
Dairy cattle recording in large-scale and smallholder commercial herds in Zimbabwe

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The dairy industry in Zimbabwe comprises three sectors; the large-scale commercial farmers who produce milk mainly for the urban population, the smallholder subsistence who produce milk for their own consumption and the smallholder commercial producers who supply mainly the rural population with excess sold to urban processing plants. The latter group was introduced after Zimbabwe's political independence in 1980 and has been growing in numbers since then. For more details on Zimbabwe's dairy production systems, see a review by Smith *et al* (1998). Milk recording services exist for the large-scale and smallholder commercial sectors.

Background

For the large-scale sector, milk recording was introduced in 1929 with official milk recording starting in 1932. There has been changes in management of the scheme, type of data collected, and use of data collected over the 70 years (1932 to 2002). The developments in the scheme were described by Banga (1998).

Milk recording in the large-scale commercial sector

The scheme has always been run by a government department in the Ministry of Agriculture. Farmers were charged a nominal fee and virtually all costs of delivering the milk recording services was borne by government. In 1993, a dairy herd improvement association was formed, and that association and the government jointly administered the new milk recording services. The cost of running the scheme is being shifted gradually to farmers.

Initially the scheme collected basic production records and these were processed manually. Later a more detailed scheme was introduced where farmers were required to collect information daily. Milk records office staff visited farmers bi-monthly to check the information collected by farmers, record milk produced and compare with figures collected by farmers, collect samples of milk for milk compositional tests to be carried out at the

milk records office. Records were processed and information made available to farmers at the end of the year. Initially the information sent out was just herd averages. Starting in 1986, breeding values were estimated and participating farmers received at the end of the year a *sire summary* with breeding values for bulls used in the recording herds. They also received estimated breeding values for top cows in their own herds. A new milk recording scheme, adapted from Canada, was introduced in 1993. This new scheme provided an opportunity to collect more information at more frequent intervals. With automation and computerisation, the scheme is able to generate and send out regular reports to farmers. This scheme also introduced the estimation of breeding values using the animal model.

Milk recording in the smallholder commercial sector

Commercial dairy production in the smallholder sector was introduced under the Dairy Development Programme (DDP) which was initiated by the Dairy Marketing Board (a parastatal organisation) in 1983. The Dairy Development Programme was later moved to a different parastatal, the Agricultural Rural Development Authority (ARDA). The DDP was funded by Norwegian, Danish and British governments. The aim of DDP was to introduce commercial dairy production in communal, resettlement and small-scale commercial farming areas (Mupunga and Dube, 1993). These herds were to supply milk to the rural people who were situated far from the formal distribution centres and deliver excess to city processing plants.

For the purposes of extension, supply of inputs and marketing of milk and milk products, farmers were encouraged to work as a group and each group was centred around a milk collection centre. Members of the group included producing and non-producing herds (also referred to as active milk producers). The non-active members are prospective milk producers. Some of the main concerns during the early stages were; supply of dairy animals (appropriate genotypes), teaching farmers basic principles of dairy production including the keeping of records and marketing of milk. These were addressed first and milk recording in this sector started in 1993 when the new milk recording scheme for the large-scale sector was introduced. Milk recording services were given to smallholder farmers as a group.

Management of the milk recording scheme

The Zimbabwe Dairy Herd Improvement Association (now called the Zimbabwe Dairy Services Association or ZDSA) was formed in 1993. Part of its mandate is to run the milk recording scheme for the dairy industry.

The chief dairy officer is the person in charge of ZDSA. Her immediate subordinates are officers in charge of the dairy laboratory (for testing the hygienic and compositional quality of milk from dairy herds and compositional tests for individual cows) and the one in charge of milk recording services. The milk recording services employ milk recorders

who visit members of the scheme to collect milk samples and data on farms. There are also staff based at the central office who analyse milk samples and process data received from farms to produce reports which are sent back to farmers and other interested organisations. Further processing of data is now done by an organisation called the Livestock Identification Trust (LIT). The LIT is a joint venture between farmers and the government. For the smallholder sector, the DDP helps in collection of records.

Sources of funding for the milk recording scheme include dairy industry levies, government support and fees paid by farmers. Unlike with earlier schemes, the farmer fees are the biggest source of income for the milk recording services and the aim is to gradually phase out contributions from levies and government.

There are two types of recording programmes for the large-scale sector, the fully supervised official recording and owner recording. For the fully-supervised programme, ZDSA staff (milk recorders) collect and record the data. The records completed on this programme are certified and published. For the owner recording programme, a herd owner collects and records the data after instruction and with regular assistance from a milk recorder. The records from this programme are not certified and may not be published as proof of individual performance although they may be printed for owner use.

Current recording programmes for the large-scale sector

The number of herds participating in milk recording from 1983 to 1994 has ranged from 18 to 24 percent of the total number of large-scale commercial dairy herds (Banga, 1998). The membership of the milk recording scheme is not improving mainly due to lack of appreciation of usefulness of dairy recording by farmers. Lately, the size of the national dairy herds has also been decreasing and among herds leaving the dairy industry are milk-recorded herds.

The records collected can be broken into four types:

- 1) *Identification*: The main and first step in recording is the identification of animals in the herd. The animals are classified by breed and differentiation made between purebred and grade animals. Animals get a unique number for use by the recording scheme. The name and/or number given the animal by the farmer is also recorded.
- 2) *Reproduction*: Data collected includes date of calving, days dry, calving interval, parity, and lactation length.
- 3) *Production*: Milk yield is recorded at milking and laboratory tests carried out to determine butterfat and protein content for milk samples collected.
- 4) *Health*: Milk samples are also tested for mastitis by carrying out somatic cell counts.

A minimum of ten test days is to be provided to each herd each year and the number of days between two consecutive test days should normally not exceed 50 days and if they exceed 75 days, that record cannot be certified.

Current recording programme for the smallholder sector

Because of small herd size, smallholder dairy herds normally participate in a Group Testing programme. Under this programme, several herd owners belonging to a formal collective milk marketing scheme participate in an owner recording programme in which all cows in the scheme are tested as one herd.

A group is admitted into the milk recording scheme if a minimum of one third of active milk producers join the scheme. A Group Co-ordinator is chosen who is responsible to the testing authority. For each Group, trained supervisors conduct regular test days, carrying out tasks similar to those done by milk recorders for large-scale commercial recording programmes.

Other technical requirements and information collected under this programme is similar to that collected for the programmes described for the large-scale commercial producers.

Processing and use of milk records

Test day reports

The records are processed to produce test-day and annual reports for member herds.

The test-day reports are essentially in two parts; individual cow information and herd information. For individual cows the following information is provided; identity, calving date for current lactation, age at calving, parity, milk yield on test day, days in milk, milk component test results, and accumulated totals for current lactation for days in milk, KGs of milk produced and KGs of components produced. For the herd, a rolling breed herd average for milk production is given. After an animal has completed all test days under the Official test, a certificate of production is issued. The information listed on the certificate includes:

- the exact identity of the animal
- all lactations that have been completed on Official test for the animal
- lifetime averages of records completed on Official test for the animal
- information on individual records which includes age at calving, date of calving, production totals for 305 days and for total lactation (both milk and component production totals), component percentages.

Annual reports

The annual reports are called Herd Averages. These reports are an historic record of what happened in the herd. These averages are calculated annually from the production records of dairy cows that have completed a lactation between 1 January and 31 December in the year under review, or been in milk for 305 days as at 31 December. Details of records qualifying

for use in calculating Herd Averages are given by ZDSA (2001). Only participating herds that have been actively recording throughout the year under review and had at least six farm tests have a Herd Average calculated. Cows that were dried off or left the herd before having been in milk for 250 days are excluded from the calculations. Herd averages have been the main report that the farmers have been receiving but their content has been changing over the years. The most recent publication of herd averages at the time of writing this paper was for the year 2000 and it is divided into seven sections:

- *Section 1:* Herds are ranked by breed and 305-day milk production. For each herd, an average for milk yield, fat yield, protein yield, calving interval, lactation index and number of records used to calculate the averages is given.
- *Section 2:* Herds are ranked by breed and combined fat and protein yield for 305-day lactations giving information on milk yield, fat yield, protein yield, combined fat and protein yield, and number of records for each herd.
- *Section 3:* Herds are ranked by breed and net return for 305-day lactations. Net return, milk yield, fat yield, protein yield, lactation index, calving interval, days dry and number of records are given for each herd.
- *Section 4:* Herds are ranked by milk production per herd-size class. The herd-size classes are 1-50 cows per herd, 51-100, 101-200 and >200. For each herd, information given is net return, milk yield, fat yield, protein yield, calving interval, days dry and combined fat and protein yield.
- *Section 5:* This section has two subdivisions. Section 5 (i) gives breed averages by year (for example 1996 to 2000) for milk yield, fat yield, protein yield, calving interval, days dry, combined fat and protein yield and number of records. Section 5 (ii) is a table of calving pattern and number of animals culled for the year under review. The number of cows that calved or those culled are given by month.
- *Section 6:* This section gives information on somatic cell counts. Section 6 (i) gives average somatic cell counts by herd over several years (e.g. 1996 to 2000) and number of records used to calculate the average. Section 6 (ii) gives somatic cell count bands for milk recorded herds over several years. The bands used are <300, 301-400, 401-600, 601-750, 751-1 000, >1 000 000. For each year, the number of herds in the milk recording scheme falling into that band are given and what percent of the total number of herds they constitute.
- *Section 7* lists the top cows by breed, the ranking being on milk yield. The top 20 cows are listed for the Holstein breed and top 10 for other breeds. For each cow, the herd in which it was milked, its unique identity number, its name, age at calving, milk yield, fat yield and protein yield are given.

Table 1. Breed averages for the year 2000 for the large-scale commercial sector.

Breed	Milk yield (kg)	Fat yield (kg)	Protein yield (kg)	No. of records in average
Ayrshire	4 839	194	164	92
Guernsey	6 043	252	201	67
Holstein	6 376	234	210	4 885
Jersey	4 997	221	179	498
Red Dane	5 616	247	198	560
Overall	5 574	230	190	6 102

Source: Zimbabwe Dairy Herd Services, Annual Herd Averages for the Year 2000.

The use of records

Table 1 gives breed averages for the year 2000 for the large-scale commercial sector.

Milk recording produces information whose primary use is for management for the participating herds. Test day information is used mainly by producers for management. This information, as described above, is normally processed further and outputs (e.g. herd averages) used by various organisations including farmer organisations, universities, and government departments, e.g. the Central Statistical Office and Research and Extension in the Ministry of Agriculture. The information has also been used to calculate breeding values used in selection although the use of records for this purpose has met a lot of problems.

Even if the information produced by milk recording services has value on a national basis, national benefits of milk recording in Zimbabwe are largely untapped. The use of records has been limited to the occasional research project undertaken by post graduate students (e.g. Mpofu 1987; Mpofu *et al*, 1992) and to production of herd averages (ZDSA, 2001). Regular use of milk records would be in national planning for the dairy industry. For example, data from the smallholder sector can be used in planning further development projects/ directions for this “new” sector (for examples see Mpofu, 1995 or Venge, 1997) or in drawing long-term development plans for the dairy industry (e.g. Mpofu *et al*, 1992; Mpofu *et al*, 1993). Data from both sectors can be used in resolving demand/supply and cost/price issues that so bedevil our industry.

Conclusions and recommendations

The main problems with the Zimbabwe’s milk recording scheme after the introduction of the new scheme in 1993 can be classified into two main groups; that of membership and that of effective use of records. Membership has failed to rise (Banga, 1998) and now it is going down as farmers leave the dairy industry due to unfavourable production conditions. Although the Scheme is now funded mainly by members, the government’s contribution should continue or even be increased especially

to cover extension and recruitment of new members to the Scheme. There is a real need to study the problems of milk recording in Zimbabwe for both sectors. CARNET (1995) gave four constraints to milk recording in the smallholder sectors in East and Southern Africa and some of these could be the reason for low membership. However, a detailed country study is needed and it should provide suggestions for the way forward. It can also be used as a case study for other countries in the region.

Setting up and running a milk recording scheme is quite involved and uses a lot of resources, thus making it imperative that records collected are fully utilised. Member herds are the main users of the records and with the improved scheme, they have been able to use records more effectively than before as the turn-around time for test day records was reduced. Before the new scheme, farmers used to receive only herd averages at the end of the year. However, as alluded to in sections above, the records are not fully utilised. The study referred to in the preceding paragraph should also include a survey of potential users for the data and find out what their main constraints to using the data are. Suggestions on data flow, its use and feedback and innovative ways of using the milk records (to produce informative/ usable reports) can be made.

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Summary and conclusions

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The Interbull meeting and 33rd session of ICAR were held in Interlaken, Switzerland from May 26 to 31, 2002. In this connection a joint ICAR/FAO seminar was conducted to discuss how sustainable livestock development can be enhanced in developing and transition countries through efficient organization of animal recording and skills development. The seminar referred to ICAR's earlier efforts to develop approaches and solutions in smallholder production environments for animal performance recording in the South and East:

- Animal recording for smallholders in developing countries, Anand, India, 1997.
- Cattle identification and milk recording in central and eastern European countries, Warsaw, Poland, 1998.
- Developing breeding strategies for low input animal production environments, Bella, Italy, 1999.
- Animal recording for improved breeding and management strategies for buffaloes, Bled, Slovenia, 2000.

After the opening of the seminar by ICAR president J. Crettenand, the global context, the frame conditions and the recent trends were introduced by three papers (J. Maki-Hokkonen, FAO; T. Vares, FAO; T.W. Schillhorn van Veen, World Bank). Two review papers discussed the development trends in livestock identification and recording (K.J. Peters; J. Phelan) and seven case studies illustrated and discussed approaches and experiences in relation to efforts to improve animal recording systems in transition and developing countries, focusing mainly on smallholder systems in cattle, goats and sheep. The case studies were presented by R. Cardellino, FAO/Uruguay; C.T. Chacko, India; M. Klopčič, Slovenia; A. Kretov, Kyrgyzstan; B. Moioli, Italy; N. Mpofu, Zimbabwe and R. Sadek, Egypt. The presentations were followed by a structured plenary discussion. A summary, major conclusions and recommendations were presented in the plenary session along with the presentations of the ICAR sub committees, task forces and working groups.

Introduction

Structure of the seminar, speakers and discussions

Global context, frame conditions and underlying recent trends

The rapid increasing demand for animal products in developing and transition countries has been widely discussed in the recent years. Delgado's predictions are starting to become reality as a recent update of the data of the 1999 publication (Delgado et al. 2001) reveals. There is an increasing concern for livestock and environment issues. The introductory papers referred to the Livestock Environment and Development initiative (LEAD) which is specifically addressing livestock environment interactions in developing and transition countries. Furthermore, there is increasing concern for food safety which calls for better methods to trace livestock and livestock products. There also is growing concern in view of the trend that rural smallholders are being increasingly marginalized in spite of a rising demand for livestock products in developing and transition countries. This trend expresses itself as lack of access to inputs and markets for smallholders, due to an array of reasons such as remoteness of the smallholder dwellings, missing quality standards and erratic supply potentials.

Trends in transition countries

The inherited ownership structures in the transition countries are changing at a slower pace than expected. Real and tangible reforms take a lot of time. The major impact of the transition for the mainly small livestock keepers are the decreasing livestock populations and an almost total loss of the erstwhile markets. These developments lead to increasing poverty among the livestock keepers and to a migration to urban areas in some countries. The role of the livestock sector in the transition countries has shifted from being a major source for food and raw material (e.g. wool) to a role which, in addition to food and raw material, also includes risk aversion and social buffer elements. The aim clearly is, as stated in various case studies, to work towards the establishment of livestock as a significant source of income, without jeopardizing the presently very important social buffer element. While the introductory paper painted a rather gloomy picture of the livestock sector and specifically the animal identification and recording elements of livestock production, the case studies demonstrated that there are examples which prove that progress, though slow, is being made in various countries and programmes.

Identified key elements

Driving force for identification and recording needs. The driving force to start an animal identification and recording system often is a selection programme to develop and preserve local genetic resources for milk production. Organised dairy farming projects often start by identifying a suitable market, capable of absorbing increasing quantities of milk while in the case of life animals and meat the driving force for identification and recording systems often are requirements of export markets which demand traceable products. However, even in these contexts animal identification and recording do not always enjoy a high priority.

Benefits of identification and recording are not obvious to the smallholder livestock keepers. The seminar discussed the economic benefits of animal performance recording systems and concluded that there are more benefits of recording than just making genetic improvement possible. Examples of such benefits are management information and a higher value of the recorded animals in the market due to available performance records. This fact is not well understood by various stakeholders and needs to be communicated to all concerned more specifically. The quantification and documentation of such benefits must become a priority research issue. Economic models on costs and return on investment in animal recording programmes need to be developed and published.

Private public partnership. In the East and South the importance of efficient Private Public Partnerships (PPP) for livestock development and herewith for animal identification and performance recording has been stressed in various case studies and also in the discussion. There is a need to improve networking and make knowledge and experience available both to public as well as private institutions. There are indications, that private institutions are willing to pay for such services, provided the economic long term benefit can be demonstrated.

Legal and policy framework. Legal and policy frameworks and strategies often are not conducive for the new production systems in the transition countries. The debate in the seminar, whether to set priorities on developing “made to measure” policy frameworks or on the demonstration of functioning identification and recording systems, concluded, that both elements are important and that the best approach is to involve the policy and strategy makers into the development of the systems at an early stage.

Management and administrative effectiveness. Animal identification and performance recording systems, to be successful and to yield the expected results, need to be run efficiently and professionally. The seminar discussed the administrative effectiveness of government versus private structures. On the one hand, government structures often are not very responsive to the need of these systems, on the other hand, government needs to be involved both for the development of policies and strategies as well as for finance. The question was also raised how to improve systems which are well established but somewhat have become routine and are not developing any further without additional efforts and inputs.

Research needs. Clear and focused research and development priorities for identification and recording systems in CIS and CEE countries need to be established. Research priorities to establish a toolbox for identification and recording tools need to be established. An important tool will be the establishment of a system to efficiently and accurately estimate the costs of such programmes. Research is also needed to further develop adapted

Conclusions and Recommendations

animal identification systems, tuning cultural and traditional aspects with sophisticated technical solutions. To develop a set of ICAR standards which define optimal service packages including reporting and feed back mechanisms to the livestock keepers and defining adapted recording intervals, is another important area of research to be done.

Demonstration and communication of economic benefits. The demonstration of economic benefits of animal recording (recommendation of ICAR seminar, Anand 1997) needs yet to be done. On the one hand this should be a research priority, on the other hand it will be a big step ahead if successful cases are properly documented and are made available to a wide public via publications both printed and on electronic platforms. An important element in these documents will be recommendations on strategies on how to upscale and replicate successful pilot programmes.

Sustainable use of domestic animal genetic resources. In the context to support the development of sustainable livelihood systems in rural and often mountainous areas, the sustainable use of local domestic animal resources has become an important development issue. In order to do selective breeding within these indigenous breeds, these programmes need to apply identification and performance recording tools. This is another important reason why ICAR needs to continue its efforts to develop comprehensive animal identification and performance recording tools for smallholder livestock systems.

Global network versus regional initiatives. The global network (ICAR seminar proceedings, seminars, etc.) is appreciated. However there is an expressed need for regional initiatives in order to intensify the sharing of experience, to develop region specific solutions and to allow a larger group of persons to participate. The plenary discussion recommended to ICAR to explore the possibilities to establish such regional networks, possibly species specific, without abandoning the global platforms such as the Interlaken seminar. Such regional networks would need the support of NARS and regional research networks. The question on who will finance these regional initiatives remained unanswered.

Overall recommendation. The seminar recommended to develop model procedures on how to start animal identification and performance recording programmes. These model procedures with checklists for the major requirements and tested approaches could serve as a baseline. Case studies, as the ones presented in Interlaken, would then be used to refine and complete these model procedures. This approach over time, would result in a set of best practices, based on tested and successful field experience. The seminar concluded with the overall recommendation that the setting of proper research priorities and the question on how to learn more efficiently from each other's experience need to remain in the centre of ICAR's attention.