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Impact of silage on livestock production systems in rain fed coastal areas of Morocco

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Abstract

Livestock production systems in Morocco varies but generally livestock feeding is based upon straw and fallow supplemented with concentrate. Forage contribution is low and highly variable (from 3 to 18% of energy intake). The feeding calendar is characterised by a lack of fresh forage from August to December, which some farmers have tried to overcome by making silage. In a survey conducted in the rain fed Atlantic coastal areas, all farmers with experience in silage making were questioned regarding their animal, crop production and their experiences with silage production and samples of silage were taken from all silos, with the objectives to get a clear picture of the present state of silage making in the area. A total of 54 farmers rearing cattle (94%) and/or sheep (79%) who had practised silage making for 1-38 years took part in the survey. Cattle farmers had on average 96 head of cattle and sheep farmers 313 animals. Crop production system was based on cereal (for grain) and forage. The proportion of land set apart for production of forage crops was 18.5%, largely exceeding the national ratio of forage land (10%). Silage was made from oat (74%), barley (15%) and Triticale (10%). 31% of the crop was harvested at a ripe stage and 9% at an earlier stage. Chemical analysis of silage samples from the area showed a crude protein content of approx. 10% and crude fibre of 25% on a dry matter basis. Most silage samples had a high butyric acid content indicating a clostridia fermentation. The average yield of ensiled crop was 3750 UF/ha compared to 1500 UF/ha yielded by oat harvested as hay. Therefore ensiling increased the energy yield. Forage conservation in the form of silage allows for livestock production intensification in the rain fed areas of coastal Morocco. The survey indicated a wide variation in silage quality within the areas and specific differences in livestock production among the surveyed farmers. Another outcome of the survey indicated that extension approaches and methods should be fields problems oriented.

Introduction

Morocco has a subtropical climate with a dry season during summer and autumn and rainy season during the winter time. Precipitation is highly variable from year to year both regarding its quantity and its distribution. On about 50% of Morocco's cultivable land yearly rainfall amounts to only around 350 mm or less (DS, 1994). Though large

areas have been irrigated, farms in rainfed areas still produce 76% of crops and almost all livestock. In these areas feeding systems vary widely among farms. Sheep feeding is mainly based upon straw and fallow which contributes respectively by 15 to 50% and 8 to 50% to the total energy intake. Concentrate make up 8-40% of energy intake, whereas forage only contribute 3 to 18%. The feeding calendar is characterised by a lack of forage from August to December. This is unfortunate because this period coincides with breeding and lambing seasons. The consequence is a seasonal production and low productivity (MADRPM-DE, 1998).

To overcome the dry season's lack of fresh forage, silage making was introduced in Morocco as early as in 1930s. Especially in the rain fed Atlantic coastal areas much effort was done to improve silage techniques and to adapt them to the context of the country. Investments were made in silos and experiments carried out. Vestiges in Casablanca, Benslimane, Rabat and Khemisset's zones still remain and are indicating the state of silage technology progress at that time.

During recent years, dairy and meat production in the rainfed Atlantic coastal areas, have been intensified by certain farmers. Although silage making have been practised on some of these farms 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 few years.

A survey was conducted in the rainfed Atlantic coastal areas, in order to get a clear picture of the current 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 also set up the basis for extension on improved strategies for silage making to resolve yearly recurring feedings problems faced by Moroccan livestock farmers during autumn and winter.

Methodology

The study was conducted in four zones of in the rainfed Atlantic coastal areas, Casablanca, Khemisset, Benslimane and Rabat. All farms which either practise silage making or have been practising it previously participated. A questionnaire was prepared with questions concerning farms characteristics and silage practices. Data was collected from January to May 1998 to keep effects of sale of animals at a minimum. Farms were visited twice in February and in April. From each silo samples of silage were taken for proximate analysis and volatile fatty acids determination (HPLC). For the statistical analysis, means, standards deviation, coefficient of variance and frequency were calculated.

Results

54 farmers which had produced silage for 1 to 38 years with an average of 7.5 years took part in the survey. Silage making are practised by livestock producers rearing cattle (94 %) and / or sheep (78 %). Among cattle producers each farmer has in average 96 heads of cattle out of which 54 are adult cows representing a ratio of 56 % per farm. 80 % of cattle herds consists of pure breeds. Dairy breeds, such as Friesian, 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 where 78 % of the cattle are local or crossbred.

Average herd size of sheep producers is 313 animals with 210 ewes. The proportion of ewes within the herds varies among the regions from 56.2% in Benslimane to 74.8% in Khemisset. This indicates differences in production systems. 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 programmes. The rest may have herds consisting of more breeds but in pure breeding. Two Moroccan breeds: Timahdit with 54 % and Sardi with 14,3 % dominate the sheep population. Different crossbreeds make up 21,5%. The sheep production systems on farms practising silage making are mainly intensive in Casablanca, Benslimane and Rabat and extensive in Khemisset.

Crop production system is based upon cereal (for grain) and forage. The proportion of land set apart for production of forage crops is 18.5 %, which largely exceeds the national average area of forage.

The total storage capacity of the region is around 36 600 m³. With the assumptions of forage density equal to 500 kg/m³, silage production would be around 18 300 metric tons with an average yield of 15 tons /ha.

Silage is made out of oat (74 %), barley (15%) and triticale (10 %). Legumes have been used in mixture with oat up to 38 % of the area. Ensiled forage were harvested at different growth stages. Most of the fodder was harvested at the optimum stage (60 %), while 31 % were harvested at more mature stage usually above 35 %. Only 9% were ensiled at earlier stage with a dry matter content less than 30 %.

The chemical analysis of silage samples taken from farms shows an average crude protein content of 10 % DM varying from 7,3 to 15 % DM. The crude fibre content averaged 25,6% DM varying from 20 to 35 % DM. An average value of 0,75 UF/kg DM ranging from 0,61 to 0,81 UF/kg DM was calculated (Table 1).

Table 1. Average nutritive composition of farms silage samples (% DM)

	Ash	Fat	Crude protein	Crude fibre	UF* /kg DM
Average	7.61±3.38	5.16±1.62	10.02±2.55	25.57±5.13	0.75±0.06
Minimum	4.82	3.05	7.29	19.71	0.61
Maximum	14.38	7.67	15.08	35.03	0.81
CV** %	44.41	31.4	25.45	20.06	8.0

* UF: Unité Fouragère (French unit for net energy evaluation)

**CV: Coefficient of variance

The analysis of volatile fatty acids showed that most of the tested silage samples was characterised by high butyric acid content (Table 2). This indicate that the silage have been exposed to clostridia fermentation and aerobic spoilage. This may be a consequence of poor packing and sealing during preparation, a result from low dry matter content or infiltration of water.

Table 2. Average fermentation components in farms silage samples

	%N-NH ₃ / Total N	mg/ml				
		Lactic	Propionic	Butyric	Acetic	Formic
Average	4.38±4.33	1.54±1.03	0.38±0.14	0.17±0.184	0.87±0.37	0.04±0.02
Minimum	1.15	0.016	0.09	0.034	0.19	0.019
Maximum	15.10	4.06	0.55	0.632	1.32	0.058
CV %	98.85	66.88	37	108.23	43	48

The average energy yield per ha of all ensiled crops in this region is about 3750 UF/ha. This is much higher than the average yield of oat harvested as hay which is estimated to 1500 UF/ha (Bounajmate et al., 1997). Ensiling thus increase energy yield of forage in rain fed regions which can improve the feed availability of farms, decrease the use of concentrates as more energy is coming from silage, and allows for more flexibility in herd feeding management.

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, the 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 a quantity of 2 tons per farm and per day. It represents the basic feed in the period of lambing and stabilises milk production throughout the year. The production pattern on these farms doesn't show characteristics of usual rainfall dependent production behaviour, which are characterised by low production during late summer and autumn and high production in late winter and spring. Silage contribution to the total energy available to livestock in this region, 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.

Constraints concerned mainly aerobic spoilage, as farmers paid small attention to cover their silos after removing the silage. About 47% of the visited farms leave their silos open after feeding. Butyric fermentation were 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

Forage conservation in the form of silage allows for an intensive livestock production in rainfed areas of coastal Morocco.

The survey indicated a wide variation in silage quality within the areas and specific differences in livestock production among the surveyed farmers. Another outcome of the survey indicated that extension approaches and methods should be fields problems oriented. In southern zones (Casablanca and Benslimane) efforts should focus on improvement of silage technologies while in northern zones (Rabat and Khemisset) the benefit of silage as a strategic feedstuff to substitute part of the concentrate in the intensive animal production should be stressed.

References

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