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MONITORING OF REPRODUCTION ACTIVITY ON ALGERIAN DAIRY CATTLE FARMS

Aziza Ferag[1,3], Djalel Eddine Gherissi[1,2], Nadjat Bordja[1], Amel Boughanem[4], Hafida Hadj Moussa[4], Tarek Khenenou[1,3]

[1]Institute of Agriculture and Veterinary Sciences
[2]Laboratory of Animal Production, Biotechnologies, and Health
[3]Laboratory of Sciences and Techniques for Living
University of Souk-Ahras
[4]National Centre for Artificial Insemination and Genetic Improvement (CNIAAG), Birtouta, Algeria

d.gherissi@univ-soukahras.dz

ABSTRACT

This study aimed to evaluate the reproductive monitoring activity in Algerian dairy cattle herds. A participatory survey was conducted with 75 veterinarians and inseminators affiliated with the National Centre for Artificial Insemination and Genetic Improvement (CNIAAG). Reproduction monitoring represents a primary activity for 12 % of the veterinarians. Only 10.8 % of veterinarians earn more than 50 % of the yearly global revenue from reproductive activities. 85.3 % of the veterinarians fix the herd monitoring objectives, 64 % use a paper notebook to manage breeding data, and only 22 % establish a reproduction statute inventory. The most requested information before the visit is the last mating (80 %), oestrus (80 %), and calving (90.7 %) dates. Monthly routine fertility visits were practiced by 32 % of the interviewed veterinarians, and only about half of them (52 %) checked the cows systematically at post-partum. The pregnancy diagnosis is practiced by 72 % of veterinarians at 56.71 ± 22.82 days postpartum and confirmed at 91.85 ± 26.94 days postpartum. Furthermore, 73 % of the respondents systematically examined non-pregnant cows after 3 matings; however, only 48 % simultaneously recorded the cows' body condition score. Regarding postpartum genital pathology control 38.7 %, 22.7 %, and 26.7 % of veterinarians always perform manual transrectal exploration of the genital tract, vaginoscopy, and ultrasonography, respectively. While, 73 % of them examine the cows' cyclicity when evaluating uterine involution. A substantial proportion of veterinarians included monitoring feed, milk quality/mammary disease, and livestock diseases, in their regular visits. The dairy farmers must be advised of the economic benefits of routine fertility monitoring to achieve good herd reproductive traits.

Key words: dairy cattle; fertility; population medicine; reproduction monitoring; veterinary practices

INTRODUCTION

One aspect of the globalization of dairy production and the unrestrained competition between giant dairy producers, and individual producers of "popular milk", is the control of dairy herd reproduction [25]. Technical management issues affect Algerian dairy production, as seen by the low milk output, which falls short of demand,

and the large importation of milk powder, which cost the nation 800 $ million in 2016 [11]. Milk production cannot be optimal without reproducing, due to physiological interactions, between lactation, and reproduction [2]. Performances in reproduction, and productivity, significantly impact dairy farmers' economic success [34]. These tasks require proper management and monitoring [22]. Therefore, population medicine in dairy cattle herds offers valuable tools, to enhance dairy-cow-herd health and reproductive management. Monitoring is a program planned, and coordinated between the breeder, and the veterinarian, to allow intervention at the most appropriate time, while limiting factors that affect health, preventing problems, and improving reproduction [28]. This includes assessing fertility metrics, such as the calving-to-first-service period, a crucial period ideally lasting fewer than 70 days. Monitoring days open, as an extended period negatively impacts calving intervals, and leads to economic losses. The length of the calving interval, a key aspect of reproductive performance, significantly influences livestock production, with an optimal duration targeted at 12 to 13 months. Additionally, monitoring the conception rate, at the first artificial insemination, is crucial for reproductive success [16]. The present study's aim was to carry out a survey, with veterinarians, and cattle inseminators, to investigate current reproduction monitoring organizations, and practices, in dairy cattle herds, and to explore the factors limiting the development of this activity on Algerian cattle farms.

MATERIALS AND METHODS

Study design

The present research was based on a questionnaire containing 32 questions. The survey was first delivered by hand on paper to veterinary practitioners during professional meetings about the Brucellosis Health Statute, at the Institute of Agricultural and Veterinary Sciences of Souk Ahras University, Algeria. From 80 veterinarians who received the survey manuscript during this phase, 32 veterinarians (37.5 %) participated in the survey. For the second time, the survey was distributed on an online platform (Google Forms), during the period between September 2021 and August 2022. Also, veterinarians affiliated with, the National Centre for Artificial Insemination, and Genetic Improvement (CNIAAG) were notified about the survey by e-mail to get more accurate results. Indeed, a total of 75 practicing veterinarians, and cattle inseminators, belonging to twenty-four Algerian departments were effectively involved in this study.

Survey description

These data were collected, after approval was received from competent authorities, using a standardized semi-structured questionnaire by an individual, or focus group participatory surveys with the participants in the six questionnaire sections: veterinary office activity, reproduction monitoring, animal examination, post-partum pathologies, reproduction monitoring organization, and future development of reproduction monitoring in dairy herds.

The first section checklist, contained different questions, including the number of practitioners, and those who just do the reproductive monitoring, Likert-scale questions about the bovine reproductive activity as a percentage, the annual proportion of global income from reproductive activities, and the main activity (milk, feedlot, reproduction, or milk/ reproduction activity).

The second section checklist contained questions about the experience in veterinary practice, the number of farms with regular and occasional interventions, as well as their evolution (increasing, stagnating, and decreasing). Furthermore, Likert-scale questions were asked about time spent on reproduction monitoring, as a percentage of overall time, and income from reproductive activities as a percentage. Multiple-choice questions were used to investigate requested information, before the farm visit, (calving dates, oestrus dates, insemination dates, and individual dairy production) and tools used to perform reproduction data recording, (papers, documents, software, personal tools).

The examination of animals was the subject of the third section. Multiple-choice questions were asked about animal selection (veterinarian, breeder, or both), categories of bovine animals examined, as part of breeding monitoring, pregnancy diagnosis, and confirmation (yes, no, delay), use of ultrasonography (yes, no, costs), examination of non-pregnant cows after three matings, (systematically realized, not realized), and simultaneous scoring of body condition when examining non-pregnant cows, after three matings (always, sometimes, never).

The fourth section asked a multiple-choice question about diagnosis tools, manual genital exploration, vagi-

noscopy, ultrasonography (systematically, sometimes, or never used), or other techniques. This section also included the question about examining cow cyclicity during uterine involution control (Yes, No).

In the fifth section, questions about activity billing, variability of a flat rate, the frequency of the average intervention per farm (monthly, bimonthly), closed questions about the determination of objectives, modalities of monitoring work collaboration, the establishment of reproductive assessment, and integration of feed monitoring, milk quality/mastitis monitoring, and livestock pathologies during routine visits.

The last section contained questions about the evolution of monitored dairy farms during the last five years, veterinary tendencies, prospecting for the development of reproductive monitoring activity (remain in the state, could develop a little or a lot), and finally, Likert scale question about constraints related to reproduction monitoring activity development (1–5).

Statistical analysis

These data were validated, after an initial exclusion of incongruent declarations, before data processing and analysis. Statistical analyses were conducted on collection using SPSS® Statistics 26 (IBM Corp, Armonk, NY). Descriptive statistics, including the average, percentages, and standard deviation, were carried out. The categories defined in each variable are considered to occur in an equitable manner. The asymptotic p-value was calculated using an approximation to the true distribution. We retained this hypothesis at $P > 0.05$ and rejected it at $P < 0.05$.

RESULTS

Veterinary office activities

The results of our study indicate that in Algerian veterinary clinics, a single veterinarian works in 57 % of clinics, and 80 % of these veterinarians perform reproductive activities. Reproduction activity constitutes 40 % of the interventions in 16 % of the veterinary offices. 21.3 % of the participants have an income rate based on reproduction activity greater than 50 %. Additionally, 69.3 % of veterinary clinics perform mixed activities, and only 12 % dominant reproductive activities (Table 1).

Table 1. Characteristics of veterinary offices involved in cattle reproduction activity

Variables	Modalities	Frequency	Percentage	P
Number of practitioners per veterinary office (%)	1	43	57.3	**
	2	25	33.3	
	3	6	8.0	
	4	1	1.3	
Number of practitioners engaged in the reproductive activity (%)	1	60	80	***
	2	15	20	
Income percentage by reproduction activity per year (%)	50%	13	17.3	***
	60%	8	10.7	
	70%	1	1.3	
	80%	4	5.3	
	90%	3	4.0	
Type of bovine activity (%)	Dominant reproduction	9	12.0	**
	Dominant milk activity	10	13.3	
	Dominant meat activity	4	5.3	
	Mixed activity	52	69.3	

Significance: The categories defined in each variable occur in an equitable manner: $P > 0.05$ retains the hypothesis; $P<0.05$ rejects the hypothesis; *P <0.05; **P <0.01; ***P <0.001.

Reproduction monitoring

The average number of cattle farms where the veterinary office carries out breeding monitoring, a regular and occasional activity is 14, 8, and 13, respectively. Inquired veterinarians had a variety of experiences ranging from 1 to 33 years (Table 2). The percentage of activity time occupied by the breeding monitoring is very often limited between 10 and 50 % (93.4 %). The dates of the last mating (80 %), the dates of oestrus (80 %), and the dates of calving (90.7 %)are the pieces of information that veterinarians most frequently inquire about before a visit. 64 % of veterinarians use paper media to manage reproductive data (Table 3).

Table 2. Reproduction practice of veterinary offices and their experience in the routine reproduction monitoring activity

	N	Minimum	Maximum	Mean	SD
Number of cattle farms where the veterinary office intervenes for reproduction failure	69	1	300	14.57	38.50
Number of farms with occasional intervention	48	1	100	13.33	20.40
Number of farms with regular intervention	58	1	30	8.20	7.45
Veterinary experience in reproduction monitoring activity (years)	75	1	11	3.41	2.772

SD – standard deviation

Table 3. Importance and practice of reproduction monitoring activity by the veterinary offices

Variables	Modalities (%)	Frequency	Percentage	P
Percentage of activity time occupied by reproductive monitoring	10	14	18.7	Ns
	20	8	10.7	
	30	24	32.0	
	40	12	16.0	
	50	12	16.0	
Percentage of income in bovine activity occupied by reproductive monitoring	10	17	18.7	Ns
	20	7	9.3	
	30	18	24.0	
	40	8	10.7	
	50	17	22.7	
Type of information requested before the visit	Individual dairy production	36	48	*
	Last mating dates	60	80	
	Oestrus dates	60	80	
	Calving dates	68	90.7	
	Other information	29	38.7	
	No information	1	1.3	
Tools used to perform reproduction data management	Software	5	6.7	***
	Personal tool	17	22.7	
	Paper documents	48	64.0	
	Any tools	5	6.7	

Significance: The categories defined in each variable occur in an equitable manner: $P > 0.05$ retains the hypothesis; $P < 0.05$ rejects the hypothesis; *$P < 0.05$; **$P < 0.01$; ***$P < 0.001$; Ns – not significant

When it comes to the examination of animals during visits, the breeder and veterinarian jointly decide which animals will be checked, only half (52 %) of veterinarians routinely examine postpartum cows, 82.7 % consult problem cows before the systematic check-update, and 73.3 % systematically evaluate cows treated during the previous visit. When diagnosing pregnancy, 80 % of clinicians perform a pregnancy report on mated females, and 72 % confirm it (Table 4), at 56.71 ± 22.82 and 91.85 ± 26.94 days, respectively (Table 5). Additionally, 25 % of vets use ultrasonography, which may be done for between 1500 and 3000 days (between $10 and $20) (Table 5).

On the other hand, 73 % of respondents routinely examine non-pregnant cows after three copulations, but only 48 % concurrently record the cows' body condition. In cases of pathological anoestrus, only 48 % of veterinarians always note body conditions when examining cows not seen in the postpartum oestrus (Table 4).

Table 4. Reproduction monitoring activities related to animals' examination and management and pregnancy diagnosis

Variables	Modalities	Frequency	Percentage	P
Selection of females for examination during breeding monitoring: decision making	Veterinarians	10	13.3	**
	The breeder	18	24.0	
	Both	47	62.7	
Cow's categories examined as part of the breeding monitoring	Systematic postpartum cows' control	39	52	Ns
	Cows with reproductive problems before systematic control	62	82.7	
	Systematic control of cows treated at previous visit	55	73.3	
Practice of a pregnancy diagnosis on females after mating	Yes	60	80	***
	No	15	20	
Practice of pregnancy confirmation	Yes	54	72	***
	No	21	28	
Examination of non-pregnant cows after three mating (infertile cows)	Systematic	55	73.3	***
	Not realized	20	26.7	
Simultaneous examination of BCS when examining non-pregnant cows after three mating	Always	36	48.0	**
	Sometimes	34	45.3	
	Never	5	6.7	

Significance: The categories defined in each variable occur in an equitable manner. $P > 0.05$ retains the hypothesis. $P < 0.05$ rejects the hypothesis. *$P < 0.05$; **$P < 0.01$; ***$P < 0.001$; Ns – not significant

Table 5. Pregnancy diagnosis and conception confirmation

	N	Minimum	Maximum	Mean	SD
Days post-mating for first pregnancy diagnosis	68	20	120	56.71	22.826
Days post-mating for first pregnancy confirmation	54	45	180	91.85	26.940
Costs (AD) for pregnancy diagnosis made by ultrasound	19	1500	3000	2136.36	636.039

SD – standard deviation

Post-partum pathologies

Veterinarians still use the manual transrectal exploration of the genital tract, vaginoscopy, and ultrasound to diagnose postpartum genital pathology in cows, with percentages of 38.7 %, 22.7 %, and 26.7 %, respectively. However, 73 % of them also searched the cyclicity of the cows when examining uterine involution (Table 6).

Table 6. Modalities and tools of dairy cows' examination for post-partum pathologies

Variables	Modalities	Frequency	Percentage	P
Simultaneous scoring of BCS when examining cows not seen in heat postpartum	Always	36	48	**
	Sometimes	34	45.3	
	Never	5	6.7	
Using manual exploration as a tool of diagnosis for cows with genital pathologies	Always	29	38.7	***
	Sometimes	44	58.7	
	Never	2	2.7	
Using vaginoscopy as a tool of diagnosis for cows with genital pathologies	Always	17	22.7	**
	Sometimes	25	33.3	
	Never	33	44.0	
Using ultrasound as a tool of diagnosis for cows with genital pathologies	Always	20	26.7	**
	Sometimes	18	24.0	
	Never	37	49.3	
Using other gynecological examination techniques	Yes	8	10.7	***
	No	67	89.3	
Examination of cows' cyclicity during the control of uterine involution	Yes	55	73.3	***
	No	20	26.7	

Significance: The categories defined in each variable occur in an equitable manner. P > 0.05 retains the hypothesis; P < 0.05 rejects the hypothesis; *P < 0.05; **P < 0.01; ***P < 0.001

Organization of reproduction monitoring

The main factor of variability in flat-rate reproduction monitoring pricing is the number of cows examined (Table 7). Monthly and bi-monthly monitoring visits are carried out by 32 % and 21.33 % of veterinarians. 85.3 % of veterinarians set monitoring objectives, and 44 % collaborate with other vets on farm visits. Only 22 % of veterinarians responsible for monitoring animals establish a reproductive assessment. During routine visits, a significant portion (64 to 80 %) of these veterinarians combine feed monitoring, milk quality/mastitis monitoring, and livestock disease monitoring during regular visits (Table 7).

Table 7. Organization of reproduction monitoring activities

Variables	Modalities	Frequency	Percentage	P
Variability of flat rate pricing in reproduction monitoring activity	Number of examined cows	40	53.3	***
	Number of presented cows	2	2.7	
	Number of calved cows	5	6.7	
	Number of inseminated cows	3	4.0	
	Number of pregnant cows	11	14.7	
	Other	11	14.7	
	No opinion	3	4.0	
The average frequency of intervention per farm during monitoring	Monthly	24	32	***
	Bimonthly	16	21.3	
	Other	32	42.67	
	No opinion	3	4	
Determination of monitoring objectives	Yes	64	85.3	***
	No	11	14.7	
Collaboration during breeding monitoring	Yes	33	44	*
	No	42	56	
Establishment of a reproductive report by the veterinarian responsible for breeding monitoring	Systematically	17	22.67	*
	Sometimes	38	50.67	
	Never	20	26.67	
Integration of feed monitoring into the livestock visit	Yes	57	76.0	***
	No	18	24.0	
Integration of milk quality/mastitis monitoring into the livestock visit	Yes	48	64.0	***
	No	27	36.0	
Integration of the livestock pathologies monitoring into the visit	Yes	66	88	***
	No	9	12	

Significance: The categories defined in each variable occur in an equitable manner. P > 0.05 retains the hypothesis; P < 0.05 rejects the hypothesis; *P < 0.05; **P < 0.01; ***P < 0.001

Future development of reproduction monitoring in dairy herds

A reduction in the number of farms monitored over the past five years is considered by 53 % of veterinarians. 88 % of veterinarians tend to develop the activity, and 52 % of veterinarians think the activity can develop a little. The main constraint for the reproduction monitoring activity development is the breeder's cost (Table 8).

Table 8. Veterinarians' tendency, prospects, and the constraint about reproduction monitoring activity development

Variables	Modalities	Frequency	Percentage	P
Evolution of the number of monitored farms over the last five years	Increasing	15	20	**
	Stagnating	16	21.3	
	Decreasing	40	53.3	
	No opinion	4	5.3	
Veterinarian's tendency to develop reproductive monitoring activity	Yes	66	88.0	***
	No	2	2.7	
	No opinion	7	9.3	
Prospects of veterinarians for the development of the reproduction monitoring activity	Will remain as it is	18	24.0	**
	Could develop a little	39	52.0	
	Can develop a lot	14	18.7	
	No opinion	4	5.3	
Constraint to the development of the reproductive activity related to the availability of the breeder	Very weak	28	37.3	*
	Weak	16	21.3	
	Medium	12	16.0	
	Important	7	9.3	
	Very important	12	16.0	
Constraint to the development of the reproductive activity related to the availability of veterinarian	Very weak	30	40.0	***
	Weak	24	32.0	
	Medium	7	9.3	
	Important	5	6.7	
	Very important	9	12.0	
Constraint to the development of the reproductive activity related to the lack of motivation of breeders	Very weak	30	40.0	**
	Weak	12	16.0	
	Medium	8	10.7	
	Important	12	16.0	
	Very important	13	17.3	
Constraint to the development of the Reproductive activity related to the lack of veterinarians' motivation	Very weak	29	38.7	***
	Weak	27	36.0	
	Medium	5	6.7	
	Important	6	8.0	
	Very important	8	10.7	
Constraint to the development of the reproductive activity related to the lack of veterinarian's technical level	Very weak	24	32.0	**
	Weak	24	32.0	
	Medium	9	12.0	
	Important	10	13.3	
	Very important	8	10.7	
Constraint to the development of the reproductive activity related to organizational aspects	Very weak	25	33.3	**
	Weak	18	24.0	
	Medium	12	16.0	
	Important	5	6.7	
	Very important	15	20.0	
Constraint to the development of the reproductive activity related to high cost for the breeder	Very weak	28	37.3	**
	Weak	11	14.7	
	Medium	9	12.0	
	Important	10	13.3	
	Very important	17	22.7	
Constraint to the development of the reproductive activity related to competition from other contributor	Very weak	32	42.7	***
	Weak	18	24.0	
	Medium	12	16.0	
	Important	4	5.3	
	Very important	9	12.0	
Constraint to the development of the reproductive activity related to the risk of failure to improve outcomes	Very weak	30	40.0	***
	Weak	21	28.0	
	Medium	11	14.7	
	Important	5	6.7	
	Very important	7	10.7	

Significance: The categories defined in each variable occur in an equitable manner. $P > 0.05$ retains the hypothesis; $P < 0.05$ rejects the hypothesis; *$P < 0.05$; **$P < 0.01$; ***$P < 0.001$

DISCUSSION

The relationship between the frequency of genital pathologies and the welfare of dairy cattle underscores the crucial role of veterinary monitoring activities on farms. The frequency of genital pathologies directly reflects the overall well-being of dairy cattle [30]. Regular veterinary monitoring proves instrumental in identifying and addressing these issues promptly. By closely observing and assessing the reproductive health of the cattle, veterinarians contribute significantly to mitigating genital pathologies. This proactive approach not only enhances the health and comfort of the animals but also has broader implications for the overall productivity and sustainability of dairy farms [15]. Therefore, emphasizing the importance of veterinary monitoring activities becomes pivotal in resolving and preventing genital pathologies, ultimately promoting the welfare and optimal functioning of dairy cattle [30].

Our survey involving 75 veterinarians showed that Algerian veterinarians prefer to operate alone; 57.3 % of offices have just one veterinarian, and 80 % of these clinicians act in reproduction. For 16 % of the veterinary offices, reproduction activity constitutes 40 % of the inter-

ventions. Only 21.3 % of the veterinary offices surveyed may earn more than 50 % of their total income from this activity. The clients of these veterinary clinics are primarily mixed bovine, which may be explained by the fact that most farms in Algeria are dairy operations that also produce meat.

Reproduction monitoring activity is minimal in Algerian offices, where the average number of breeding has a reproduction activity of 14. From the viewpoint of the time spent on reproduction monitoring (30 % for the third practices), as well as from the perspective of revenue, which accounts for 30 % for 24 % of the veterinary office, the reproduction monitoring activity continues to be a limited activity and constitutes a negligible source of income. It appears that experience is not a deciding factor for participation in this activity because the veterinarians who participated in the study had experience ranging from 1 to 33 years.

Before each visit, it is advisable to obtain information facilitating access and analysis to improve the visitor's progress. The exciting data to consider are the results of milk recording (production, protein, and butterfat levels, individual cell counts, etc.), as well as insemination and the breeding record (dates of calving, dates of mating) [3, 13].

According to our findings, 64 % of vets record farm information on paper, while just 6.7 % do it electronically. This is generally caused by a lack of technicalities and limits the exchange of data or the establishment of a database to enhance farm performance.

When it comes to the examination of animals during visits, in contrast to veterinarians, who are primarily affected and directed by the breeder's decisions, it appears that the breeder plays an essential role and actively participates in selecting animals to be examined.

Cows should be examined frequently during the postpartum period since it is a sensitive and important period. Reported results demonstrated that 52 % of surveyed practitioners routinely control uterine involution, which takes three weeks of calving [33], indicating that it is a frequent technique. It was also mentioned that surveyed veterinarians frequently (82.7 %) performed early checks of cows with a risk of calving, cows having had dystotic calving, retained placenta, or acute metritis; this demonstrates that breeders are very conscious when it comes to the selection of cows to be examined.

We inquired about veterinarians' attitudes toward pregnancy diagnosis, which is crucial to an efficient dairy cattle management strategy [17]. Pregnancy diagnostic is used to identify non-pregnant animals so they can be inseminated again or culled rather than pregnant ones [22]. During our research, veterinarians initially notice pregnancy between 20 and 120 days after AI; theoretically, the first observation could be performed between 30 and 60 days after mating [5]. For positive animals, further confirmatory diagnosis is recommended to identify cows that have lost their pregnancy, which can occur at any time [18,42]. Pregnancy confirmation increases farmers' income and the potential for high-yielding dairy cattle to reproduce [19]. A confirmation approximately 60 days after mating is necessary [27]. According to our survey, about two-thirds (72 %) of veterinarians recheck positive cows within 45–180 days.

To determine the alert threshold of infertility considered in cows who need three artificial inseminations/ mating or more, a question on the examination of non-pregnant cows after three matings. About two-thirds of practitioners seemed to practice this (73 %). Early detection of infertile cows is essential. It is a relatively common issue on farms and results in significant economic losses due to the costs of inseminations, veterinary services, treatments, culling losses, and decreased productivity [10, 41]. The best way to increase cow productivity is to minimize fertility problems [1].

A total of 48 % of veterinarians use simultaneous BCS scoring, whereas 45 % do so occasionally. In the monitoring of reproduction, this is an essential element. Good body condition management leads to improved reproductive performance, including fertility. According to several research, the body condition score can decrease the insemination rate, influence the success rate of first insemination, affect the resumption of cyclicity, reduce oestrus activity, worse ovarian activity, and raise the chance of early embryo mortality / non-fecundation [5, 6, 10, 35, 40]. Similarly, decreasing BCS impairs fertility and profitability, causing a rise in disease appearances such as subclinical endometritis [36].

Following calving, the uterine lumen almost automatically becomes contaminated with germs, leading to infections that may impair function. The appropriate choice of pharmaceutical items to be employed, including their associations, and ultimately the success of therapy, depends

on the choice of diagnostic techniques [26]. In our study, we found great variability in the use of the different tools of diagnosis, where the choice of a diagnostic method is mainly made according to precocity; the sooner the diagnosis is made, the sooner the implementation of treatment will be, and therefore ultimately the greater the risk of its effectiveness and practicability; it conditions the implementation of tools and therefore of very different investments, accuracy; it determines the choice of the most appropriate treatment at the individual level, and at the herd level, it determines the precision of the quantification and therefore of the risk analysis [24].

Transrectal palpation is commonly practiced by 38.7 % of veterinarians who participated in this study. Although it is the simplest and most affordable method, it appears to be the least sensitive and specific among the diagnostic techniques [21]. The method lacks accuracy in identifying cows infertile due to endometritis [43]. According to some [33] the diameter of the horns at their base does not appear to be a reliable diagnostic criterion; only the cervical diameter, in conjunction with another clinical symptom (the existence of unusual uterovaginal discharge), is related to the presence of chronic metritis. This technique facilitates the exteriorization of secretions; it helps to evaluate the disease's severity [44]. Ultrasound is a rapid, practical, and less invasive technology for diagnosing endometritis 4 and 5 weeks postpartum, especially when combined with the detection of intrauterine fluid accumulation and measurement of cervical diameter thickness [8]. In particular, at week fourpostpartum, S a l a h and Y i m e r [43] found a low correlation between this approach and the cytological examination; this technique demonstrated 83.3 % sensitivity and 73.3 % specificity. We find that the veterinarians in the study systematically (26.7 %) or occasionally (24 %) rely on ultrasonography to diagnose endometritis.

Vaginoscopy is a helpful procedure for checking the cervix and vagina, spotting and identifying the source of discharges (mucus, pee, pus...), describing discharges in terms of appearance, and identifying the presence of trauma and/or intravaginal scars [7]. When to diagnosing endometritis, the vaginoscopy has a sensitivity (Se) of 54 to 72 % and specificity (Sp) range of 87 to 96 %; it is a highly accurate technique [38, 39]. The inquired veterinarians have not used this tool frequently, with utilization rates ranging from 22.7 % (systemically) to 33.3 % (sometimes); this may be due to the potential for contaminating healthy cows, the obligation to use the appropriate tools, and the requirement to clean the material and the vulva before each examination [48]. Combining different diagnostic techniques may result in more accurate diagnoses than using only one [31].

The condition of the uterus and ovarian activity are strongly correlated in research; the location and selection of ovarian follicles are altered by uterine bacterial infection, which also impairs follicle development and function [39]. They also show that therapies can only be functionally beneficial if they decrease uterine infections and restore ovarian activity, necessitating an ovaries-with-uterine-control evaluation [37]. This was in line with our findings, which showed that 73 % of practitioners simultaneously examine the uterus and the cow's cyclicity.

Reproduction monitoring involves the breeder and the veterinarian working together to develop the best possible observational conditions for the breeder's animals and the shortest possible clinical examination times and anamnesis for the animals. To ensure the animals are performing correctly and being monitored effectively, it is advised to arrange monthly inspections with a frequency suitable to breeding and to evaluate every individual and every case [43]. Indeed, 32 % of the veterinarians surveyed selected this activity as their regular rhythm.

Setting goals is important because it shows the breeder where the deficit is coming from, highlights issues, and offers a plan of action. More than two-thirds of the veterinarians in the survey set visit objectives. Alternatively, it is necessary to discuss objectives to assess if the goals have been achieved. Incomplete problem solutions might reveal areas that want improvement, whether in terms of visits or the manner advised treatments were administered. This is finished by performing a reproduction assessment, which gives the breeder control over the treatments that will be used, the cows that will be exposed at the following visit, and the creation of a final bill for the monitoring season. This activity was chosen to be applied by 22.67 %.

Most veterinarians (56 %) involved in our study preferred to work individually because they considered other veterinarians' competitors rather than collaborators. A significant majority of veterinary surveys also include additional items for routine reproduction monitoring (feeding, mastitis, and lameness) because of their effects on production, reproductive performance, and economics. These pathologies are known as a reason for culling cows [14,

47]. Numerous studies have demonstrated the critical impact nutrition plays in the stability and efficiency of bodily functions. Any nutritional or dietary imbalance has commonly been associated with pathological problems that result in infertility and infecundity, and any weight loss might affect reproduction and milk production even later [12, 20, 44]. Nutrition acts at the brain to exert control of the reproductive endocrine system and also influences the amounts of metabolic substrates that act directly at ovarian follicles, oocytes, and embryos [9, 14, 20].

The study by L o g r o ñ o et al. [34] showed a poor correlation between lameness and milk production, a reduced probability of service and pregnancy, and prolonged calving to conception delay. This is mostly caused by intense discomfort and pain, which reduces the severity of agitation symptoms and releases pro-inflammatory mediators that alter behaviour, resulting in an energy deficit [4, 8, 9, 23].

There is still debate on how mastitis affects fertility. Mastitis is a serious disease that has cost the dairy industry millions of dollars; it causes delayed oestrus, a drop in pregnancy rates, increases the number of services per conception, and a rise in abortion risk [29, 32, 45, 46].

Overall, the practitioners and inseminators reported that the monitoring of reproduction in dairy cattle farms has decreased during the past five years. They mostly attributed that to the competition from other players, the lack of motivation among breeders and veterinarians, and ultimately costs for breeders. The veterinarian must know what the client wants and provide him with services according to his real needs and the veterinarian must resist competition. For motivation to occur, the breeder has to feel invested in the procedure. He must be alerted of his problems, confronted with them, and given the necessary resources to address them. It is considered crucial to create and elaborate a professional guide that calculates the breeder's losses and illustrates the profitability when issues are resolved. The commitment to improving the practice of livestock monitoring was highlighted by 88 % of veterinarians. Finally, a significant percentage of respondents (52 %) are optimistic about the evolution of monitoring in the future.

CONCLUSIONS

Even though reproduction is the cornerstone of cow productivity and the success of modern farms, the present study showed that it only represents a minor portion of practices and is significantly declining activity. The veterinarians are primarily depending on primitive diagnostic and recordkeeping techniques that limited information diffusion and monitoring activity. However, specific procedures were consistent with those described in the literature. An associated effort between animal owners and veterinarians should consider a well-reasoned reproduction monitoring in individual and group dimensions for problem resolution and prevention within a large prospective development of the population medicine approach.

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