Field performance recording of cross-bred dairy cows in Kerala (India)

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1. Introduction

The State of Kerala located in the south western part of the Peninsular of India is one of the smaller states (provinces) of India (38 863 km²) with a population density of 810 / km², which is among the highest in the country. This has led to a situation whereby the per capita availability of cultivable land is among the lowest in the country (0.1 ha). Due to the relentless pressure on land, as a natural sequel, agriculture has been preferred over animal husbandry in the traditional farming system of the State. Dairying was being resorted with the purpose of serving only as a supporting activity by providing milk for domestic consumption and manure. The agro-climatic conditions prevailing in the State can also be termed as being hostile to dairying (hot and humid climate almost throughout the year, scarcity of feed and fodder, prevalence of tropical diseases, high rainfall and mineral depletion). All these factors resulted in the formation of a small non-descript type of cattle that was hardy, resistant to disease and adapted to the prevailing climatic conditions. However, the milk production potential of these animals was very low (about 400 kg per lactation). Even in well managed conditions they only yielded up to a maximum of 800 kg per lactation with an adult body weight of about 250 kg.

2. Cattle breeding programmes

The origin of a systematic cross-breeding programme of the State can be traced back to the advent of the bilateral project, for example, the Indo Swiss Project Kerala (ISPK) in the year 1963 in Mattupatti, which evolved later into the Kerala Livestock Development Board (KLDB). The main objective of the project was to develop a new breed of cattle through cross-breeding and selection. The concept of the Key Village Scheme which ultimately resulted in the formation of the Intensive Cattle Development Project (ICDP) during the late 1960s under the Animal Husbandry Department and the introduction of lay inseminators under the Dairy Development Department during the 1970s resulted in rapid and substantial growth of cross-breeding activity through Artificial Insemination (AI) in the State. Changed food habits coupled with an

ever-increasing population increased the demand for milk, which was a scarce commodity. This prompted the policy makers to take serious note of the situation and to try and improve the quality of the animals with respect to milk production. As a step in this direction, a definite cattle breeding policy was formulated. The implementing agencies were identified and entrusted with specific tasks aimed at the improvement of the quality of the animals with respect to their milk production. Today, 70 percent of the cattle in the State are cross-breeds. The milk production and per capita availability of milk have registered vertical growth during the last two decades (Figure 1).

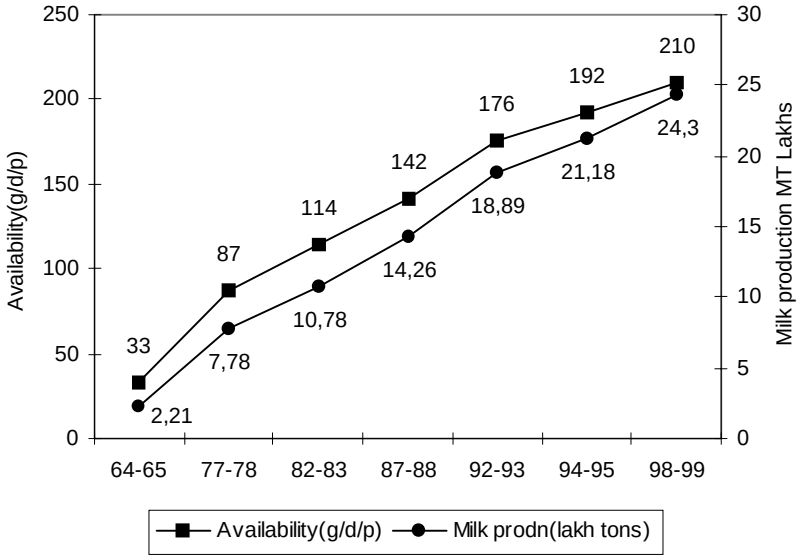

Figure 1. Milk Production and per capita availability, 1964-65 to 1998-99.

The analyses of milk production in the past have shown that nearly 73 percent of the increase has occurred due to the increase in productivity of the cross-bred cows. The challenge ahead is how to maintain and further improve the milk production potential in an environment, which is altogether hostile to dairying. With the bull being virtually more than half the herd in an AI based breeding operation, it was fit to begin a sire selection programme simultaneously. The KLDB during the year 1977 with the financial assistance from the Government of India started a programme for the field progeny testing of bulls used in the breeding programme based on field performance recording of their female offspring.

3. Field Performance Recording (FPR)

The KLDB being the agency responsible for the production and distribution of frozen semen required for AI operations throughout the State, believed it correct to change the then existing system of bull selection which was based exclusively on the pedigree, to that of a more scientific and reliable

method based on the performance of the daughters (progeny testing programme). It was thus decided to have field performance recording, which can fit into Kerala conditions.

With low importance given to dairy-based agriculture, individual animal identification, the basic requirement of a recording system, was absent. The practice of recording the production / reproduction / management levels offered to the animals, was virtually non-existent. At this juncture, it is worth mentioning that in the prevailing situations, there were no compelling reasons for such a system to be put into practice from the point of view of the farmers. The absence of a cattle breeding policy was also one of the main limiting factors.

3.1 Design of field performance recording and selection of area

Field performance (FPR) recording systems available in the temperate countries were very advanced, thus preventing a repetition in Kerala conditions. The not so advanced stage of development of the dairy sector, lack of qualified recorders to man the sophisticated systems of performance recording, inadequacies in the information levels of the livestock farmers, etc., were other factors contributing to the difficulties faced to set up a FPR system.

While designing the system, the inverse relationship between the rate of genetic progress and the number of traits for which selection is practised was kept in mind. Developing the recording system was an evolutionary process. Thus the initial system applied had only those criteria / traits which could be measured easily and were absolutely essential. To begin with, a herd book system for individual identification and recording the pedigree and milk production details, was introduced. As it was difficult to establish and successfully run such a system in its entire state, it was thought more practicable to identify areas with a higher concentration of cross-breds and to implement the system in these areas. A well established AI system in these areas was a major factor that led to such a decision making process. The areas from four districts representing a cross-section of the three geographic zones of the State, (coastal, midland and high ranges) and qualifying in respect of the above-mentioned criteria were selected and performance recording was started. The FPR initially had three major elements, namely, herd book registration, growth and development recording and milk recording. The organization of FPR is illustrated in Figure 2.

3.2 Herd book registration

The female calves born in the identified areas are brought to the herd book after permanent identification using metal eartags. These female calves are followed up on a regular basis until their death, sale to areas outside the operational zones or first calving, whichever comes first. The process has been a continuous one for the past two decades. To date a herd book of 88 000 animals has been created and is being maintained

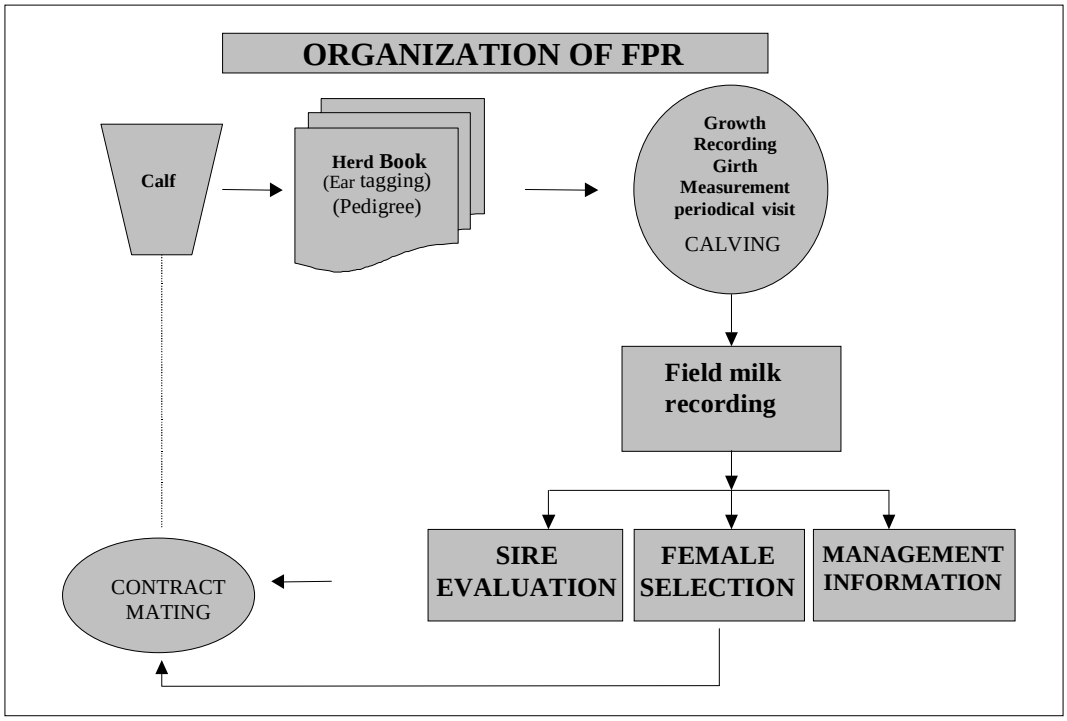

Figure 2. Organization of FPR and application in a Breeding Programme.

using a computer programme (Table 1). In order to motivate the farmers to cooperate with the on-going programmes, a farmer beneficiary programme like supply of mineral supplements, de-worming medicines, etc., is carried out. This programme is covering all the animals included in the FPR scheme. A subsidised insurance programme for the animals is also being operated in collaboration with an insurance company. The animals so followed up will be inducted into the field milk recording programme after calving, if it has been sired by a test bull.

3.3 Measurement of growth and development

The FPR is updated regularly by incorporating possible additional records on the performance of these animals with respect to their growth by way of girth measurements carried out by the milk recorders at regular intervals. Scoring based on management factors like housing, hygiene, etc., is carried out once during the initial stage of the first lactation (survey date) by the supervisors of the KLDB. On the date of survey, the feed and fodder used for feeding the animals together with their quantities, are also recorded. Based on the nutritive value of these feed ingredients, the DCP and TDN value of the feed fed to the animal is calculated. Also the TDN and DCP requirement is calculated based on the milk yield obtained on the day nearest to the survey date, 350 kg adult body weight being taken as a constant for the calculation of the maintenance ration. This being a recent

Table 1. Female calves registered under the herd book programme.

Years	No. of animals registered	Cumulative total
Upto 1991	42 318	
1991-92	7 049	49 367
1992-93	5 508	54 875
1993-94	6 606	66 481
1994-95	6 490	66 971
1995-96	4 889	71 860
1996-97	5 519	77 379
1997-98	5 222	82 601
1998-99	4 414	87 015

addition to the field milk recording programme, further streamlining of the system is required in order to draw meaningful conclusions on its effects on production and productivity of the cross-bred dairy herd.

3.4 Field milk recording

The monthly milk recording system is the most widely accepted one within the FPR system. To carry out the milk recording of cross-bred cattle in the selected areas, the following possible options were tested:

a) Official milk recording. Appointing qualified personnel as regular employees and using them for milk recording.
b) Own recording. Where the farmer does the recording himself;
c) Contract recording. Where part-time milk recorders are engaged on a contract basis.

Before ultimately resorting to the third option, the other two options were studied carefully. Due to the administrative and prevailing socio-cultural situation, the first two options were not found to be suitable. Considering the factors like high cost involved, small herd size with scattered distribution, the need to have a relatively larger population in the recording programme and the need to integrate the performance recording into the progeny testing of cross-bred bulls, it was thought appropriate to engage part time milk recorders on a contract basis. These recorders were recruited from local areas.

The animals registered in the herd book and those calved in the selected area, are entered into a field milk recording system (FMS) and their milk is recorded at monthly intervals (AM / PM recording) with samples for fat content analysis. A maximum of ten recordings per cow per lactation is

made. From the recorded milk yield, the lactation yield is estimated by applying the method of "centering date". The results obtained are brought into the herd book. The result of the field milk recording is given in Table 2.

Table 2. Details of cows enrolled for milk recording under field conditions.

Years	No of cows under milk recording	
	Enrolled	Completed
Upto 1987-88	28 149	19 123
1988-89	3 642	2 877
1989-90	2 729	2 610
1990-91	2 823	2 140
1991-92	3 600	2 464
1992-93	2 608	2 946
1993-94	3 049	1 955
1994-95	2 713	2 428
1995-96	2 658	2 178
1996-97	2 715	2 399
1997-98	2 508	2 380
Total	57 192	43 700

From the total cows enrolled, 1 521 are yet to complete milk recording. Therefore it can be seen from Table 2 that only 78 percent of the cows milk recorded complete the programme. This can be attributed to high rates of migration of animals during lactation, mostly sales to other areas.

The average first standard lactation yield in the performance-recorded area over the years is given in Table 3. It is observed that the lactation yield has registered a steady increment over the years. The increase amounts to 3.4 percent over the base year of 1983, which is commendable in the given situation. This improvement is made possible due to the synergetic effect of genetic improvement of the cross-bred cattle and the overall improvement of animal management.

4. Constraints of FPR in Kerala conditions

With the dairy animals in Kerala having a scattered distribution and belonging to small holder agricultural farmers following a diversified farming system, meticulous follow-up of these animals is a highly labour intensive process. Initially the farmers were reluctant to cooperate as they feared official interventions and application of food adulteration laws. A milk recorder can only record two cows in a day because animals being recorded are widely scattered since most households keep only one lactating cow. Cattle migration from the recorded to outside areas aggravates the problem. Farmers do not fully recognise the importance of

Table 3. Average first standard lactation milk yield of crossbred cows (kg).

Year	n	Yield Mean	s.d.
1983	1 627	1 480	481
1984	1 763	1 640	539
1985	1 865	1 669	511
1986	1 943	1 691	570
1987	1 987	1 726	530
1988	2 196	1 749	546
1989	1 988	1 796	564
1990	2 039	1 796	569
1991	3 017	1 833	560
1992	1 700	1 960	621
1993	1 823	1 985	598
1994	1 897	2 046	618
1995	1 827	2 134	604
1996	2 072	2 194	710
1997	1 565	2 191	621

FPR in respect of production, reproduction and management parameters. Although the actual milk recording is a part-time job, often a full day has to be devoted because the milking takes place twice a day, early morning and evening. The lack of adequate remuneration to the recorder due to financial limitations is a contributing factor and obstacles the successful operation of the whole system. Another major hurdle is the inter-departmental relation. The AI, maintenance of breeding records and identification of the farmer and the cow are the responsibility of the Government Department while the FPR is under the KLDB. This at times, results in difficult access to records. The frequent transfer of personnel, changes in policies and programmes of these departments, etc., also influence the efficiency of FPR The recorded animals are owned by a large number of farmers spread across a large area and the accuracy of the records is influenced by the enormous environmental variation.

The cost of the FPR and selection is fully met by the Government and the farmer meets only part of the AI cost. In other words, the improvement resulting from FPR is partially subsidised. Typically, the entire cost of FPR, selection and consequent improvement must be built into the AI system. Due to the small herd size and associated low profit margin, the entire cost of FPR cannot be absorbed in full by the AI industry. This problem is typical to low input output dairy systems.

5. Policy implications

The FPR in Kerala is well integrated with a sound breeding and selection programme. The benefits derived are:

- All the bulls used for AI are progeny tested and selected based on FPR of daughters or young bulls out of nominated mating between proven bull and elite bull mothers;
- The elite cows of the farmers are identified by applying FPR. A contract mating system is developed between the KLDB and the farmer. The male progeny born out of such mating is purchased by the KLDB while the farmer retains the female;
- The bulls selected on the basis of progeny testing and cows selected on the basis of FPR are mated to produce the next generation of young bulls. The semen of these bulls is used for AI. Hence the genetic merit accrued in the nucleus stock is disseminated to the general population in the field through AI using semen from young bulls resulting from nominated mating of selected sires and dams. The elite cows are inseminated using semen of proven bulls. It can therefore be seen that the sole means of disseminating the improved stock is through AI;
- It allows effective interaction between the farmers and KLDB resulting in mutual benefits;
- Individual farmers receive benefits like mineral supplements, insurance, etc.;
- The production data generated is extrapolated to estimate the production in the State;
- The data is used for the formulation of livestock policies and programmes for wider application and benefit of the farming community as a whole;
- The feed back of information on production and reproduction enables the farmer to follow proper breeding and feeding practices;
- A designated elite cow is often the pride of the farmer, which elevates his position in the farming society. On the other hand, an identified and recorded cow often fetches a higher price on the market and is easily sold.

Lessons learned

FPR can be employed as an effective tool for monitoring the performance of livestock owned by small holders provided it is adapted to the local situations. To make the program successful the participation at all levels,(farmers / institutional / inter-institutional) has to be ensured. Part time recorders under the official / semi-official agencies will be more practical than full time recorders or farmer recording in small holder situations. It remains to be difficult to attract part time recorders due to the low remuneration payable. Proper identification of the animal, high migration of the animal from the recorded area, follow up at various level high cost of recording etc., are the problems to be addressed.

6. Summary and conclusions

The KLDB has been implementing a FPR of cross-bred dairy cattle in a small holder situation since 1977. The programme employs part-time recorders to record information on breeding, feeding and management in field conditions. The FPR is well integrated with a breeding and selection programme of bulls and cows for genetic improvement. The data shows that an annual progress of 3.4 percent is achieved. FPR helps the policy makers in formulating policies and programmes for wider application and benefit of the farming community. The individual small holder farmers benefit through increased production, fringe benefits through contract mating and by using the data for management support. Lack of sufficient numbers and motivated recorders remains the greatest problem. Alternative systems of farmer recording did not succeed. Further research and development is needed to perfect the system to be made applicable in identical situations elsewhere.