RECORDING DESIGN AND RESULTS FOR MANAGING GENETIC RESOURCES OF SMALL POPULATIONS OF ADAPTED BREEDS

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SUMMARY

Genetic resource management of livestock is greatly supported by attending to the needs of local producers with breeds that suit small scale commodity production. The technology of small purebred populations has been neglected but applies to essential food production and gene preservation in the most practical means. Essentially a recording system, regardless of how simple it is is as important to breeders in developing industries as are the highly specialized systems in industrialized societies. Together with social needs of rural societies, small livestock populations of nucleus herds or flocks for gene migration and residence in new environments, recording is basic to maintaining the most efficient genotypes.

INTRODUCTION

Livestock recording can be very complicated as it is in most industrialized countries. It is difficult to know whether all the different kind of forms, information and calculations are a result of competition between computer technologists or from the demands of the dairy farmers for service needed for efficient herd management. In most industrialized countries the largest and most sophisticated computers are used in large livestock recording centers. In contrast there is an increasing community of livestock producers that are devising their own computer programs for micro computers. Such programs are custom made and prepared by packaged programs for spreadsheets, data bases and word processors. There is an abundance of small herds and flocks in both industrialized and developing countries that are not recognized by more advanced official livestock recording programs but that are beginning to benefit from the use of micro computers and custom made herd management programs. Likewise the less popular breeds are also ignored by the official recording systems and thus are ripe for improving herd efficiency by applying micro computer technology.

Private services are now available that make micro computer applications available for operating breeding programs that are based on regular culling, selection and management. Such computer methods also provide registration and herdbook services for minor breeds, so called, and some basic performance recording, especially related to reproduction. These services should allow minor breeds or small populations of imported nucleus herds an opportunity to keep a gene pool in good condition and offset the usual discouragement and propaganda against the less popular methods of livestock breeding (FAO). This applies particularly to developing countries where no effort has been made, until recently through private efforts, for breed recognition and development.

Simple records and analysis in small populations can be very useful in increasing the productive efficiency of small populations and at the same time assure a sound method of conservation of genetic resources. This fits well the basic principles for the management of genetic resources. Millions of dollars are granted by

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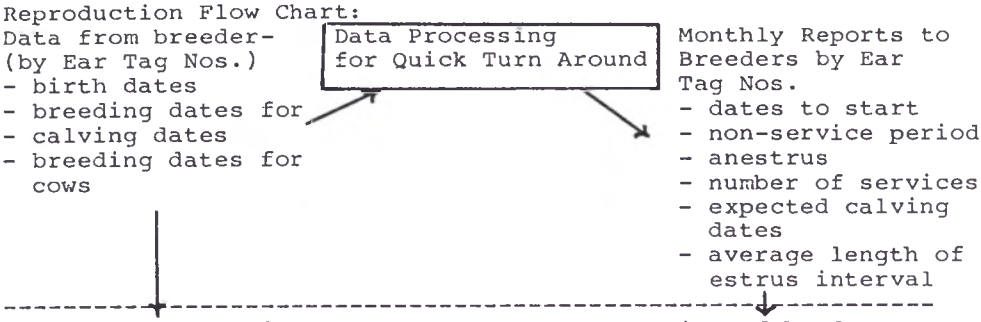
one UN organization to another for such conservation projects but there are no results in observable genetic resource protection. Obviously, it is quite likely that genetic resources will continue to erode despite tremendous official funding to prevent it, because of the influence of political and personal preferences influencing the use of the funds (Hickman,1982).

DESIGN OF RECORDING SYSTEMS

The following flowcharts indicate the kinds of results for the livestock breeder from different amounts of data inputs.

Reproduction Flow Chart:



By adding production records to the above a vast array of outputs can be generated. The possibilities are unlimited but for present purposes the most simple method of milk yield measurement will be cited namely: 1) Maximum daily yield in a lactation, and 2) drying off date.

Calculation of herd averages of the above and the average of these averages for the region give the breeder the within-herd rating of each cow and the within-region status of his herd. This is particularly helpful when even the simplest production data are submitted.

If input is augmented again with pedigree information, ie., the sire and dam ear tag number, then pedigree registration can be performed along with the issuance of registration certificates and compilation of a Herd Book which is easily constructed in the memory of a computer for reference by search commands for any piece of pedigree information.

When production and pedigree information is available registration can be controlled by production and reproduction records and deviations from herd average. This approach makes it abundantly possible for even the smallest populations to be continuously under selection pressure for performance and thus greatly adapted to the existing environment and management conditions.

Such recording systems and selection practices make it possible to fairly evaluate native or local stock. Too often when evaluations are made with imported breeds only the culls of native stock are used and thus the propaganda against local breeds and optimum levels of production persists.

RESULTS

The need for livestock recording operations comes from the objective of assuring high levels of offtake and output from herds and flocks with fixed levels of input. For this purpose records are divided into two basic categories, a) reproduction and b) production. These are certainly not separate biologically or economically but require distinctly different recording methods and operations.

Results show that individual production records can be misleading when breeding for maximum rate of commodity production per time period. Comparisons of native and exotic stock shows that daily milk shipments are negatively related to lactation yield. The same phenomenon has been observed for wool production per season and for lifetime production. This relationship seems to result from high production of milk and wool having an adverse effect on reproduction.

Figure 1 shows that for customary conditions in developing countries, or wherever livestock are maintained for supplement farming, the lowest cost of production is not likely the highest level of production. However, cost of production is impossible to estimate completely because the extreme genotypes (high nutritive intake popultaions) are normally provided with expensive barns and equipment. Alternately, adapted stocks have minimal overhead requirements and produce well on local feed which often has no market value. In addition, purchased feeds are often not available and require expensive storage facilities. But assuming equal level of rate of consumption and care, it is apparent that regular reproduction enables high daily levels of production. The high levels of individual production of exotic stock is not evident in daily rates of production because of reproductive failure. Much of this problem, according only to limited data to date, may result from the distinctly higher levels of dystocia in exotic stock in comparison to native stock and the unfamiliarity with such problems without special training and equipment that heretofore is not needed. Similar indirect effects on reproduction by the obviously higher levels of foot rot by exotic stock and also the unusual regular requirement of foot care which is usually lacking and feet of the unadapted stock reach critical lameness. The native and exotic animals in this analysis are in different herds so the comparisons are not unbiased by environmental herd effects. Also, the number of observations is very small.

Table 1

Rate and Amount of Production for Native and Exotic Breeds

YEAR	1	2	3	4	5
TRAIT					
Daily kg		10.9	10.5	10.4	10.0
Interval E		457	473	488	518
Lactation E	4000	5000	5000	5100	5150
Lactation N	2000	2100	2400	2450	3100
Interval N	442	427	427	427	411
Daily kg	4.5	4.9	5.6	5.7	7.5
D.E./D.N.		2.2	1.9	1.8	1.3

The high levels of individual production of exotic stock is not evident in daily rates of production because of the decreased rates of reproduction. The trends in Figure 1 show the results of recent

importation of high producing breeds into farms that have traditionally maintained only native stock. The trends will obviously change with time for those farmers that have been capable enough to cope with these biological problems as well as survive the obvious related financial losses.

Limitations in production measurements:

Small populations, especially in developing countries, are limited in data availability by the lack of convenient milk-fat analysis equipment. Most if not all of the research in livestock development associated with recording systems has been developed for only highly specialized and large scale operations. In consequence when special efforts are made to evaluate performance in non-recorded populations rather surprising results are obtained. For example, in Bhutan where the most popular breed is the native Siri the most important commodities are butter and cheese. However, the milk fat and protein content is very low, near 4 and 3 percent, respectively. Clearly, the only selection criteria over the centuries has been level of milk production which has, by lack of fat test records, lowered the fat content. To overcome this problem a cross-species procedure has been introduced by using Mithun bulls from India. This produces an excellent and prized milk cow, the milk of which is about 7 percent butterfat. The male Fl is a valued draft animal. Although this has provided a useful solution for commodity breedng in the Kingdom of Bhutan the fact is that the Mithun are in limited supply and the cost to the average milk producing farmer for a Mithun bull is becoming prohibitive. Thus a simple piece of equipment that would give a fairly accurate butterfat test measurement would make possible a much more useful purebred breeding program in Bhutan and all other developing countries suffering the same problem of not being able to properly evaluate breeding stock. Increased levels of specialization are not a good prospect so there is little justification for purchasing modern electronic milk testing devices. It is unfortunate that international developers do not take these basic problems of livestock development seriously and provide support for the research needed to develop proper genetic management.

The same kind of problem is evident when milking machines are introduced into traditional livestock production environments.It is true that when modern cows are imported for use in developing livestock industries, level and efficiency of milk production can be increased but for this to be successful milking machines and other modern management tools are needed as well. Without special attention to equipment maintenance, failure is inevitable. Milking machine pulsators in developing circumstances is a case in point. Figure 2 shows non-atypical tracings of pulsators on traditional farms for milking machine units after only less than a year of use. The problem here is that developers, realizing the unreliability of electricity, introduced the ind of pulsator that is outdated in the industrialized world and that operates on a vacuum activation rather on an electromagnet for modern equipment. It is known of course that these outdated pulsators were never perfected in the industrialized world. The results in milk production is not difficult to predict as indicated in Table 1. The design of a suitable pulsator for non-specialized conditions is not difficult but there

has been no incentive to encourage the needed development research.

CONCLUSIONS

Obviously it is only with reliable markets and favourably stable commodity prices that allows individually high production to become the preferred method of production. Generally, long term breeding programs at optimum levels of production allow genetic management that accumulates efficient genotypes. This concept is also supported by the domestic low or optimum level of individual level of milk production in New Zealand that has apparently produced by a population genotype of superior high production with forced feeding. (PL148 Holstein Strain Comparison,Poland)

Genetic research in native populations has not been popular in development projects and thus very little is known about the production potential of such stock under practical conditions. Unfortunately the usual way of evaluating native stock is to put them in a research station under care and management of foreign farming practices. This is not very helpful for promoting much needed genetic resource management programs as well as economic assessments of farmer production procedures under practical conditions. Because of this general lack of objectiveness in livestock development projects several results indicate the lack of suitable equipment for developing circumstances.

The policy regarding genetic resource management for livestock suggested by present results relies primarily on a recording and registry service for local breeds or nucleus herds(Hickman,1980). Accompanying such service is the breeding program design and culling and selection operations that are necessary for sound breed management. Unfortunately private or governmental development agencies do not participate in such livestock development programs. Until fair evaluations of base line prospects of commodity production are made it is impossible to assess the relative importance of different methods and courses of development(Barker, 1981). The general tendency is for international development agencies to discourage private enterprise involvement in favour of satisfying the public administrators or politicians with the introduction of agricultural practices from industrialized countries which is not in the best interests of the genetic needs for long term agricultural production.

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Figure 1 Trends in Production and Reproduction

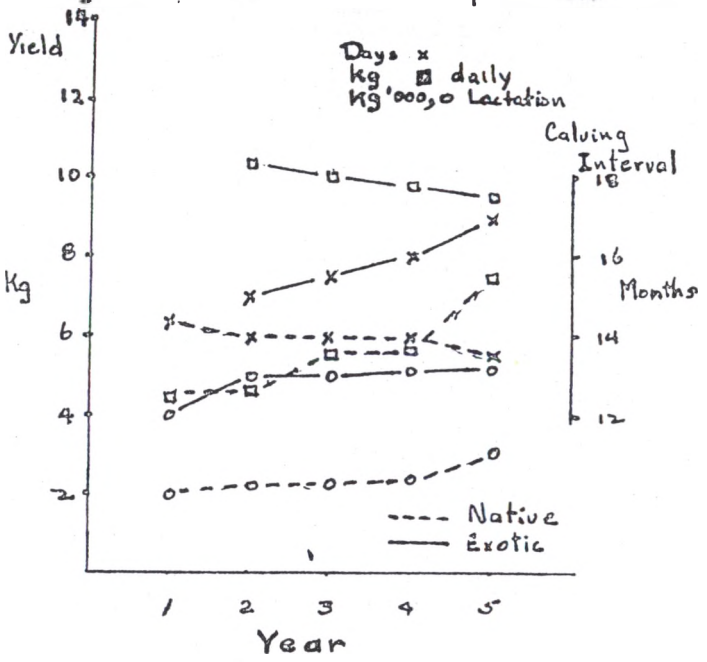

Figure 2 Pulsator Tracings on New Milking Machines