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Impact of silage making on evolution of livestock production systems in the Bour coastal areas of Morocco

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SUMMARY – In a work conducted in the Bour Atlantic coastal areas, all farmers experienced in silage making were questioned regarding their livestock, crop production and their experience with silage production. Samples of silage were taken from all silos. Objectives were to get a clear picture of the current state of silage making in the area and its impact on livestock production systems. Experience of farmers in making silage varies from 1 to 38 years. They are rearing cattle and/or sheep. Herds average 96 head of cattle and 313 head for sheep. Cows represent a ratio of 56% per farm. 80% of cattle herds consist of pure breeds. 63% of sheep producers work with crossbreeding programs. Crop production system is based on cereal and forage. Proportion of land set for forage production is 18.5%, exceeding largely the national ratio, 10%. Silage is made out of oat, at 74%, barley, 15%, and triticale, 10%. Chemical analysis of silage samples from the silos of farmers shows a low crude protein content. Average energy yield per ha of ensiled crop is 4900 FU/ha. Most of the silage samples have a high butyric acid content. Silage is used during the dry periods of summer and autumn when livestock producers face severe shortage of forage. It represents the basic feed in the period of lambing and stabilises milk production throughout the year. It represents the second energy source after concentrates, whose contribution still remains high. Forage conservation in the form of silage allows for the intensification of livestock production in the bour areas of coastal Morocco. The survey indicated a wide variation in silage quality between the areas. Extension approaches should be reviewed.

Key words: Silage, livestock, production systems, Morocco.

RESUME – *"Impact de la technique d'ensilage sur l'évolution des systèmes de productions animales dans les zones bour côtières du Maroc". L'étude a eu lieu dans le bour atlantique intermédiaire. Elle a pour but de déterminer le rôle de l'ensilage dans la mutation opérée dans les systèmes d'élevage des zones bour. Les exploitations qui font de l'ensilage ont été caractérisées et l'effet de l'ensilage déterminé. L'expérience des agriculteurs dans l'ensilage varie de 1 à 38 ans. La taille moyenne du cheptel est de 313 têtes pour les ovins et 96 pour les bovins. Le mode de conduite est dominé par le croisement dans le cas des ovins soit 63% des élevages. La production végétale est basée sur la céréaliculture et la production de fourrages. Cette dernière concerne 18,5% de la superficie agricole totale de la région. Le fourrage ensilé est en majorité composé d'avoine, 74%, orge, 15%, et triticale, 10%. Le taux moyen des matières azotées totales est bas et le rendement énergétique est de 4900 UF/ha. La plupart des fourrages ensilés ont un niveau élevé d'acide butyrique. Le calendrier fourrager dans ces exploitations est caractérisé par l'absence de période de soudure. L'ensilage est utilisé pendant l'automne et l'été. Il représente l'aliment principal pendant l'agnelage et régularise la production laitière au cours de l'année. La pratique de l'ensilage comme méthode de conservation des fourrages en zone bour a eu un impact positif. Le système de production s'est intensifié. Toutefois la technique de vulgarisation de l'ensilage devra être mieux adaptée aux conditions techniques et sociales des exploitations.*

Mots-clés : *Ensilage, ruminant, système de production, Maroc.*

Introduction

Morocco has a subtropical climate with a dry season during summer and autumn and a rainy season during the winter time. Precipitation is highly variable from year to year both regarding the quantity and the distribution. On about 50% of cultivable land receive rainfall around 350 mm or less per year (DS, 1994). Although, large areas have been irrigated, farms in non-irrigated zones are still produce 76% of crops and rear almost all livestock. Feeding programs varies widely among regions. A general tendency indicates that sheep feeding is based mainly upon straw and fallow which

contributes respectively by 15 to 50% and 8-40% of the total energy intake. Concentrates make up 8-40% of energy intake, whereas forage contributes only with 3-18%. Feeding calendar is characterized by a feed shortage from August to December. This is unfortunate because this period corresponds to the months of breeding and lambing. The consequence is a seasonal production and a low productivity (MADRPM-DE, 1998).

To overcome this feed deficiency, silage making has been introduced in certain parts of the country, as early as in the 1930s. In the Bour Atlantic coastal areas, called "Bour Atlantic Intermediary" (BAI), much effort has been done to improve silage techniques and to adapt them to the context of farms. Investments were made in silos construction and experiments were carried out.

Along recent years, dairy and meat production in BAI have been intensified by certain farmers. Silage making have been practiced in the area since 1960. Other producers have only adopted the technology during the last decade. Experiences of bad silage quality due to the use of inappropriate techniques has partly led to disappointed farmers and caused some of them to stop silage production after only a few years.

A survey was conducted in of BAI with the objectives to get a clear picture of the present state of silage making in the area and to evaluate the impact of silage on the development of integrated crop-livestock systems in the region The survey should have made the base for extension on improved strategies for silage making to resolve yearly recurring feedings problems faced by Moroccan livestock farmers.

Materials and methods

The study was conducted in four zones of BAI: Casablanca, Khemisset, Benslimane and Rabat. All farms which either practiced silage making or had been practicing it previously took part in this study. A survey included questions concerning farms characteristics, silage practices and livestock production system. Data were collected during the period January to May 1998. Farms were visited twice in February and in April. From each silo samples of silage were taken for proximate analysis and volatile components determination using HPLC. For the statistical analysis, means, standards deviation and coefficient of variance were calculated.

Results

Farmers that took part in this survey (54) have been producing silage for a period of one to thirty eight years with an average of 7.5 years. Silage making were practiced by livestock producers rearing cattle (94%) and/or sheep (79%). Among cattle producers, farmers had at the average 96 heads of cattle out of which 54 are adult cows representing a ratio of 56% per farm. 80% of cattle herds consist of pure breeds. Dairy breeds, such as Pie noire, Monthbeliard and Holstein represents 69% of the total population. Meat breeds which mostly consist of Charolais, Tarentaise and Santas Gertridus adds up to 11%. The crossbreeds and local breeds constitute only 20% of total cattle population. The opposite situation is true on national level were 80% of the cattle are local or crossbred.

Average herd size of sheep producers is 313 animals. The proportion of ewes within the herds varies among the regions, from 56.2% in Benslimane to 74.8% in Khemisset. This indicate that production systems prevailing in these areas are different. In Benslimane and Casablanca, farmers are rearing a higher number of young animals for fattening in order to supply meat to the urban market. 63% of sheep producers work with crossbreeding programs. The remainder may have herd consisting of more different breeds but apply no crossbreeding programs. Two Moroccan breeds: Timahdit and Sardi dominate the sheep population representing respectively 54% and 14.3%. Crossbreeds make up 21.5% of sheep herds. Sheep production systems on farms practicing silage making are mainly intensive in Casablanca, Benslimane and Rabat and extensive in Khemisset.

Crop production system is based upon cereal for grain and on forage. Proportion of land set reserved for forage production is 18.5%, which is largely exceeding the national ratio of forage land, 10%.

Silage is made out of oat, 74%, barley, 15%, and triticale, 10%. Legumes are used in mixture with oat up to 38%. Ensiled forage are harvested at different growth stages. Most of the fodder is harvested at the optimum stage (heading and milking), 60%, while 31% are harvested too late at dough stage usually having a dry matter content above 35%. Only 8.7% represent early harvest with a dry matter content less than 30%.

The total storage capacity of forage in the form of silage in this region is around 36,600 m³ with the assumptions of forage density equal to 500 kg/m³, silage production would be around 1830 tons with an average yield of 15 tons/ha.

Chemical analysis of silage samples taken out of farms show an average crude protein content of 10% varying from 7.3% to 15%. The crude fibre content average 25.6% and vary from 20 to 35%. Energy content of silage in this region is of 0.75 FU/kg DM ranging from 0.61 to 0.81 FU/kg DM. (Unité Fourragère, a French energy unit) (Table 1).

Table 1. Average nutritive composition of farmer's silage samples (% of DM)

	Ash	Fat	Crude protein	Crude fibre	FU†/kg DM
Number of samples	20	20	20	20	20
Average	7.61	5.16	10.02	25.57	0.75
Min.	4.82	3.05	7.29	19.71	0.61
Max.	14.38	7.67	15.08	35.03	0.81
SD	3.38	1.62	2.55	5.13	0.06
CV %	44.41	31.4	25.45	20.06	8

†FU: Feed unit.

Analysis of volatile components shows that samples are characterized by normal and acceptable values except for butyric acid which present a high content (Table 2). This indicate that the silage have been exposed to clostridia fermentation and aerobic spoilage. It may be a consequence of too poor packing and sealing during preparation, a result from low dry matter content or infiltration of water.

Table 2. Average fermentation components in farmer's silage samples

	% N-NH_3/ Total N	Lactic acid (mg/ml)	Propionic acid (mg/ml)	Butyric acid (mg/ml)	Acetic acid (mg/ml)	Formic acid (mg/ml)
Average	4.38	1.54	0.38	0.17	0.87	0.04
Min.	1.15	0.016	0.09	0.034	0.19	0.019
Max.	15.10	4.06	0.55	0.632	1.32	0.058
SD	4.33	1.03	0.14	0.184	0.37	0.02
CV %	98.85	66.88	37	108.23	43	48

Discussion

Silage plays an important role in the feeding calendar. During the dry periods of summer and autumn when livestock producers are facing severe shortage of forage, feeding of both cattle and sheep is based upon straw, silage and concentrate. For an average of 6.4 months varying from 2 to 12 months silage is used in the ruminants rations with 2 tons per farm and day. It represents the basic feed in the period of laming and regularizes consequently milk production within the year. Thus production patterns on these farms doesn't show the characteristics of usual rainfall dependent production patterns, which are characterized by a low production during late summer and autumn and high production, even excessive in late winter and spring. Average energy yield per ha of all ensiled crops in this region is about 4900 FU/ha. This is much higher than the average yield of oat harvested

as hay, which is estimated at 1500 FU/ha (Bounejmate and Jaritz, 1997). Ensiling thus increase energy yield of the forage fields in non-irrigated rain fed regions which can improve the capacity of farms, decrease the use of concentrates as more energy is coming from silage and allow for more flexibility in the management. Silage contribution to the total energy available to the regions herds, is variable within the investigated zones. It is 30% in Benslimane, 17% in Khemisset and Casablanca and only 5% in Rabat. It represents the second energy source after the concentrates whose contribution still remains high.

Management constraints are limited and concerned mainly aerobic spoilage, as farmers paid a small attention to covering their silos after taking off silage. About 47% of the visited farms leave their silos open after feeding. Thus, there is real problem and deficiency of sealing silos after feeding and aerobic spoilage had been noted. Butyric fermentation are observed in the case of cereals silage, in certain cases with a bad smell and very dark colour of the ensiled forage.

Conclusions and recommendations

Preservation of forage in the form of silage allow for an intensification of livestock production even in non irrigated areas like the coastal part Morocco (breeds, production systems, dairy for cattle and crossbreeding for sheep).

Moreover silage techniques and quality within the areas are very variable. This induce that more emphasis should be put on extension methods as far as silage making is concerned. For example in the southern zones efforts should focus the improvement of silage technologies, while in northern zones (Rabat and Khemisset) the benefit of silage as a strategic foodstuff to substitute part of the concentrate in the intensive animal production should be stressed and demonstrated.

For the research part, efforts should be oriented towards the incorporation of silage in ration and ways to optimize its use, considering nutritive specifications of silage as foodstuff (high non protein nitrogen, and presence of volatile components).

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