The Improvement of Livestock Production in Nigeria through Breeding

By

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INTRODUCTION

LIVESTOCK production is an important sector of economic activity in Nigeria. The current capital value of the Nigerian Livestock Industry is estimated as ₦2,000 million (50% in cattle; 35% in sheep and goats; 7% in poultry and the remaining 8% shared between pigs, horses and other domestic animals). Annual gross output at producer price has been estimated at ₦175 million.

Unlike agricultural crops which earn foreign exchange (₦234 million estimated for 1974/75) very little livestock or its products is exported (except for hides and skins which netted ₦4 million for 1974/75). The domestic demand for meat and animal products remains unsatisfied and Nigeria still imports annually up to ₦97 million worth of meat and live animals from neighbouring countries. With expected better education, increases in income and population it is reasonable to predict that there will be even greater demand for animal products. The need for improved livestock production is therefore obvious.

My paper will deal mostly with improvements through breeding i.e. raising the GENETIC potential for production in the trait of interest. Genetic improvement stands apart from all other methods. All the other methods of improvement involve some modification of the animals *external* environment. Breeding, on the other hand, concentrates on the animal: what it really is, what it received from its progenitors, and what it will pass on to its offsprings.

But before we go further, let us look at ways of measuring what we want to improve.

MEASURES OF LIVESTOCK PRODUCTIVITY

(a) Numbers

One way of measuring livestock productivity is by considering their numbers. All things being equal, a farmer who has 50 heads of cattle is capable of producing more beef than one who has 10. Table 1 shows figures based on a recent livestock population statistics issued by the Nigerian Livestock Development Council. It is clear from these numbers that the bulk of Nigerian cattle are found in the Northern States, most of the pigs which include exotic breeds are reared in the South; Sheep, Goats and Poultry are widely distributed throughout the country. The livestock population can also be related to the various vegetation zones in which they occur. As shown in Figure 1, Nigeria can be divided into 4 major vegetation zones. Detailed description of the climatic environment in each zone can be found in any standard geography text. What is of interest to us now is that these zones do not offer equal opportunity for livestock production. If the FAO animal equivalent unit (under each species name in Table 1) is used, it can be seen that the Coastal Mangrove and Fresh Water Swamp area support less than 1% of Nigerian Livestock population; the Forest and Derived Savanna, 6%; the Guinea Savanna, 24%; and the Sudan, about 70

TABLE 1

Nigerian Livestock Population: Thousand (adapted from: the NLDC report (1974))

State	Cattle 0.82	Goats 0.1	Sheep 0.1	Pigs 0.2	Poultry 0.01	Equivalent Animal Units (approx)	% approx
Benue Plateau 16.4.73	479	448	343	55	—	391	3.03
East Central 19.10.72	106	1,060	530	25	12,750	376	2.91
Kano 19.6.73	459	1,006	462	—	—	712	5.51
Kwara 13.2.73	132	201	178	20	—	148	1.15
Lagos 31.3.73	4	4	—	5	91	13	0.11
Mid West 16.3.73	18	504	105	38	3,499	117	0.91
North Central 6.10.72	750	2,000	900	40	7,500	973	7.52
North East 11.4.73	4,000	10,000	5,000	31	—	5,471	42.29
North West *16.3.73	2,162	10,810	8,648	—	—	3,675	28.41
Rivers 13.3.73	0.3	40	20	6	2,400	31	0.24
South East 24.10.73	22	212	95	24	1,512	69	0.53
Western 18.12.73	101	3,027	95	258	10,274	958	7.40
Total (thousand)	8,133	29,314	20,483	505	38,857	12,939	100

NB. 2. The decimal figures under each species heading is the FAO unit for the calculation of Animal Units.

Fig. 1 Primary Area of Cattle Breeds in Nigeria and Major Vegetation zones.

%. Obviously more livestock is found in the Sudan as against the other zones because the natural environment is the most favourable.

(b) Performance

Another method of measuring productivity is by giving the actual performance of an animal for the trait of interest. This method is more useful to the animal breeder. For one thing, it brings out the fact that animals do not have the same production potential with respect to any trait. Animals within a breed have different rates of growth, different milking abilities, different survival rates when exposed to same disease, etc. In other words there

is *variability* — the clay with which, as it were, the breeder works. Table 2 summarizes representative data on the performance of some of our livestock. In most cases the figures are from one research station. There is still need to plan exhaustive surveys and design good experiments to obtain good data on the limits of performance of our indigenous breeds of livestock.

Generally, it is much more informative to consider numbers as well as performance in evaluating livestock resources. As regards improvement, our aim should be to increase the number of high quality stock.

TABLE 2
Some performance data of exotic relative to indigenous breeds of dairy cattle and pigs at 3 University farms

Type of Stock	Trait	Local	Exotic		Source
		White Fulani	German Brown	German Holstein	
Dairy cattle	Birth weight (kg)	25.1	33 ± 4	29 ± 5	University of Ibadan
	Age of 1st calving (mo.)	46	36 ± 10	33 ± 7	
	Average 1st lactation	915	1925 ± 441	1856 ± 538	
	Best individual lact. yield	2951	3107	3671	
	Average length of life (No. of lact.)	5.8	—	—	
	Average milk fat %	5.6	3.9 ± 0.2	3.6 ± 0.2	
	Average solids-not-fat %	9.0	8.6 ± 0.3	8.5 ± 0.2	
Pigs			Local Black	Large White	University of Ghana
	Carcass length, cm.		56	77	
	Backfat depth, cm.		3.7	2.5	
	Loin eye area, sq. cm		21.9	23.8	
	Ham, kg.		4.9	9.2	
	Shoulder (untrimmed, kg. including butt)		5.6	8.1	
	Age at slaughter, days		206	258	
	Weight at slaughter, kg.		53	92	
	Gain/day, kg.		0.25	0.36	
	Bacon, kg.		2.4	5.5	
	Litter size at birth		7	9	
	" " " Weaning (35 days)		5	8	
	Average birth wt/pig, kg.		0.7	1.3	
	Average weaning wt/pig, kg.		9.9	14.5	

SOME IMPORTANT FEATURES OF GOOD ANIMAL BREEDING PROGRAMMES

A. We had earlier mentioned that increase in livestock productivity is possible by means other than breeding and it is usual for animal scientists to argue as to whether breeding is more important than nutrition, health and management; or whether animals should not be fed first or trypanosomiasis eradicated before breeding programmes can be initiated. Such arguments arise because the problem of livestock improvement is not being considered in its full dimension: under normal conditions, if a group of animals of same breed (even same parents) are fed to the same extent, they do not respond *equally* — some grow faster; or if the group is exposed to the same degree of stress by disease, some survive. *And because there will always be this differential performance under normal production conditions there should always be need for an animal breeder who should investigate the possible genetic basis of such differences and plan their exploitation.* Therefore the first feature of a good animal breeding programme is that it should have a scheme for identification of superior genotypes for selection.

B. It is conceivable that a breeder may not find any local animal that satisfies his production expectations. He may then look elsewhere for a breed that will introduce/increase the frequency of the desired gene. This is crossbreeding which can also result in hybrid vigor i.e. when the offspring exceeds the average performance of the parents with respect to some traits. It should be remembered here that usually the local animal has come to be the best adapted to the existing environment and introduction of exotic gene is usually at the expense of some costs, such as higher

feeds, health care etc. so that gains from crossbreeding should be weighed against these increased inputs.

C. A breeder may want to improve the reliability of breeding behaviour of his stock by inbreeding. Inbreeding can also be used in conjunction with crossbreeding for exploiting heterosis.

D. The breeder makes his inference from analysis of large volumes of good data. This is due to the indirect and random nature of the hereditary process. Let us illustrate why this is so with another random event which is simpler. If we toss a fair coin, we expect that it will fall head or tail (we rule out the possibility of its resting on its edge). The coin tossing experiment is a random event since after each toss the coin is just as likely to fall heads as it is to fall tails, just as in the case of inheritance when the allelic pair of genes separate and enter into separate egg or sperm cell which one of the pair enters which cell is a random event. Now, although it is possible in 10 tosses of the coin to get all heads, the coin is less likely to fall all heads in 100 tosses, and still much less likely to be all heads in 1,000 tosses unless the coin is not a fair one, i.e. is biased. After a large number of observations, one can discover certain laws about the population, e.g. we can say with confidence that in 1,000 tosses of a fair coin, the coin will fall heads about half the time; such statements are unreliable with small samples. Similarly, because of the random way the hereditary material is distributed, an offspring receives a random half of the genes of its parents. We consequently need to consider many of these samples in order to get a reliable estimate of the average genetic merit of the parent. When we use small numbers we cannot be sure that what we observe is not due to some fortuitous environmental conditions.

E. Though the male and female contribute equally to the genotype of their offspring, the male is by far more important to the breeder because of his "greater reach". If we take cattle as an example a really good female may leave up to 10 offsprings in her lifetime, the male on the other hand can, with the help of artificial insemination, leave up to 500,000 offsprings in his lifetime.

TWO EXAMPLES OF ANIMAL BREEDING PROGRAMMES FROM DEVELOPED COUNTRIES (U.S.A. & GERMANY)

Practically all developed countries have breeding programmes that combine most of the above features. Let us take dairy cattle for which progeny testing is the most accurate way of assessing the genetic merit of the sires.

In U.S.A., dairy farms are large and there is relatively widespread use of artificial insemination. Every quarter of a year the United States Department of Agriculture (U.S.D.A.) and the Dairy Herd Improvement Association put out Sire summaries. These summaries show, among other things, how a sire ranks relative to other sires for milk, butterfat and type. The ranks are calculated by comparing the production of the daughters of one sire with the production of her contemporaries. This aspect of sire selection is called sire proofing. Another crucial aspect of sire selection is the sampling of young bulls who will become the future sires. As semen of high-priced bulls are marketed by Artificial Insemination Organisation, they carry out the young sire sampling. One of such organisation is the American Breeders Service whose programme is outlined. The organisation samples about 100 young sires per

year. These are used as early as possible so as to obtain their first proof when they are about 5 years old. Each bull is bred to 200 cows in selected farm located all over U.S.A. The 200 cows settled should provide 50-60 daughters with reported lactations. Sampling this number of young sires (100) requires some 60,000 cows in the selected farms. The *sires* of the *young bulls* included in the sampling programmes must be $\pm$ 500 kg milk above breed average. The *dams* of the *young sires* must be:

- (i) Registered daughters of an AI-proven sire showing more than $\pm$ 250 kg superiority.
- (ii) Among the top 5% of daughters of this sire on the basis of her production.
- (iii) Pass in an on-the-farm inspection for overall desirability.

When the preliminary proof on the 100 sampled young bulls are ready the top 20% are selected for general A.I. service. Records are all the time kept on the production of the daughters of all bulls in service and the top 5% will again be selected as sires of future young sires to sample.

In Germany, the herds are not as large and A.I. is not as widespread but the programme for sire selection is remarkably similar. One feature of their programme worth mentioning here is the control of males. By law, all males must be licensed. Only males who have licenses can be bought by farmers at auction. When a male is being licensed it is assigned to a class (1-4). The class an individual belongs to will indicate how widely he can be used i.e. Number 4 implies the animal can be used in only *one* herd while Number 1 implies as wide a use as possible. Fig. 2 shows the programme of one of the States for selecting as well as generating young sires for the future.

Fig. 2

NIGERIAN LIVESTOCK BREEDING PROGRAMMES IN THE 3RD NATIONAL DEVELOPMENT PLAN (1975-80).

Both the Federal and State Governments recognise the importance of improving livestock in Nigeria and have allocated

considerable sums towards this end (N344 million for 1975-1980 period). All the livestock species have programmes planned at both levels during the period but it will not be particularly useful here to discuss these separately because most of the plans are similar and share common features. The programmes will therefore be discussed under 2 main headings.

(a) *Ruminants* (cattle, sheep and goats)

The programmes at both levels (Federal and States) envisage the establishment of (i) Ranches, (ii) Fattening centres (iii) Breeding cattle resistant to trypanosomiasis; and goats especially for dairying; (iv) Crossbreeding with exotic cattle, sheep (v) Supply of improved stock to farmers; (vi) Establishing of breeding and multiplication centres.

(b) *Non-Ruminants* (Pigs and Poultry)

Establishment of (i) Multiplication centres to supply good breeding stock to farmers.

There is no doubt that these plans, if well executed, have merit and will go a long way towards alleviating Nigeria's short term needs. It must be noted, however, that figures used in calculating extraction rates and hence animal protein availability may be way off and if recent experiences are anything to go by, we might be faced with serious gaps between production and requirements in the future.

With the non-ruminants one will agree that since the imported stock perform satisfactorily in our environment the main emphasis should be on their feed (especially as they compete directly with man). There is no reason why we should not, if we can, make use of improved stock developed elsewhere if they perform satisfactorily here. However, all imported stock are not of equal merit in our environment. It is, therefore, necessary for the breeder to assess their performance at various breed evaluation centres to ensure not only that the farmer gets the best stock but that he has enough of the best. At the same time, it might be useful to assess our local pigs and poultry under controlled conditions of breeding centres to determine if they possess any genes worth preserving.

As for the ruminants the picture is not so good. Without special care, imported ruminant stock quickly succumb to a host of environmental hazards. The programmes for these, therefore, need greater scrutiny. It will help in the exercise to remember what features had been enumerated as characterising good breeding programmes.

Ranching can be considered more an exercise in production than in breeding because there is not that much close attention on the animals for discrimination and selection as required in breeding. The same can be said for fattening. It is possible to envisage breeding activities running concurrently in ranches/fattening centres but usually the commercial objectives of these two enterprises run counter to those of rigid selection and culling that breeding requires, unless part of the enterprise is reserved specifically for breeding.

Crossbreeding either for new breed development, introduction of "resistant" gene or exploitation of heterosis, does not mean much unless selection is also practised. Although this method has considerable potential with ruminants there is little evidence that our Third, National Development Plan has any plans for generating, analysing and using data on which breeding decisions should be based. The general impression is that the designers of the development plan defined animal breeding as animal multiplication. This is an acceptable common usage of the word "breeding" but is not what it means to the practitioners of the science. Any animal breeding programme must have the mechanism to discriminate among animals in the population on basis of genetic differences between them.

SUGGESTIONS

1. There is an urgent need for trained personnel in the Science of Animal Breeding. Every breeding centre should have at least one trained animal breeder and some animal breeding assistants, depending on its size and programmes.

2. There should be some way of controlling the use of bulls. Since the Fulanis will more readily sell the bull than the female calf, use should be made of this fact. Bull calves could be purchased at subsidized prices. These calves should then be evaluated at various breeding centres scattered all over the country (more, of course, in the Northern States where there are more cattle). The selected bulls are made available to the cattle farmers; free to some selected

farmers but at a minimal fee to others. The selected farmers (criteria of selection defined by breeders) should sign an agreement to sell all bulls resulting from the mating to the breeding centres. This scheme will lead to

3. Data centre where information on the performance of these bulls from all the breeding centres are sent for recording, analysis and interpretation.

4. We start first with cattle; the plan, when operative, will serve both as a model as well as centres for organising breeding activities for our other farm livestock.

Such a scheme will generate large quantity of data which, as we have seen, is so essential for making valid breeding decisions; concentrate on the male, possess a mechanism for discriminating between animals and so is most likely to succeed.