World-Wide Trends in Milk-Recording in Cattle

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Abstract

It was decided that the Dairy Cattle Milk Recording Working Group would update ICAR Guidelines Section 2, which focuses on milk recording, and to organise a worldwide survey to cover all relevant dairy countries around the world, including ICAR members and non-members. The questionnaire included 106 questions focusing on milk-recording, management, methodology, organisation and new technology as applied to Section 2 of the ICAR Guidelines. This paper is one of three articles prepared on the basis of this survey for the ICAR Technical Workshop to be held in Krakow in June, 2015. The goals included the monitoring of the current situation in milk recording and the organisation of milk recording and trends in methodology and management in milk-recording organisations, improvement of the ICAR Guidelines and strengthening communication with ICAR members in order to obtain useful comparisons of methodologies, protocols and practices. This survey serves as a starting point for the continued work of milk-recording organisations. The survey was prepared by the Dairy Cattle Milk Recording Working Group together with invited milk recording organisations. Data were obtained from 46 organisations across the world. All participants completed a questionnaire. The respondents represented 287 organisations (some of the responding organisations are representing their member organisations on the national level), 169 laboratories and 21,486,116 cows.

Keywords: ICAR, Dairy Cattle Milk Recording Working Group, milk recording, survey, ICAR Guidelines, questionnaire, milk-recording organisations.

Introduction

In recent years we have seen many changes to milk recording in cattle along with rapid technological development. It was decided that the Dairy Cattle Milk Recording Working Group would update Section 2 of the ICAR Guidelines, which focuses on milk recording, and to prepare a worldwide survey to cover all relevant dairy countries around the world, including ICAR members and non-members. A thorough analysis of survey results will provide the basis for an enhanced version of Section 2 of the ICAR Guidelines. This survey is an official project of the ICAR Dairy Cattle Milk Recording Working Group and features a wide range of the most important ICAR members and non-members.

The survey

The survey included 106 questions covering the most important phases of milk recording, incorporating the collaboration and feedback of milk-recording organisations involved in the project. The main goal of this part of the survey is to analyse methodological aspects of milk recording, which are covered in Section 2 of the ICAR Guidelines and to analyse approaches used in data capture, milk-recording identification, sample transport, milk-recording methods, sampling, calculation of 24-hour milk production, lactation calculation and other relevant methodological milk-recording aspects.

Data capture was designed electronically using SurveyMonkey software and optionally for some participants using PDF formats. Obtained results were checked from a logical and methodological point of view and some of the points were clarified with participating organisations. Data were obtained from 46 organisations (Table 1). All participants completed a questionnaire of 106 questions. The respondents represented 287 organisations, (any one organisation may represent other organisations in its own country), 169 laboratories and 21,486,116 cows (Table 2). The Dairy Cattle Milk Recording Working Group acknowledges and thanks all participants in the survey for the feedback used in the project.

Most of the responses covered entire countries (74% organisations). Responses covering parts of countries only totaled 26%. If we take a look at the number of organisations, only 27% were umbrella organisations.

Table 1. Organisations (countries) which provide raw data along with relevant contacts and responsible persons (authors from milk-recording organisations).

Country	Organisation	Respondent
ARG	Asociación Criadores de Holando Argentino	Liliana Chazo
AUT	LKV Austria	Karl Zottl
BEL	Association wallone de l'élevage asbl	Carlo Bertozzi
BGR	Executive Agency on Selection and Reproduction in Animal Breeding	Vasil Nikolov
CAN	CanWest DHI	Neil Petreny and Richard Cantin
CHE	Association of Swiss Cattle Breeders	Eric Barras
CHL	Cooprinsem	Eduardo Winkler
CHN	Shanghai Dairy Cattle Breeding Center Co., Ltd.	Pengpeng An
COL	Asosimmental - Simbrah Colombia	Filippo Rapaioli
CZE	Czech Moravian Breeders´ Corporation	Pavel Bucek, Josef Kucera (CFBA) and Zdenka Vesela (IAS)
GER	German Association for Performance and Quality Testing	Folkert Onken
DNK	RYK	Uffe Lauritsen
EGY	Mansoura University, Faculty of Agriculture	Elsaid Z.M. Oudah
ESP	Asociacion Nacional De Raza Parda	Francisco Javier Castro Gutier
ESP	CONAFE	Sofia Alday
EST	Estonian Livestock Performance Recording Ltd.	Aire Pentjärv
FIN	ProAgria Group	Juho Kyntäjä
FRA	France Génétique Elevage	Gilles Thomas and Laurent Journaux
GBR	Quality Milk Management Services Ltd	Andrew Bradley
GBR	National Milk Records plc	Tony Craven
GBR	Cattle Information Services	Suzanne Harding
HRV	Croatian Agricultural Agency	Zdravko Barac
HUN	LPT LTD/Hungary	Julianna Kóti Seenger
IND	BAIF Development Research Foundation	Ramchandra Bhagat
IRL	Irish Cattle Breeding Federation	Brian Coughlan
ISL	The Icelandic Agricultural Advisory Centre	Gudmundur Johannesson
ISR	Israel Cattle Breeders Association	Yaniv Lavon
ITA	Associazione Italiana Allevatori	Mauro Fioretti and Riccardo Negrini
JEY	RJA&HS	David Hambrook
LTU	Animal Recording Control	Gintare Kisieliene
LUX	CONVIS s.c.	Armand Braun
MAR	Coopérative Mabrouka Des Eleveurs de Bovins	Nadia Mousili
NLD	CRV	Louwrens van Keulen and Hans Wilmink
NOR	TINE SA	Tone Roalkvam
NZL	LIC	Bevin Harris

POL	Polish Federation of Cattle Breeders and Dairy Farmers	Danuta Radzio
ROU	Innovative Agricultural Services	Cosmin Popa
RUS	RC "Plinor" Ltd.	Olga Kachanova and Elena Turenkova
BGR	EASRAB	Vasil Nikolov
SRB	Agricultural faculty of Novi Sad	Mile Pecinar
SVN	University of Ljubljana, Biotechnical Faculty - Department of Animal Science	Marija Klopčič
SWE	Växa Sverige	Nils-Erik Larsson
URY	Instituto Nacional para el Control y Mejoramiento Lechero	Fernando Sotelo Carro
USA	AgSource Cooperative Services	Robert Fourdraine
USA	Lancaster Dairy Herd Improvement Association	Jere High
USA	NorthStar Cooperative	Kevin Haase
ZAF	South African Stud Book and Animal Improvement Association	Japie van der Westhuizen

Table 2. General overview of the project and available data.

Indicator	Number
Dairy cows covered in the questionnaire	21,486,116
Number of recording organisations	287
Number of milk-analysis laboratories	169
Number of organisations that completed the questionnaire	46

Results

This part of the survey covers areas relevant mainly for methodology and ICAR Guidelines.

Lactation calculation methods (calculation of accumulated milk yield)

The ICAR Guidelines cover the needs of milk-recording organisations. With that in mind, it seems likely that some of the methods listed under “other options” will be selected, which should extend the options open to ICAR members.

Data about lactation calculation methods were obtained from 43 countries; 3 countries skipped this question. The most common approach is to use only one method for lactation calculation (93%); only 7% of organisations use two methods for lactation calculation. No organisation uses more than two methods for lactation calculation, which means that organisations included in the survey mostly use a unique system of lactation calculation.

From the analysis (Table 3), it is evident that most organisations use the Test Interval Method and Interpolation using Standard Lactation Curves.

Table 3 Lactation calculation methods used in milk-recording organisations.

Answer options	Number of organisations
Test Interval Method (TIM) (Sargent, 1968)	29
Interpolation using Standard Lactation Curves (ISLC) (Wilmink, 1987)	8
Multiple-Traits Procedure (MTP) (Schaffer and Jamrozik, 1996)	2
Best prediction (VanRaden, 1997)	5
Other methods	7

Seven organisations used other methods and from these 7 organisations 2 did not describe the methods used. These 5 additional methods will be analysed if it is feasible to include them in the new version of the ICAR Guidelines. The future policy of the Dairy Cattle Milk Recording Working Group is to continuously monitor development and keep the ICAR Guidelines updated in this field.

Daily-yield calculation methods used in milk-recording organisations

A very important part of the Dairy Cattle Milk-Recording Working Group's operations is revision of daily yield calculation methods used in milk-recording organisations. The data must be obtained by direct measuring, so as to avoid any alterations. Computation of 24-hour yields are performed by the milk-recording organisation, not by the milking equipment software. This is done in order to guarantee the harmonisation of calculation methods between the different brands of equipment. The same recommendation is valid for lactation calculations.

Table 4. Daily-yield calculation methods used in milk-recording organisations.

Answer options	Number of organisations
AM/PM milkings, Liu et al. (2000)	14
Delorenzo and Wiggans (1986)	10
Correction based on preceding intervals, ICAR Guidelines 2. 1. 7. 1.	8
AMS (milking robots); Data used from more than one day (Lazenby et al., 2002)	16
AMS (milking robots); Data used from 1 day (Bouloc et al. 2002)	3
AMS (milking robots); Estimation of fat and protein yield (Galesloot and Peeters, 2000)	7
AMS (milking robots); Sampling period (Hand et al., 2004; Bouloc et al., 2004)	2
Electronic Milk Metre (EMM); Data used from more than one day (Hand et al., 2006)	3
Other methods (in brief)	12

42 organisations filled in this question and 4 skipped this question. The highest share of methods for daily-yield calculation (Table 4):

- AMS (milking robots); Data used from more than one day (Lazenby et al., 2002).
- AM/PM milkings, Liu et al. (2000).

It is planned that other options will be analysed if some of these methods become valuable and feasible for the ICAR Guidelines.

Milk recording using milking robots (automatic milking systems)

From the answers in the survey it is evident that most of the organisations have less than 5% of milking robots (24% in interval 0-1% milking robots and 33% in interval 1.1-5% milking robots). The share of milking robots increased year by year and 14% of organisations were in interval 5.1-10% of milking robots, 10% organisations are in interval 11.0-20.0% of milking robots and 19% organisations in interval 21.0% and more of milking robots. Some organisations do not record this option separately.

Analyses showed that countries use different minimum sampling durations for milking robots (Table 5). This trend reduces sampling duration due to the high costs for milk recording in AMS. It is most common to employ a minimal sample duration lasting between 16-24 hours. Some countries use minimal sampling durations of less than 10 hours. Only one organisation has a minimal sampling duration of more than 24 hours. This question was answered by 31 organisations.

Table 5. What is the minimum sampling duration on the test day (in hours)?

	Response	
Answer options	Percentage	Number of organisations
Less than 10 hours	36	11
11-15 hours	13	4
16-24 hours	48	15
More than 24 hours	3	1

Table 6. How many samples do you take during the sampling period?

Answer options	Number of organisations
Only one	27
From each milking	14
How many from a limited number of milkings?	5 (in all cases, 2 samples)

Results for the number of samples taken when using automatic milking robots were provided by 37 organisations. Most of the organisations use only one option for sampling when using milking robots (84%). 8% of organisations use two options for sampling and 8% of organisations offer 3 options for sampling.

Due to the high costs involved, organisations prefer only one sample (27 organisations) (Table 6).

Table 7. In the case of more than one sample, how are these samples taken?

Answer options	Number of organisations
Separately (each sample is analysed)	11
Samples are mixed proportionally (just one sample analysed)	5
Samples are mixed in a fixed amount (just one sample analysed)	3
Other options	1

In the case of more than one sample, organisations mostly analyse samples separately (11 of organisations). Some of the organisations use "Samples are mixed proportionally" (just one sample analysed) – 5 organisations and "Samples are mixed in a fixed amount" (just one sample analysed) – 3 organisations (Table 7). The most common approach is to have one sampling scheme in the case of more than one sample. Only one country marked 2 options from Table 7.

Table 8. Over how long a period is milk yield production recorded and calculated (e.g. 1, 5, 7 days, 1 month, etc.)?

	Response	
Answer options	Percentage	Number of organisations
Test day only	44	16
Multiple number of days - test day included	50	18
Multiple number of days - test day excluded	6	2

A total of 36 organisations provided data on the duration of milk-yield production, recording and calculation and 16 for the number of days (Table 8). Organisations mostly use options with multiple numbers of days including the test day (50%). In the case of multiple numbers of days – it is not common to exclude the test day. A large share of organisation use the test day only (44%). Almost all countries use only one option in the duration section and only one organisation uses 2 options. 25% of organisations specified 1-3 days; 19% – 4 days; 13% – 5 days; 0% – 6 days and 43% – more than 6 days. From the survey, the maximum period given was 10 days.

If milk-yield production is recorded from a period greater than one day, the approach on how to combine data of this multiple milk yield with fat and protein measurements is a very important issue. Milk-recording organisations currently use different approaches of combining these data. The most common method is to use milk production from multiple days with the milk content from the test day (8 organisations), to calculate % of fat, % protein, etc. on the basis of the milk yield from the test day (7 organisations), and then to combine contents of solids from the test day with the milk production from the test day. Two types of milk production are recorded (one for protein and fat production calculation, and the other for officially published milk yield production for milk production from a multiple number of days). Five organisations used this method. Other approaches are less common.

Stationary parlour meters

Stationary parlour meters ensure easy access to data on milk yield production. This part was filled in by countries that use milk-yield production from more than one day (e.g. stationary parlour metres, data used from more than one day (Hand et al., 2006)). There are more stationary parlour meters than milking robots. 29 organisations filled in this question (Table 9). In this case test days from one day (69%) is mostly used. Results from more than one day are less common (31%).

Table 9. Stationary parlour meters - do you use milk yields from more than one day?

	Response	
Answer options	Percentage	Number of organisations
Yes	31	9
No	69	20

46% organisations use 1-10% of stationary parlour meters, 15% organisations use 10.1-20% of stationary parlour meters and 39% organisations use more than 20% of stationary parlour meters.

Table 10. Over how long a period is milk yield recorded and calculated (e.g. 1, 5, 7 days, 1 month, etc.)?

Answer options	Number of organisations
The test day	16
Multiple number of days – test day included	5
Multiple number of days – test day excluded	1

The most common approach found in the survey was the period of milk yield from test day only. Using an approach with multiple numbers of days was less common (Table 10). This table was filled in by 21 organisations.

The length of the period from which milk yield production is recorded over multiple number of days is usually 7 days and for one organisation, 5 days.

There are different ways of combining content of fat and protein with milk-yield production. The most common options are: combine milk production from multiple days with the milk content from the test day; calculation of % of fat, % protein, etc. on the basis of the milk yield from the test day (weighted average); combine contents of solids from the test day with the milk production from the test day. Two types of milk production are recorded: one for protein and fat production calculation; the other for officially published milk yield production for milk production over a multiple number of days.

Milk-recording methods

ICAR uses three milk-recording methods:

- *A technician (supervised).*
- *B farmer (unsupervised).*
- *C combination of supervised and unsupervised.*

43 organisations filled in and 3 skipped this question. According to ICAR nomenclature, method A is still the most common method (Table 11).

Table 11. Milk-recording methods.

Answer options	Number of organisations
A (technician)	38
B (farmer)	30
C (combination of A and B)	12

Most organisations use more than one milk-recording method in their herds. Only 1 method was used in 42% of organisations, 2 methods in 30% of organisations and 3 methods in 28% organisations.

13 organisations used method A only, while 5 organisations used only method B. Method C was used in combination with other methods.

The share of methods with respect to herds is in accordance with the distribution of milk recording methods with respect to the share of cows (Table 12).

Table 12. Milk-recording methods.

	Response	
Answer options	Cows (millions)	Number of organisations
A (technician)	14.9	38
B (farmer)	5.5	30
C (combination of A and B)	0.4	12

Sampling schemes

One of the most important tasks for the Dairy Cattle Milk-Recording Working Group is to revise sampling and to design an easy-to-use and understandable nomenclature. Some methods were not given, but this could benefit many ICAR members and add flexibility. Method Z is an important method, but the most common method of sampling is alternate one-milk-recording T. Information on sampling was obtained from 41 countries with 5 counties skipping this question.

Table 13. Sampling schemes.

Answer options	Response	
	Cows (millions)	Number of organisations
Proportional sampling (P)	4.6	15
Equal measure sampling (E)	5.3	17
One-milking sampling with milk weights from more than one milking (Z)	3.2	19
Multiple sampling (M)	0.6	6
Alternated one-milking recording (T)	7.0	31
Constant one-milking recording (C)	0.05	2

The most important method was alternated one-milking recording (T) with 7.0 millions cows in 31 organisations (Table 13). It seems a new nomenclature is needed in order to update the ICAR Guidelines and offer more flexibility. The discussion on sampling schemes seems yet to continue and improvements may well be made before the next issue of the ICAR Guidelines.

It is very usual to have more than one option for sampling. One scheme of sampling is used in 29% organisations, two in 32% of organisations, three in 34% of organisations and more than three in 5% of organisations.

Recording intervals in weeks

Information on recording intervals was obtained from 41 organisations, which offer very often more than one option for recording intervals. The 4-week interval (Table 14) is still the most common. Other commonly used options are five, eight and six weeks. Discussion on daily milk recording will be of particular importance to the Dairy Cattle Milk Recording Working Group in the future.

Table 14. Recording intervals in weeks.

Answer options	Response	
	Cows (millions)	Number of organisations
Daily	0.154	3
1	0.011	1
2	0.024	4
3	0.193	2
4	11.599	36
5	2.869	11
6	1.418	10
7	0.254	2
8	3.25	11
9	0.659	1

What system for identifying animals is approved for official milk-recording?

This question was filled in by 45 organisations and only 1 skipped it (Table 15). The key prerequisite for accurate milk recording and for ensuring data quality is to use a proper method of identification, preferably a unique national scheme.

Table 15. What system for identifying animals is approved for official milk-recording?

Answer options	Number of organisations
Official identification number (unique national scheme)	40
Herdbook number	9
Other option (please specify)	5

Common practice among ICAR members is to use an official identification number (unique national scheme), implemented in 40 organisations (Table 15). In 9 organisations, herdbook numbers are used. Only 5 organisations use different schemes (e.g. official ID used as a herdbook number, management number or a combination of a herdbook and freeze number). Most organisations use 1 system for animal identification (80%), while 20% accept 2 systems.

Which methods do you use to identify animals during milk recording?

Data for this question were obtained from 45 organisations and only 1 skipped this question. The most common methods for identifying animals are to use either permanent visual plastic eartags without barcodes or permanent visual plastic eartags with barcodes. RFID eartags are also very common. Other milk-recording identification methods include metal eartags, RFID boluses, tattoos and cuts. Some organisations use collars, freeze brands or a combination of freeze brands and eartags; all of which are included in "other options". Some organisations combine official identification methods (e.g. permanent visual plastic eartags without barcodes as well as RFID eartags, etc.).

Only 33.3% of organisations use only one option of identification. Most organisations offer 2 or more options for animal identification during milk recording.

Table 16. Which methods do you use to identify animals during milk recording?

Answer options	Number of organisations
Metal eartag	5
Permanent visual plastic eartags without barcode	29
Permanent visual plastic eartags with barcode	23
RFID eartags	19
RFID boluses	2
Tattoo	3
Cut	1
Other option or comment	10

Do you use any additional methods of identification (during milk recording)?

In the survey additional animal identification methods were also analysed. 29 organisations specified that they use them. Most use one additional identification method (76%), while others use two (24%).

Aside from official identification methods, it is common for ICAR members to use other identification methods for cattle milk-recording. Most organisations use farm transponders and freeze numbers. In some cases, the names of the animals and tattoos are given. 29 organisations entered additional tools, but some did not enter any.

Table 17. Do you use any additional methods of identification (during milk recording)?

Answer options	Number of organisations
Farm transponder	22
Freeze number	12
Others	2

Are repeated tests for recording (supervisory control) implemented?

45 organisations completed the information for repeated tests, while 1 organisation skipped it. 62% of organisations use repeated milk-recording testing and 38 % do not (Table 18).

Table 18. Are repeated tests for recording (supervisory control) implemented?

	Response	
Answer options	Percentage	Number of organisations
Yes	62	28
No	38	17

Repeated testing among small shares of cows are very often used (Table 18). Sizeable variability was found in the length of time between the test day and repeated testing. The time period is mostly very short, with the common standard being less than 3 days. Some organisations use longer intervals.

How are the supervisory controls (repeated tests, repeated recordings) carried out in the field?

Repeated testing is carried out using different options (Table 19). Data were obtained from 30 organisations. The most common is repeated testing applied in herds, where an extraordinary increase in production was recorded for leading herds/cows and herds outside confidence intervals (e.g. fat %). Most organisations combine different approaches and use more than one option when repeated testing is used.

Table 19. How are the supervisory controls (repeated tests, repeated recordings) carried out in the field?

Answer options	Number of organisations
Random	13
Leading herds / cows	17
Producers of AI bulls	9
Herds outside confidence intervals (e.g. fat %)	16
Herds with an extraordinary increase in production	18
Other (please specify in brief)	7

Animals inspected in repeated recordings (supervisory control, repeated tests)?

Organisations often combine different methods for retesting animals. Some combine retests for all animals and selected animals in the herd (26 retest all animals and 8 retest selected animals). Some organisations use both options.

Table 20. Animals inspected in repeated recordings (supervisory control, repeated tests)?

Answer options	Number of organisations
All	26
Selected animals in the herd	8

Which traits do you use for repeated tests (supervisory control) and who provides these tests?

The three most important traits for retesting are: milk production, fat percentage and protein percentage. Protein and fat production are less often used (Table 21). Other possibilities include lactose, SCC and urea. 29 organisations filled in this question and most use a combination of different traits.

Table 21. Which traits do you use for repeated tests (supervisory control)?

Answer options	Number of organisations
Milk production	27
Fat %	23
Fat kg	12
Protein %	21
Protein kg	12
Other (please specify these traits)	7

Table 22. Who performs the supervisory control?

Answer options	Number of organisations
Managers of milk recording organisations (not the usual sample taker)	10
Specialist supervisors from milk recording organisations (supervisors who are not your usual sample takers, and who are in some cases involved in other milk-recording inspections, i.e. identification)	18
Authorised personnel outside milk recording organisations (outsourced)	3
Other options	5

For which herds is a bulk tank comparison implemented?

Bulk tank comparison is a very useful tool for quality inspections, and 20 milk-recording organisations use this method (Table 23).

Table 23 For which herds is a bulk tank comparison implemented?

Answer options	Number of organisations
All milk-recording herds	20
Only in specific cases, e.g. method B (farmer, owner sampling)	4
Not implemented	13
Other possibilities and specific approaches used (please specify)	7

Table 24 Which traits do you use to compare milk-recording with bulk tank

Answer options	Number of organisations
Milk yield	26
Fat %	24
Fat kg	2
Protein %	22
Protein kg	2
Other	7

The most commons traits used for bulk tank comparisons are milk yield, fat % and protein % (Table 24). Other possible options include fat and protein production, but the shares of these two traits are very low.

Conclusion

The survey reviews the situation in milk-recording as it applies to Section 2 of the ICAR Guidelines. On the basis of the results, it might be possible to expand the guidelines with regards to the lactation calculation methods and daily-yield calculation methods used among milk-recording organisations. It is evident that the group's priority should be given over to automatic milking systems (dairy robots) and stationary parlour meters, since the current trend is for automatisation. Some organisations are interested in in-line analysers, which will be a very important issue during the group's discussions. The group is planning to extend sampling parameters as it applies to the ICAR Guidelines because some of the options which meet these criteria are in use, yet absent from the ICAR Guidelines, especially method Z. The most common milk-recording interval in use is still 4 weeks. Flexibility will need to be increased due to the decrease in milk-recording subsidies. A major challenge is the improvement of quality management in the ICAR Guidelines, which is partly covered in this paper as per the request of milk-recording organisations. The Dairy Cattle Milk Recording Working Group is also preparing new parts for section 2 of the ICAR Guidelines to cover all processes (e.g. training, transport, etc.).

These results are important in order to monitor the situation in milk-recording organisations. They also serve as a basis for changes and improvements to the ICAR Guidelines and to identify new approaches. They are also useful for the ICAR Guidelines in defining new needs of milk-recording organisations, while also being valuable for participating countries, providing feedback and comparisons of the most common milk-recording practices among ICAR members and non-members. Results of this survey can offset changes in different milk-recording organisations. Another benefit of the project is the strengthening of collaboration and communication between the Dairy Cattle Milk Recording Working Group and milk-recording organisations. This survey could serve as an inspiring document for the work of milk-recording organisations in its catering for the different structures, environment, management, economic conditions and practical responses to the requirements and needs of milk-recording organisations.

New requirements from milk recording organisations arose from the survey (only selected comments are included):

- Absence of some "production systems", which are not necessarily Western. In particular India and other Asian countries.
- ICAR milk-recording training in Colombia.
- Lactation calculation methods.
- The calibration system.
- How to rework data in cases where milk-yield production is calculated over more than one day.
- We did find the guidelines to be very useful for DHI performance checks (checking sample limits, etc.).
- ICAR guidelines on missing results and/or abnormal 2.1.7 intervals.
- AMS daily milk recording

- There is information in the guidelines which states that MROs have to implement a supervision system but there is no more information on what it should look like. Some general frames might be useful.

The group is planning to incorporate some of these requirements and use them during the preparation of the new version of the ICAR Guidelines. All of the suggestions and generous support are greatly appreciated. A future survey will be conducted, targeted at addressing specific issues but restricted to a limited amount of questions.

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