Journal of Animal and Veterinary Advances 9 (17): 2229-2238, 2010
ISSN: 1680-5593

Analysis and Classification of Nutritional, Husbandry and Health Related Indicators to Define Specialist Dairy Farming: Nutritional and Production Measures at Dairy Farming

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Abstract: In this full-text research study the level of specialist dairy farming in the Burdur region of Turkey, in comparison to its recent alignment with European Union (EU) was investigated. The experimental parameters were based on various nutritional, husbandry, breeding, health and product safety and quality indicators which were simple and decisive in the perspective of dairy policies. An assessment based on other important zootechnical indicators was previously published. The present study was conducted in the form of a face-to-face survey, comprised of questions asked to the farmers. The obtained results were stored in a spreadsheet for further processing. The data was transformed to numerical values before statistical analysis. A multiple-response analysis was performed to define the classification of dairy farms into qualified, averaged and unqualified which were established according to algorithmic rules established within each set of indicators. Knowledge of animal nutrition, expertise level of feeds and feedings, statue of reproduction and breeding and awareness in animal health and product safety and quality were determined and analysed. The results revealed that the level of sustainability in other word, specialist dairy farms was only 41% of total whereas 33% were unqualified (a high figure) and 26% averaged farms. In summary, the specialist dairy farming system in Burdur accounts only 41% of total. This figure is too low as compared to the overall European figure of 83%. This clearly indicated that Turkish dairy farming is not convincing during the EU enlargement process where some serious reforms were made while their effects were not yet seen. This was explained by a comparative discussion, suggesting the need for intervention programmes to be undertaken in the region by the concerned public and private bodies.

Key words: Nutrition, husbandry, dairy farming, decision making indicators, agricultural policies, Turkey

INTRODUCTION

Turkish Agricultural Policy has been changing with alignment of European Agricultural Regulations. Dairy policy makers and/or service providers need to generate sustainable policies which are based on pin-pointed data extracted from a sound assessment of agricultural farms including those in animal production. For assessment of agricultural farms a wide range of management indicators can be used to simplify a complex reality on farms. The farm typologies are therefore commonly recognised indicators to demonstrate farm management practises as well as environmental performance in a given agricultural policy context (Andersen *et al*., 2007). The indicators are suggested to be classified into an integrated form rather than in a single form. Such approach provides useful tools for assessing and designing different farming policies taking into account of a wide range of differences between various types of farms (Andersen *et al*., 2004). This reflects that the farm typology is decided upon in a period when the main goals of the agricultural policies are related to production and economy (Commission of the European Community, 2003). Towards integration of Turkey's Dairy farming the sustainability level in other word the level of specialist dairy farming is to be known and determined. Sustainability must be understood to be more than an economical analysis. As recommended in the Dutch model the aspect of sustainability is to be extensively studied for various dimensions; ecological, economical, environmental, safety, welfare and health and moreover a criteria based approach is suggested to be followed (Van Calker, 2005).

In the first part of this research study an example of such farm typology (only farm size, housing, milking mechanisation) to was published demonstrate the statues of typical Turkish dairy farms (Orhan and Yasar, 2010).

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The results were discussed along with the results obtained from other econometric studies. In the former publication, the current agricultural policies were extensively discussed on basis of a simple farm typology and useful recommendations were publicly made available. This is now followed by an extension of this type of farm typology. Researchers investigated new indicators based on nutrition, husbandry, health indicators in order to further specify Turkish dairy farm typologies.

The province of Burdur is an excellent representation for Turkey and is to be examined in detail. In the region, we acted as animal extension experts to analyse and classify the scientific and technical data obtained from the studied farms. In addition we carried out pin-pointed intervention studies with the helps of local service providers.

In the study a set of algorithmic rules was tested to determine the levels of dairy farming specialists, as qualified farms, average farms and unqualified farms. The data collected were clustered into: a) farm Size, b) animal Housing, c) milking mechanization, d) animal nutrition and husbandry, e) animal health.

The information obtained was large. Therefore, the first part of results regarding farm size, animal housing and milking mechanization was published earlier by Orhan and Yasar (2010). Herein the results regarding animal nutrition, animal husbandry and animal health on the same subjects is now presented.

The study was designed to collect, analyse and interpret the nutritional, husbandry and health related indicators for the purpose of providing good quality of services by the local and national authorities. The aim is to demonstrate specialist dairy farming by determining the following measures:

- Practical knowledge of animal nutrition (during calving, lactation and dry period)
- Expertise level on feed and feeding strategies (forages, silage and concentrate feeding)
- Farm statues in reproduction and breeding
- Awareness in animal health and product safety and quality

MATERIALS AND METHODS

The study was based on a survey carried out amongst 172 dairy farms located in the province of Burdur in Turkey. A face to face questionnaire was asked. All data obtained from the survey was entered manually to a spreadsheet using Microsoft Office Excel Application. Data to be selected for statistical treatment was transformed to numerical values. Multiple-Response Test was applied to the data by using a window-based statistical package program SPSS (2006) version 15.

The survey questions were asked under the categories of animal nutrition, feeds and feeding, reproduction and husbandry and health and product safety and quality.

The questions asked were highly related to important management measures which allow determining the level of farmer's qualification for on-going farm activities. Thus these measures were considered as zootechnical performance characteristics upon which a set of algorithmic rules were setup.

These rules were then subjected to a multiple-response analysis in order to establish the level of speciality within each of categories. The applicability (Orhan, 2007) and validity (Orhan and Yasar, 2010) of multiple-response test was before successfully tested to evaluate the results obtained from such multiple-questionnaires.

RESULTS AND DISCUSSION

Practical knowledge of animal nutrition (during calving, lactation and dry period): This study related to determination of speciality of dairy farmers on nutritional management of animals kept per farm. The questions asked were very simple and decisive to understand whether the farmers are technically capable of performing these daily activities. This section is divided into three parts.

During calving: In animal nutrition, the new born calves must be fed with sufficient amount of milk during at least 24 h after calving since the milk produced during these hours (colostrums) are nutritionally valuable for calves, containing high density of nutrients as well as providing necessary immunoglobulin molecules.

About 41% of farmers fed their calves with a daily amount of 3-4 L milk per calve, 33 with 5-6 L and 6 with 7-8 L, whereas 20% did not measure or know daily amount of colostrums provided per calve (Table 1).

Where the price of milk is relatively high a specifically formulated feed in place of milk (milk replacement feed) are often used to provide the new-born animals with a formula similar to fresh milk to meet daily nutritional requirements. As a result 95% of farmers did not replace the milk with any kind of milk replacement

Table 1: The frequencies and classification of nutritional indicators to determine the level of specialist dairy farming in the region of Burdur in Turkey (Calving period)

Indicators	Multiple-levels	Frequency (%)	Codification*
Amount of colostrums per calf	3-4 L	41.0	2
	5-6 L	33.0	2
	7-8 L	6.0	1
	Do not know	20.0	3
Use of milk replacement feed?	Yes	3.0	1
	No	95.0	3
	Do not know	2.0	2
Use of calf starter feed?	Yes	80.0	1
	No	19.0	3
	Do not know	1.0	2

*Within each of the multiple-levels every farm (total 172) was codified as 1, 2 and 3 to define the algorithmic rules: qualified farmers indicated by 1; averaged farmers by 2 and unqualified farmers by 3, respectively

feed. However after weaning when the calves begin to consume solid feed materials 80% of farmers provided the weaned young animals with a starter feed.

Health of new born animals is important for a successful animal production. In the study 31% of farmers reported nutritional disorders (mainly diarrhea) of new born animals while 68% not.

During lactation: Production characteristic of a dairy cow is that lactation (milk production) is initiated by the birth given to a calf and milk production increases gradually by reaching to peak at 6 weeks then a slow but steady decrease generally occurs until two months prior to the next calving when the cow is turned dry. The nutritional needs of dairy cows throughout the lactation cycle are variable and must be met with an appropriate feeding regime. In this study it was shown that 67.4% of farms applied almost a feeding strategy which is basically based on an understanding of the farmer from the nutrition of dairy cows (Table 2). Wrong feeding strategies may diminish significantly the milk potency of dairy cows. For instance, underfeeding has a significant impact during early lactation than late lactation. Maximum profit, the objective in feeding dairy cows, generally correlates well both with highest milk yield per cow and with providing required nutrients at least cost. In region almost 72% of farmers are able to calculate their net profit only based on the cost of feed/milk ratio, irrespective to various phases of lactation.

Technically speaking the majority of farmers was not highly skilled-dairy man. Moreover, 44% of farmers were shown to calculate the total feed on monthly milk production per cow, 20% on daily milk yield per cow and 13% on average milk yield per lactation, whereas 23% of farmers did not know how to calculate total feed required for their animals kept in. Besides an economical analysis a feeding strategy based on using cheap sources of replacement feed materials such as urea for plant

Table 2: The frequencies and classification of nutritional indicators to determine the level of specialist dairy farming inthe regionof Burdur in Turkey (Lactation period)

Indicators	Multiple-levels	Frequency (%)	Codification*
Cost analysis?	Yes	72.0	1
	No	23.0	3
	Do not know	5.0	2
Apply a feeding regime?	Yes	67.0	1
	No	25.0	3
	Do not know	8.0	2
Total feed calculated on?	Daily milk yield	20.0	2
	Monthly milk yield	44.0	1
	Lactation milk yield	13.0	1
	None	23.0	3
Availability of sufficient water?	Yes	92.5	1
	No	7.5	3
Disease preventive)? measures (vaccination, disinfectant, hygiene	One of measures	45.0	2
	Three of measures	29.1	1
	Two of measures	25.0	1
	None	1.2	3
Nutritional disorders? (displaced abomasums, milk fewer, acidosis, ketosis, other)	Any of above	41.0	1
	Two of above	24.0	2
	3 or more of above	10.0	3
	Do not know	25.0	3
Feed is bought in	Monthly	93.0	1
	Quarterly	2.0	2
	Other	5.0	3
Moulding in feed?	Yes	19.0	3
	No	75.0	1
	Do not know	6.0	2

*Within each of the multiple-levels every farm (total 172) was codified as 1, 2 and 3 to define the algorithmic rules: qualified farmers indicated by 1; averaged farmers by 2 and unqualified farmers by 3, respectively

proteins can be best fit obtain a maximum net profit concept. This indicates the level of highly skilled practising dairyman. Many examples may have a small effect on net profits, with a substantial number; the total effect may be appreciable. Almost all the farmers were shown to never practise any kind of such feeding strategies.

Feed may represent 70% or more of the total costs of producing milk. Least-cost formulation is therefore necessary for every dairy farm, based on the use of an appropriate mixture of sufficient quality of forages/ roughages with formulated concentrate feeds at individually or group fed levels. Least-cost feeding was seen to be not applied at the studied farms. Regional farmers were asked to provide monthly amount of concentrate feed and forages (Table 3).

On the other hand, almost all the farmers were aware of providing sufficient clean water to dairy cows (92.5%). Disease preventive practises during lactation periods are shown in the Table 2, indicating that a good degree of preventive action is performed.

Successful dairy cattle feeders understand well how the dairy cows utilise nutrients what nutrients are required and which feeds supply these nutrients and how to feed various types of dairy cattle. Accordingly they must be prepared to cope with nutritional and metabolic disorders, such as milk fewer, displaced abomasums, ketosis,

Table 3: Variety and quantity of feed materials used at the studied dairy farms

Parameters	n	Frequency (%)
Concentrate Feed (Kg month^{-1})		
100-500	28	16.3
501-1000	15	8.7
1001-2000	63	36.6
2001-5000	34	19.8
5001-10000	4	2.3
No answer	28	16.3
Total	172	100.0
Forages and roughages		
Silage		
1000-8000	5	3.0
Hay	70	40.7
Forages		
100-1000	32	18.6
1001-2000	21	12.2
2001-5000	15	8.7
5001-10000	3	1.7
No answer	26	15.0
Total	172	100.0

acidosis and others. The percentage of farmers reporting any of the above mentioned disorders were 41%, whereas the percentages of farmers reporting 2 and 3 or more of these disorders associated together were 24 and 10%, respectively and 25% of farmers reported none occurrences of these disorders.

Reasearchers asked also the farmers how often they buy the concentrate feed in. The majority of farmers (93%) buy concentrate feed on a regular monthly base. Occurrence of feed moulding is reported by 19% of farms.

During dry period: The nutritional practise during dry period where the milk production markedly decreased during the last 2 months of pregnancy is vital for the preparation of pregnant cows for the next lactation cycle and for having a healthy calf. The majority (96%) was aware that an adaptation period is needed when a dairy cow goes to a dry period (Table 4). However, there is variability amongst farmers for the duration of dry period: 60% of farmers kept the dairy cows for a dry period of >60 days, 6% of the farmers kept <60 days and 33% kept exactly on 60 days.

Moreover, 25% of farmers used an antibiotic treatment during the dry period. Mineral and vitamin supplementation just before the calving is practised by almost 50% of farmers. Again the half of farmers applies a feeding regime which requires at least a week of period for changing from one feed to another, whereas 34% of farmers suddenly change from one to another feed. As overall 65% of farmers claimed that they are aware of how the dairy cows are fed during the dry period. Technically speaking the percentages showing a good degree of animal nutrition were not convincing for a competitive and profitable dairy farming.

Table 4: The frequencies and classification of nutritional indicators to determine the level of specialist dairy farming in the region of Burdur in Turkey (dry period)

Indicators	Multiple-levels	Frequency (%)	Codification*
An adaptation	Yes	96.0	1
period is applied?	No	3.0	3
	Do not know	1.0	2
Duration of dry period	60 days	33.0	1
	<60 days	6.0	3
	>60 days	60.0	2
	Do not know	1.0	2
Antibiotics are applied?	Yes	25.0	3
	No	66.0	1
	Do not know	9.0	2
Mineral and vitamin	Yes	49.0	1
support?	No	48.0	3
	Do not know	3.0	2
Change from one to	Suddenly	34.0	3
another feed.	1 day	3.0	2
	7 days	51.0	1
	Do not know	12.0	2
A special feeding	Yes	65.7	1
regime applied?	No	32.0	3
	Do not know	2.3	2

*Within each of the multiple-levels every farm (total 172) was codified as 1, 2 and 3 to define the algorithmic rules: qualified farmers indicated by 1; averaged farmers by 2 and unqualified farmers by 3, respectively

Determination of specialist dairy farming from the above mentioned nutritional indicators: Tables 1, 2 and 4 show the nutritional factors influencing dairy management. About 172 farms were coded by 1, 2 or 3 as qualified, averaged and unqualified farms, respectively for each of the answers given to the questions which were presented and discussed hereafter. A multiple-response test was used to analyse and classify the number and frequency of the coded farms as qualified, averaged and unqualified farmers from algorithmic rules established from these nutritional indicators.

The results of multiple-response analysis were shown in Table 5. The indicators have shown that the majority of farmers (68%) have an appropriate knowledge in the nutrition of lactating dairy cows, whereas they were not good at caring and nutrition of dairy calves (50) and nearly 40% of farmers showed a good practise of non-lactating, pregnant, dairy cows. After pooling these figures regarding various phases of lactation cycle, dairy farmers can be classified as 50 qualified, 23 averaged and 27% unqualified farmers within the frame of nutritional indicators (Table 5). Therefore, there is high potentially (73% including those qualified and averaged farms) for the policy-maker and service providers to take actions for the nutritional improvements.

Expertise level on feed and feeding strategies (forages, silage and concentrate feeding): A good dairy-man should give a consideration on how dairy cows use

Table 5: The results of multiple response analysis. Frequency of qualified, averaged and unqualified farmers determined from algorithmic rules based on nutritional, husbandry and health and product safety parameters

Indicators	Qualified farms (%)	Averaged farms (%)	Unqualified farms (%)
Nutritional			
Dry period	40.0	37.0	23.0
Calving	30.0	20.0	50.0
Lactation	68.0	15.0	17.0
pooled	50.0	23.0	27.0
Feeds and feeding			
Forages and silage	25.0	30.0	45.0
Concentrate feeding	59.0	5.0	36.0
pooled	38.0	20.0	42.0
Breeding-Health			
Reproduction-breeding	51.0	24.0	25.0
Health-product safety	51.0	17.0	32.0
pooled	51.0	19.0	30.0
Overall results	47.0	20.0	33.0
Zootechnical Orhan and Yasar (2010)*			
Farm size	18.6	30.6	50.7
Housing	38.1	31.5	30.4
Milking mechanisation	23.1	53.6	23.3
pooled	27.0	38.0	35.0
Regional statue	41.0	26.0	33.0

*The present results were combined with the results obtained from zootechnical (Orhan and Yasar, 2010) and presented here in order to reveal the entire statue in Burdur region

nutrients, the needed nutrients, feeds as sources of nutrients and the evaluation of feeds. This knowledge is important and useful in planning practical feeding programs for different types of dairy cows and varying farm conditions. A typical dairy cow of 630 kg will eat about 20 kg of air-dried feed each day. For a 10-cow milking herd this is 200 kg daily or 73 tons year^{-1}. The most of best practical feeding programs for milking herds are based on the use of high proportion of high quality forages. As milk production increases the cows usually can not consume sufficient forage to fully meet their energy requirement, thus supplemental concentrates are needed since forages are often deficient in one or more other needed nutrients. The concentrated feed must therefore formulated to make up any deficiencies.

Forages and silages: The percentage of farms using silage as a source of forage was only 26% (Table 6). These farms use one or more of silage compounds such as salt, molasses, cereals and some others to obtain a better quality of silage whereas they do not know about the availability of silage additives (i.e., organic acids and micro-organisms). There is a variability seen in the fermentation time of silage amongst the farms, the majority of farms (71.5%) did not know how long silage should be fermented for. Only 13% of these farms exactly know how much of silage should be given per dairy cow and 70% with no knowledge at all. The use of Sugar Beet Pulp (SBP) as silage is preferred by only 1.7% of farmers. Mostly SBP is either stored on ground (48%) or in a confined store (13%) for daily use. Mixing SBP with other

Table 6: The frequencies and classification of the indicators related to feeds and feeding strategies to determine the level of specialist dairy farming in the region of Burdur in Turkey (forages and silage)

Indicators	Multiple-levels	Frequency (%)	Codification*
Production of silage?	Yes	25.6	1
	No	64.5	3
	I do not know	9.9	2
Use of silage additive?	Yes	26.7	1
	No	73.3	3
How long silage left for fermentation?	30 days	1.2	3
	45 days	17.4	2
	60 days	9.3	1
	Variable	0.6	3
	I do not know	71.5	3
Do you measure the quantity of silage per cow per day?	Yes	12.8	1
	No	18.0	2
	I do not know	69.2	3
How you feed animals with Sugar Beet Pulp (SBP)?	As silage	1.7	1
	Stored on ground and directly fed to animals	48.3	2
	Stored on closed place	13.4	1
	I don not know	36.6	3
Digestive problems with SBP?	Yes	8.1	3
	No	41.9	1
	I do not know	50.0	2
Mixing SBP with other feed materials?	Yes	32.6	1
	No	14.5	3
	I do not know.	52.9	2
Mixing feed with molasses?	Yes	14.0	1
	No	73.3	3
	I do not know.	12.8	2
Sources of forages?	Alfalfa	23.4	1
	Silage	9.6	1
	Hay	26.3	3
	Dried oats plants	23.2	2
	Other forages	17.5	2

*Within each of the multiple-levels every farm (total 172) was codified as 1, 2 and 3 to define the algorithmic rules: qualified farmers indicated by 1; averaged farmers by 2 and unqualified farmers by 3, respectively

feeding materials is preferred by 33% of farmers and 8% had noticed some digestive problems in dairy cows. The farmers mixing feedingstuffs with molasses were only 14%. The percentage of farmers using alfalfa as a source of good quality forage was 23%, whereas 49.5% of farmers preferred to use hay or dried oats plants as a source of bad quality forage.

Concentrate feed: About 57% of farmers did not know any information over the composition of feed ingredients used in concentrated feeds used in their farms (Table 7). Majority of farmers (70%) fed their dairy cows according to measured milk yield. About 52% of farmers believe that a chemical analysis of feed would tell a better idea about quality of concentrate feed used. About 75% of farmers did not use additional supplements or premixtures to be added to concentrated feed for a better nutritional performance at a least-cost level and 70% of farmers preferred to using a coarse ground concentrate feed for dairy cows. The measures used to evaluate the quality of

Table 7: The frequencies and classification of the indicators related to feeds and feeding strategies to determine the level of specialist dairy farming in the region of Burdur in Turkey (Concentrated feed)

Indicators	Multiple-levels	Frequency (%)	Codification*
Having knowledge over	Yes	38.0	1
ingredient composition	No	57.0	3
in concentrate feed?	I do not know	5.0	2
Feeding animals according	Yes	69.0	1
to milk yield?	No	29.0	3
	I do not know	2.0	2
Do you believe a chemical	Yes	52.0	1
analysis of feed important?	No	47.0	3
	I do not know	1.0	2
Use of feed supplements	Yes	24.0	1
/premixture in addition	No	75.0	3
to concentrate feed?	I do not know	1.0	2
Texture of feed you	Fine	20.0	2
prefer?	Coarse	70.0	1
	I do not know	10.0	3
Calculate daily concentrate	Yes	74.0	1
feed per dairy cows/	No	24.0	3
	I do not know	2.0	2
Important criteria	Physical examination	6.6	3
quality of concentrate feed	Chemical analysis	2.3	2
	Observing increase in milk yield	85.5	1
	I do not know	5.6	3

*Within each of the multiple-levels every farm (total 172) was codified as 1, 2 and 3 to define the algorithmic rules: qualified farmers indicated by 1; averaged farmers by 2 and unqualified farmers by 3, respectively

daily used concentrate milk were physical examination of feed by the farmer (6.6%), chemical analysis (2.3%) or measured milk yield (85.5%).

Determination of specialist dairy farming from the indicators of feed and feeding strategies: Table 5 showed the results of specialist dairy farming estimated according to the indicators relating to feeds and feeding. Important results were obtained: 45% of farmers were unqualified in the use of forages to dairy cows. For the concentrate feed and feedings, nearly 60% of farmers were evaluated to be qualified farmers. As overall the farmers were defined as 42 unqualified, 38 qualified and 20% averaged.

Farm statues in reproduction and breeding: Oestrous cycle occurs repeatedly at every 21 day at normal conditions. It lasts about 12-18 h. This frequency can be depended upon several factors: husbandry, nutrition, breed, climate and the presence of male at the barn. For instance, at extremely hot or cold season the cycle can be extended to 2 days.

Majority of farmers (92%) reported a normal oestrous cycle of 21 days (Table 8). Frequency of aborted fetus during the pregnancy was seen to be 32%. The percentage of farms reported normal birth to a calf is about 50% and those reported difficult births were nearly 50% as well.

Table 8: The frequencies and classification of the indicators related to husbandry and breeding practises to determine the level of specialist dairy farming in the region of Burdur in Turkey

Indicators	Multiple-levels	Frequency (%)	Codification*
Oestrous cyle	21 day	92.0	1
	30 day	5.0	3
	I do not know	3.0	2
Labour (Birth)?	Normal	49.0	1
	Difficult	49.0	3
	Caesarean	0.5	2
	I do not know	1.5	2
Human intervention	Yes	45.0	1
during labour?	No	53.0	3
	I do not know	2.0	2
Aborted fetus?	Yes	32.0	3
	No	66.0	1
	I do not know	2.0	2
Period of having	1 year	61.0	1
a healthy calf.	1.5 year	33.0	2
	2 year	4.0	3
	I do not know	2.0	3
First oestrous	45 day	12.0	1
after birth	60 day	36.0	2
	80 day	43.0	2
	5 months	6.0	3
	I do not know	3.0	3
Reproductive	No oestrous	11.0	2
problems?	Infertility	22.0	2
	No Oestrous and infertility	31.0	3
	No problem	35.0	1
	I do not know	1.0	1

*Within each of the multiple-levels every farm (total 172) was codified as 1, 2 and 3 to define the algorithmic rules: qualified farmers indicated by 1; averaged farmers by 2 and unqualified farmers by 3, respectively

Human intervention during the labour (birth) is reported to be practised by 45% of farmers. About 61% of farmers have reported to have one calf per year, 33% reported to have a calf every 1.5 year and 4% reported to have 2 or more year. After the birth, the first oestrous cycle observed in the dairy cows is reported to be at 80 days by 43% of farmers, whereas 36% reported after 60 days and 12% after 45 days. The percentage of farms reported reproductive problems of having no oestrous at all is about 11% having no successful fertilisation is about 22% and having no oestrous and no fertilisation is about 31%.

Awareness in animal health and product safety and quality: The success of dairy industry has been built on the consumers' confidence in the quality of dairy products. Dairy operations must be able to meet the task every day of producing a high quality product. Production of high quality milk is dependent upon maintaining excellent hygienic standards. Emphasis on monitoring animal and facility hygiene can help ensure that the milk produced continues to meet consumer demands.

It asked the farmers some basic questions over health and food safety aspects (Table 9). For instance,

Table 9: The frequencies and classification of the indicators related health and product safety to determine the level of specialist dairy farming in the region of Burdur in Turkey

Indicators	Multiple-levels	Frequency (%)	Codification*
How you clean up	Medicinal antiseptic	29.0	1
the navel cord?	Non-medic antiseptic	49.0	2
	Both	8.7	1
	None	5.8	3
	No answer	7.6	2
What happened to	Waste bin	26.0	3
aborted fetus?	Sent to laboratory	3.0	1
	Disposed	28.0	2
	No answer	43.0	3
Calves are vaccinated?	Yes	65.0	1
	No	34.0	3
	No answer	1.0	2
Milking bucket	Plastic	10.0	3
	Stainless steel	28.0	2
	Aluminium	60.0	1
	Other	2.0	3
How milk is treated	Raw milk	22.0	3
for the production of	Heated milk	64.0	1
cheese?	No answer	14.0	2
Do you know the	Yes	24.0	1
source of Anthrax?	No	40.0	3
	No answer	36.0	2
What is it used to	Yeast	59.0	1
produce cheese?	Calcium chloride	39.0	3
	No answer	2.0	2
Brucellosis is a	Yes	64.0	1
transmissible disease?	No	13.0	3
	No answer	23.0	2
Use of antibiotics for	Yes	78.0	1
treatment may cause	No	5.0	3
reduced milk quality/	No answer	17.0	2
health related problem?			
The presence of micro-	Yes	51.0	1
organisms in milk may	No	46.0	3
exert health/product	No answer	7.0	2
quality related problem?			
Do you know source of	Yes	60.0	1
micro-organism coming	No	36.0	3
to milk?	No answer	4.0	2
Can cooling milk is	Yes	51.0	1
beneficial for a better	No	46.0	3
milk quality?	No answer	2.0	2
Do you know the	Yes	16.0	1
total bacteria count	No	80.0	3
in milk?	No answer	4.0	2

*Within each of the multiple-levels every farm (total 172) was codified as 1, 2 and 3 to define the algorithmic rules: qualified farmers indicated by 1; averaged farmers by 2 and unqualified farmers by 3, respectively

when we asked how you clean up the navel cord: 29% used a medicinal antiseptic while 49% used non-medical antiseptic (cologne). The results regarding to what happens to any aborted fetus were: 26% of farmers placed to waste bin, 3% sent it a laboratory for investigation and 28% properly disposed it into the ground. About 65% of farms vaccinated the calves. About 60% of farmers collect the milk into an aluminium barrel, 28% to a stainless steel barrels and 10% to a plastic barrel. The production of cheese was made of raw milk (22%) or heated milk (64%). The use of yeast in cheese production is about 84% and the use of calcium chloride is about 39%. About 40% of farmers did know well what the source of anthrax is at a dairy farm and only 64% of farmers did know that brucellosis is all about. About 78% of farmers knew well that during the antibiotic treatment, the residues of antibiotics in milk may have any potential effects on human health. About 51% of farmers did know that the presence of micro-organisms in milk above threshold may exert deleterious effect on human health and quality of product badly affected and 60% did know the source of micro-organisms transmitted to the milk. About 81% of farmers believed that total bacteria count in the collected milk is an important indicator and establishment of cooling systems at milk collection centres are useful to keep the quality of fresh milk at a desired level.

Determination of specialist dairy farming from the indicators of reproduction-breeding and health-product safety: As overall the studied indicators showed that the dairy farmers were classified as 51% qualified farmers for the on-going farm activities relating to reproduction, breeding and health and product safety in dairy farming (Table 5).

Pooled results on the level of speciality of dairy farming in Burdur: The results regarding the level of specialist dairy farming under each of the sections were pooled and analysed and the results were shown at the end of Table 5. As overall, 47% of dairy farmers were qualified, 20% averaged and 33% unqualified for the studied indicators. As formerly some of other zootechnical characteristics studied (Orhan and Yasar, 2010) the entire statues of region was also shown on the Table 5, where it can be concluded that 41% of farmers were qualified farmers, whereas 33% were unqualified and 26% averaged farmers, estimated by the studied scientific and technical indicatosrs such as zootechnical, nutritional, husbandry, reproduction, health and product safety and quality.

Impact of European Union's Common Agricultural Policy (CAP) during the enlargement process of Turkey has been extensively studied in the light of econometric aspects by Koc *et al*. (2001) and recently summarised by Bayaner (2007). These results indicated that implementation of such policy would have a different impact on crop and livestock sectors; crop production is expected to be competitive while livestock production is not. This was strongly supported by our findings related to the statue of dairy farming in Burdur Region: the rate of acceptable competitive dairy farmers was not over 50% of the entire farmer population (Table 5).

Only large scaled enterprises with high profitability rate in dairy business have been shown to be remained as competitive as possible after Turkey's unification with Europe (Cicek *et al*., 2009). Orhan and Yasar (2010) that the percentage of these farmers was not at reasonable levels in the region and all over the country. Both Bayaner

(2007), Orhan and Yasar (2010) mentioned about a reformist programme in order to change current unsustainable agricultural policies. Bayaner (2007) declared that such a reformist policy was put into action. However, the results of such programme has not yet been realised or revealed although it is expected not to be promising.

Several studies for dairy farming were undertaken; the majority have dealt with factors affecting productivity and profitability of dairy farming. Cicek *et al.* (2008) found that the profitability in dairy farming in the province of Afyon (nearby Burdur) is worse affected by the lack of having farmer's own initiative on the determination of feed and milk prices. Moreover one unit increase in the cost of feed and management inputs had negative impact on profitability. This issue was well outlined by Orhan and Yasar (2010): although the majority of dairy farmers were the member of one of the regional co-operatives and/or associations they were observed to be ineffective in the decision making process. Therefore, the price of milk is tended to remain relatively unchanged for many decades compared to the high feed cost.

Amongst several factors the amount of concentrate feed in dairy cattle farms has significant impact on the success of dairy business (Kulekci and Adem, 2008; Aksoy *et al*., 2009). According to Fuller *et al*. (1999) dairy producers must consider good quality concentrated feeds to be an integral part of their feeding regime, whereas concentrate feed is being replaced with grains, oilseed meals or by-products when the price of concentrate increases. Therefore, the demand for lower quality feeds tends to be more elastic than for concentrate feed. Economical parameters indicated that increasing quality of feed ingredients significantly improves feed efficiency and productivity. The finding revealed that the dairy farmers did not follow a proper feeding strategy, where the qualitative and quantitative aspects of feeding dairy cows were respected.

Azabagaoglu (2004) found that the average fodder consumption per dairy cow is 14.6 tons year^{-1}, silage consumption to be 47.1 tons year^{-1} and compound mixed feed 8.18 tons year^{-1}. The dairy farmers' response indicates that low price of milk and fluctuations in market and higher feed prices are the major problem in Turkey. This was the reason why the daily consumptions levels of feeds per dairy cows were too low in the present case (Table 3) and that the farmers tended to use low quality of forages (3% silage versus 60% hay) and nearly 60% farms used improper amount of concentrate feed per dairy farm. One of the other important factors is that Burdur Region has comparatively low grazing area. Moreover no farmers stated that they kept grazing dairy cows on the pasture and grassland in the present study. The forages and roughages were preserved for indoor feeding, where the usage of these feed materials as silage was not >26% of the total (Table 6). Yalcin *et al*. (2008) conducted a prospective longitudinal observation study, where dairy farms at various locations including Burdur were visited to determine incidence rates of several diseases. Fertility disorders (30.2%) and udder diseases (28.3%) were most commonly seen and this is followed by puerperal disorders (18.3%) and locomotor system disorders (10.0%). Exactly same percentage of fertility disorders (31%) was observed at Burdur's dairy farms. Good reproductive practices in dairy cows were important for having healthy and productive animals at next generations. However, these aspects were seen to be not adequately handled.

Nutrient management studies are of significant importance for sustainable dairy farming. No studies have been undertaken for Turkish dairy farming to reveal the status. For instance, ration balancing for dairy farms was shown to be realised by the services of feed and mineral sale representatives (85% of farms) and manure management by fertiliser dealers (40%), as stated by Dou *et al*. (2001). None of these extension activities were observed to be carried out at Burdur Region. The intervention studies (unpublished results) indicated that balancing daily rations of a few local farmers had resulted in great improvements of production and profitability. In addition, the willingness to receive such management services by technical and scientific expert by the farmers was too low due to their cost effects (too expensive to buy). Therefore, the introduction of such management services at low prices or free of charge could be an alternative solution provided by the state or local authorities.

Awareness for a better quality of milk is a key factor in the light of consumer health and economy. However, safety and quality of fresh milk before and during collection at the regional collection centres were not fully respected. Quality control analysis of raw milk at the milk collection centres were not carried out in the region of Izmir due to the lack of qualified expert and inadequate equipment (Demirbas *et al*., 2008).

This is also valid for the region of Burdur. Some sensory properties of raw milk were generally analysed at these collection centres. The quality of raw milk (i.e., fat content, bacteria count) appeared to affect the price paid for the collected milk at these centres and the proportional high number of small sized dairy farms which account over 50% in total directly has 50.3% determination coefficient on the farm gate milk prices (Uzmay, 2009). The safety and quality of milk begins during milking and ends up with bottling or packaging. Therefore, awareness in the product safety and quality is important and must be investigated amongst these farmers to reveal the present statue and thereby recommend useful preventive and corrective actions to be taken by the local authorities.

CONCLUSION AND RECOMMENDATIONS

The following conclusion and recommendations can be drawn from the present results:

- The studied farms were mostly small and medium sized farms in terms of cultivated land and number of lactating animals and therefore they were not profitable and sustainable. It is suggested that these types of farms must be directed to other branches of agriculture
- Housing structure and management of indoor animal housing were too conventional and primitive. Therefore, an open-barn housing design is suitable for the region and must be promoted for those intending to build new animal barns. Information on technical aspects of indoor animal housing along side the variable nutritional regimes according to the changed climate conditions must be inseminated by the regional service providers
- The studied farms demonstrated an average degree of skilled milking techniques and animal health and product safety aspects before, after and during milking while these aspects were not complaint with the product safety and quality parameters in consumer perfective. Awareness amongst farmers must be increased
- Nutritional managements and feeding strategies were not least-cost effective. The lack of availability of good quality of forages is the most determining factor. The significantly low milk yield was due to underfeeding dairy cows. Therefore, a ration balancing for lactating cows at different stages of lactation period can be inseminated with the helps of local feed manufacturers. The use of industrial by-products as animal feeds are alternative feed sources in the region and must be promoted. The state subsidy for the amount of milk produced per farm must be increased and replaced with a subsidy for the production of silage and good quality forages (i.e., alfalfa)
- Veterinarian services are lacking in the region. This was not deeply studied. However, one of the reasons is that these services were too expensive to buy. The region still suffered from the reproductive problems. Average period of obtaining a dairy calf can sometimes extend over 2 years. Unproductive and underproductive (those having late oestrus and fertilised late) animals are too costly for the farmers to feed them. The reason of reproductive problems appeared to be related to mostly nutritional impairments. Therefore, the nutrition of dairy cows is very important aspect and must be tacked with local seminars and technical meetings, giving an emphasis on the important roles of mineral and vitamin nutrition in reproduction and fertility and the need of such supplemental additional feeding of dairy cows with commercially well proved additives and premixtures
- The number of intervention studies by the service providers was rare in the region. The costumers' targeted interventions by the service providers must be promoted and the cost of these activities must be exempted from a state tax
- The network teams consisting of scientific and technical consultants from private and public sectors must be encouraged to act in the region and received a financial support from the state. This type of animal extension activities must be exempted from a state tax and must be subsided where it is necessary

In short, the specialist dairy farming system in Burdur accounts only 41% of total. This figure is too low as compared to the overall European figure of 83%, reported by Van Arendonk and Liinamo (2003). This clearly indicated that Turkish dairy farming is not convincing. Therefore, an immediate action from the side of policy-maker is needed.

ACKNOWLEDGEMENTS

The researchers thanks to Mr. Kamil Ekinci from EKINCILER Yem Fabrikasi (feed manufacturer) for the conduction of preliminary intervention studies for balancing dairy rations and to Dr. Ibrahim Onaran of Suleyman Demirel University, School of Medicine for helping to organize the sections of survey related to the animal health.

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