



THE GLOBAL STANDARD FOR LIVESTOCK DATA

Animal Data Exchange Working Group. Report to the ICAR Board.

Chile / October 2016.

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1 Members

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2 Summary

At the end of 2015, a first version of the standards for data exchange between central data base and on farm data collection systems, so called Animal Data Exchange (ADE) was issued in order to start pilot implementations with three manufacturers, DELAVAL, FULLWOOD, and LELY, in France, Germany and in the Netherlands.

The pilot implementations were cancelled, so the working group decided to slow its activity, and to analyse the need for its efforts on behalf of ICAR's members.

We conducted a survey which confirmed the importance of international standards and the commitment of ICAR in the field a data exchange. It also confirmed the ICAR standards meets the most frequent needs of ICAR members.

We recommend:

- That ADE WG should continue its work.
- The ICAR guidelines for data exchange should now be updated based on work undertaken by the ADE WG.
- That over the next two years the priority of the ADE WG will be to complete a pilot ADE implementation in collaboration with those manufacturers and ICAR members who have expressed a willingness to participate.

3 Background

At the end of 2015, a first version of ADE for data exchange between on farm data collection systems and central databases was completed.

It included:

- 15 messages to exchange, milking results, milk analysis laboratory results, animal movements and reproduction events.
- Principles for data exchange based on a client / server approach where the client is the on farm data collection system and the central data base the server.
- Technical specifications of the messages according to the XML¹ standard available through XSD files.
- Technical specifications for communication protocol in accordance the SOAP standard available through WSDL files.

At the end of 2014, some major manufacturers and recording organizations from France, Germany and the Netherlands committed to start pilot implementations in 2015. These projects failed in particular due to manufacturer priorities.

¹ Refer to section 8 below for all abbreviations used in this report.

At the beginning of 2016, the working group decided to slow its works and to analyze the need for its efforts on behalf of ICAR's members through:

- Face to face meetings with the manufacturers during the first half of 2016.
- A survey sent to all the ICAR members and manufacturers in July 2016 which obtained 59 responses.

In September 2016, the working group met in Arnhem to share the background analysis and to draft a strategy for the future.

4 Survey Results

A copy of the survey results is attached as appendix 1.

4.1 Current situation

More than 60 % of the participants are already performing electronic data exchanges between on farm data collection systems and central databases.

Several formats are used. In order of importance:

- XML
- CSV
- ISO ADE / ADIS
- JSON
- ...

Miscellaneous communication protocols are used:

- FTP
- SOAP web services
- RESTFUL web services
- ...

4.2 Opinions

For 80 % of the participants, it is "very important" or "important" to retrieve data from on farm data collection systems to send them to a central database.

For 70 % of the participants, it is "very important" or "important" to send data from a central database to an on farm data collection device.

More than 70 % of the participants report that farmers consider as important the ability to seamlessly data transmission from their farm system to any central database.

Conclusion: ***Data exchange between central databases and on farm data collection systems are already widely implemented in both direction. ICAR members see data exchange a important for their own businesses and for farmers.***

4.3 Needs

4.3.1 Frequency of data exchange

For 60 % of the participants, data exchange should be performed continually or at least daily in both directions. In addition 1 out of 2 consider that a majority of farmers would be willing to allow a

permanent secure access to their on farm data collection systems for the purpose of data transmissions.

4.3.2 Data which should be retrieved from on farm data collection systems

For a majority of participants and in order of importance, the most important types of data to be retrieved are first:

- Identification and animal movement including birth and death.
- Milk production.
- Health data.
- Mating.

... then:

- Body condition.
- Activity.
- Growth.
- Hoof trimming.

1 out of 3 mentioned miscellaneous other type of data:

- Temperament.
- Milk composition and somatic cell count.
- Milk temperature and conductivity.
- Milking duration.
- Reproduction events.
- Milk quantity at first 30 and 60 seconds.
- Feeding records.
- Animal temperature.
- Teat coordinates and udder shape.
- Feeding behavior.

4.3.3 Data which should be sent to on farm data collection systems.

For a majority of participants and in order of importance, the most important types of data to be sent to on farm collection systems are, first:

- Identification and animal movement including birth and death.
- Official milk records.
- Reproduction events.
- Milk test laboratory results.
- Mating.
- Genetic evaluation.
- Disease test laboratory results.

... then:

- Mating recommendations.
- Genotype test results.

1 out of 4 participants mentioned miscellaneous other types of data:

- Type.
- Miscellaneous alerts.
- Ketosis risk indicator.
- Rumination status.
- Fat depression risk.
- Animal temperature.
- Health data.

4.3.4 Main conclusions - Needs.

Data exchange should be performed in both direction: from the central database to the on farm data collection system and vice versa.

The core needs concerns data which are already widely used. There are new needs for new data but they are diverse.

Potentially any data should be considered. Not only milking data due to the link between on farm electronic data collection systems and farm management software since more and more manufacturers are providing both equipment and a farm management software.

4.4 Importance of international standards

70 % of the participants consider that international standards would deliver value to their business and that ICAR should deal with that issue.

In addition 70 % are aware that ICAR has already established standards for data exchange.

5 Does ADE meet the needs expressed through the survey?

5.1 Exchange features.

In compliance with the needs, ADE allows permanent data exchange in both ways.

5.2 Business content.

The current ADE version covers already more of the half of the most frequent data:

- Milking result.
- Milk test laboratory results.
- Reproduction events.
- Identification and animal movement including birth and death.

The most important missing data are:

- Health data from on farm data collection systems and from disease test laboratory results.

- Official milk recording.
- Genetic evaluation and genotype test results.
- Pedigree
- Mating recommendations

The gap between the needs and the current specifications may be easily overcome as long as the semantic content of data is well defined; for example official milking results. However in some cases, the lack of precise definition would make standard not relevant.

5.3 Technical specifications.

To ensure the success of ADE, technical specifications are based on only one widely used technical standard:

- XML for messages.
- SOAP for communication protocol.

It does not suit to other approaches based on JSON or RESTFUL.

5.4 Main conclusions

ADE business content does not meet all the needs but it is in compliance with the most important ones and it might be enhanced easily and quickly as long as semantic definitions exist.

Technical specifications are the critical issue. The main concern is how to make the technical specifications as flexible as possible without jeopardizing the success of ADE because of a too wide range of technical diversity.

6 Stakeholder attitude.

The main ADE stakeholders may be distributed in:

- “Implementers”, which may be distributed in:
 - + “Early adopters”
 - + “Other adopters”.
- “Indirect beneficiaries”
- “Third party software editors”

6.1 Implementers.

Implementers are entities which should invest to implement ADE. Implementers include recording organizations or similar, related data processing centers, manufacturers and miscellaneous consortium such as “Farmnet365” in Germany, NDX in Scandinavia or “Smart dairy farming” in the Netherlands.

The survey and the meetings with the manufacturers confirm that:

- The majority of implementers support an international standard developed by ICAR.
- The current ADE version is in compliance with the more frequent needs as well with the state of art of ICT.

Considering that ADE has addressed the lack of international standards which was one of the bottlenecks, the key prerequisite is now a critical mass of users to make the investment in ADE profitable. That this critical mass exists has been confirmed by the survey.

The critical mass is a group of significant recording organizations and manufacturers. The working group considers that some European organizations might be the starting point as long as they harmonize their demands addressed to the manufacturers on two main issues:

- **Date:** start operating the ICAR ADE services in 2018.
- **Type of demand:** not replacing the existing interfaces, but addressing the need for new ones.

6.2 Indirect beneficiaries.

Indirect beneficiaries do not invest but they get benefit from an improvement of data exchange between on farm data collection systems and central data bases. That group is diverse. The main categories are:

- Farmers using an on farm data collection systems.
- Artificial breeding organizations.
- Research and development organisations.

That group is not in favour or against international standards considering the results more important than the way to achieve them.

6.2.1 Farmers

The survey confirms a good level awareness of farmers of data exchange between central databases and on farm systems. Furthermore, ICAR's members believe farmers would be willing to give secure access to on farm systems for data transmission. The main benefits are to avoid double data entry and a more transparent way to monitor data flows between farms and central databases. Farmers are considered the most important group of beneficiaries.

6.2.2 Artificial breeding organizations.

For artificial breeding organizations the main benefit is to access to new data or to more data to improve genetic evaluations for their breeding programs.

6.2.3 Research and development organisations.

Currently, how combinations of huge amounts of diverse data can be analysed to improve decision-making is an important research topic. That activity may also benefit from an improvement in data exchange between central databases and on farm data collection devices.

6.2.4 Third party solution providers.

In many cases data exchange is performed through third party solutions. Several solutions have been developed to communicate with different on farm data collection systems through a lot of heterogeneous interfaces. Some of these solutions are marketed by farm management software providers, others are developed by recording organizations. In some countries farm management software providers play a key role in data exchange. The implementation of an international standards would have an impact on that business by reducing the cost a maintaining many difference date exchange systems.

7 Recommendations for the future.

7.1 Continue to develop standards

According to our survey, international standards are important to making data exchange between central databases and on farm data collection systems easier, faster and more reliable.

The working group members consider that ICAR should edit and maintain these standards which are already rather well known.

However to avoid unjustified duplication of efforts, ICAR should coordinate its activity with the two main standard makers, ISO and UNCEFACT. Furthermore, internal duplications within the ICAR working groups should be avoided.

7.2 ICAR guidelines

Even there is no implementation, the current ADE version which meets the most important needs and which is in compliance with state of art of ICT should be submitted to the approval of members.

7.3 Road map by mid 2018.

Considering that a critical mass of users may be existing by the end of 2018, ICAR should take the following provisions:

7.3.1 Fostering and supporting early adopters.

ICAR should support as much as possible the early adopters by:

- Regular contacts.
- Monitoring progress.
- Sharing information.
- Responding in a reactive manner to any demand dealing with the ADE.

7.3.2 Issuing a reviewed version 1.9 for the early adopters by mid-2017.

The results of the survey confirming that the existing messages meets already an important subset of the needs, the priority should be not the business content but to make the technical specifications as flexible as possible without jeopardizing the profitability of the investments because of a too wide range of technical diversity.

By mid-2017, a reviewed, version 1.9, addressing at least the following technical issues should be issued:

- Message syntax: XML, JSON, JSON + XML + CSV...
- Communication protocol: SOAP, REST, SOAP + REST...
- Roles during the communication: is the equipment always the client? Might it be also the server?

7.3.3 Issuing a new version 2.0 by mid 2018

As long as early will have started using ADE, a new version should be issued by the mid 2018 to take into consideration the feedback from the early adopters and to enlarge the business content to close the gaps identified by the survey:

- Health data from on farm data collection systems.
- Health data from disease test laboratory results.
- Official milk recording.
- Genetic: genetic evaluation.
- Genotype test results.

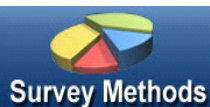
- Pedigree.
- Mating recommendations.
- ...

8 Abbreviations.

ADE	Animal Data Exchange
ADED	Agricultural data element dictionary
ADIS	Agri-cultural Data Interchange Syntax
CSV	Comma-separated values
FTP	File Transfer Protocol
ICT	Information and communication technology
ISO	International Organization for Standardization
JSON	JavaScript Object Notation
REST	Representational state transfer
SOAP	Simple Object Access Protocol
UNCEFACT	United Nations Centre for Trade Facilitation and Electronic Business
WSDL	Web Service Description Language
XML	Extensible Markup Language
XSD	XML Scheme Description

Ref: Macintosh HD:Users:bww>Data:Wickham Ltd:Customers:ICAR:ICAR SC WG TF:Groups:Working Groups:Animal Data Exchange:2016:ADE WG Report to ICAR Board Sept 2016.docx

Appendix 1. Animal Data Exchange WG - Survey Results.



Survey Software: **Ask, Analyze, Improve**

Survey Creation, Deployment, & Analysis Tools for Businesses

Survey: ICAR Animal Data Exchange Survey

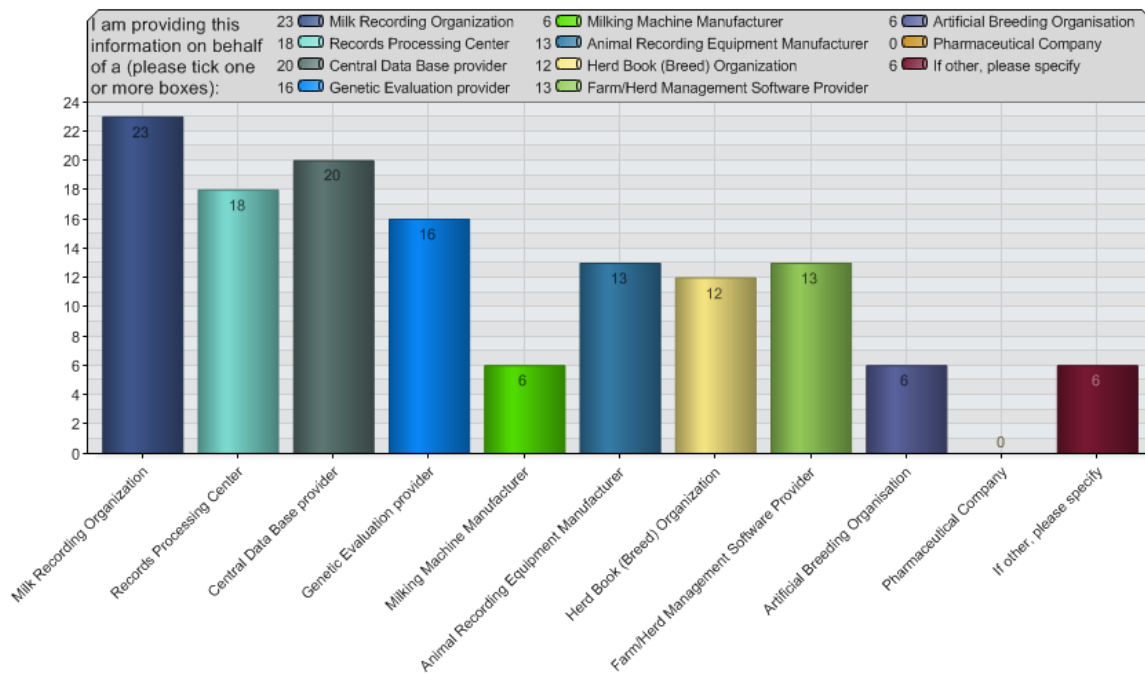
Report: Default Report

Survey Status	Respondent Statistics	Points Summary
Status: Live Deploy Date: 06/20/2016 Closed Date:	Total Responses: 59 Completes: 42 Partials: 17	No Points Questions used in this survey.

1.

I am providing this information on behalf of a (please tick one or more boxes):

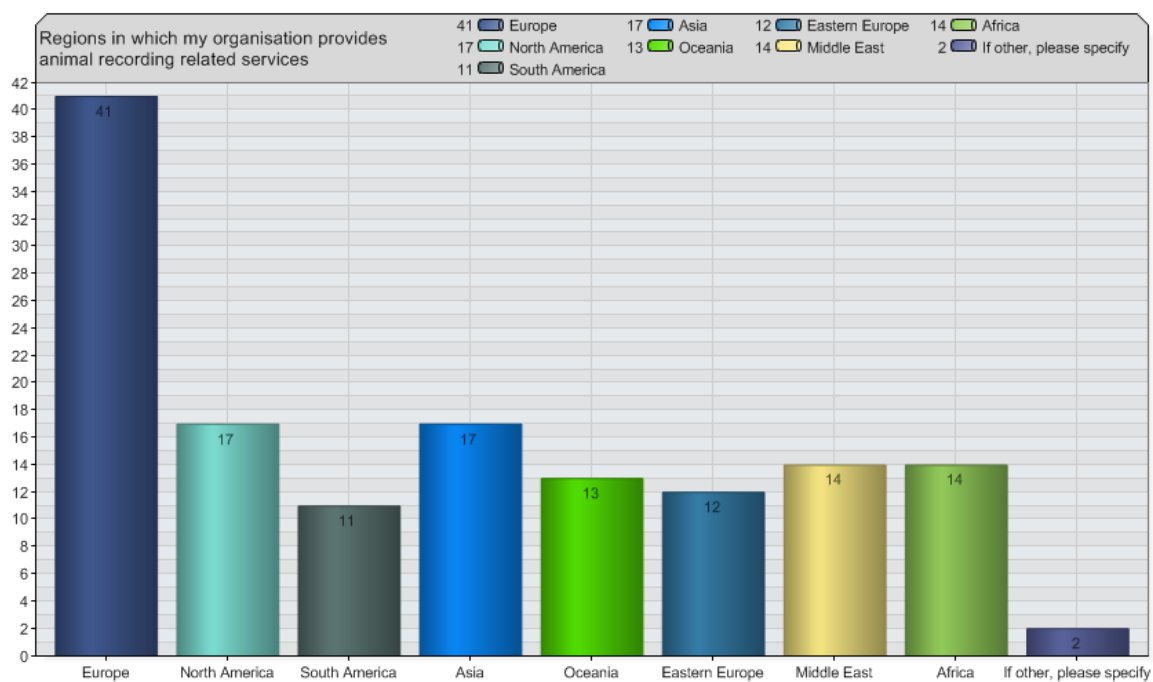
	Responses	Percent
Milk Recording Organization: 	23	38.98%
Records Processing Center: 	18	30.51%
Central Data Base provider: 	20	33.9%
Genetic Evaluation provider: 	16	27.12%
Milking Machine Manufacturer: 	6	10.17%
Animal Recording Equipment Manufacturer: 	13	22.03%
Herd Book (Breed) Organization: 	12	20.34%
Farm/Herd Management Software Provider: 	13	22.03%
Artificial Breeding Organisation: 	6	10.17%
Pharmaceutical Company:	0	0%
If other, please specify: 	6	10%
Total Responded to this question:	59	100%
Total who skipped this question:	0	0%
Total:	59	100%



2.

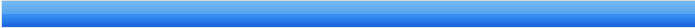
Regions in which my organisation provides animal recording related services

	Responses	Percent
Europe:	41	70.69%
North America:	17	29.31%
South America:	11	18.97%
Asia:	17	29.31%
Oceania:	13	22.41%
Eastern Europe:	12	20.69%
Middle East:	14	24.14%
Africa:	14	24.14%
If other, please specify:	2	3%
Total Responded to this question:		58
Total who skipped this question:		1
Total:		59
		98.31%
		1.69%
		100%



3.

Please provide your contact information

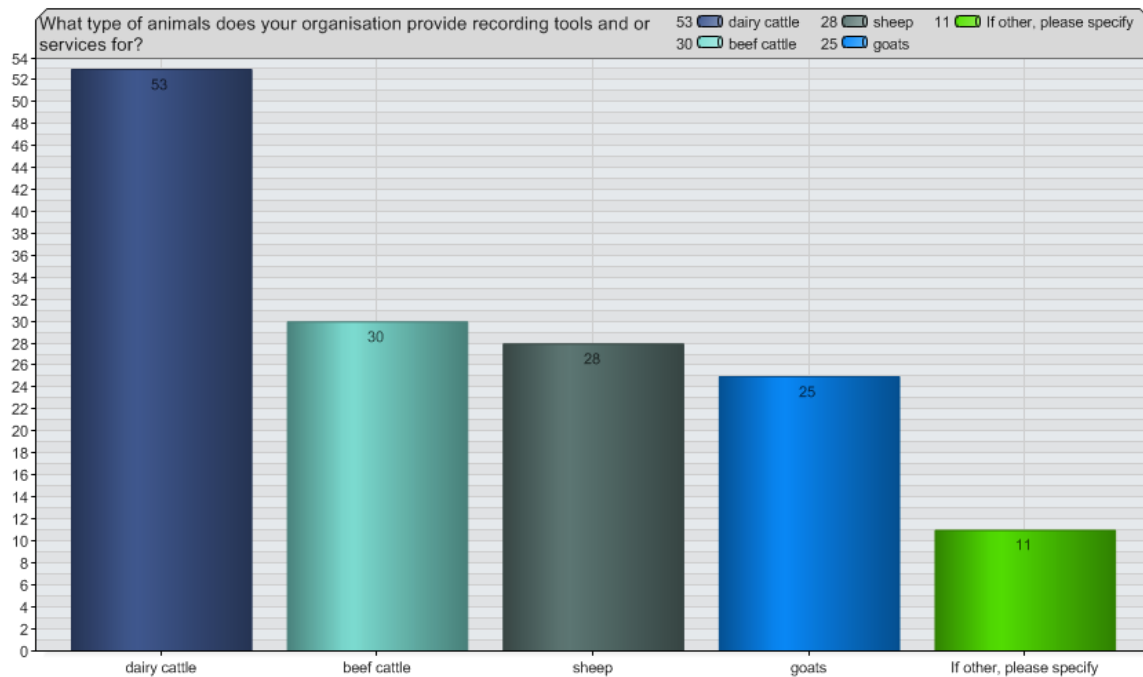
		Responses	Percent
First Name:		52	100%
Last Name:		52	100%
Country:		52	100%
Email Address:		52	100%
Total Responded to this question:		52	88.14%
Total who skipped this question:		7	11.86%
Total:		59	100%

Graph/Chart function not relevant for this question type.

4.

What type of animals does your organisation provide recording tools and or services for?

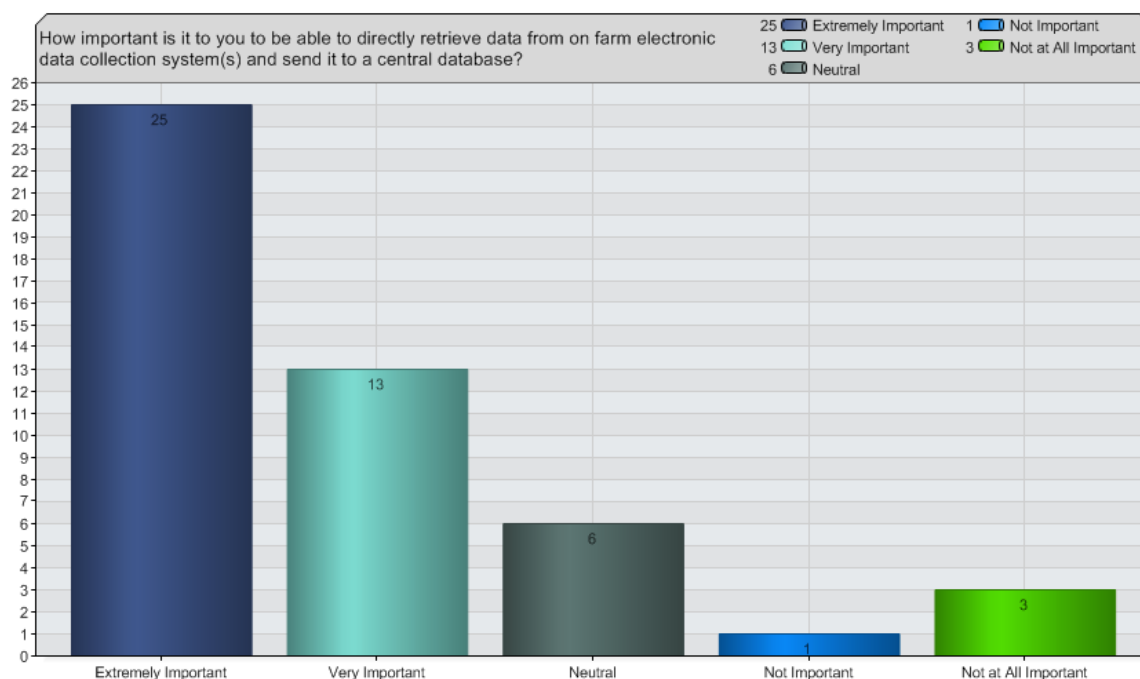
	Responses	Percent
dairy cattle:	53	91.38%
beef cattle:	30	51.72%
sheep:	28	48.28%
goats:	25	43.1%
If other, please specify:	11	18%
Total Responded to this question:	58	98.31%
Total who skipped this question:	1	1.69%
Total:	59	100%



5.

How important is it to you to be able to directly retrieve data from on farm electronic data collection system(s) and send it to a central database?

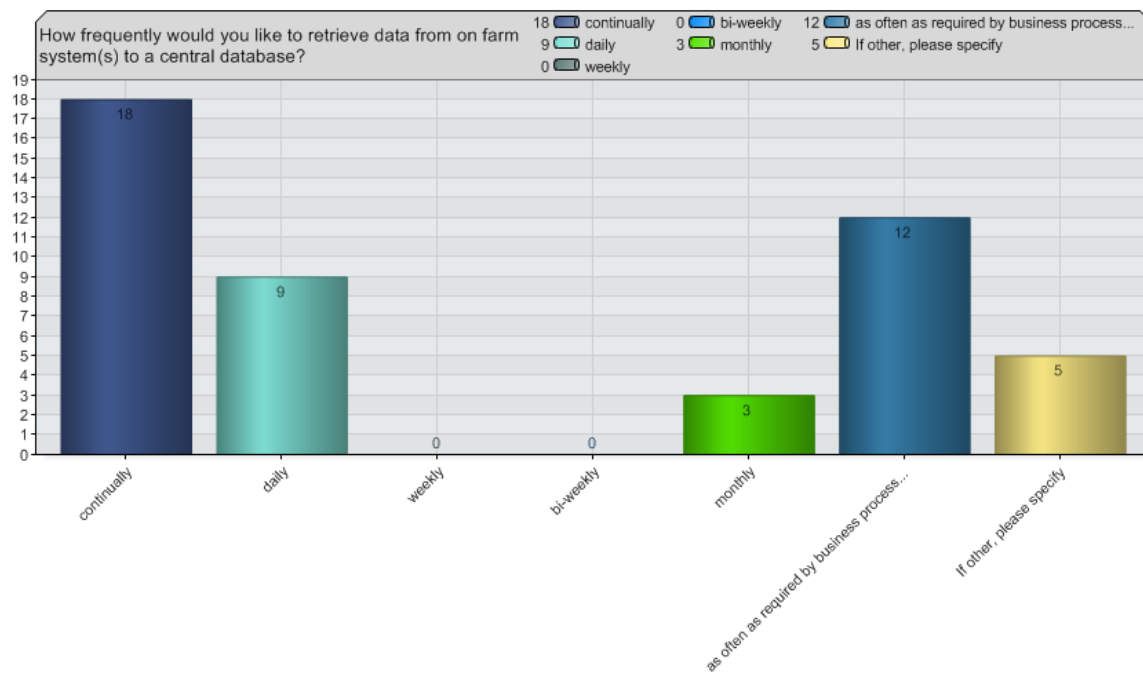
	Responses	Percent
Extremely Important:	25	52.08%
Very Important:	13	27.08%
Neutral:	6	12.5%
Not Important:	1	2.08%
Not at All Important:	3	6.25%
Total Responded to this question:	48	81.36%
Total who skipped this question:	11	18.64%
Total:	59	100%



6.

How frequently would you like to retrieve data from on farm system(s) to a central database?

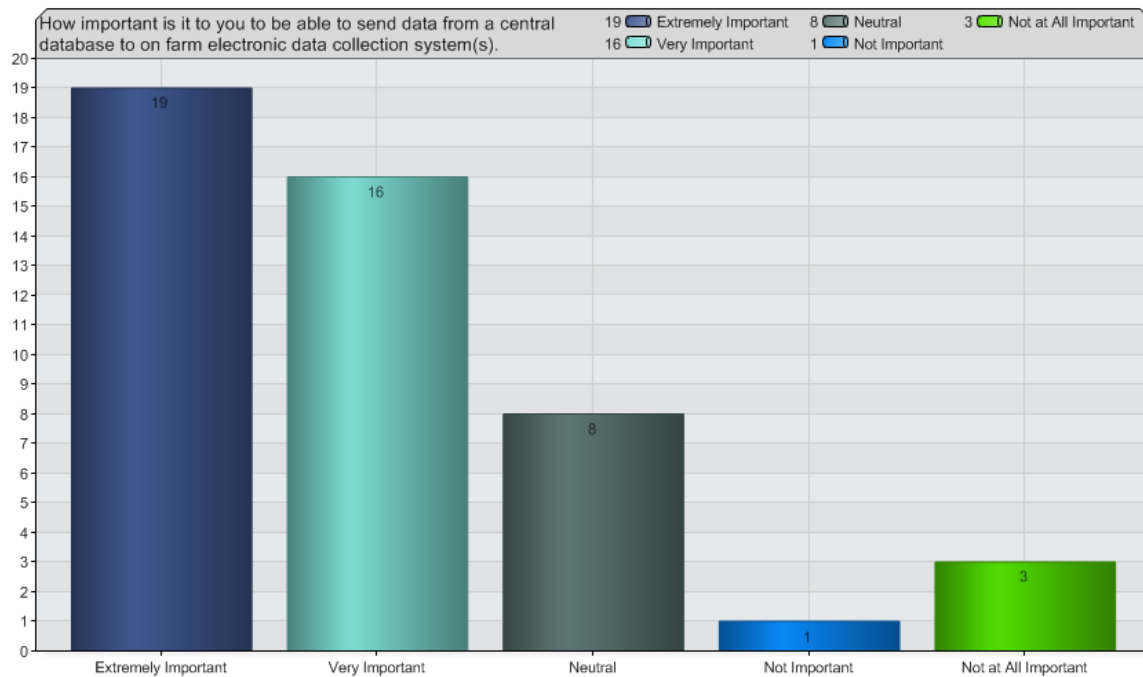
	Responses	Percent
continually:	18	38.3%
daily:	9	19.15%
weekly:	0	0%
bi-weekly:	0	0%
monthly:	3	6.38%
as often as required by business process:	12	25.53%
If other, please specify:	5	10.64%
Total Responded to this question:	47	79.66%
Total who skipped this question:	12	20.34%
Total:	59	100%



7.

How important is it to you to be able to send data from a central database to on farm electronic data collection system(s).

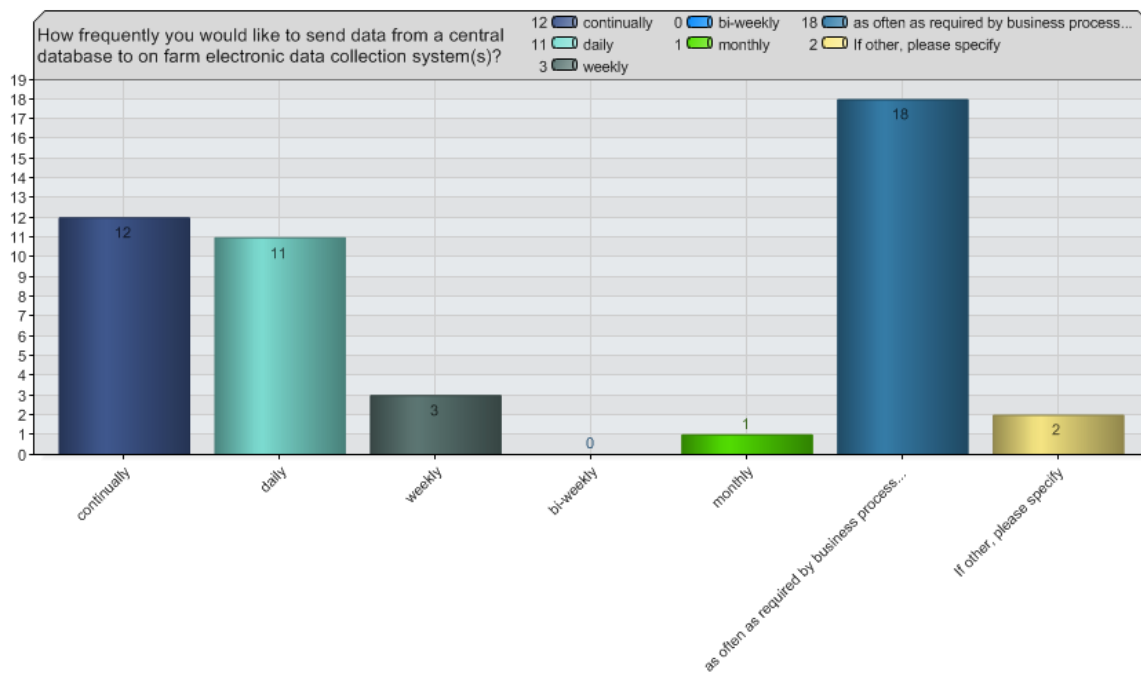
	Responses	Percent
Extremely Important: 	19	40.43%
Very Important: 	16	34.04%
Neutral: 	8	17.02%
Not Important: 	1	2.13%
Not at All Important: 	3	6.38%
Total Responded to this question:	47	79.66%
Total who skipped this question:	12	20.34%
Total:	59	100%



8.

How frequently you would like to send data from a central database to on farm electronic data collection system(s)?

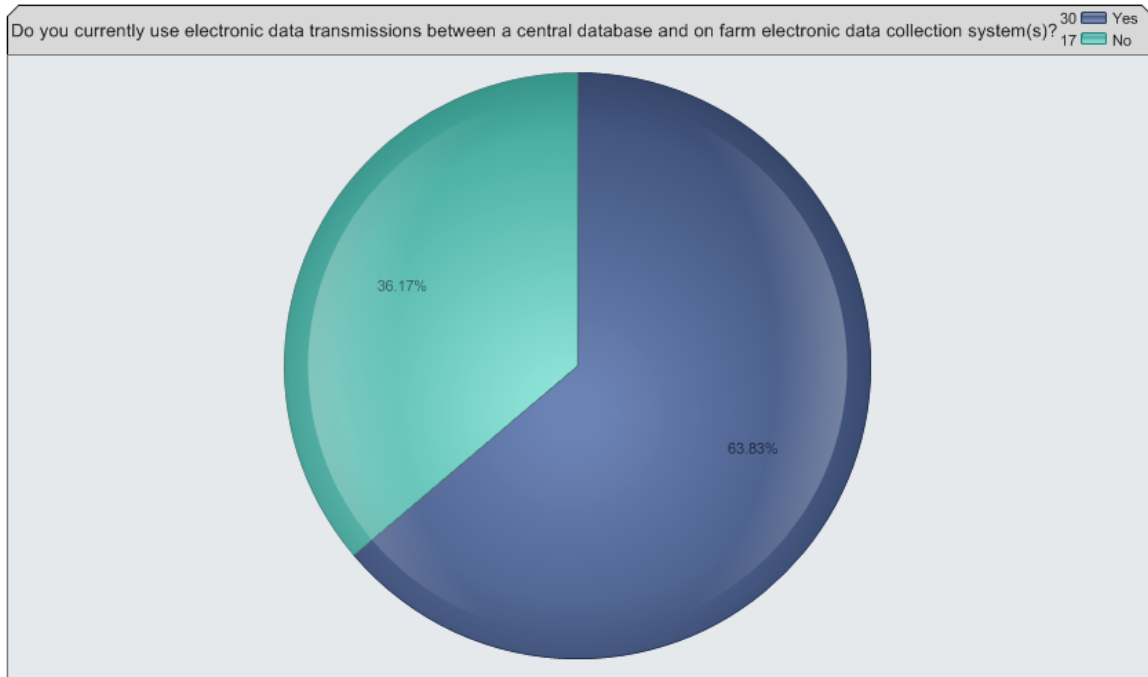
	Responses	Percent
continually:	12	25.53%
daily:	11	23.4%
weekly:	3	6.38%
bi-weekly:	0	0%
monthly:	1	2.13%
as often as required by business process:	18	38.3%
If other, please specify:	2	4.26%
Total Responded to this question:	47	79.66%
Total who skipped this question:	12	20.34%
Total:	59	100%



9.

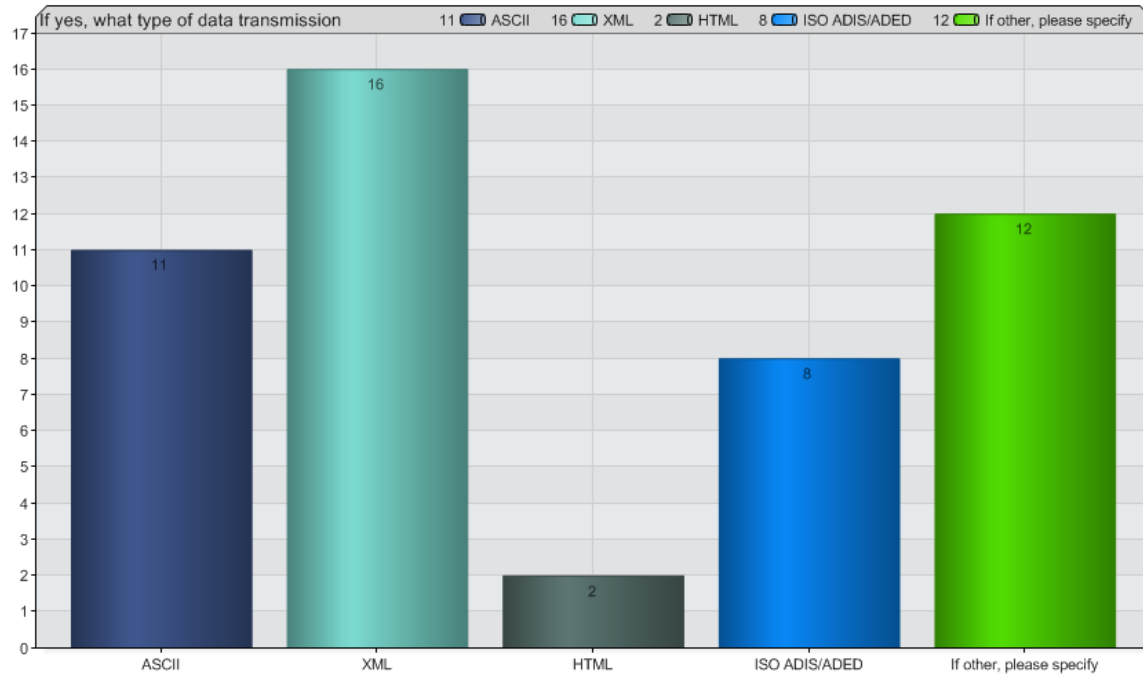
Do you currently use electronic data transmissions between a central database and on farm electronic data collection system (s)?

	Responses	Percent
Yes: 	30	63.83%
No: 	17	36.17%
Total Responded to this question:	47	79.66%
Total who skipped this question:	12	20.34%
Total:	59	100%



10. If yes, what type of data transmission

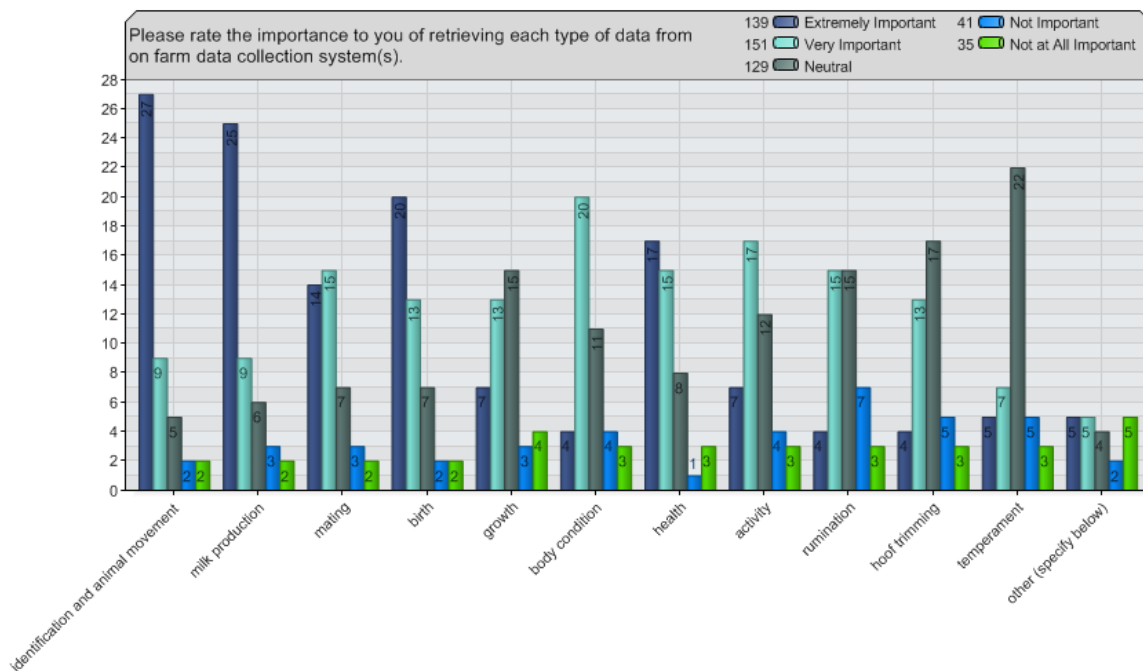
	Responses	Percent
ASCII:	11	36.67%
XML:	16	53.33%
HTML:	2	6.67%
ISO ADIS/ADED:	8	26.67%
If other, please specify:	12	40%
Total Responded to this question:		30
Total who skipped this question:		29
Total:		59
		100%



11.

Please rate the importance to you of retrieving each type of data from on farm data collection system(s).

	Extremely Important	Very Important	Neutral	Not Important	Not at All Important	Total
identification and animal movement:	27(60%)	9(20%)	5(11.11%)	2(4.44%)	2(4.44%)	45
milk production:	25(55.56%)	9(20%)	6(13.33%)	3(6.67%)	2(4.44%)	45
mating:	14(34.15%)	15(36.59%)	7(17.07%)	3(7.32%)	2(4.88%)	41
birth:	20(45.45%)	13(29.55%)	7(15.91%)	2(4.55%)	2(4.55%)	44
growth:	7(16.67%)	13(30.95%)	15(35.71%)	3(7.14%)	4(9.52%)	42
body condition:	4(9.52%)	20(47.62%)	11(26.19%)	4(9.52%)	3(7.14%)	42
health:	17(38.64%)	15(34.09%)	8(18.18%)	1(2.27%)	3(6.82%)	44
activity:	7(16.28%)	17(39.53%)	12(27.91%)	4(9.3%)	3(6.98%)	43
rumination:	4(9.09%)	15(34.09%)	15(34.09%)	7(15.91%)	3(6.82%)	44
hoof trimming:	4(9.52%)	13(30.95%)	17(40.48%)	5(11.9%)	3(7.14%)	42
temperament:	5(11.9%)	7(16.67%)	22(52.38%)	5(11.9%)	3(7.14%)	42
other (specify below):	5(23.81%)	5(23.81%)	4(19.05%)	2(9.52%)	5(23.81%)	21
Total Responded to this question:					45	76.27%
Total who skipped this question:					14	23.73%
Total:					59	100%



12.

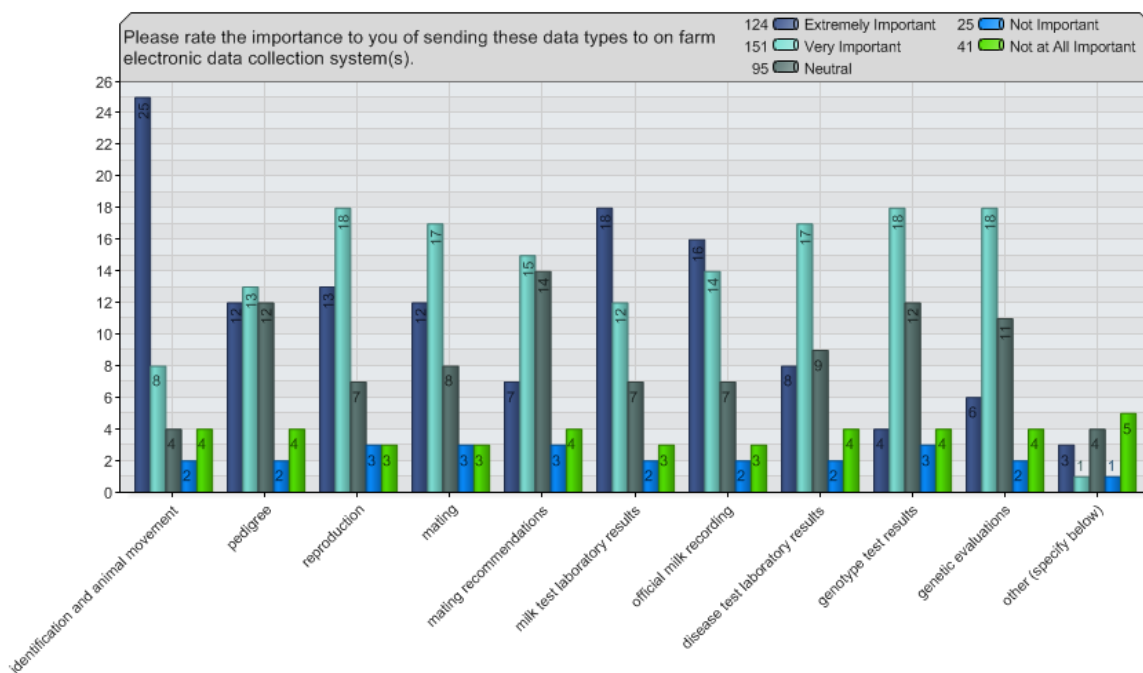
What other types of data are a priority for you for collection from on farm electronic data collection systems?

	Responses	Percent
Responses: 	16	100%
Total Responded to this question:	16	27.12%
Total who skipped this question:	43	72.88%
Total:	59	100%
Graph/Chart function not relevant for this question type.		

13.

Please rate the importance to you of sending these data types to on farm electronic data collection system(s).

	Extremely Important	Very Important	Neutral	Not Important	Not at All Important	Total
identification and animal movement:	25(58.14%)	8(18.6%)	4(9.3%)	2(4.65%)	4(9.3%)	43
pedigree:	12(27.91%)	13(30.23%)	12(27.91%)	2(4.65%)	4(9.3%)	43
reproduction:	13(29.55%)	18(40.91%)	7(15.91%)	3(6.82%)	3(6.82%)	44
mating:	12(27.91%)	17(39.53%)	8(18.6%)	3(6.98%)	3(6.98%)	43
mating recommendations:	7(16.28%)	15(34.88%)	14(32.56%)	3(6.98%)	4(9.3%)	43
milk test laboratory results:	18(42.86%)	12(28.57%)	7(16.67%)	2(4.76%)	3(7.14%)	42
official milk recording:	16(38.1%)	14(33.33%)	7(16.67%)	2(4.76%)	3(7.14%)	42
disease test laboratory results:	8(20%)	17(42.5%)	9(22.5%)	2(5%)	4(10%)	40
genotype test results:	4(9.76%)	18(43.9%)	12(29.27%)	3(7.32%)	4(9.76%)	41
genetic evaluations:	6(14.63%)	18(43.9%)	11(26.83%)	2(4.88%)	4(9.76%)	41
other (specify below):	3(21.43%)	1(7.14%)	4(28.57%)	1(7.14%)	5(35.71%)	14
Total Responded to this question:					44	74.58%
Total who skipped this question:					15	25.42%
Total:					59	100%



14.

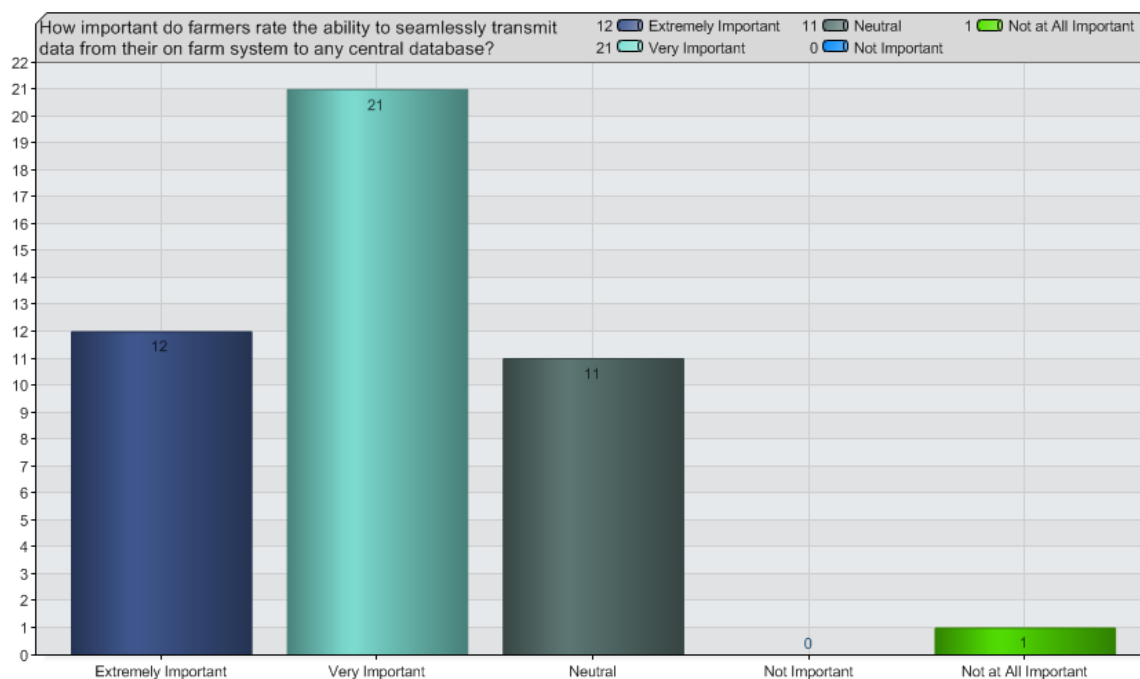
What other types of data are a priority to send to farms?

	Responses	Percent
Responses: 	9	100%
Total Responded to this question:	9	15.25%
Total who skipped this question:	50	84.75%
Total:	59	100%
Graph/Chart function not relevant for this question type.		

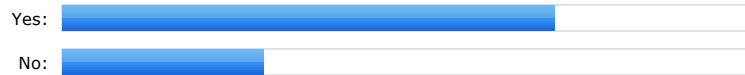
15.

How important do farmers rate the ability to seamlessly transmit data from their on farm system to any central database?

	Responses	Percent
Extremely Important: 	12	26.67%
Very Important: 	21	46.67%
Neutral: 	11	24.44%
Not Important: 	0	0%
Not at All Important: 	1	2.22%
Total Responded to this question:	45	76.27%
Total who skipped this question:	14	23.73%
Total:	59	100%



16. Are you aware that an ICAR working group has established standards for data transmissions between centralized systems and on farm systems?



Responses **Percent**

32 71.11%

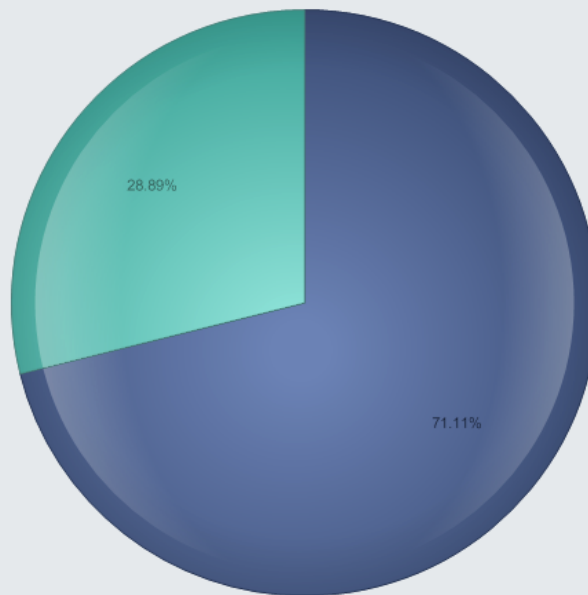
13 28.89%

Total Responded to this question: 45 76.27%

Total who skipped this question: 14 23.73%

Total: 59 100%

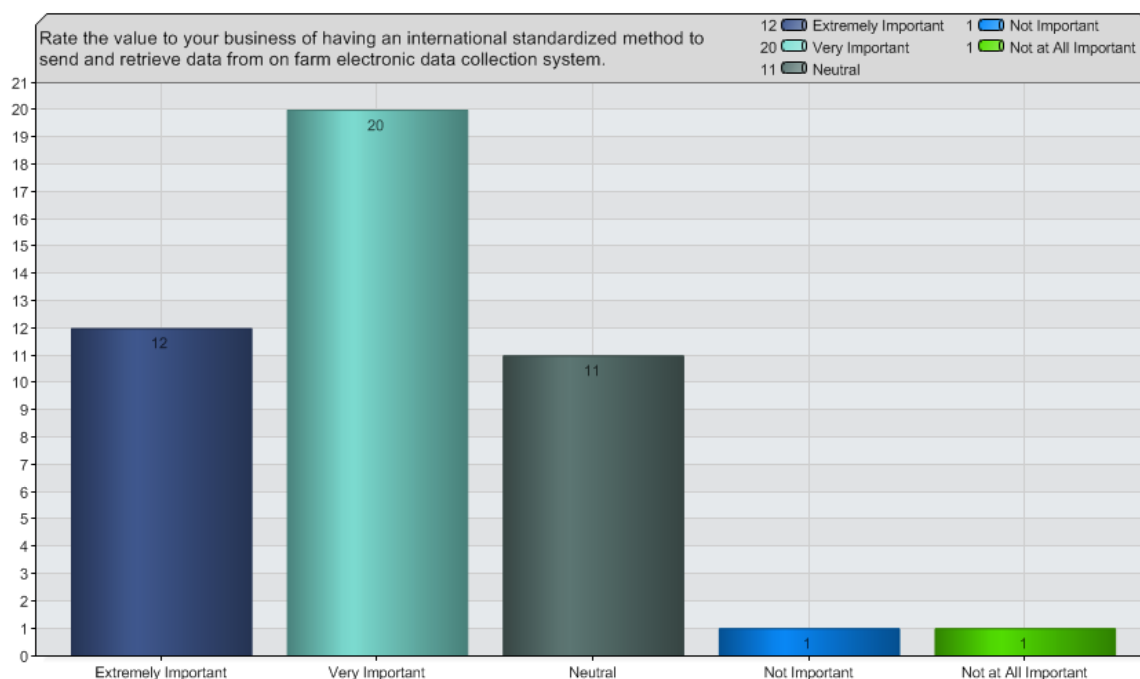
Are you aware that an ICAR working group has established standards for data transmissions between centralized systems and on farm systems? 32 Yes
13 No



17.

Rate the value to your business of having an international standardized method to send and retrieve data from on farm electronic data collection system.

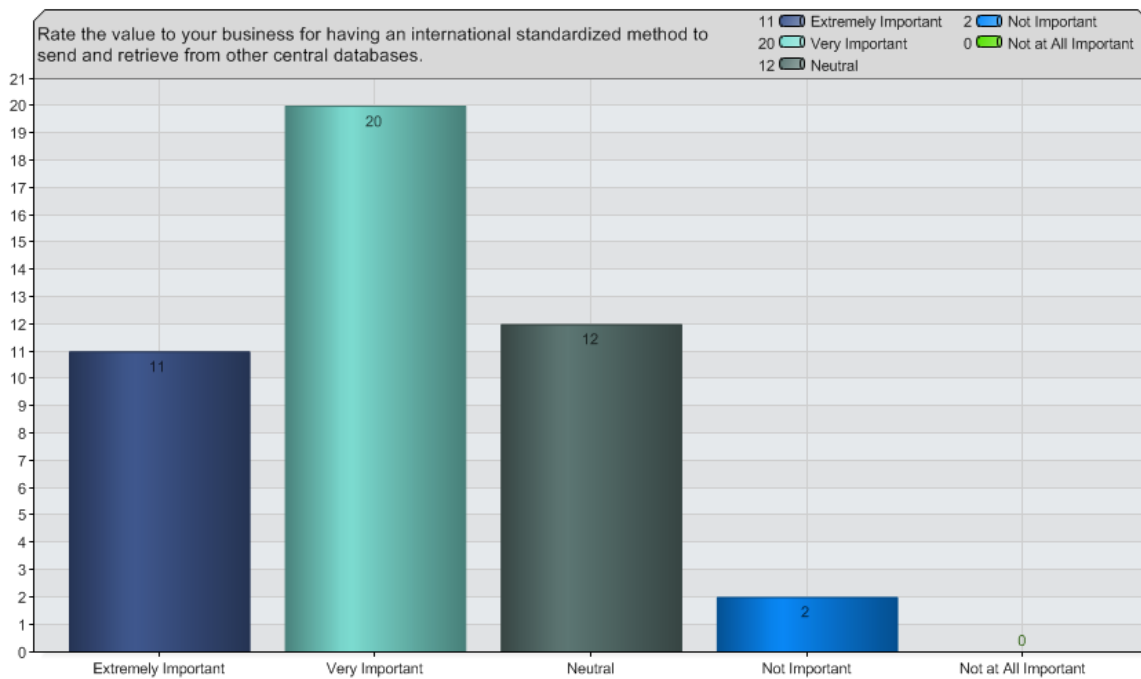
	Responses	Percent
Extremely Important: 	12	26.67%
Very Important: 	20	44.44%
Neutral: 	11	24.44%
Not Important: 	1	2.22%
Not at All Important: 	1	2.22%
Total Responded to this question:	45	76.27%
Total who skipped this question:	14	23.73%
Total:	59	100%



18.

Rate the value to your business for having an international standardized method to send and retrieve from other central databases.

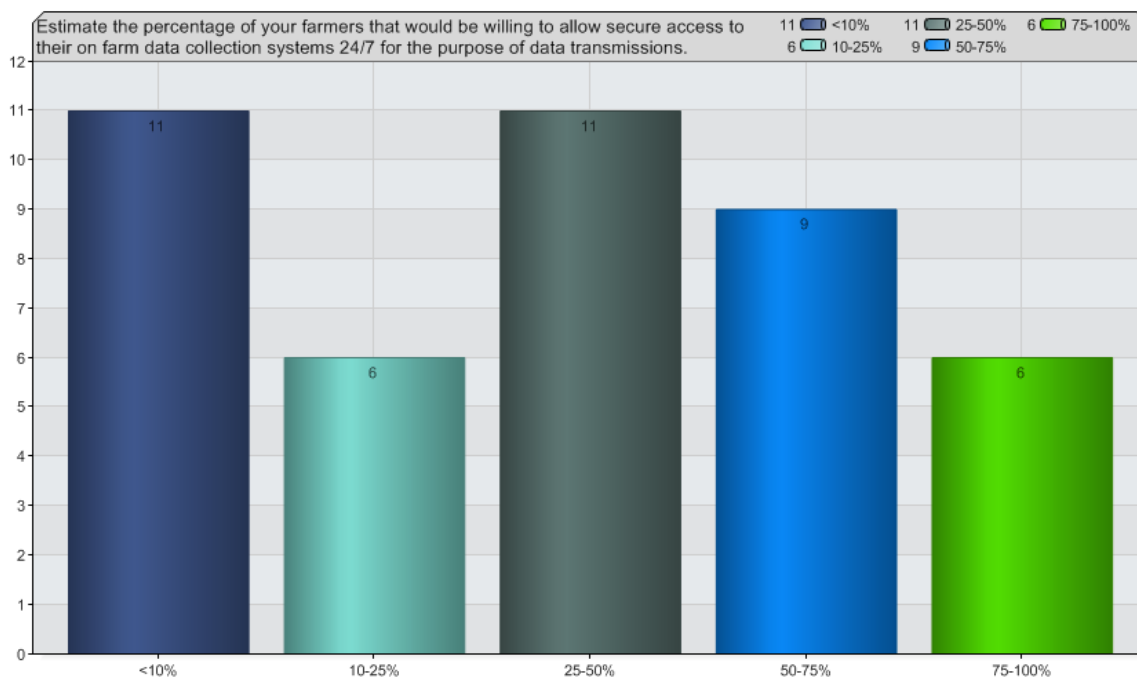
	Responses	Percent
Extremely Important: 	11	24.44%
Very Important: 	20	44.44%
Neutral: 	12	26.67%
Not Important: 	2	4.44%
Not at All Important: 	0	0%
Total Responded to this question:	45	76.27%
Total who skipped this question:	14	23.73%
Total:	59	100%



19.

Estimate the percentage of your farmers that would be willing to allow secure access to their on farm data collection systems 24/7 for the purpose of data transmissions.

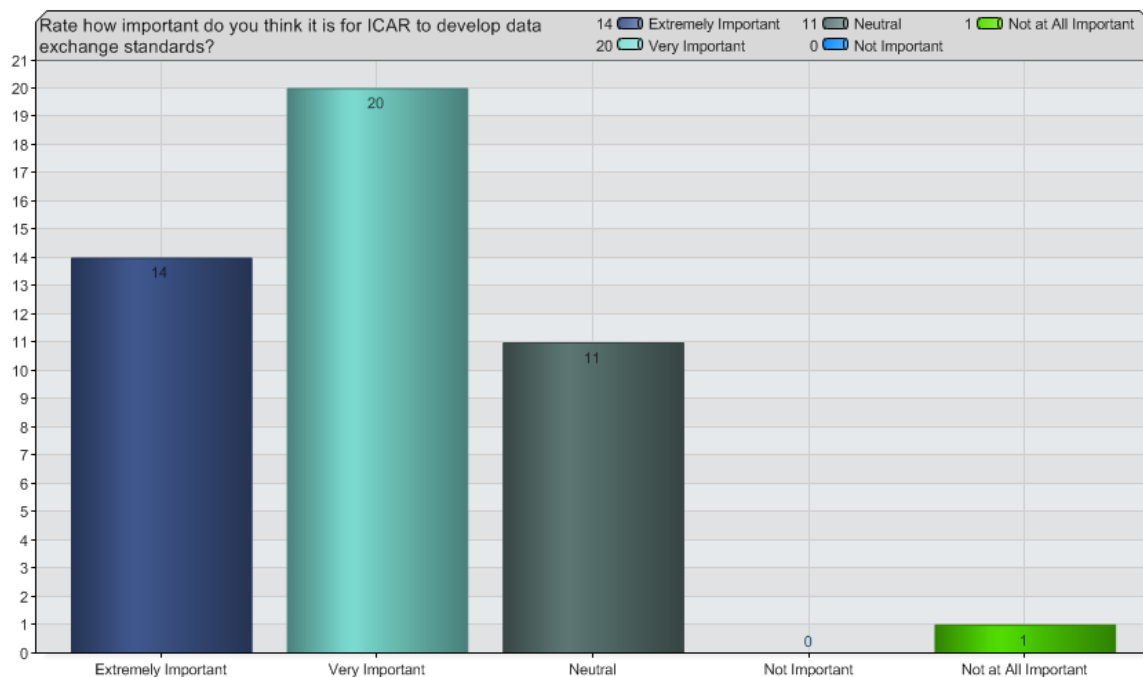
	Responses	Percent
<10%:	11	25.58%
10-25%:	6	13.95%
25-50%:	11	25.58%
50-75%:	9	20.93%
75-100%:	6	13.95%
Total Responded to this question:	43	72.88%
Total who skipped this question:	16	27.12%
Total:	59	100%



20.

Rate how important do you think it is for ICAR to develop data exchange standards?

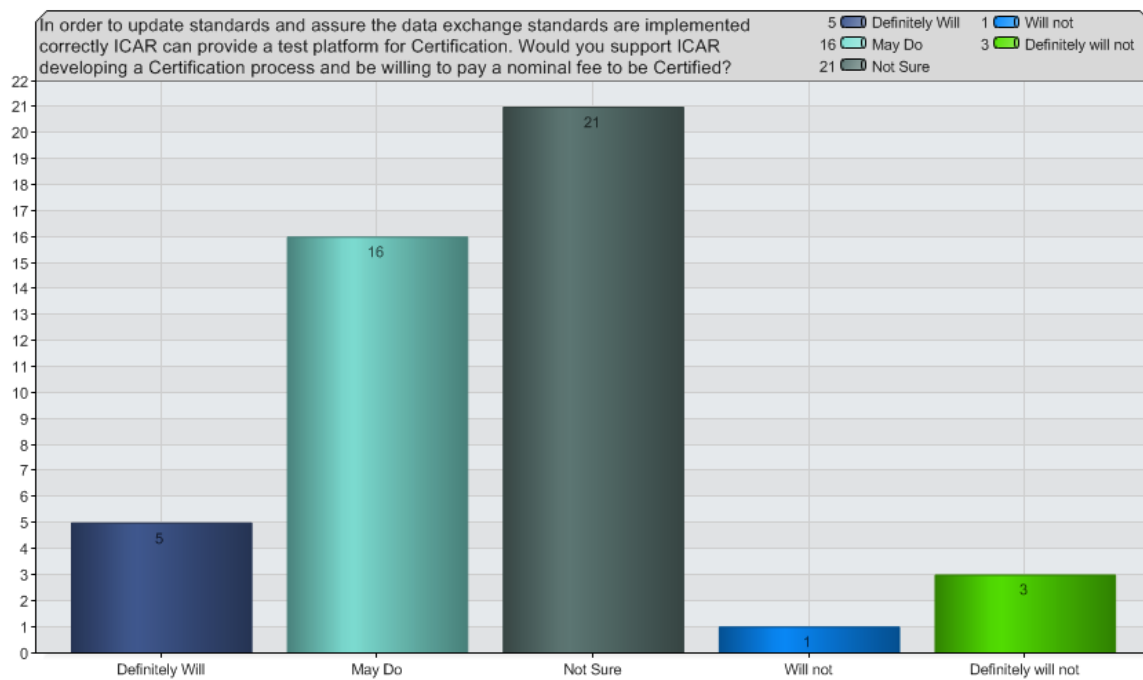
	Responses	Percent
Extremely Important: 	14	30.43%
Very Important: 	20	43.48%
Neutral: 	11	23.91%
Not Important: 	0	0%
Not at All Important: 	1	2.17%
Additional Comments: 	7	15.22%
Total Responded to this question:	46	77.97%
Total who skipped this question:	13	22.03%
Total:	59	100%



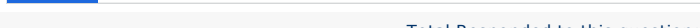
21.

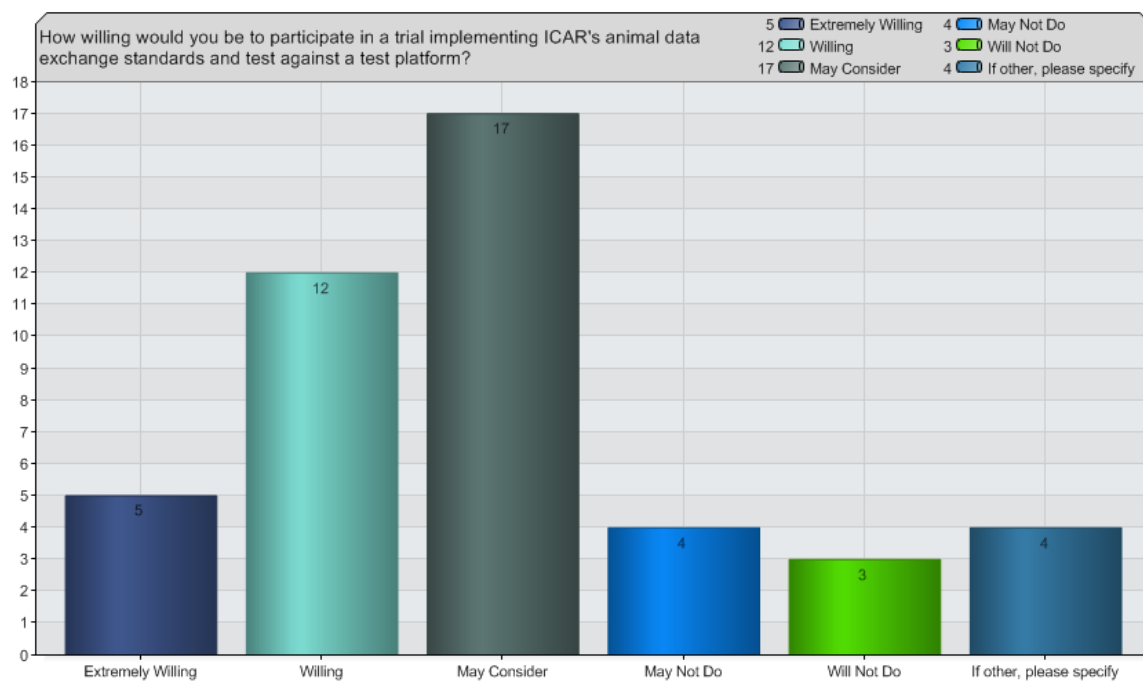
In order to update standards and assure the data exchange standards are implemented correctly ICAR can provide a test platform for Certification. Would you support ICAR developing a Certification process and be willing to pay a nominal fee to be Certified?

	Responses	Percent
Definitely Will:	5	10.87%
May Do:	16	34.78%
Not Sure:	21	45.65%
Will not:	1	2.17%
Definitely will not:	3	6.52%
Additional Comments:	9	19.57%
Total Responded to this question:	46	77.97%
Total who skipped this question:	13	22.03%
Total:	59	100%



22. How willing would you be to participate in a trial implementing ICAR's animal data exchange standards and test against a test platform?

	Responses	Percent
Extremely Willing: 	5	11.11%
Willing: 	12	26.67%
May Consider: 	17	37.78%
May Not Do: 	4	8.89%
Will Not Do: 	3	6.67%
If other, please specify: 	4	8.89%
Additional Comments: 	6	13.33%
Total Responded to this question:		45
Total who skipped this question:		14
Total:		59
		76.27%
		23.73%
		100%



23.

If you are not willing or able to participate in a trial can you please give us the name and email address of somebody you think might be.

		Responses	Percent
Responses:		6	100%
Total Responded to this question:		6	10.17%
Total who skipped this question:		53	89.83%
Total:		59	100%
Graph/Chart function not relevant for this question type.			

24.

Do you have any other comments?

	Responses	Percent
Responses: 	14	100%
Total Responded to this question:	14	23.73%
Total who skipped this question:	45	76.27%
Total:	59	100%
Graph/Chart function not relevant for this question type.		