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Research Article

CATTLE AND CALF RAISING PRACTICES IN THE EASTERN ANATOLIA REGION: AN EXAMPLE OF CENTRAL COUNTY OF AĞRI PROVINCE

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ABSTRACT. This study was conducted to determine the farm management, dairy cattle, and calf raising practices of dairy cattle enterprises in the central county of Ağrı province. For this purpose, data were obtained by conducting a face-to-face survey with 400 owners of the enterprises. It was determined that 74.8% of the farmers who participated in the survey kept individual records and 90.0% of the enterprises specifically kept records of artificial insemination and breeding. It was also found out that 93.2% of the farms had their cows artificially inseminated, the insemination was generally performed at the first heat after birth (92.8%), and the majority of the cattle breeders (69.7%) stated that they were pleased from the artificial insemination service. Furthermore, 51.7% of the breeders stated that the cows were dried off spontaneously in their farms. Foot and hoof diseases were determined to be the most common disease (58.4%) in dairy cattle farms. The calves were vaccinated against septicemia (86.0%) and umbilical cord care was applied to calves in the majority of the farms (76.3%). Colostrum feeding lasted for three days in 85.2% of the farms, and the colostrum was fed to calves by suckling their dams (81.7%) or with a bottle (16.5%). As a result of the study, some improper practices were determined in terms of farm management, dairy cattle, and calf raising in the cattle enterprises of the central county of Ağrı province. It was concluded that farmer training activities should be carried out in cooperation with relevant institutions and organizations in order to improve cattle breeding practices in the central county and to carry out more profitable animal husbandry.

Keywords: *Eastern Anatolia, Cattle, Calf, Artificial Insemination, Keeping Record*

INTRODUCTION

The agricultural sector is one of the important fields of economic activity with plant and animal production. This sector maintains its importance due to its functions such as producing basic foodstuffs, providing raw materials to different industries and creating employment. Since the industrial development of the Eastern Anatolia Region is low and the geographical structure is mostly mountainous, the agricultural sector has been the most important source of income for regions people for many years. Besides occupying a prominent place in the agricultural sector, animal husbandry is also highly important for human nutrition because it produces the source of essential nutrients and contributes to an adequate and balanced diet.

Due to the rapid population growth, the concern about meeting the sufficient animal-derived foodstuff needs of the world population has increased. For this reason, to meet the needs of the increasing population, it is necessary to obtain the highest possible yield sustainably from the existing animals. To increase productivity and to make profitable husbandry, proper farm management and cattle breeding practices are required in dairy cattle enterprises.

One of the main targets of the dairy cattle enterprises to ensure profitability and sustainability is to produce one calf from each cow every year. The initiation of lactation and the future of the herd depend on calving. For this reason, it is highly required to achieve the optimum fertility level in dairy cattle enterprises. Ensuring the continuing profitability in the enterprises is possible with the selection of suitable cattle for breeding and well-managed interbreeding programs [1]. The continuity of the herd can be achieved with the healthy heifers that will be obtained as a result of an appropriate raising program to be applied on the quality calves. In order to attain this goal, it is necessary to determine accurately the cows or heifers in estrous and inseminate them at the appropriate time. Achieving optimum fertility is possible only if the breeding records of the heat period of the cows, the number of inseminations for pregnancy, and the voluntary waiting period are kept regularly. These records could be updated in line with observation, experience, follow-up, and determined targets. In addition to these records, keeping other records (milk yield, health records, etc.) of the animals in the enterprise is extremely important for the future of the enterprise. The future success of the enterprises depends on these properly kept records.

According to the 2019 data of the Turkish Statistical Institute, the number of cattle in Ağrı Province is 399 838 heads in total, which constitutes approximately 2.2% of Turkey's cattle presence, and the number of dairy cows is 138 924, which constitutes 2.1% of Turkey's total dairy cow population [2]. Although the number of cattle in Ağrı Province is considerably high, milk production per cow is quite low. One of the main reasons for this is the lack of knowledge and skills of cattle enterprise owners about farm management and organization. Achieving the desired production is only possible by managing and utilizing the enterprises' resources at the maximum level in line with the modern cattle breeding requirements and practices.

The study was conducted to find out existing problems related to farm management, cattle, and calf raising practices and to propose solutions for the application of a sustainable production model.

MATERIAL AND METHOD

The material of the study consisted of face-to-face surveys with 400 out of 5852 randomly selected cattle farm owners in the central county of Ağrı Province. Surveys were prepared to reveal the cattle breeding practices applied in the enterprises. Besides survey questions, cattle farms were visited, observations and examinations were made to reveal the current situation.

In the determination of the random sample size (number of enterprises) in this research, a method whose formula is given below, was used. This formula is for cases where the variance is unknown, the population is limited and there are qualitative variables dependent on probability [3].

$$n = \frac{N.t^2.p.q}{(N-1).D^2 + t^2.p.q}$$

n=Number of samples,
N=Population size,
D=Acceptable or desired sampling error (5%),
t= Table value (t=1.96 for α= 0.05),
p=The rate to be calculated (0.5),
q=1-p.

$$n = \frac{5852.(1.96)^2.0.5.(1-0.5)}{(5852-1).(0.05)^2+(1.965)^2.0.5.(1-0.5)} = 360.55$$

With the formula given above, the estimated sample size was calculated to be approximately 361. According to this result, the number of surveys was increased by 10.8% (39 pieces) and the number of surveys to be conducted in the villages of the central county of Ağrı Province was determined as 400. Since some of the questions in the survey required more than one answer, there was a change in the quantity of the "n" number.

The obtained data were analyzed by frequency analysis in SPSS 20.0 statistical program, and numerical and proportional values were obtained. The results were interpreted using both proportional values and graphics [4].

RESULTS

Results concerning record keeping and receiving information support of the cattle breeders in the central county of Ağrı province are presented in Table 1. It was determined that 74.8% of the breeders kept individual records while 90.0% of the enterprises kept insemination records. It was also revealed that only 3.5% of the respondents had their cattle insured. Almost all of the enterprises received information support concerning cattle husbandry (98.0%) and this support was mostly received from Provincial or Counties' Directorates of Agriculture and Forestry (42.4%), self-employed veterinarians (30.1%), and associations (25.4%) of which they were members.

Table 1. *Results Concerning Record Keeping and Receiving Information Support*

	Number of Enterprises (n)	**Percentage (%)**
Do you keep individual records of your cattle?		
Yes	299	74.8
No	101	25.2
Total	**400**	**100**
If yes, which records do you keep?		
Artificial Insemination and Natural Breeding Records	297	90.0
Pregnancy and Birth Records	22	6.7
Milk Production Records	11	3.3
Total	**330**	**100**
Do you make insurance for your cattle?		
Yes	14	3.5
No	386	96.5
Total	**400**	**100**
Do you receive information support concerning animal husbandry?		
Yes	392	98.0
No	2	2.0
Total	**400**	**100**
If yes, what is your information source?		
Associations	190	25.4
Veterinary Faculty	8	1.1
Directorates of Agriculture and Forestry	317	42.4
Private Veterinarian	225	30.1
Other Family Members	7	0.9
Total	**747**	**100**

Findings about the status of cattle breeding practices and animal health of the enterprises are presented in Table 2 and Table 3. It was determined that artificial insemination was applied at a high rate (93.2%) in the enterprises and the majority of the respondents were satisfied with this application (69.7%). The farm owners stated that they identify the animals in heat when they see mounting behavior (48.2%) and hear bellowing sounds (34.0%). In the majority of the enterprises, cows were inseminated at the first estrous after birth (92.8%), and the heifers were inseminated for the first time when they were 2 years old (78.5%) (Table 2).

Table 2. *Data concerning cattle breeding practices*

	Number of Enterprises (n)	**Percentage (%)**
Is artificial insemination applied in your farm?		
Yes	373	93.2
No	27	6.8
Total	**400**	**100**
Are you satisfied with artificial insemination?		
Yes	260	69.7
No	113	30.3
Total	**373**	**100**
How do you determine the cows or heifers in heat?		
Bellowing	136	34.0
Mounting Behavior	193	48.2
Mucus Discharge from the vulva	71	17.8
Total	**400**	**100**
When do you inseminate your cows after birth?		
In the First Estrous	371	92.8
In the Second Estrous	29	7.2
Total	**400**	**100**
What is the age of the first insemination of heifers?		
1 Year of Age	10	2.5
2 Years of Age	315	78.5
3 Years of Age	75	18.8
Total	**400**	**100**

It was found out that the surplus young cattle were generally sold when they were one (27%) or two (65.2%) years old. More than half of the farm owners (51.7%) stated that the animals were dried off spontaneously. The percentage of the farm owners who claimed that they vaccinated their pregnant cows against septicemia during the dry period was 72.7% (Table 3). Foot and hoof diseases were determined to be the most common diseases (58.4%), followed by abortion (14.6%) and mastitis (13.6%) in dairy cattle enterprises of the county.

Table 3. *Findings concerning cattle breeding practices and animal health*

	Number of Enterprises (n)	Percentage (%)
When do you sell the surplus animal?		
1 Year of Age	108	27.0
2 Years of Age	261	65.2
3 Years of Age	31	7.8
Total	**400**	**100**
When do you dry your cow off?		
One Month Before Birth	16	4.0
Two Months Before Birth	120	30.0
Three Months Before Birth	57	14.3
Whenever Milk Production Stops (Spontaneously)	207	51.7
Total	**400**	**100**
Do you vaccinate pregnant cows against septicemia during dry period?		
Yes	291	72.7
No	109	27.3
Total	**400**	**100**
Which diseases are the most common in your enterprise?		
Dystocia	62	11.4
Foot And Hoof Diseases	318	58.4
Abortion	79	14.6
Mastitis	74	13.6
Other	11	2.0
Total	**544**	**100**

Septicemia vaccine and umbilical cord care application to calves after birth is important in terms of strengthening immunity and preventing the entry of pathogenic microorganisms into their body. In the present study, it was determined that the majority of the farm owners vaccinated their calves against septicemia (86.0%) and umbilical care was performed in most of the enterprises (76.3%) for calves (Figure 1).

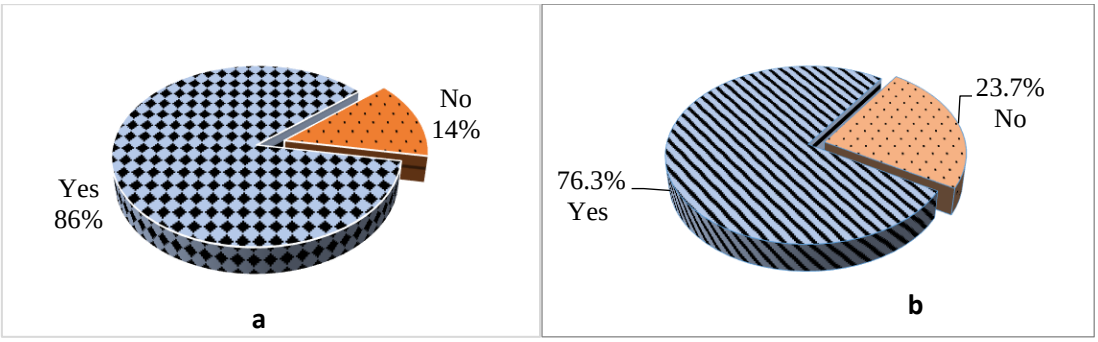

Fig. 1. *Septicemia vaccine administration (a) and umbilical cord care (b) status.*

Calves must receive colostrum for at least three days since it has a significant effect on their health and viability. It was revealed that colostrum was offered to calves in almost all of the farms (99.8%) and the percentage of the respondents who indicated that they fed their calves by colostrum for three days was 85.2% (Figure 2).

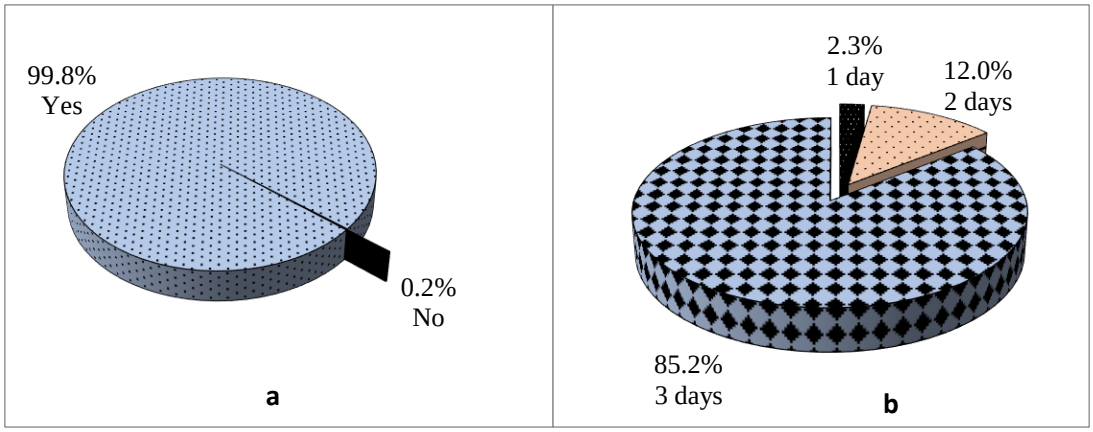

Fig. 2. *Colostrum feeding status (a) and the length of colostrum feeding period (b)*

Newborn calves must consume a sufficient amount of colostrum. It was determined that in surveyed enterprises this practice was mostly done by suckling their mother (81.7%) or by feeding with a bottle (16.5%) (Figure 3).

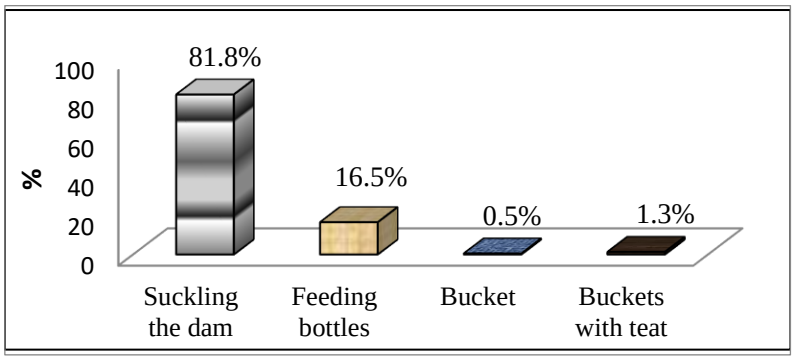

Fig. 3. *Colostrum feeding types (%)*

Breeders stated that they didn't have any criteria for determining the average daily amount of milk to be given to calves, determination of the milk amount was mostly made by rough estimate (86.8%). The amount of average daily milk fed to calves was determined to be approximately 4-5 liters (78.2%) in the county (Figure 4).

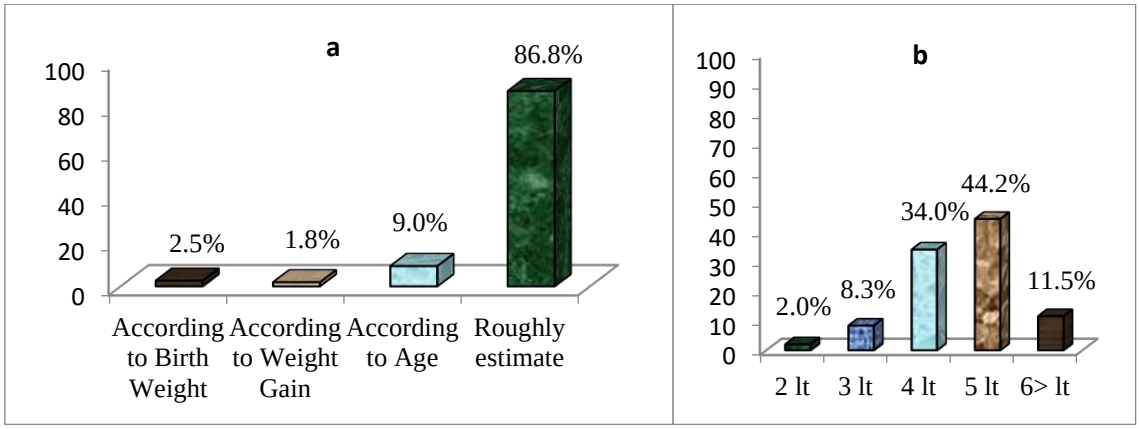

Fig. 4. *The method to determine the amount of milk to feed the calves (a) and the amount of milk (b)*

Weaning time is highly important for profitability in dairy cattle enterprises. Overfeeding the calves with milk could result in economic losses, so the calves should be weaned when the calf is in good condition. Applications related to the weaning times of calves in enterprises are given in Figure 5. The most preferred weaning time for calves was determined to be 6 months of age (58%) in the county.

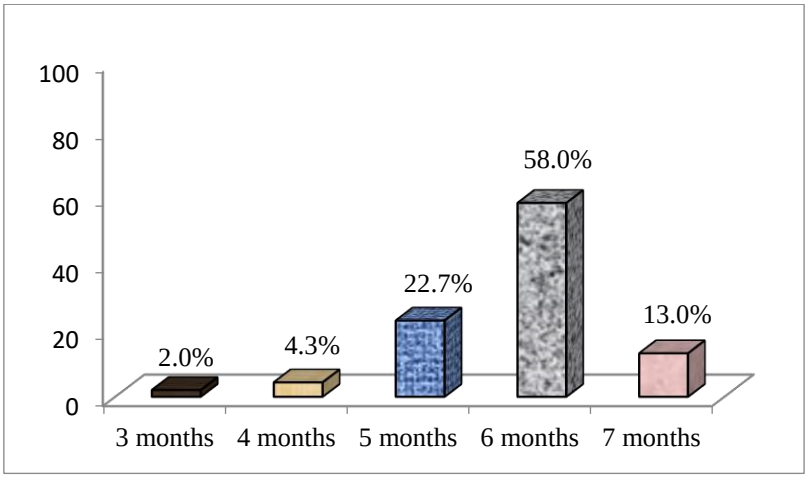

Fig. 5. *Weaning ages of calves (month) (%)*

DISCUSSION

In dairy cattle enterprises keeping the records of cattle and the farm is highly important in the technical and economic aspects. Determining the current situation, getting information, and planning the future of the enterprise depends largely on these records [5].

In the present study, percentages of the enterprise owners who keep records in the central county of Ağrı were found to be similar to those reported for Iğdır (74.1%) and Ağrı Provinces (81.1%) by Eryılmaz et al. [5] and Bakan and Aydın [6], respectively. However, the findings were higher than the reports of Özyürek et al. [7] and Koçyiğit et al. [8] who surveyed the dairy cattle enterprises in Çayırlı county (47.3%) and Hınıs county (26%).

It was determined that the rate of the cattle breeders who receive technical information support was quite high in the central county and the source of information was mostly public institutions (Table 1). The percentages of the enterprises that receive information support were reported as 59.0% and 66.0% in Narman County of Erzurum Province [9], and Niğde Province [10], respectively. On the other hand, it was reported that 84.0% and 83.0% of the enterprises in Uşak Province [11] and Hınıs county of Erzurum Province [8] did not prefer to receive information support. The sources of information were reported as family members (72.9%) and neighboring farms' owners (67.1%) in Samsun Province by Eryılmaz et al. [5]. Demirhan and Yenilmez [11] reported that technical information was received mostly from the Directorates of Agriculture and Forestry (24%), while Koçyiğit et al. [8] stated that associations were the primary information sources of the cattle breeders (58.0%).

The percentage of the enterprises that preferred to make insurance for their cattle was determined as 3.5% in the present study. The share of enterprises that insure their cattle were reported as 19.5% in Malatya Province [12] and 19.5% in Sivas Province [13]. High

insurance costs, conditions that the farm owners cannot fulfill, and lack of information among breeders for livestock insurance could be considered as the main reasons for the low insurance rate in the central county of Ağrı province.

As could be seen in Table 2, the proportion of the respondents who prefer artificial insemination and the rate of those who are happy with this application were quite high in the county. While the percentages of enterprises that practice artificial insemination in the central county of Ağrı is higher than different regions of Turkey [9,14,15,16,17], Baykalır et al. [18] reported similar findings.

The majority of the respondents stated that they identify the heat cows or heifers when they see mounting behavior or hear bellowing sounds (Table 2). Similarly, mounting (29%) and bellowing (14%) in Narman county, mounting (33%) and bellowing (33%) in Kahramanmaraş and mounting (45.7%) were reported to be the primary signs of estrous by Diler et al. [9], Kaygısız et al. [16] and Tugay and Bakır [19] respectively.

In order to get maximum milk yield from dairy cows, increase the success of insemination and likelihood of successful insemination, cows that come into heat in the first month after delivery should not be inseminated, it is suggested to wait for at least 45-60 days, this period is called the voluntary waiting period. However, it was determined that the percentage of the farm owners who chose to inseminate their cows right after the delivery was quite high (92.8%) in the central county of Ağrı province (Table 2). It is highly required to increase the level of awareness among farmers for the voluntary waiting period. In similar studies, Bakır and Kibar [20] determined that the first postpartum insemination was made at first estrous in 33.8% of the enterprises, 45 days after birth in 35.3% of them and two months after delivery in 30.9% of them. Kaylan et al. [14] reported that the most preferred first postpartum insemination time was 60-90 days after birth (91.0%), while 90 days was reported to be preferred in 48% of the enterprises by Koçyiğit et al. [8]. Moreover, Kaygısız et al. [16] reported that in 31% of the surveyed enterprises cows were inseminated in the first estrous, in 23% at the second estrous and in 46% two months after birth.

It was found out that heifers were inseminated when they are two years old in most of the enterprises (Table 2). It is desirable for heifers to become reproductive as early as possible in dairy cattle farms. However, sufficient body development of heifers must be completed. First insemination ages of heifers in dairy cattle enterprises were reported as 15-16 months in Edirne Province (61.4%) and Serbia, 18 months (33.9%) in Muş Province, and two years in Hınıs county of Erzurum (75%) by Önal and Özder [21], Bogdanovic et al. [22], Şeker et al. [23] and Koçyiğit et al. [8] respectively.

Surplus young cattle are sold at the age of two (65.2%) in the majority of enterprises in the county (Table 3). In other studies, it was reported that this practice was mostly done when animals were older than 13 months of age [16,19,23].

It is highly important to dry dairy cattle off at least two months prior to delivery as suggested by Savaş and Yenice [24] and Özhan et al. [25]. It was determined that this criterion was not complied in the surveyed enterprises of the county, more than half of the respondents (51.7%) stated that they dried the cows off spontaneously (Table 3). However, milking the cows until birth could result in the production of weak calves with low viability and a decrease in the next lactation milk yield. In similar studies, percentages of the enterprises that dry their cows off two months before the delivery were reported as 82.8, 38.7, and 91.3 percent by Tugay and Bakır [19], Şeker et al. [23], and Savaş and Yenice [24] respectively.

Most of the breeders (72.7%) in the county vaccinated pregnant cows for septicemia in the dry period (Table 3). In similar studies, vaccination percentages in dairy cattle enterprises against septicemia were reported between 10-60% [10,11,24,26]. This result shows that the awareness level of the farm owners against septicemia is considerably high in the county.

Foot and hoof diseases have a negative impact on the economy of enterprise since they cause problems such as loss of body weight, shortening of the lactation period, decrease in milk yield, increase in treatment costs, and infertility in cattle. It was determined that foot and hoof diseases were quite common (58.4%) in the county (Table 3). Similarly, in other studies, the percentages of the enterprises that foot and hoof diseases were seen were reported as 50.7%, 9.3%, 36.4%, and 55.2% by Şeker et al. (2012), Yaylak et al. [27], Koçyiğit et al. [26] and Kibar and Bakır [28], respectively.

It is crucial to apply septicemia vaccine and umbilical cord care to newborn calves in cattle enterprises. In other studies, the percentages of farms that vaccinate their calves for septicemia vary between 32.0% and 64.0% [10,24,26,28]. Findings of the present study were found to be higher than the results of these studies (Figure 1). Awareness of the breeders concerning septicemia vaccination and umbilical cord care in the county is considerably high. Similar findings for umbilical cord care were reported by Özyürek et al. [7] and Ünalan et al. [10].

Of all the respondents, the percentage of those who stated that they feed their newborn calves by colostrum (99.8%) and those who offer colostrum to calves for three days (85.2%) as suggested was significantly higher than similar studies (Figure 2). In the studies conducted in Narman and Hınıs counties of Erzurum province, researchers reported the percentages of enterprises that feed newborn calves with colostrum as 53.0% and 75.0%, respectively, and the percentages of those that offer colostrum to calves for three days were 16.0% and 21.0%, respectively [8,9].

Reports of similar studies show that the percentages of the cattle enterprises that allow the calves to suckle their dams for colostrum feeding is considerably high (57.0%-92.0%) [8,11,24,29]. The findings of the present study were found to be similar to these results. On the other hand, Hannien et al. [30] reported that in 51.3% and 36.5% of the enterprises bottle and buckets were used to offer colostrum to calves, while Vasseur et al. [31] reported that 17.7% and 92.0% of the enterprises feed milk to calves in buckets and in feeding bottles.

The practice of breeders for determining the amount of milk to feed the calves by roughly estimate (86.8%) is wrong in terms of calf health and profitability of the enterprise. The daily amount of milk to be fed to the calves is recommended to be 10% of its body weight and should not exceed 7-8 liters [25]. In the present study, the daily amount of milk (4-5 lt) offered to the calves was found to be in line with this recommendation. Similarly, the daily amount of milk offered to calves in different regions of Turkey were reported as 5 liters and 4-5 liters in 15.9% and in 21.5% of the enterprises by Kurt et al. [29] and Hozman [13] respectively.

Calves are recommended to be weaned when they are healthy and able to consume 500-750 gr concentrate feed in a day [25]. The findings of the present study showed that calves were weaned later than the recommended weaning period (Figure 5). Therefore, the awareness and information levels of the breeders have to be increased concerning optimum weaning time. In contrast to this result, Savaş and Yenice [24], Hozman [13], Tugay and Bakır [19] reported that calves in Rize, Sivas, and Giresun provinces respectively were weaned about at two months old.

CONCLUSION AND SUGGESTIONS

The suggestion for the solutions of problems revealed in this study concerning cow and calf rearing practices in the central county of Ağrı province are as follows.

a. The breeders should be informed and encouraged to make insurance for their cattle and necessary infrastructure should be set up.
b. Cows that show heat in the first month after delivery should not be inseminated, it is recommended to wait for 45-60 days of post-partum. Awareness and information of breeders should be raised in terms of this practice in the county.
c. The cattle breeders in the county have to be informed about the optimum first insemination age of the heifers.
d. For a healthy lactation period and high milk yield, cows should be dried off two months prior to the calving. Additionally, proper care and dry cows diet for the pregnant cows must be provided during this period.
e. Preventive and educational veterinary health services should be provided to the cattle breeders in order to inform and raise awareness as well as to decrease incidences of the diseases.
f. It was also recommended to provide current technical information support to the breeders on the determination of the amount of milk given to the calves and the weaning period.

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