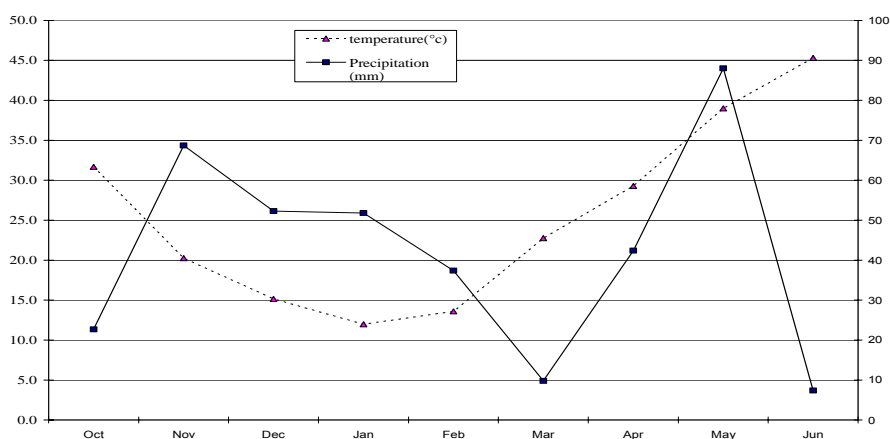


Fig. 1. 2005-2006 climate trends.

## Methods of installation and evaluation of "Fertiprado®" pasture

(i) *Ploughings*: The ploughing was on surface (15 cm of depth). The number of passages are the necessary to obtain a good seed bed.

(ii) *Sowing*: Sowing was carried out on a depth from 0.5 to 1 cm followed by a rolling. The amount of sowing is 33.81 kg/ha.

(iii) *Irrigation*: A watering by sprinkling of a quantity of water equivalent to approximately 30 mm of rain was carried out after sowing in order to ensure a good installation. At April, upon one month dryness another equivalent watering was followed.

(iv) *Emergence*: The number of legumes plants, grasses sown and those not sown has been estimated in 6 samples distributed randomly taken in quadrates of 0.25 X 0.25 m<sup>2</sup>.

(v) *Height*: the height of grass was made to launch the pasture. It was made on 50 points using an ordinary ruler. The pasture is launched when the height of grass exceeds 15 cm.

(vi) *Pasture*: A free grazing was carried out by a herd of 198 suckled ewes, during 5 hours per day. They repeated this kind of grazing, over 7 days to obtain a vegetation cover of approximately 4 cm.

(vii) *Mow*: 8 samples of 1 m<sup>2</sup> in randomised locations were mown before and after pasture to estimate the biomass and its composition, as well as the dry matter and the food value. The same operation was carried out in the cages at the stage flowering beginning of legumes plants.

(viii) *Recognition of the species*: It was made using photographs then using individual plans planted beforehand in pots.

(ix) *Fodder quality*: This measurement have been finalized according to *Van-Soest* standards.

(x) *Fallow biomass estimation*: In order to have an indicative idea of the productivity and fodder quality of the installed pasture, fallow biomass mowing was done on a wood square (1m X 1m) at 8 randomised locations.

## Results and discussion

### Climate trends

This year was characterized by value of precipitation close to the average. The late winter and early spring were dry and the late spring was rainy. At this period, temperatures raised strongly.

### Emergence

A synthetic reading of the results emphasizes that 990 seedlings emerged per m<sup>2</sup> including 53 % grasses, 33 % legumes and less than 15% not sown plants. It seems that plant emergence average was different from seed botanical balance (Fig. 2). Figure 3 shows that there were some legumes lost and local grasses appeared.

### Biomass production and its botanical composition

*Seasonal biomass production*: The biomass collected out on cages corresponds to 3.8 t ha<sup>-1</sup> of dry matter (Fig. 4).

The botanical composition is 43% grasses, 22,5% legumes and 26,3% others. This produced quantity represents plus than the double of that produced on the grazed fallow (1.6 t ha<sup>-1</sup>).

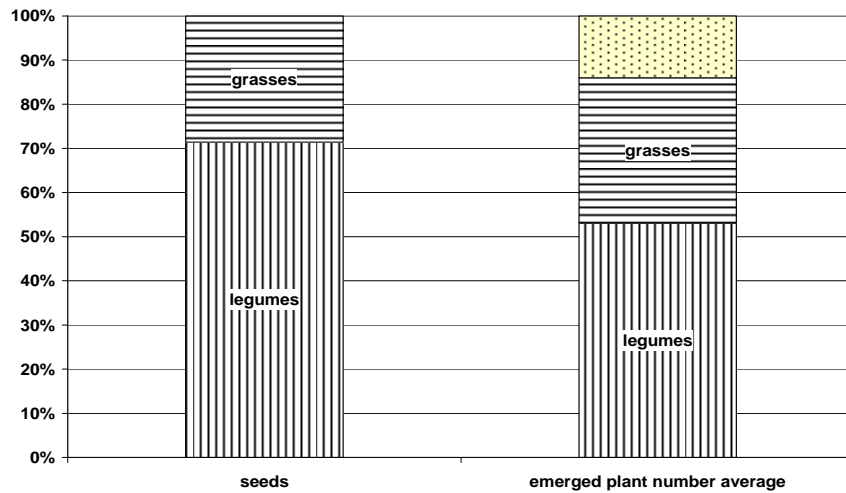


Fig. 2. Seed composition and emergence average (plants/m<sup>2</sup>) in %.

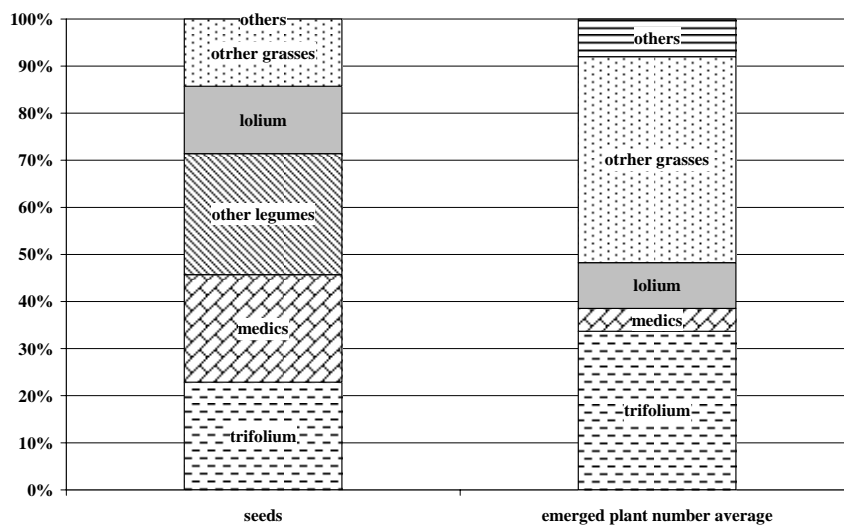


Fig. 3. Botanical emergence average in %.

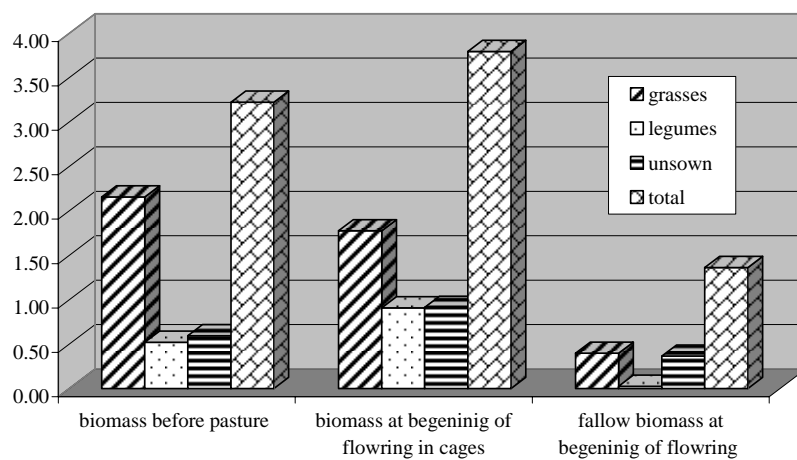


Fig. 4. Biomass averages and botanical composition.

## Biomass production at grazing stage

The biomass is estimated at 3.2 t ha<sup>-1</sup> of dry matter. Botanical composition is 57% grasses, 21% legumes and 21.5% others. Bibliographic discussion of these results does not appear pertinent at this stage of work (establishment first year). It is only important to note the interesting performances observed on the new pasture.

Fodder quality: It appears that parietal component of cells at the beginning of legumes flowering is comparable between "Fertiprado"® fodder mixture and fallow fodder mixture (Tables 2 and 3). At vegetative stage "Fertiprado"® mixture is significantly poorer concerning these parameters. About feeding value, the "Fertiprado"® fodder mixture is richer than fallow fodder mixture concerning PDIA at cutting stage. At grazing stage "Fertiprado"® fodder mixture is significantly richer than the other samples ("Fertiprado"® and fallow at cutting stage) concerning PDIA, but significantly poorer concerning PDIN and PDIE (digestible proteins in the intestine of agote, digestible proteins in the intestine of energetic origin).

Table 2. Averages and standard deviation of parietal components

	NDF %	ADF %	ADL %	Lignine %
Cages fodder mixture	40.10 a ±4.96	20.74 a ±3.58	14.49 a ±2.50	4.32 a ±1.82
Fallow fodder mixture	41.10 a ±4.96	21.20 a ±0.74	15.63 a ±2.21	4.35 a ±2.26
Grazing stage fodder mixture	39.98 b ±2.89	20.05 b ±2.87	12.41 b ±1.40	3.91 b ±1.36

a, b different = significant difference value at  $\alpha < 0.05$ .

Table 3. Averages and standard deviation of the food value

	By kg of DM		g/kg DM		
	Milk FU	Meat FU	PDIA	PDIN	PDIE
Grazing stage of fodder mixture	0.72 a ±0.03	0.64 a ±0.03	64.25 a b ± 12.88	87.61 a b ±24.39	89.31 a ±12.66
Cages of fodder mixture	0.68 a ±0.05	0.62 a ±0.06	58.91a ± 4.84	108.84 a ±10.49	99.64 b ±4.46
Fallow fodder mixture	0.73 a ±0.04	0.65 a ±0.04	54.06b ± 4.14	102.33 a ±7.75	97.33 b ±2.21

a, b different = significant difference value at  $\alpha < 0.05$ .

## Conclusions

Fallow fodder or pastoral function alternative in Algerian semi arid area seems possible with multi species grazing pasture. In this first year, biomass production and quality is very encouraging. It is perhaps necessary to take these indications with prudence. The reestablishment of this pasture is very important in this case.

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