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Kraiem.khemais@iresa.agrinet.tn

Feeding systems for dairy cows and their constraints in the Central East region of Tunisia

K. Kraiem & R. Aloulou
ESHE Chott Mariem, B.P. 47, 4042 Sousse, Tunisia

ABSTRACT

We conducted a survey in 194 dairy producers in the Central East region of Tunisia to identify the feeding systems and their technical limitations. The information gathered concern the producers, their farms and techniques and ways of feeding cows (type of feeds, quantity distributed, period of distribution). We calculated many technical parameters and made comparisons between 3 areas in the region. The results showed that concentrates, wheat bran and wheat straw were widely utilized by producers (100, 65.5 and 71.1 % of them for respectively concentrates, wheat bran and wheat straw). The green chopped forages were fed by a large number of producers, but the quantities fed were low and the periods of distribution were limited. Producers were feeding many rations all year around that were classified into 3 types : (1) rations constituted by dry forages or roughages (DF) and concentrates (Cc) (2) rations constituted by DF, Cc and winter green chop forages (WGCF) (3) rations constituted by DF, Cc and summer green chop forages (SGCF). We identified 4 feeding systems that were used in this region based on the types of the rations used. The mostly used system was the one where producers were feeding DF, WGCF and SGCF. The no land system based only on DF which are not produced in the farm but bought from the market was used by few producers. The main limitations or constraints observed were : (1) feedstuff and total dry matter intakes were limited (2) feedstuff quality was low (3) proportion of feedstuffs produced in the farm was very low (4) concentrates were used in large quantities (5) most of the rations were unbalanced.

Key words : survey, feeding system, dairy cows.

INTRODUCTION

During the last decade, there was a large development of dairy production in Tunisia (Revue de l'Agriculture, 2000). The Central East region which did not have a dairy vocation and was absent from statistics (FAO,1995) is becoming a dairy region (Ministère de l'agriculture, 1996). However its durability is questionable because of increased cost of purchased feeds and low productivity of cows in spite of high genetic potential. Many constraints are responsible for this situation. One of the main constraints is nutrition or feeding. In fact high productivity requires the application of good feeding techniques. The objectives of this study were to identify feeding techniques and systems in this region and to identify the main feeding constraints and propose solutions for them.

MATERIAL AND METHODS

We conducted a survey in 3 areas in the region

1. **Questionnaire :**
   There were 3 parts :

a- Information concerning the producers : name, age, main activity, education level.
b- Information concerning the farms : land area, soil occupation, forage crops…
c- Information concerning feeding techniques : feeds, quantities distributed, periods of distribution…

2. Survey :

The survey was conducted in 3 regions :

District of Mahdia : 100 producers
District of Monastir : 50 producers
District of Sousse : 44 producers

For each producer, we made 1 or 2 visits. The information gathered was based on answers to our questions, our observations and measures.

3- Data analyses

We calculated many technical parameters and their distribution.

For each producer we identified the rations used during all year. For each ration we indicated the quantities of each feed, the distribution period and feed composition. Then we classified the rations into 3 types:

Type 1: rations constituted by dry forages or roughages (DF) and concentrates (Cc)
Type 2: rations constituted by DF, Cc and winter green chop forages (WGCF)
Type 3: rations constituted by DF, Cc and summer green chop forages (SGCF).

Based on this classification we identified 4 feeding systems:

System 1: based on rations of type 1: no land system.
System 2: based on rations of type 1 and 2: winter forages.
System 3: based on rations of type 1 and 3: summer forages.
System 4: based on rations of type 1, 2 and 3: winter and summer forages.

Then we compared the systems for many feeding parameters: feeds and rations used, forages and concentrate consumption.

Data analyses were conducted using the program SAS.

RESULTS

1. Identification of farms:

a. Size of the farm *:* The results in table 1 showed that the farms are small and family-run. The size of farms was higher in the district of Sousse and lowest in district of Mahdia. Figure 1 shows that 16% of farms didn't have cultivated land with a large proportion in the district of Sousse (38.6%). The district of Sousse had a high proportion of farms (34.1%) with cultivated area over 5 ha. The average area for forage crops is low (0.406 ha / farm). 48.4% of producers didn't have forage crops and 91.7% of them had an area of forage crops lower than 0.5 ha (table 2).

Table 1: Cultivated land area

	Mahdia	Monastir	Sousse	Total
Cultivated area, ha	2.23	3.78	4.09	3.05
Irrigated area, ha	1.27	1.00	1.19	1.18
Forage crop area, ha	0.370	0.203	0.718	0.406

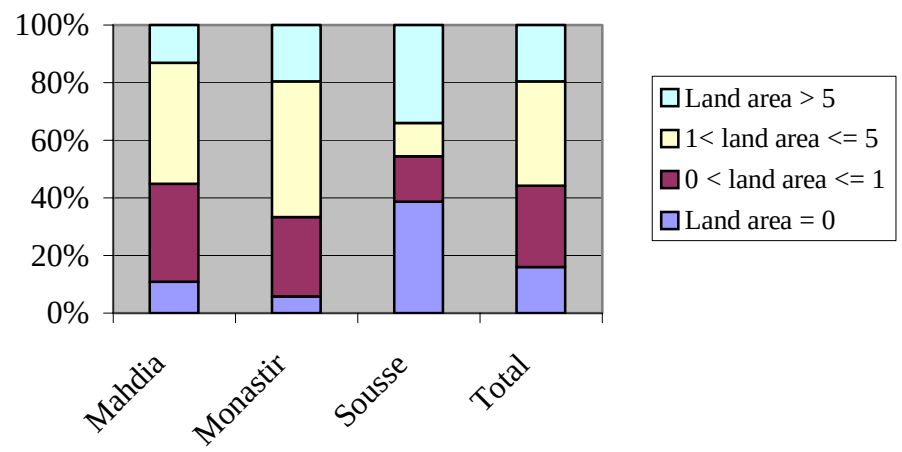

Figure 1: Distribution of producers based on land area

Table 2 : Distribution of producers based on forage crop area (%)

Forage Crop Area (FCA)	Mahdia	Monastir	Sousse	Total
FCA = 0 ha	33	64	65.9	48.4
0 < FCA ≤ 0.25 ha	44	20	6.8	29.4
0.25 < FCA ≤ 0.5 ha	17	12	9.1	13.9
0.5 < FCA ≤ 1 ha	6	4	6.8	5.7
FCA > 1 ha	0	0	11.4	2.6

b. Size of the herd : the average size of the herds was 3.94 cows varying from 3.2 in the district of Mahdia to 6.11 in the district of Sousse (table 3). 47.4% of the producers own 1 or 2 cows and only 12.4% of them own more than 10 cows. We noted large differences between regions. In the district of Sousse the proportion of large herds is greater (figure 2).

Table 3 : Herd size

	Mahdia	Monastir	Sousse	Total
Total cows	3.2	3.52	6.11	3.94
Cows in milk	2.62	2.78	4.79	3.15
Heifers	1.27	1.28	2.45	1.54
Calves	2.14	1.92	3.66	2.42

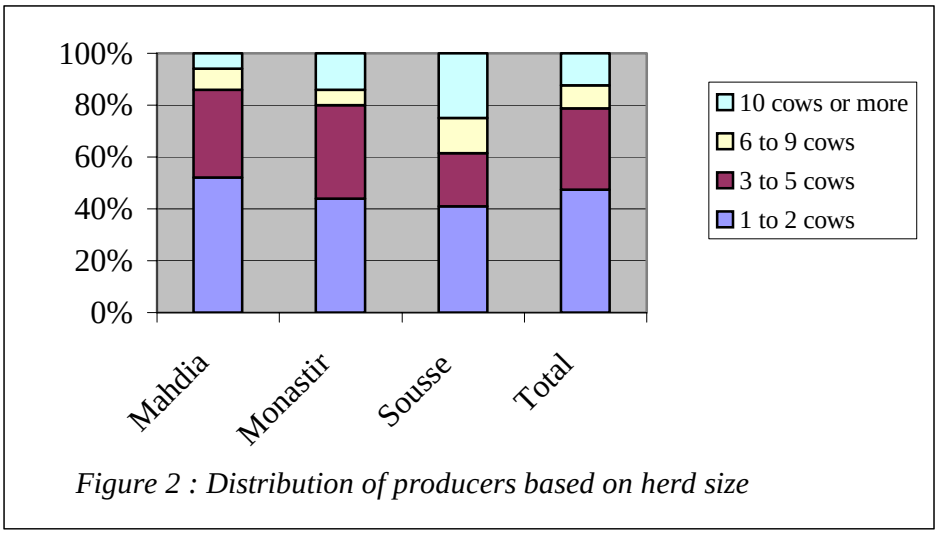

Figure 2 : Distribution of producers based on herd size

c. Milk production: We estimated 3 production parameters: average milk production the day of our visit, the average peak milk production for all cows and the average daily milk production for all year. We noted that all parameters were low (table 4).

Table 4: Estimated production parameters

	Mahdia	Monastir	Sousse	Global
Production the day of visit, l/day	17.5	19.1	12.3	15.44
Peak milk production, l/day	24.1	26.6	22.2	23.83
Yearly milk production, l/day	16.7	18.5	14.5	16.7

2. Feeding systems:

Table 5 : Quantities of feeds and the frequency of their utilization

Feeds	Mean kg	Minimum kg	Maximum kg	Standard deviation, kg	Frequency (%)
Dry Roughages and forages					
Oats vetch hay	5.38	2.00	12.0	2.18	43.3
Wheat straw	5.39	2.00	10.0	1.99	71.1
Alfalfa pellets	2.3	0.7	6.0	1.00	27.3
Concentrate feeds					
Commercial concentrate	7.45	2.50	14.5	2.57	100
Wheat bran	4.05	1.25	8	1.61	65.5
Cereal grains	3.04	2	6	1.13	10.3
Green chop forages					
Alfalfa	11.6	5	20	3.99	32
Sorghum	18.75	5	30	6.84	33.5
Egyptian clover	17.27	8	30	6.74	15.5
Oats	21.24	6	40	7.95	11.3
Carrot	25.09	10	40	7.92	27.8
weeds	22.96	7	40	6.7	41.2

a. **Feeds used :** table 5 shows the quantities of feeds and frequency of their utilization by producers. We noted that :
***** All producers use commercial concentrates
* Almost 2/3 of producers use wheat bran
* 71.3% of producers use wheat straw and 43.3% use oats-vetch hay.

b. **Rations used :** we identified 9 rations used by producers. The ration the mostly used is the one based on wheat straw and concentrate feeds (table 6). The average number of rations used by the producers was 2.64. 43.8% of the producers were using 3 or 4 rations which shows a good diversification of rations (table 7).

Table 6 : Rations used

Ration	Composition of rations	Period of distribution, day	% of producers
1	Wheat straw (WS) + concentrate feeds (CF)	185	68.5
2	WS + hay + CF	248	4.6
3	Hay + CF	195	34.5
4	WS or/and hay + weeds + CF	77	43.3
5	WS or/and hay + carrot + CF	100	27.8
6	WS or/and hay + Egyptian clover + CF	109	15.5
7	WS or/and hay + barley + CF	81	10.8
8	WS or/and hay + alfalfa + CF	124	31.4
9	WS or/and hay + sorghum + AC	89	34.5

Table 7 : Distribution of producers based on number of rations (%)

Region	One ration	2 rations	3 rations	4 rations	5 rations or more
Mahdia	4	27	27	35	7
Monastir	36	26	16	14	8
Sousse	40.9	40.9	13.6	4.6	0
Total	20.6	29.9	21.1	22.7	5.7

c. **Feeding systems :** we defined 4 feeding systems based on the types of rations. The system 4 based on dry roughages and winter and summer green forages is the most widely used (37.6% of producers). The no land system (system 1) is used by only 22.7%. There was large difference between regions, in fact 7% of producers in district of Mahdia and 40.9% of the district of Sousse used the no land system (table 8).

Table 8 : Distribution of producers based on feeding systems (%)

Region	System 1	System 2	System 3	System 4
Mahdia	7	37	3	53
Monastir	38	16	14	32
Sousse	40.9	29.55	20.45	9.1
Total	22.2	30.4	9.8	37.6

**** Feed consumption :***

Table 9 shows feed consumption. Total feed consumption was low for all systems which means that the cows are not fed *ad libitum*. The total feed consumption was slightly

higher for system 4 than the other systems. The consumption of roughages and forages was low for all systems (from 41.8 to 45 %). There was a slight increase in forage consumption in the systems with green forages compared to the no land system. The reason for this is that the producers feed green chop forages in limited quantities and they are not aware of the concept of dry matter intake. The proportions of green chop forages were low for all systems because of limited areas reserved to these crops (figure 3). Concentrate feed consumption was high. Because of economic reasons producers use many types of concentrate feeds, particularly wheat bran which is used in relatively high proportion (23.3 % of concentrated feeds) and commercial fattening concentrate (figure 4).

Table 9 : Feed consumption

Parameters	System1	System2	System3	System4	Total
Number of rations	1.25	2.4	2.21	3.9	2.7
Total intake, kg DM/cow/day	16.4	16.0	16.03	17.05	16.5
Roughage intake, kg DM/cow/day	6.76	7.24	6.95	7.18	7.1
Concentrate feed intake, kg DM/cow/day	9.64	8.76	9.08	9.87	9.4
Area of forage crops, ha / cow	0	0.032	0.146	0.208	0.10

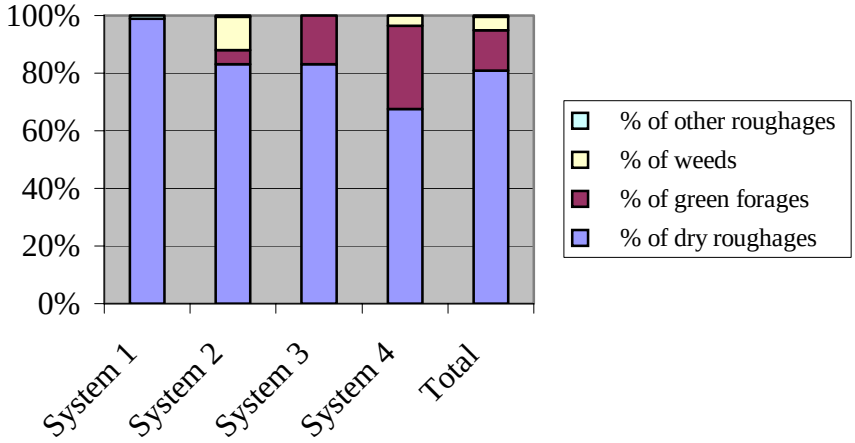

Figure 3 : proportion of different types of roughages

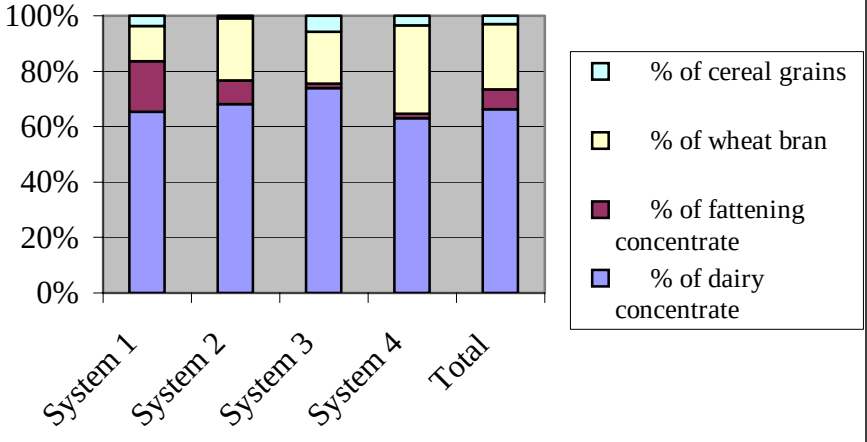

Figure 4: proportion of different types of concentrates

**** Quantities of milk permitted by rations:*** We calculated the nutrients provided by all rations and quantities of milk permitted by these nutrients. We noted that all rations were unbalanced. The most widely used ration (ration 1) is the poorest. We also noted an unbalance between Calcium and Phosphorous, with an excess phosphorous due to excessive wheat bran intake (table 10).

Table 10 : Quantities of milk permitted by the rations

Rations	Milk permitted by energy (UFL)	Milk permitted by digestible protein	Milk permitted by Calcium	Milk permitted by Phosphorous
1	16.5	13.1	15.7	25
2	18.6	15	17.6	27.3
3	20.3	17.1	19	34.3
4	19.7	16.9	16	29.7
5	21.6	17	13	29.1
6	20.3	18.7	23.1	35.1
7	21.3	16.6	16.3	33.1
8	20.7	18.7	17.9	31.1
9	22.3	16.7	16.9	30.9

CONCLUSION

We can say that the dairy husbandry in this region is family-run type, low size herd. Most of the producers use wheat straw as a main roughage and limited quantities of green chop forages. They feed limited quantities of forages and roughages because of high cost and low availability. They also use low cost concentrate feeds like wheat bran, cereal grains and fattening commercial concentrate. Most of producers feed similar quantities of concentrate feeds to all cows regardless of their productions.

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