GENETIC IMPROVEMENT IN MEDIUM TO LOW- INPUT SYSTEMS OF ANIMAL PRODUCTION- EXPERIENCES TO DATE: THE WEST AFRICAN EXPERIENCE

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INTRODUCTION

Historical overview. Rudimentary genetic improvement in livestock in West Africa predates the advent of the European colonialists. Traditional cattle keepers were known to improve the quality of their stock through the retention and exclusive use of outstanding bulls for breeding. Modern animal genetic improvement started with crossbreeding by colonial settlers. Crossbreeding was believed to produce faster results and so in the 1960s exotic-based crossbreeding was popular in the region. Lack of funds and the lack of adaptation of the crossbreds to the feed and health environment compromised the sustainability of crossbreeding in the region. Attention was then re-focused in the 1980s on improvement on local breeds, through straightbreeding.. However, these programmes were restricted to research stations and much of the gains realized were not transmitted to farmers' herds. In the 1990s, open nucleus breeding schemes (ONBS) were being advocated (Dempfle, 1993) and in few cases being implemented (Yapi-Gnaore *et al*., 1996). The objective of the current analysis is to use case studies in the region to illustrate the various genetic improvement approaches.

CASE STUDIES ON ANIMAL GENETIC IMPROVEMENTS

Crossbreeding involving exotic and indigenous breeds. Improvement in meat production has been an objective in many programmes. In the 1930s a programme based on imported Montbeliard and the local Gudali (*Bos indicus*) was initiated in Cameroon. The programme failed for reasons of lack of biological and socio-economic adaptation (Mbah, 1993). A second attempt in the 1950s, to incorporate Brahman genes into the Gudali produced genotypes highly susceptible to dermatophlilois, and therefore economically unsuitable for the environment. Ghana's attempt to improve meat production of the N'Dama by crossing with Red Poll and Gertrudis appeared to have produced encouraging results but the progeny were not transferred to farmers. With respect to milk production, several attempts were made in crossing various local cattle with exotic breeds. In the humid zone of Ghana, N'Dama cows were crossed with Holstein bulls to improve milk production after a pilot scheme on introduction of straightbred Holsteins failed (Kabuga and Agyemang, 1984). In Nigeria, the White Fulani, Gudali and Wadara were crossed with Friesians. These efforts were mainly undertaken on University stations and were generally considered a failure. Weak managerial capacity and excessive bureaucratic constraints were major contributing factors (Oluwadiya,1993). From 1960, efforts were made in Mali to create breeds with composition of 5/8 exotic and 3/8 local. Most of the crossbreds were found to have very low fitness and could not survive the production environment (Sangare, 1999). There are however a few success stories. Experiences from a private commercial farm at the Jos Plateau in Nigeria using crosses between the White Fulani and Friesians show that sustainable production is feasible where feed, drugs and managerial inputs are adequate

Crossbreeding involving indigenous animals. The objective has been to improve meat production and disease resistance. The production of heavier crosses for traction has also been an objective in some cases. The formation of the "Métis de Bambey" (3/16 Zebu Gobra and 13/16 N'Dama) in Senegal was undertaken by a government research station. Before the new genotype could be released on an extensive basis to farmers, the production environment for which the breed was developed had changed so much Zebu cattle had established their presence in the area. The programme was therefore terminated in 1980 (Mbaye, 1993).

Straightbreeding. Several straightbreeding programmes have been undertaken or are on-going in the region. Straightbreeding for Zebu cattle in Dahra, Senegal, started in the early 1960s and for N'Dama cattle in Kolda in 1969, have all stopped by the 1990s. The majority of these breeding programmes were initiated with donor funds that enabled the establishment of the required infrastructure and the recruitment of foreign expertise. Then the states took over the management of these programmes. There were seldom clearly defined national policies to back up breeding schemes. On the technical side, not only was the number of nucleus animals involved and the number of bulls produced yearly not large enough, but also the difficulties to disseminate the genetic material from stations to producers reduced the performance. An ONBS on small ruminants is on going in Bouake, Cote d' Ivoire (Yapi-Gnaore *et al*., 1996) since 1983. A contributing factor to the longevity of this programme rests upon the continuous financial support from the government, France and EEC from 1983 to 1998. In Ghana, ONBS for the Ashanti Black Forest pig and for the WASH, Djallonke sheep and the West African Dwarf (WAD) goats with financial support from the World Bank. In The Gambia N'Dama cattle, Djallonke sheep and (WAD) goats are being improved for meat, milk (in the case cattle and WAD) and for tolerance to trypanosomosis in a 3-tier nucleus scheme (station nucleus, multiplier, producer). These programmes, being implemented by the ITC have been running for approximately 8 years. The strengths of the scheme stem from its design and operation intended to overcome some of the limitations and constraints identified in previous programmes. (1) The breeding goals and selection criteria were determined taking into account the goals set by policy makers, the results of a large participatory rural appraisal study and the outcome of a model calculation deriving marginal profit, (2) the programme infrastructure and operation are designed to minimize the possibilities of selecting animals that might perform poorly in producers' flocks/herds (genotype by environment interaction). The conditions in nucleus and testing herds and flocks are made quite similar to those of farmers, (3) the programme places strong emphasis on the dissemination of the genetic material. With the collaboration of the Department of Livestock Services (DLS), multiplication herds and flocks have been established in villages and are being monitored regularly. The multiplication of superior males is undertaken in producers' herds and flocks. Central to the ITC approach for these breeding programmes is producers participation. This is being encouraged through not only screening operations but also through farmers training courses, field visits to the breeding facilities and the establishment of livestock breeders associations.

Targeted breeding programmes in support of peri-urban systems. Despite failures of crossbreeding initiatives**,** it is generally been accepted that under certain market considerations such programmes are justified. Based on this premise, a crossbreeding programme of cattle to

increase milk supplies to the city of Bamako, Mali has been in operation for the last 20 years. In Senegal, a government sponsored crossbreeding of producers' cows has been running since 1998. In The Gambia, a crossbreeding using semen of Jersey or Friesian with N'Dama has been in operation for 6 years. Bottlenecks identified so far are the inability of the ITC to meet the demand for the F1 cows from interested farmers. Logistics associated with the importation and storage of frozen semen continues to be a constraint in expanding the programme.

LESSONS LEARNT AND EXPERIENCED OBTAINED

Policy considerations. Prior to the 1980s and 1990s most of the countries in the West African region did not have coherent policies on animal genetic improvement (Ahunu, 1993; Oluwadiya, 1993; Fannieh, 1999). This has led to implementation of many ill advised cross breeding programmes (Cunningham, 1993). Most governments have since put together statements on livestock production and their role in human nutrition and their contribution to economic development. In many cases attention is now focused on the improvement of indigenous animals. Crossbreeding with exotic breeds is implemented only under careful defined conditions and clearly stated objectives. More countries are adopting open nucleus breeding with screening of animals from a larger population as an option. Mechanisms to diffuse improved genetic material and the awareness of the existence of such improved genotypes and services such as A.I. are also being considered in such policies.

Operational considerations. The causes of non-sustainability of breeding programmes in the West African region include inadequate or lack of sustained funding and poor management of breeding programmes. Whereas governments often do not have difficulties in starting projects usually funded under donor agreements or facilities, there appears to be lack of long-term commitment on the part of the decision-makers to secure funds on a sustained basis to run these programmes.

Technical and practical considerations. One of the major constraints to the achievement of genetic gains in a sustainable basis is the lack of well-trained manpower to run breeding programmes. The process of selection requires expertise trained to design affective mating plans, organize data collection, analyze and draw valid conclusions. The number of such trained personnel is relatively small in the region. At the level of breeding projects, there appears to be difficulties in the definition of breeding goals and selection criteria and they are rarely documented before programmes are implemented. A related problem is the lack of participation of stakeholders, especially producers, in the selection process. As a consequence of their non-participation, the station-based programmes often do not have mechanisms developed to disseminate genetic progress in producers' herd/ flocks.

CONCLUSIONS AND RECOMMENDATIONS

There appears to be a general consensus among policy makers and technical personnel that there is a need to look at indigenous animal resources when genetic improvements are planned. ONBS are being considered in policies now being formulated. However, expertise to implement such programmes appears to be lacking. The experiences obtained from pilot schemes in the Cote d'Ivoire and The Gambia can serve as models for other situations in the

region. Lack of funds is a recurring problem and is a major factor in the collapse of many animal improvement programmes. These failures seem to be a contributing factor to the rush to implement crossbreeding programmes, which also fail in the long run for reasons of inadequate funds and lack of adaptability of the new genotypes. The need for training of higher-level technicians should be stressed and the possibilities of using the expertise of the few well-trained personnel on the continent must be investigated. Finally, firmer commitments by Governments and donors to genetic improvement must be given a priority.

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