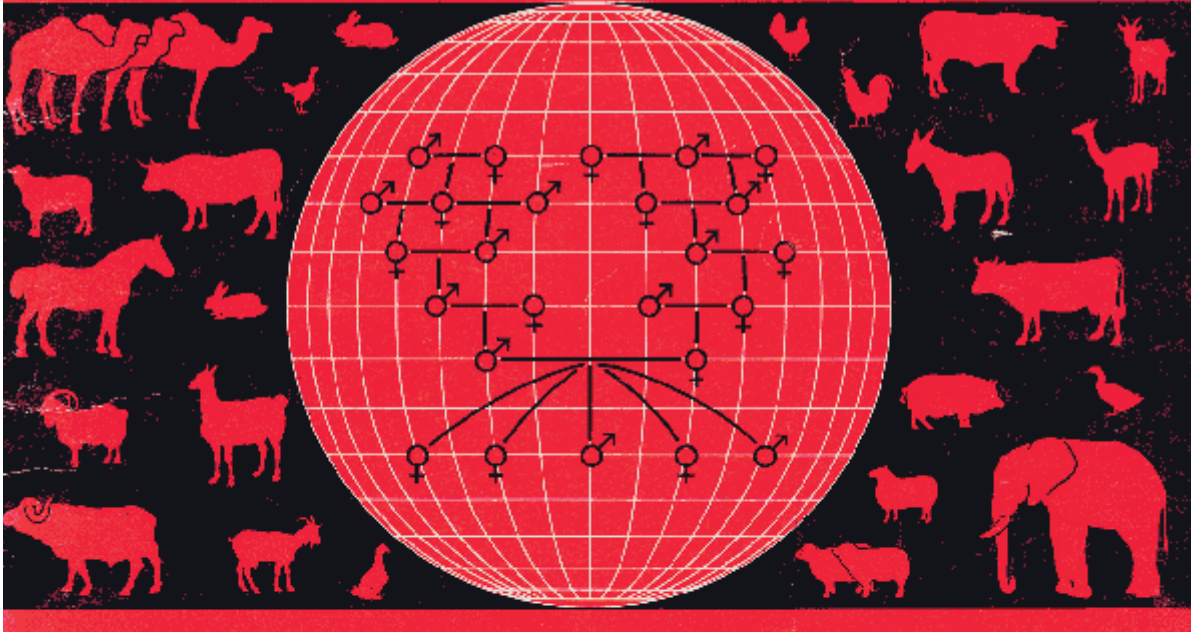
ANIMAL GENETIC RESOURCES INFORMATION

BULLETIN D'INFORMATION SUR LES RESSOURCES GÉNÉTIQUES ANIMALES

BOLETIN DE INFORMACION SOBRE RECURSOS GENETICOS ANIMALES

1/84



1/84

ANIMAL GENETIC RESOURCES INFORMATION

BULLETIN D'INFORMATION SUR LES RESSOURCES GENETIQUES ANIMALES

BOLETIN DE INFORMACION SOBRE RECURSOS GENETICOS ANIMALES

UNITED NATIONS ENVIRONMENT PROGRAMME
PROGRAMME DES NATIONS UNIES POUR, L'ENVIRONNEMENT
PROGRAMA DE LAS NACIONES UNIDAS PARA EL MEDIO AMBIENTE

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
ORGANISATION DES NATIONS UNIES POUR L'ALIMENTATION ET L'AGRICULTURE
ORGANIZACION DE LAS NACIONES UNIDAS PARA LA AGRICULTURA Y LA ALIMENTACION
Rome, Roma 1984

CONTENTS

Animal Genetic Resources Information is published under the joint auspices of the Food and Agriculture Organization of the United Nations (FAO) and the United Nations Environment Programme (UNEP). It is edited in the Animal Production Service of the Animal Production and Health Division of FAO and will appear twice yearly. It is available direct from FAO or through the usual FAO sales agents.

Le Bulletin d'informations sur les ressources génétiques animales est publié sous les auspices conjoints de l'organisation des Nations Unies pour 1'Alimentation et 1'Agriculture (FAO) et du Programme des Nations Unies pour 1'Environnement (UNEP). Cette publication semestrielle est editée par le Service de la Production Animale de la Division de la Production et de la Sante Animales de la FAO. On peut se la procurer directement au siege de la FAO ou auprés des depositaires et agents habituels de vente de publication de l'Organisation.

El Boletin de Información sobre Recursos Geniticos Animales se publica bajo 1os auspicios de la Organización de las Naciones Unidas para la Agricultura y la Alimentación (FAO) y de1 Programa de las Naciones Unidas para el Medio Ambiente (UNEP). Se edita en el Servicio de Producción Animal de la Dirección de Producción y Sanidad Animal de la FAO y aparece dos veces al año. Se puede obtener directamente de la FAO o a traves de sus agentes de venta habituales.

Editor-Editeur: John Hodges

Acknowledgment

The editor would like to thank Mr. I.L. Mason for his contribution to the production of this issue.

Remerciements

L'editeur tient á remercier M. I.L. Mason pour sa contribution à la redaction de ce numéro.

Agradecimientos

El editor desea agradecer al Sr. I.L. Mason por su valiosa contribución en la producción de este número.

EDITORIAL

A major step forward in the development of a global strategy for the Conservation and Management of Animal Genetic Resources Programme took place during the latter part of 1983. An Expert Panel of 36 eminent animal geneticists (see pages 37-39) was established jointly by FAO and UNEP and held its first meeting. The scientists have competence and experience in the different aspects of animal breeding and genetics. While they were appointed by virtue of their individual professional stature, and not as representatives of national governments, they are in fact drawn from 28 countries, and thus, are experienced in the needs, resources and opportunities of all parts of the world, including developing and developed, socialist and capitalist, north and south, tropical and temperate. They also have expertise in the major species of domestic animals and birds. Additionally they provide links with the various Regional Organizations engaged in animal breeding and genetic improvement work.

Their task is to advise the Director-General of FAO and the Executive Director of UNEP on all aspects of Animal Genetic Resources Conservation and Management. This work will be undertaken by periodic meetings, and by correspondence. The meetings will bring together those Panel Members best qualified to address the issues under consideration at that time. Approximately half the Panel Members were present at the first meeting in Rome in October 1983, a report of which is given on page 36.

The definition of Conservation was debated at the first meeting. The Panel affirmed and adopted the definition used by the World Conservation Strategy, which makes it clear that Conservation is not, as some have supposed, simply Preservation.

> Conservation is the management of human use of the biosphere so that it may yield the greatest sustainable benefit to present generations while maintaining its potential to meet the needs and aspirations of future generations. Thus conservation is positive, embracing preservation, maintenance, sustainable utilization, restoration and enhancement of natural resources.

This issue of AGRI provides prominence to the Criollo cattle, a unique animal genetic resource of the Americas, already threatened by the introduction both of other *Bos taurus* and also by Bos indicus cattle, but having much to offer in the future as well as having been immensely important in the past. The comprehensive review is therefore of greater length than normal for articles in this Newsletter because of the continuing importance of Criollo cattle in many countries of Latin America and the Caribbean.

GUTD E TO CONTRIBUTORS

Animal Genetic Resources Information will be pleased to receive contributions up to 3000 words long in English, French or Spanish. If accepted they will be published in the original language with summaries in the other two. Reports, news and notes about meetings, conservation and evaluation activities, and techniques, would be appreciated. Manuscripts should be typed in double space and accompanied by a summary of not more than 5 percent of the original length. Photopraphs are acceptable but only high quality black and white prints. AGRI will also review new books on animal genetic resources. Correspondence is invited.

All contributions should be addressed to:

The Editor, AGRI, AGAP, FAO,
Via delle Terme di Caracalla,
00100 Rome, Italy.

Le Bulletin d'information sur les ressources génétiques animales souhaite recevoir des articles en anglais, en francais ou en espagnol, de 3000 mots au maximum. Les communications publiies paraitront dans la langue originale avec des resumés dans les deux autres langues. Les rapports, informations et notes concernant les réunions et les activitks de conservation et d'évaluation et les techniques seraient particuliérement appréciés. Les manuscrits devront être dactylographiès en double interligne et accompagnès d'un résumé ne dépassant pas cinq pour cent de la longuer de l'original. Le Bulletin accepte les photographies à condition qu'il s'agisse de bonnes épreuves en noir et blanc. Le Bulletin rendra également compte des ouvrages nouvellement parus sur les ressources gènètiques animales. Un échange de corresporidance est le bienvenu.

Adresser toutes les contributions à l'adresse suivante:

L'Editeur, AGRI, AGAP, FAO,
Via delle Terme di Caracalla,
00100 Rome, Italie.

El Boletin de Información sobre Recursos Genéticos Animales recibirá con mucho gusto colaboraciones de hasta 3000 palabras de extensión en español, francés o inglés. Si son aceptadas, las contribuciones se publicarán en el idioma original junta con resúmenes en 1os otros dos idiomas interesa recibir informes, noticias y notas sobre reuniones, actividades de conservación y evaluación, y cuestiones técnicas. Los originales deberán presentarse mecanografíados a doble espacio y acompañados de un resumen que no supere el 5 por ento de is extensión original. Se aceptan fotografias, pero únicamente en blanco y negro y de buena calidad. AGRI también publicará reseñas de libros sobre recursos genéticos animales. Se solicita correspondencia.

Todas las contribuciones deberán dirigirse a:

El Editor, AGRI, AGAP FAO,
Via delle Terme di Caracalla,
00100 Roma, Italia.

ANIMAL GENETIC RESOURCES INFORMATION will be sent free of charge to those concerned with the conservation, management or utilization of domestic livestock. Anyone wishing to receive it regularly should send their name and address to The Editor, at the address on page vii.

BULLETIN D'INFORMATION SUR LES RESSOURCES GENETIQUES ANIMALES sera envoyé gratuitement aux personnes intéressées par la conservation, l'élevage ou l'exploitation du bétail domestique. Les personnes souhaitant recevoir cette publication régulièrement voudront bien faire parvenir leurs nom et adresse à l'éditeur, à l'adresse indiquee en page vii.

BOLETIN DE INFORMACION SOBRE RECURSOS GENETICOS ANIMALES será enviado gratuitamente a aquellos quienes sean interesados en la conservación, gestión 0 utilización del ganado domésticos. Si se desea recibirlo regularmente, se ruega comunicar nombre, apellido y dirección al Editor a la dirección indicada en la página vii.

CRIOLLO CATTLE OF THE AMERICAS

J.V. Wilkins
Centro de Investigación Agricola Tropical
Casilla 359, Santa Cruz, Bolivia

SUMMARY

The origin of the Criollo cattle of the Americas is described. Then a review is given of the Criollo in each of a number of different Latin American countries with their present known performances, their geographical distributions, numbers and improvement programmes.

RESUME

Cette note décrit l'origine des bovins Criollo que l'on trouve sur le continent americain et donne un apercu de leurs performances, de leur repartition géographique, de leurs effectifs et des programmes d'amélioration dans plusieurs pays latino-américains.

RESUMEN

Se describe el origen de los vacunos criollos de las Americas. Se hace luego un examen de los criollos de algunos países de América Latina con sus rendimientos actualmente conocidos, su distribución geográfica, número y programas de mejora.

* * * * * *

Criollo cattle are defined in this article as cattle in the Americas that are thought to be descended only from animals directly or indirectly imported from the Iberian Peninsula.

Cattle were first imported into the Americas in 1493 when Colombus landed cattle at the settlement he established on the north coast of Hispaniola. Rouse (1977) states that virtually all the ancestors of Criollo cattle that were to populate all of Latin America and what is now the southwest United States by the beginning of the 19th century, were landed in the first fifty years of colonization and numbered less than one thousand head.

The same author states that the majority of cattle were shipped from southwestern Spain and then describes the similarities of some Criollo cattle to the modern breeds of that area like the Retinta Andaluza and the Berrenda. However, Colombus loaded his cattle in the Canary Islands that had been settled by colonists from northern Spain some twenty years before. This shorter distance for transhipment to the Americas was obviously advantageous and the islands were to provide a source of cattle for many years. For example cattle were taken to Colombia from the islands in

1542 (Rubio 1976) and to San Antonio, Texas, in 1731 (Dobie 1941). It is therefore not surprising that Criollo cattle similar to the present day Galician and Asturian breeds of northern Spain can also be found.

Criollo cattle of the Caracú breed of Brazil are stated to have similar origins to the modern Minhota, Barrosã, Arouquesa and Mirandesa breeds (Carvalho Dias 1957). These are all breeds of northern Portugal and the Minhota is identical to the Galician breed. The similarities between the breeds of Brazil and Spanish speaking America may be explained by these close geographical origins.

Hill (1967) cites Santiago (0 zebú no Brazil. Anuaria dos Criadores 1 (1) 52-56 1960) as stating that the first cattle landed in Brazil were from Madeira and the Cape Verde islands and that they arrived in Saõ Vicente in 1534.

It is probable that the imported cattle were of very diverse colour and type as there is no record of selection for breeds by colour and conformation in Europe until the latter half of the 18th century. For example it is known that the colour frequency of cattle in Britain and the Netherlands changed dramatically between the 18th and 19th centuries. English auction records identifying cattle by colour in the 18th century list cattle of a wide range of colours many of which had disappeared by the late 19th century when atypical breed colours had been selected out. It may therefore be incorrect to suppose that the Iberian cattle imported to the Americas in the 16th century bore a close resemblance to the present day indigenous breeds of Spain and Portugal.

From the foregoing it is clear that Criollo cattle are not a breed but have a geographical origin in Spain and Portugal and multiplied in the Americas from what was a relatively small but very heterogeneous gene pool. Breeds have been selected from these cattle to form herds of uniform colour and conformation. However, there is a very large population of unselected Criollo cattle in the Andes and they are of every colour and pattern that exists in *Bos taurus* (Rabasa *et al.* 1976).

A typical horn shape can be described although variation in shape and size exist. In females, the horns commence growth laterally and then curve forward. The horn growth is also twisted so that subsequent growth is then upward. This may continue in an outward spiral. In males, the degree of twisting in the horn growth is much less or is absent so that the horns grow out laterally and then curve forward with little or no twist.

The one characteristic which appears to be universal in the Criollo population is extreme docility. This character is not easy to measure or compare and is, of course, greatly affected by management. However, under the same management, Criollo cattle are usually more docile than zebus. As an example, on a ranch in the Bolivian Chaco which has 3000 head of cattle, the animals are managed extensively and worked with horse and lasso. Nevertheless a stranger can readily approach the cattle on foot to within five metres in open country without causing any sign of alarm. On the same ranch, a group of Guzerat (Kankrej) calves were bought and hand fed in a paddock near the house for ten months. Three months after release to the extensive system and running with the Criollos the Guzerat cattle cannot be approached closer than 70 metres on foot without taking flight though the Criollo cattle in the same herd remain placid. Selection for the corrida (bull fight) has shown that temperament is heritable and it may be postulated that the most important characteristic for a buyer of cattle in Spain

The white face is not dominant in Criollo cattle

or Portugal for shipment to the Americas in the sixteenth century was extreme docility to facilitate loading and transport under extremely difficult conditions in small and fragile ships.

Perhaps the superior shipping conditions of the 19th century permitted the Brazilians to import zebu cattle from India of a less placid temperament. In any event, these cattle would have been individually handled since birth and their behaviour patterns under an extensive system untested, unlike the cattle of 15th century Spain where extensive cattle management was common (Bishko 1952).

Criollo cattle also differ from zebus under extensive management in their grazing habits. While zebu cattle prefer to graze as a close herd, Criollos have a much weaker herd instinct and individuals will graze or browse considerable distances from other members of the herd. This is advantageous, for example, in the Bolivian chaco where browse is scarce but makes the mustering of the cattle in the thick thorn bush extremely difficult and is only feasible when the cattle draw to water or salt.

Although the number of cattle imported from Spain into the Americas may be debated it cannot have been large due to the small size of ships involved and the great distance. It is certain, however, that the multiplication of cattle on the Caribbean islands and subsequently on the mainland was very rapid and has been described as a biological wonder (de Alba 1978). By the beginning of the 19th century the original population had multiplied to millions and now populated the Americas from the north of Mexico (then stretching to southern Oregon) to southern Argentina in a very wide range of environments. The relationship between the Texas Longhorn in the north and the Argentine Criollo in the south of this huge area was confirmed by Quintero (1976) who compared the results of his study of genetic markers in Argentina Criollos with the results of a similar study made by Miller (1966) on Texas Longhorns.

This rapid multiplication raises an interesting query. It has been said (for

example Abreu et al. 1977) that the Criollo has become adapted to the various environments of the Americas by natural selection. It may be argued that little natural selection can take place in a population whose rate of multiplication must have been close to maximum. Salazar and Cardozo (1981) state that many Spanish cattle at the end of the 15th century were the descendants of cattle brought from Africa and the Near East. They suggest that the Iberian peninsular was a point for further dispersion of cattle exotic to Spain that were being shipped to an environment in the Americas to which they were already more adapted than to that of Spain where they had been established a relatively short time. This is in contradiction to Rouse (1977) who states that importations of North African cattle to Spain by the Moors were neither numerous nor important in their effect.

Whatever the truth of the origins of Criollo cattle, the rapid multiplication in a wide variety of environments is certain and for social and political reasons it is probable that artificial selection only took place in isolated pockets until the middle of the nineteenth century. For example Gonzalez (1976) states that it is agreed that the Jesuits on the llanos of eastern Colombia "lavished the most care" on the San Martinero breed of Criollo which bears the name of a Jesuit mission in the area and as the expulsion of the Jesuits from the Spanish empire took place in 1769, any selection must have taken place before that date. Botero (1976) gives an even earlier date for the foundation of another Colombian breed the Blanco Orejinegro (the Black-eared White) but cites no evidence for this. This breed's colour is not rare in unselected Criollo cattle and the foundation of a breed with this appearance would not be difficult nor need be of long duration.

With the spread of knowledge of cattle breeding from northern Europe in the 19th century, cattlemen in the Americas generally preferred to import improved animals from northwestern Europe to grade up their unselected Criollos rather than to select and improve the stock that they owned and which after three hundred years could now be called native. In the temperate zones of the Americas this crossing was successful and resulted in a rapid decline in the pure Criollo population. At the same time, zebu cattle from India were being imported into Brazil. The zebu crossed with the Criollo led to increased productivity in the tropical areas in the first generations and this success led to massive zebu importations into all tropical America.

These twin importations resulted in the Criollo, in its pure form, disappearing completely from many areas and remaining only in the hands of a few enthusiastic breeders, in isolated communities, and in those areas where neither zebus nor northern European cattle breed thrive, for example in the semi-arid Andes and to a lesser extent the Argentine and Bolivian Chaco.

Most investigation and selection has been carried out on Criollo cattle selected by colour and performance into breeds in certain geographically well defined areas, for example the Rivas province of Nicaragua, the Rio Limon area of Zulia, Venezuela, and eastern Brazil.

Although much work has been done on Criollo cattle (Muller-Haye 1977), the results have often been published in journals that do not have wide circulation. Studies and articles by Pearson et al.(1968), Stonaker (1971), Lemka e-t al.(1973), Pearson (1974) and de Alba (1978) are readily available and FAO's Animal Production and Health Paper 22 (1981), Recursos Genéticos Animales en América Latina, contains reviews of results obtained in various Latin American countries of which Bodisco and Abreu's

Milk Production from pure Criollo cattle and Plasse's "The Use of Criollo Cattle in Crossbreeding Programmes for Meat Production in Latin America" must be considered authoritative. For this reason this article will try to avoid being a review of those articles and will attempt to complement them.

Criollo cattle are now being conserved for several purposes in a number of very different environments and selection in many cases is for subsequent use in crossbreeding programmes. Where these programmes are designed for milk production the animals are being bred for use in crossbreeding schemes with European breeds of dairy cattle and the fitness of the Criollo for this purpose should be compared with that of the zebu because the object is to combine the adaptability of the tropical breed with the high performance of the European dairy breed. The author is not aware of any studies that compare the performance of say Holstein/Gir and Holstein/Criollo cattle and it may be postulated that the zebu crossbred should be superior because of greater heterosis. The more docile temperament of the Criollo is often given as an advantage of the breed - the zebu in Latin America has a reputation for wildness and many small farmers do not wish to purchase zebu crossbreds for this reason. Nevertheless, the use of scarce resources for the conservation of the Criollo for dairy purposes is most easily justified in those countries with few if any dairy zebus.

The other common use of the Criollo is in crossbreeding with zebus for beef production. The benefits that accrue to this cross are increased fertility, reduced calf mortality and increased speed of growth over both parent breeds (Plasse 1981).

It may be that if a Dairy Criollo breed can be formed in which the cows give a total of 2000 litres of milk per year including the calf's consumption, this type of animal may be the most desirable for small farmers in isolated areas where crossbreeding is impossible due to small herd size and absence of an AI scheme. This may be more desirable than the use of crossbred bulls on crossbred cows and the resultant high variation in many characteristics of the progeny.

Whatever the purpose, the Criollo must be selected by modern, well established means. Few countries in the Americas can afford to keep conservation herds maintaining the "breed" in its original heterogeneous state as the Texas Longhorn, a Criollo breed, is maintained in the Wichita Mountains Wild Life Refuge, Oklahoma. This inevitably means that the population must have a minimum size to permit intensive selection without inbreeding and to have an impact on the livestock industry of the zone.

The current situation is summarized in Tables 1 and 2.

CRIOLLO CATTLE IN BRAZIL

Athanassof (1957) describes eight Criollo breeds but not the polled Mocho Nacional that is believed to have been bred from both Criollo and zebu cattle and therefore does not fall within the definition of a Criollo in this article. Of the eight breeds detailed by Athanassof only the Caracú still has importance (Hill 1967). A herdbook was formed for this breed in 1916 and both the government and the breed society are active in the breed's conservation and improvement. A survey of breeders in 1981 lists 32 owning 6195 cows (Freitas Trovo and Moura Duarte 1981). The majority of breeders maintain these cattle for beef production but one farm with 1100 cows that are milked with the calves at foot has been the subject of several studies by staff of the Universidad Federal di Minas Gerais (Pereira et al. 1978; 1979a; 1979b; 1979c; 1980).

Table MAJOR BEEF HERDS OF CRIOLLO CATTLE IN LATIN AMERICA

Country	Location	No. of cows
Argentina	Leales, Tucumán	200
Bolivia	Espiritu, Beni	600
Brazil	Caracú Breeders' Association, São Paulo	6195
Colombia	Turipaná	300-400
	Granja Iracá	200
Cuba	Oriente	6000
Venezuela	Calabozo	150

Table 2 MAJOR DAIRY HERDS OF CRIOLLO CATTLE IN LATIN AMERICA

Country	Location	No. of cows
Bolivia	Saavedra, Santa Cruz	65
	Chapare, Cochabamba	40
Brazil	Pocos de Caldas, M.G.	1100
Colombia	Cereté, Córdoba	360
	"El Nus", Antioquiá	300
Costa Rica	CATIE, Turrialba	35
Cuba	Oriente	6000
Dominican Republic	Santiago de los Caballeros	100
Guatemala	"El Aguacate"	250
Mexico	Tampico	40
Venezuela	Carrasquero, Zulia	200

Criollo bull of Caracú breed in Pocos de Caldas, M.G., Brazil

The property is the very well managed Fazenda Recreio in Pocos de Caldas, M.GP, of Sr. Ernesto Carvalho Dias. It is situated at an altitude between 900 and 1500 metres and has a mean annual temperature and rainfall of 18°C and 1500 mm. The average lactation milk yield is 1767 litres in 304 days. This is believed to include an estimate of the calf's milk consumption. In beef herds adult male and female liveweights are 800-1020 kg and 500-600 kg respectively (Hill 1967).

CRIOLLO CATTLE IN CUBA

Rouse (1977) states that the Cuban Criollo is the largest unhumped breed in tropical America, the females being about 540 kg and the males 820 kg on well managed properties. The speed of growth of Criollo steers relative to other breeds has been studied (Willis and Preston 1968) and their rate of growth and food conversion were shown to be superior to those of Brahman steers.

In 1972 it was estimated that there were 80 000 Criollo cattle in Cuba but the country is concentrating on the Gir breed for crossbreeding with European dairy breeds for milk production (Prada 1979). Nevertheless, Rouse (1977) reports that Criollo herds have averaged 2800 kg of milk in a 244-day lactation and that state farms are selecting the breed for dual-purpose milk and beef production. Semen of Cuban Criollo bulls has recently been exported under the auspices of FAO.

CRIOLLO CATTLE IN COSTA RICA

Criollo cattle have negligible importance in Costa Rica with the exception of the herd of the Centro Agronómico Tropical de Investigación y Enseñanza (CATIE), Turrialba, which exports far more semen than is used within the country and certainly has a larger impact abroad than within the Republic. Its foundation in 1950 is described by de Alba (1978) and it is interesting to note that the present herd is largely descended from cattle purchased in the Rivas province of Nicaragua. A particularly productive strain was obtained from the Lopez Carazo Asylum for the Aged in Rivas. The asylum's herd was dispersed after the first purchase and further important purchases of bulls were made from the herd of Don Joaquin Reyna of the same province. This herd is also now dispersed. Cows were also bought from Honduras most of which were subsequently culled and a few purchases were made in Costa Rica.

The breed known as the Central American Dairy Criollo or the Tropical Dairy Criollo was thus formed at Turrialba. It should be noted that the Criollo herd at Maracay, Venezuela, was being formed at the same time and though this herd was to form the basis for the improved Limonero Criollo breed in that country, cattle were also purchased in Nicaragua for the purpose. As will be seen subsequently, the cattle from Rivas province in Nicaragua have descendants in Mexico, Venezuela, Bolivia and the Dominican Republic as well as in Costa Rica.

De Alba's description of the Tropical Dairy Criollo is worth giving in full as it will serve for the Limonero of Venezuela, the red Criollo breeds of Colombia and the Yacumeña of Bolivia.

"The Tropical Dairy Criollo has a uniformly pigmented skin, very short hair and a lower number of hair follicles per skin area than European and zebu breeds. Coat colours vary from light dun to deep red with black markings on the extremities and around the eyes - more pronounced in bulls than in cows. A very distinctive feature is

the light tail switch and the wrinkles of the skin around the eyes, or even between the horns. The skin is thick and possesses abundant sweat glands. The configuration is angular with a deep barrel and well sprung ribs."

While a uniform red colour is desired, cattle with white patches occur. Calves with white patches have been born to parents both of whom are red in Turrialba bred cattle and in the unrelated Yacumeiio Criollo of Bolivia indicating a recessive gene in the whole population.

Unfortunately the herd was not permitted to expand in size due to the need to carry out crossbreeding and beef production investigation and in order to maintain a high average lactation yield. There are currently less than forty adult females in the herd so that progeny testing has not been possible within the herd nor practised outside it. Bulls have been selected on dam performance and in a small closed herd virtually all young bulls are related. This is doubly unfortunate as other countries have attempted to base their initial Criollo breeding programmes on semen imported from Turrialba. Nevertheless, the herd is one of the most productive dairy Criollo herds in Latin America and the heavy selection for dairy temperament has ensured that the cows can be milked in the absence of the calf, although first calving cows are constantly having to be culled for low yield probably due to poor dairy temperament.

Alvarez (1977) demonstrated the superiority of the first cross Jersey/Criollo over both parents for milk yield and fertility at Turrialba as shown in Table 3.

Table 3 MILK PRODUCTION OF CRIOLLO, JERSEY AND F_1 CATTLE IN TURRIALBA, 1949-74

Breed	No.	Lactation Yield kg	Calving interval (days)
Criollo	1117	1382	384
Jersey	433	2180	387
F_1	397	2221	378

Source: Alvarez et al. 1977

Costa Rica possesses an indigenous beef breed, the Doran, that is referred to as a Criollo although it is alleged to be descended from British Shorthorn cattle and its name is said to be a corruption of Durham. It is white with red speckling or patching that is common in Criollo cattle and there is little or nothing in the breed's physical appearance to confirm its supposed British origins.

CRIOLLO CATTLE IN THE DOMINICAN REPUBLIC

The Centro de Investigación y Mejoramiento de Producción Animal (CIMPA) in Santiago de los Caballeros began a programme for the conservation and improvement of the Dominican Criollo cattle in 1977 and de Alba (1978) stated that this programme has the best chance of success of the Criollo programmes that he discusses. The 100-cow herd has an average lactation yield to May 1981 of 1521 +—617 kg in 326 ± 89 days with a calving interval of 505 121 days (author's data). The cows are milked with the calf at foot so that this milk yield compares very favourably with yields of Criollo cattle

elsewhere. The long calving interval is ascribed to the fact that the majority of cows are old, aged cows being the only Criollo cows available for purchase when the programme commenced.

Since the beginning of the project only semen from the herd at Turrialba, Costa Rica, has been used and it is intended to use the male progeny from the best cows subsequently. As the Turrialba herd is small and the majority of bulls related, the probability of increasing inbreeding is high although, as the purpose of the herd is to produce bulls for crossbreeding with the Holstein and Brown Swiss breeds, this may not be very disadvantageous. The importation of semen from south of the Panama Canal is not permitted for veterinary control reasons so the only alternative sources of bulls are in Cuba, Guatemala and Mexico or bulls of totally unknown merit bought in the country. This problem and the alternative solutions for this herd are similar to those of the Bolivian Criollo project which will be discussed in a subsequent article in AGRI.

CRIOLLO CATTLE IN MEXICO

Although Mexican Criollo cattle were taken to the Wichita Mountain Wild Life Refuge, Oklahoma, to widen the genetic base of the Texas Longhorn there, they are now becoming rare in Mexico. Rouse (1977) stated that while the Criollo breed of Chinampo cattle still existed in Baja California, they are being eliminated rapidly by crossing with zebus.

In 1964 a herd of 18 Criollo cows from the herd of Don Joaquin Reyna of Rivas Province, Nicaragua, and two bulls from Turrialba were transported to Mexico. These with 35 Mexican Criollo cows from Guerrero and Oaxaca were formed into a nucleus herd by the Asociación Mexicana de Produccón Animal that was ultimately based at El Apuro near Tampico in 1973. De Alba (1978) reports that the average lactation yield in 1976 was 1328 kg on once daily milking with no concentrates being fed.

Crossbreeding for milk production is being carried out at the centre using Criollo, Jersey and Brown Swiss breeds.

CRIOLLO CATTLE IN GUATEMALA

Melgar (1978) reported that a herd of some 900 selected Criollo cattle were maintained at the Hacienda El Aguacate 3 km from the Pacific coast at an altitude of 45 metres in a hot dry tropical climate. The bulls measured 150 cm at the shoulder and the females 145. Adult male and female weights are 725-900 kg and 400-540 kg respectively. The colour of the animals ranges from light to dark brown with a short glossy coat. The horns are of medium size and the temperament is docile.

The heifers are reported to be first mated at 2-2$_{1/2}$ years of age and the average calving interval is 13 months.

The cows are milked once a day with the calf at foot and average daily yields are said to be 6-8 litres with a lactation length of 210 days.

Steers are sold for slaughter at 2-3 years at a weight of 400-500 kg. Castrates are also sold as work oxen.

The animals tolerate flooding and are said never to show symptoms of anaplasmosis and babesiosis.

EL SALVADOR, NICARAGUA, HONDURAS AND PANAMA

Nothing is known of the current situation in Nicaragua regarding Criollo cattle but the herds of the Lopez Carazo Asylum for the Aged and of Don Joaquin Reyna have been dispersed. Semen has been exported to Nicaragua, Honduras' and Panama from the Criollo herd at Turrialba, Costa Rica, but no information exists in Costa Rica about its subsequent use.

A programme for the conservation and improvement of Criollo cattle in El Salvador was recommended in 1977 (Maule 1979) and semen was imported for this purpose from Turrialba. It is supposed that the programme is a casualty of recent political events.

CRIOLLO CATTLE IN VENEZUELA

The two important herds of Criollo cattle in Venezuela have the same origin, although one herd is selected for dairy characteristics and one for beef. Both herds were formed from the Criollo herd that was founded at Maracay in 1954. The Maracay herd was formed from purchases made in Venezuela, Costa Rica and Nicaragua, and therefore was partially related to the Turrialba herd in Costa Rica.

A group of cattle with undesirable dairy characteristics was transferred from Maracay to Calabozo in the central plains of Venezuela in 1966 in order to form a beef herd to use in crossbreeding studies with zebu and European breeds. A group of pure Criollo cattle is maintained as a control and a resume of the results of this ongoing work is given by Plasse (1981).

The greater part of the Maracay herd was transferred to Carrasquero in 1967. This station is northwest of Maracaibo near the Rio Limon in an area where Criollo cattle are still numerous giving the breed the name Limonero. The zone has a mean

Criollo cow at Carrasquero, Venezuela

annual temperature and rainfall of 27.4°C and 920 mm. The work undertaken at Carrasquero and Maracay has been reviewed by Abreu et al. (1977).

The Limonero breed is red in colour and similar to the Central American Criollo (to which it is related) and to the Costeño con Cuernos breed. The herd at Carrasquero contains some 200 adult females that are milked in the absence of the calf. The Carrasquero station is a centre for an artificial insemination and livestock recording programme for 10 neighbouring farms with 3000 adult Criollo females and the possibilities for progeny testing Criollo bulls by contemporary comparison are the best in the continent. The current mean lactation yield of Criollo cows on the cooperating farms is 1720 kg (Abreu et al. 1977) which compares with 1897 kg for the cows on the station (Muñoz and Deaton 1981).

CRIOLLO CATTLE IN COLOMBIA

An authoritative account of the four important Colombian Criollo breeds has been published by the Institute Colombiano Agropecuario (Hernandez ***et al. 1976)***.

Both the Romosinuano and Costeño con Cuernos are red breeds of cattle from the hot humid Caribbean coast of Colombia. The Romosinuano is a polled breed from the lower valley of the Sinú river and has been selected for beef production at the National Agricultural Investigation Centre, Turipana, near Cerete, Cordoba. This station has a closed herd of 300-400 cows. A small number of private herds exists and a breeders' association has been formed.

The Costeño con Cuernos, as its name implies, is horned and is found on the coastal plains. A government herd is maintained on 400 hectares at the same station as the Romosinuano in Cerete, Cordoba, with a mean annual temperature, rainfall and elevation of 27.5°C, 1233 mm and 12 m respectively. Rubio (1976) shows that milk let-down is a problem in the breed as indicated in Table 4 for lactations recorded between 1960 and 1966.

Table 4 MILK PRODUCTION OF COSTEÑO CON CUERNOS CATTLE

	Cows milked with calf at foot	Cows milked without calf at foot
No. of lactations	376	789
Mean lactation length (days)	266 +- 42	93 +-26
Mean lactation yield (kg)	996 +-154	296 +- 94

Source: Rubio 1976

In the period 1967-72 the mean lactation length and lactation yield for the cows milked in the absence of their calves had risen to 177 ± 77 days and 768 t 396 kg. The high variation in lactation yield and length of the cows milked in the absence of their calves suggests that improvement by selection would be possible but no progeny testing of bulls for dairy characteristics has taken place.

The advantages to be gained by crossbreeding with Holstein cattle are shown in the same study.

Table 5 CROSSBREEDING WITH COSTEÑO CON CUERNOS CATTLE

	Holstein	Costeño con Cuernos	F_1
Lactation length (days)	294	177	275
Lactation yield (kg)	1950	396	2000
Fertility (%)	41.1	74.6	71.9
First calving age (months)	33	38	31
Calving interval (days)	505	453	426

Source: Rubio 1976

Rubio (1976) believes that a total of 7500 pure Costeño con Cuernos still exist in the area despite much crossing.

The third red Criollo breed in Colombia is the San Martinero from the eastern lowlands of the country, a zone which has a mean annual temperature and rainfall of 23-25°C and 3000-3500 mm. This is exclusively a beef breed and is much used in crossing with zebu cattle. The advantages of crossing are shown by Gonzalez (1976).

Table 6 CROSSBREEDING SAN MARTINERO CATTLE FOR BEEF PRODUCTION

	San Martinero	Zebu	F_1 Zebu sire	F_1 Zebu dam
Birth weight (kg)	29	26	33	27
Weaning weight (kg)	175	179	195	189
18-month weight (kg)	222	224	253	262

Source: Gonzales 1976

When Charolais bulls were used on San Martinero, and both types of F_1 femaies, the following results were achieved.

Table 7 CROSSBREEDING WITH CHAROLAIS BULLS

	San Martinero	F_1 Zebu sire	F_1 Zebu dam
Birth weight (kg)	32	30	30
Weaning weight (kg)	180	213	181
18-month weight (kg)	221	266	260

Source: Gonzales 1976

The fourth Colombian breed of importance is the Blanco Orejinegro (the black-eared white) of the foothills of the central and western Cordillera that have an elevation of 800 to 1800 metres, a mean annual temperature of 18-24°C and a mean annual

rainfall of 1800 mm. The skin of the breed is pigmented and its hair colour is white with black ears and muzzle and frequently with some black spotting. This colour is not rare among unselected Criollo cattle and is similar to the Berrenda breed of Spain.

The breed was the subject of a study by Pearson et al. (1968) and Lemka et al. (1973) studied it and the Costeño con Cuernos in a comparison with two Indian zebu breeds.

A government herd is maintained at the El Nu station, Antioquia where it is also used in crossbreeding investigations with the Jersey and Holstein breeds.

The breed's prime importance would appear to be its high resistance to the parasite *Dermatobia hominis*, even when compared with another Criollo breed, the Costeiio con Cuernos.

The breed is normally milked with the calf at foot to stimulate milk flow. Zapata and Serrano (1972) injected lactating cows with 10 i.u. of oxytocin after milking and remilked the cows forty seconds later. The results are shown in Table 8.

Table 8 EFFECT OF INJECTING OXYTOCIN IN BLANC0 OREJINEGRO COWS

System	Residual Milk (%) Beginning of lactation	Middle of lactation	End of lactation
Twice per day milking without calf	63.9	65.0	*77.9*
1 milking with calf	15.6	*17.8*	*21.8*
2 milkings with calf	*30.0*	*29.1*	*38.5*

Source: Zapata and Serrano 1972

The same authors showed that the lactation yield and weaned calf weight were highest when the cows were milked twice per day and two diagonal quarters were milked in the morning and the remaining two in the afternoon, the calf suckling after milking.

Milk yield would appear to be modest and Gonzalez (1976) cites mean lactation yields of 220 to 656 kg when cows were milked without calves to 368 to 1120 kg when milked with the calf at foot. The same author shows that crossbred Jersey and Holstein cattle yield more than the pure Blanco Orejinegro but does not give comparative yields for pure Jersey and Holstein in the same environment.

CRIOLLO CATTLE IN ECUADOR

Although Criollo cattle on small farms are not rare in the Sierra of Ecuador they are rapidly disappearing through crossbreeding and are no longer to be found on the coastal plains. However, a herd of 200 cows is maintained on the Tropical Agricultural Experimental Station of Pichilingue, Quevedo.

CRIOLLO CATTLE IN PERU

Although Peru has many hundreds of thousands of Criollo cattle in the Sierra, no investigations, conservation or improvement are believed to be underway. Hoislein cattle are kept very successfully on irrigated alfalfa on the cool dry coastal plain and Holstein and Brown Swiss cattle are also maintained without serious problems in the more favourable parts of the Andes leaving the Criollo in the harshest cold semi-arid zones of the mountains. The forest lands of the Amazon basin that are now being cleared are being stocked with zebu cattle that. are certainly better adapted to the humid tropics than the Peruvian Criollo of the high altitudes.

CRIOLLO CATTLE IN BOLIVIA

Like the other Pndean republics, Bolivia possesses a huge uncounted Crioilo cattle population in its mountains up to a height of 4000 metres. Bodisco and Abreu (1981) mentioned the importance of these sierra cattle but were unable to cite a single study of these animals that are important for draught and meat and also for milk production for a short season of the year in an extremely harsh, cold and usually dry environment. The animals are small and Rouse's suggestion (1977) that the cows and bulls weigh 295 and 350 kg respectively is not an understatement. Nevertheless, the efficiency of digestion of Criollo oxen on an Andean altiplano that plough for eight hours per day while subsisting on very scarce pasture must be high.

In the plains of eastern Bolivia as elsewhere in tropical Latin America, Criollo cattle have nearly disappeared due to crossing with zebus. Some old cows still remain on a few farms but Criollo bulls are only used on a very small number of properties of which the most important is that of Espiritu in the Beni. The Beni is a flood plain that is inundated for six months of the year and the cattle may spend twelve hours per day in a metre of water grazing aquatic grasses and returning to dry land only at night. Much of the remaining six months of the year is extremely dry.

Criollo cattle have become adapted to this hot humid environment (mean annual temperature 27^{O}C) while only 300 km away cattle with the same origins have adapted to an Andean climate at an altitude of 4000 metres.

The property of Espiritu is very well managed under an extensive system for beef production and a pure 600-cow Criollo herd is maintained as well as a pure Brahman herd of similar size. The recording system is computerized and a number of crossbreeding systems are being evaluated (Bauer 1973; Plasse 1981).

The Criollo cattle on Espiritu are known as the Yacumeño breed and are similar in colour to the Jersey. Al.1 the cows and bulls are dun or red although calves with large white patches are born giving confirmation that this characteristic is a recessive.

This herd has been selected to its present colour during the last twenty years. The herd originally contained all the colours and patterns that occur in Bos taurus cattle and the owner started to select those animals that appeared to be best adapted to the environment. His initial measure of this was a short glossy coat and a high percentage of these animals were dun or red. In order to make the herd more aesthetically pleasing, the relatively small number of other colours with fine glossy coats were subsequently eliminated.

Criollo cattle at Espiritu, Beni, Bolivia, in dry season

Criollo bull on Bolivian Altiplano at 4000 m above sea level

The Ministerio de Asuntos Campesinos y Agricultura has a property in the Bolivian Chaco designated for the conservation and improvement of Criollo cattle in that environment. The Ministerio established a forty-cow Criollo herd in the hot humid Chapare area in 1980.

A programme for the selection and improvement of Criollo cattle with dairy characteristics commenced near the city of Santa Cruz in 1978 and will be the subject of a later article in AGRI. The object is the production of Criollo bulls for use in crossbreeding programmes with European dairy breeds.

CRIOLLO CATTLE IN ARGENTINA

Work carried out in Argentina on a 200-cow Criollo herd by the Instituto National de Tecnologia Agropecuaria at Leales in the Chaco zone commenced in 1959 and is directed towards beef production in that environment. Sal Paz (1977) demonstrated that the pure Criollo produces a greater weight of weaner calf per hectare per year in the Chaco than zebus, British beef breeds or zebu crosses.

The Argentina Criollo has not been selected for colour and the Leales herd includes all the colours that exist in ***BOS taurus*** and this has permitted the study of the inheritance of colour in the breed which is not the same as that in cattle of northwestern Europe. For example, the "Hereford-like" white face is recessive in Criollo cattle (Rabasa et al. 1976). It has also permitted investigations on the association of coat colour and fertility (Sal Paz et al. 1976). Rabasa *et al.* (1976) noted that the frequency of occurrence of black in Criollo cattle is higher at higher altitudes in Argentina. The author has also observed this tendency in Bolivia and Peru.

CHILE, PARAGUAY AND URUGUAY

It is believed that the army owns the only remaining Criollo herd in Uruguay at Chui on the Atlantic coast. It is understood that no pure Criollo cattle now exist in Chile or Paraguay.

In resume, the current situation is as follows. The most promising Criollo breeding centres for milk production are:

1. In Minas Gerais, in Brazil, where a large, privately owned herd could obtain the assistance of the local university to initiate a systematic breeding programme. The university has already analysed existing data on the property.

2. The herds in Turrialba (Costa Rica), Carrasquero (Venezuela), Tampico (Mexico) and Santiago (Dominican Republic) that owe much to blood that originated in Nicaragua. The Venezuelan herd, in association with the herds on neighbouring private farms that utilize the AI and milk recording scheme, is large enough to be independent. The other herds are small and in order to progress, they will have to encourage private breeders to maintain pure Criollo herds and they should cooperate in breeding and selection plans and perhaps cooperate with Guatemalan and Cuban projects. Unfortunately, while Venezuela may import semen from north of the Panama canal, the herds to the north, for health reasons, cannot import semen from South America in order to benefit from advances made at Carrasquero.

The Costeño con Cuernos breed of Colombia needs a systematic improvement programme that should be initiated while there are still private breeders with herds in the area. An association with the Carrasquero programme in Venezuela may be mutually beneficial.

In beef production, the two most important centres are the Association of Caracú Criollo breeders of Brazil and the herd of Yacumeño Criollos of Elsner Hermanos in the Beni of Bolivia.

It is to be hoped that the excellent work being done on beef Criollo cattle at Leales, Argentina, will encourage more breeders to multiply the breed in the Chaco, where it appears to have a superior performance to other breeds and crosses.

Similarly, it is hoped that the Cuban and Nicaraguan governments conserve their valuable genetic resource of Criollo cattle for the benefit of their own and other Latin American countries.

A need exists to evaluate the numerically important Criollo cattle of the Andes and its relationship with other livestock species of the zone because its economic importance for the farmer of the area is unknown. As survival is the prime necessity in this harsh, cold, semi-arid climate, improvement in performance may best be made by reducing inbreeding levels by the exchange of bulls between isolated valleys. If this hypothesis were to be proved, the introduction of a cheap, simple programme to organize the exchange would have a beneficial effect for the very many small farmers in the mountains whose living still depends on Criollo cattle.

REFERENCES

Abreu O., Labbe S. and Perozo N. El ganado criollo venezolano puro y mestizado en la 1977 produccidn de leche y carne. FONAIAP-CIAZU, Boletin técnico No. 1. pp. 77.

Alvarez J., Deaton 0. and Muñoz H. Veinticinco aiios de selección en un hato lechero del 1977 tropico húmedo. ALPA Memoria 13 (1978): 149.

Athanassof N.A. Manual do criador. Bibl. Agron. Melh. Edocoes Melhoramentos. 1957

Bauer B. Improving native cattle by crossing with zebu. In: Crossbreeding Beef Cattle. 1973 Series 2 edited by Koger, Cunha and Warnick. Univ. of Florida Press. pp. 395-401.

Bishko C.J. The peninsular background of Latin American cattle ranching. Hisp. Am. 1952 Hist. Rev. XXXII(4).

Bodisco V. and Abreu 0. Producción de leche por vacas criollas puras. In: Estudio FAO, 1981 Producción y Sanidad Animal. 22:17-39.

Botero F.M. Ganado blanco Orejinegro. In: ICA (Bogota) Manual de Asistencia Técnica 1976 21:17-61.

Carvalho Dias E. Algunos fatores que influem sobre a producao de leite e gordura na 1957 rata caracú sob a sistema de retiros. Mimeo. Fazenda Recria, Pocos de Caldas, M.G. pp. 51.

De Alba J. Progress in the selection of the Latin American Criollo. Wld. Anim. Rev. 1978 (FAO) 28:26-30.

Dobie J.F. The Longhorns. Little, Brown & Co., Boston. 387 p. 1941

Freitas Trovo J.B. and Moura Duarte F.A. Relacao de criadores, Levantamento de 1981 criadores e planteis de bovinos caracii. Inst. de Zootec., Sertaozinho, S.P. 23 p.

Gonzalez F. Ganado San Martinero. In: ICA (Bogota) Manual de Asistencia Técnica 1976 21:63-81.

Hernandez G., Botero M., Gonzalez F. and Rubio R. Razas Criollas Colombianas. ICA 1976 (Bogota) Manual de Asistencia Técnica 21. pp. 106.

Hill D.H. Cattle breeding in Brazil. ABA 35(4):545-564. 1967

Lemka L., McDowell R.E., Van Vleck L.D., Guha H. and Salazar J.J. Reproductive 1973 efficiency and viability in two *Bos indicus* and two *Bostaurus* breeds in the tropics of India and Colombia. J. Anim. Sci. 36(4):644-652.

Maule J.P. Criollo cattle of South America. Livestock International. Jan. 1979. p. 6-9. 1979

Melgar S. Salmeco barroso criollo: orgullo national ganado criollo guatemalteco. Mimeo: 1978 presented at reunion de FAO sobre recursos genéticos animales en America latina. Bogota 1978. Not published in proceedings. 4 p.

Miller W.J. Blood groups in Longhorn cattle. Genetics 54(2):391. 1966

Muller-Haye B.D. Bibliografia del ganado vacuno criollo en las Americas. Estudio FAO: 1977 Producción y Sanidad Animal 5. pp. 57.

Muñoz H. and Deaton O.W. Producción de leche en cruzamientos con ganado criollo. 1981 Estudio FAO: Producción y Sanidad Animal 22:40-47.

Pearson de Vaccaro L., Waugh R.K., Salazar B., Botero F.M. and Acosta A. Milking 1968 performance of Blanco Orejinegro and Jersey crossbred cattle. J. Agric. Sci. 70:65-72.

Pearson de Vaccaro L. Dairy cattle breeding in tropical Latin America. FAO Animal 1974 Production and Health Paper 1:86-91.

Pereira J.C., Teodoro R.L., Matos Lemos A. Fatores de meio e heranca relacionados corn o 1978 peso aos 285 dias de idade em bovinos nativos da raca caracú. Arg. Esc. Vet. UFMG 30(3):333-348.

Pereira J.C., Matos Lemos A., Almeida e Silva M. Fatores ambientes e genéticos 1979a responsaveis pela variacao na duracao da gestacao na raca caracú. Arg. Esc. Vet. UFMG 31(2):179-185.

Pereira J.C., Pereira C.S., and Matos Lemos A. Fatores ambientas e geneticos que influem sobre a idade ao primeiro parto en femeas de raca caracú. Arg. Esc. vet. UFMG 31(2):205-210. 1979b

Pereira J.C., Pereira C.S. and Teodoro R.L. Correlacoes geneticas, fenotipicas e ambientes entre os pesos ao nascimento e a desmana e ganhos em peso de bezerros da raca caracú. Arg. Esc. Vet. UFMG 31(2):255-262. 1979c

Pereira J.C., Pereira C.S. and Matos Lemos A. Estudo de fatores ambientas e geneticos relacionados com o intervalo entre partos na raca caracu. Arg. Esc. Vet. UFMG 32(1):81-91. 1980

Plasse D. El uso del ganado criollo en programas de cruzamiento para la producción de carne en America Latina. Estudio FAO: Producción y Sanidad Animal 22:77-107. 1981

Prada N. Programa de cruzamiento lechero en Cuba. ALPA Memoria 14:163-167. 1979

Quintero I.R. Esudio racial comparativo de marcadores geneticos en bovinos criollos. Mendeliana 1(1976):9-16. 1976

Rabasa C., Sal Paz A., Sal Paz F., Bergmann F. and Rabasa S.L. Genética de pelajes en bovinos criollos. Mendeliana 1(2):81-90. 1976

Rouse J.E. The Criollo, Spanish cattle in the Americas. Univ. of Oklahoma Press, Norman. 303 p. 1977

Rubio R. Ganado costeño con cuernos. In: ICA (Bogota) Manual de Asistencia Técnica 21:83-106. 1976

Sal Paz A., Sal Paz F., Bergmann F. and Rabasa S. Asociación de la fertilidad femenina con genes mendelianos mayores en bovinos criollas. Mendeliana 1(2):91-96. 1976

Sal Paz F. Experiencia con ganado bovino criollo. Ciencia e Investigación 33:157-161. 1977

Salazar J.J. and Cardozo A. Desarrollo del ganado criollo en America Latina: resumen histórico y distribución actual. Estudio FAO: Producción y Sanidad Animal 22:8-12. 1981

Stonaker H.H. Animal breeding in the tropics of Latin America. J. Anim. Sci. 33(1):1-6. 1971

Willis M.B. and Preston T.R. The performance of different breeds of beef cattle in Cuba. Anim. Prod. 10:77-83. 1968

Zapata O. and Serrano A. Leche residual a dos razas de ganado criollo colombiano. Rev. ICA (Colombia) 7(4):449-454. 1972

SCANDINAVIAN ACTIVITIES ON THE CONSERVATION OF ANIMAL GENETIC RESOURCES

Kalle Maijala
Agricultural Research Centre, Institute of Animal Breeding
31600 Jokioinen, Finland

SUMMARY

The organization of animal genetic conservation activities in Scandinavia is described, giving the motives, methods, problems, financial organization and future proposals, and showing how the five countries cooperate in international preservation plans.

RESUME

Cette note décrit l'organisation des activites de conservation du patrimoine genetique des animaux en Scandinavie. Elle precise les motifs, les méthodes, les problémes, l'organisation financiere et les perspectives et montre comment les cinq pays scandinaves coopérent à des programmes internationaux de conservation dans ce domaine.

RESUMEN

Se decribe la organización de las actividades de conservación de recursos genéticos animales en Escandinavia, exponiendo los motivos, métodos, problemas, organización financiera y futuras propuestas, e indicando en que modo cooepran los cinco paises en los planes internacionales de conservación.

* * * * * *

1. INTRODUCTION

Scandinavia comprises Denmark, Finland, Iceland, Norway and Sweden. Animal production is an important part of agriculture, and cooperation in production techniques and organizations has been established between countries. At one such Scandinavian meeting, as early as the 1950s, worries about possible losses of genetic variation in animals were expressed (Hansson 1954). In the 1960s, similar concerns arose about poultry breeding, when hybrid breeding was becoming popular (Maijla 1970). Since then more thought has been devoted to the risk of gene and breed losses in farm animals. This paper describes the development and present position in these countries.

2. THE START OF ACTIVITIES

After the UN Environmental Conference in Stockholm in 1972, the Nordic Contact Organ for Environmental Management suggested that a joint Nordic conference be arranged to consider the establishment of Scandinavian gene banks. The Nordic Council of

Ministers (NCM) ordered a preliminary study to map out the situation and investigate possibilities of collaboration. Then the NCM financed a gene bank symposium, which was held in Finland in 1978 (SOG 1978). This concerned agricultural and horticultural plants, forest plants, wild plants and animals, microbes, farm animals and fish.

The working group on farm animals in the symposium discussed the following topics: the need for conservation of animal genetic resources, present threats in different countries and species, current activities and methods of conservation, possibilities of utilizing conserved genes, possible conservation projects, organizations responsible and the need for and organization of collaboration among the Nordic countries.

The working group suggested that the agricultural ministries in each country should have the direct responsibility for conserving national breeds. It also suggested that collaboration between countries should take place via the Board of the Gene Bank for Cultural Plants, having an Expert Group on farm animals to be responsible for a register on semen banks and threatened breeds to be utilized by researchers, officials, etc. The working group saw no reasons to create a Nordic gene bank for animals in a physical form as with plants.

3. SCANDINAVIAN EXPERT GROUP IN 1980-83

In December 1979, the NCM decided to finance the activities of the Expert Group in 1980. The Expert Group was nominated by the Board of the Animal Section of the Scandinavian Association of Agricultural Scientists (SAAS) and consists of one representative per country. The Group has met three times a year, alternating in the five countries, and the average annual grant in the years 1981-83 has been US$ 6000. The central task of the Group has been to prepare plans for the organization and coordination of animal conservation activities in Scandinavia.

The Group initiated national surveys by writing to the five agricultural ministries in 1981. Sweden had already made its study in 1978-80, and the Danish report was ready in 1982. The Finnish, Icelandic and Norwegian committees will complete their work in 1983, after which the Scandinavian group will prepare its final plans for permanent activities and coordination.

The Group took the initiative with a literature study on methods of conserving genetic resources in farm animals, especially techniques for cryogenic conservation of embryos (Wilhelmson and Sylvén 1981). In 1983, the Group initiated a study in Denmark on freezing embryos from fur-bearing animals.

In the autumn of 1982, a seminar on gene bank problems was organized by the Group in Iceland, where all aspects of the conservation on animal genetic resources in Icelandic farm animals were discussed (RALA 1983).

The working group has developed two kinds of documentation for Scandinavian animal breeds. Form I concerns the need for conservation of various animal populations, and Form II shows the traits of each breed separately: cattle, horses, pigs, sheep and goats, reindeers, fur animals, rabbits, poultry, and bees. The forms were planned for easy transfer to computer storage. The intention was also to read the forms independently of language, using a standard format, since there are five languages in Scandinavia.

In its preliminary report to the NCM the Group described the nature and importance of genetic variation in animal breeding, methods for conservation of genetic resources, possibilities of utilizing conserved genes, and practical arrangements of conservation activities. On methods, two ways were given for conserving genes of farm animals: (a) in haploid form (e.g. freezing sperm) and (b) in diploid form in maintaining animals or freezing embryos. Conservation of frozen sperm is useful and cheap in several species, but using it for special purposes is time-consuming and expensive. Hence, it is best used in combination with other methods. Storing embryos is expensive at the start, but maintenance of the store is cheap and utilization rapid.

When freezing methods are insufficient, genes must be conserved in live animal populations. Breeding must be planned so that changes in gene frequencies are prevented as much as possible. The method is suitable for small animals, such as rabbits and poultry. In larger animals, the gene banks of live animals cannot compensate for the increased costs, which should be limited to use in animal parks, museum farms, etc. The combination of cryogenic and small live animal conservation satisfies both the population-genetical and cultural-historical interests.

There are four ways of utilizing conserved genes: (a) for changing production; (b) for safety; (c) for control and scientific purposes; and (d) for education and cultural-historical purposes. The first (a) is topical when the breeding objectives change, new registration methods are developed or breeding work is started in unselected populations. Alternative (b) guards against risks of neglect of essential traits or undesirable correlated selection effects. A gene bank is an insurance in case of strong changes in society or production systems. This also applies when research reveals that desired traits, such as disease resistance, are determined by single genes. In future, the selection criteria even for other types of traits may be brought down to a simpler gene level when conserved genotypes will be valuable.

Alternative (c) concerns the measurement of the genetic progress, which is an important problem in animal breeding. The most exact method in solving this problem is a maintenance of a randombred control population. The freezing technique makes this method more effective. Utilization of gene bank material as reference points and as starting material in scientific demonstrations thus fills a need both in practical and theoretical animal breeding.

Alternative (d) derives from the fact that our farm animal breeds can be viewed as part of the conservation of old cultural practices in living exhibitions. Breeds, systematically conserved in a living gene bank, should be utilized as pasture or working animals in nature preserves and openair museums. Such living gene banks can be used for education in both animal breeding and social history.

4. PLANS FOR PERMANENT ORGANIZATION

Plans for the permanent organization of conservation activities in the Scandinavian countries have been growing for several years. The guiding rule is that each country should organize its own gene banks according to national conditions and priorities, using the existing resources for gene conservation, such as semen stores. Also embryos can be conserved in banks with frozen semen.

On the international level, a coordinating organ, "Nordic Gene Bank for Farm Animals", is to be created under the supervision of NCM. A central function in its

The Icelandic breeds of domestic animals are a unique genetic reserve of Scandinavian origin which has been kept almost completely intact for a period of 1100 years.

The photo shows the bull Vidor 76004, of the Icelandic cattle breed, born in 1976.

(Photo: Erlendur Jóhannsson)

Finnsheep ewes with their lambs, together with a young bull of East-Finnish native cattle. The numbers of Finnsheep started to decline rapidly after wool lost its importance in the 1950s, but its fertility genes have been utilized by about 40 countries during the last 20 years, in research and practice. The East-Finnish type of Finncattle is seriously endangered.

activity is to collect and mediate information of activities in the member countries. The main content can be summarized as follows:

- initiate the formation of gene banks on the national levels;

  map out threatened populations

- create an information and data processing centre on the internordic level:

  follow up progress in research for the most modern methods in storing genetic variation;

  influence public awareness both at scientific and popular levels;

- seek for collaboration among similar activities with both plants and animals, at national and international levels.

A Board for the Nordic bank will be established, with representatives from each member country. In each country, there will be a broadly based advisory council, including representatives from research, management, breeding and AI societies, cultural-historical interests and nature protection interests. The national councils will include the representative of the country in the internordic board.

A mechanism for contact between animal and plant gene banks in Scandinavia will be established, able to develop international contacts and arrange symposia in gene bank problems at 4-5 year intervals.

The annual budget of the Nordic gene bank has been proposed at US$ 15 000 consisting mainly of the salary of a part-time coordinator-secretary and of travel costs of board members and coordinator. Costs for symposia, extra travel and similar expenses which are difficult to predict should be covered according to special application or with special grants.

The coordinator should be placed in some animal breeding institute in Scandinavia, with basic resources available, especially in data processing in a research milieu and with knowledge of the newest development.

Activities can thus be divided into three levels:

(a) National: Advisory gene bank councils with representatives in the Nordic board for cooperation and development of farm animal gene banks in Scandinavia. Tasks:

map out threatened breeds or stocks;
finance, create and maintain gene banks;
register and distribute basic information for the data bank;
maintain contacts with breeding organizations and others involved in gene bank problems.

(b) Nordic: Board for coordination and development of farm animal gene banks in Scandinavia. Tasks:

organization and coordination on the Nordic level;
provide initiatives for projects;
documentation and maintenance of data banks;
research contacts concerning conservation methodology, animal breeding, Nordic plant gene bank, gene technology, culture protection;

stimulation and maintenance of contacts with corresponding international activities.

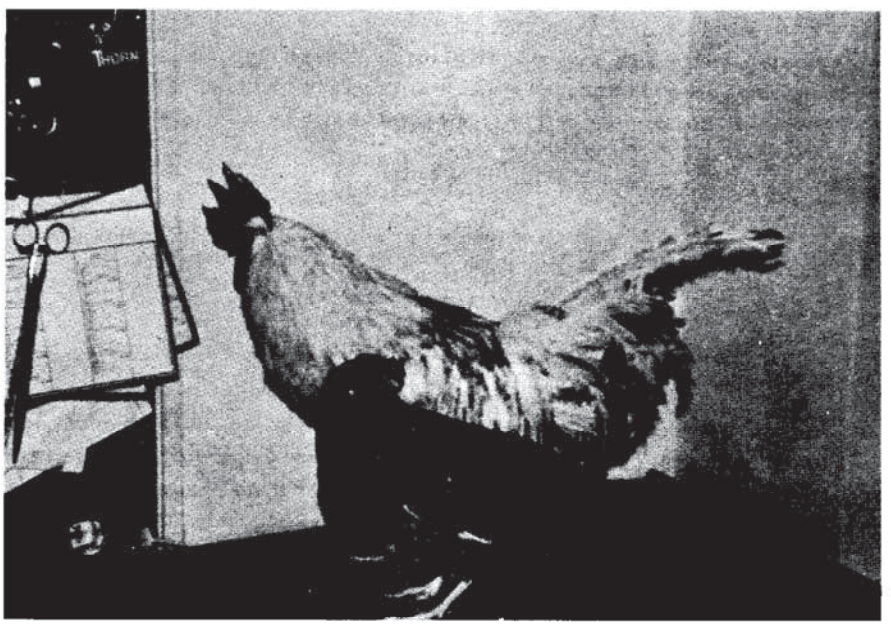
c) International collaboration on European and world level.

5. PLANS FOR FUR ANIMALS

Conservation problems in fur animals have been discussed and plans developed by the breeding committee for fur animals in the SAAS, in 1982. They considered problems from both cultural and economic viewpoints. Maintenance of different mutant types not of current interest was considered necessary, since fashions can change very rapidly. A coordinated activity appeared difficult because of the great commercial interests at the time of new fashions.

6. SCANDINAVIAN CONTROL POPULATION OF HENS

In connection with a joint research project on selection methods of egg-laying poultry, a heterogeneous control population based on seven commercial hybrids was established in the Swedish Agricultural University in 1969-71. Samples of this were distributed to Denmark, Finland and Norway in 1971 and have proved themselves useful starting material for selection in both research and practice.



The Jaer breed is a local Norwegian egg-laying breed of interest for several reasons: (i) the body weight is low; (ii) exceptional good general combining ability; (iii) superior shell quality; and (iv) autosexing.

REFERENCES

Hansson A. Seminaveln och djupfrysningen av sperma. N.0.K.-motet IV (Helsinki). p. 1954 10-17.

Maijala K. Need and methods of gene conservation in animal breeding. Ann. Genet. 1970 Select. Anim. 2:403-415.

RALA. Seminar om genbank for husdyr. (Reykjavik, 1982). RALA Report No. 100. 47 p. 1983

SOG. Symposium om genbanker. NU B 1978:30, 167 p. 1978

Wilhelmson M. and Sylvén S. Tekniska metoder for bevarande av genresurser - 1981 frysforvaring av embryoner. Rapport 53, Inst. f. husdjursforgdling o. sjukdomsgenetik, SLU, Uppsala.

THE NATIVE SHEEP OF SRI LANKA

L.A. Goonewardene, V. Ravindran, K. Nadarajah and R. Rajamahendran
Department of Animal Science, University of Peradeniya
Peradeniya, Sri Lanka

SUMMARY

The native sheep of Sri Lanka is described, and its growth and reproductive parameters under traditional management systems are reported. The need to evaluate this sheep under optimal nutritional and husbandry conditions is highlighted.

RESUME

Cette note décrit la race ovine de Sri Lanka et ses caractéristiques de croissance et de reproduction dans les conditions d'elevage traditionnelles. L'accent est mis sur la nécessité d'evaluer cette race dans des conditions optimales d'alimentation et d'klevage.

RESUMEN

Se describe la raza ovina nativa de Sri Lanka, y se indican sus paràmetros de crecimiento y reproducción con arreglo a los sistemas tradicionales de gestión. Se subraya la necesidad de evaluar las posibilidades de estos ovinos en condiciones nutricionales y de cría óptimas.

* * * * * *

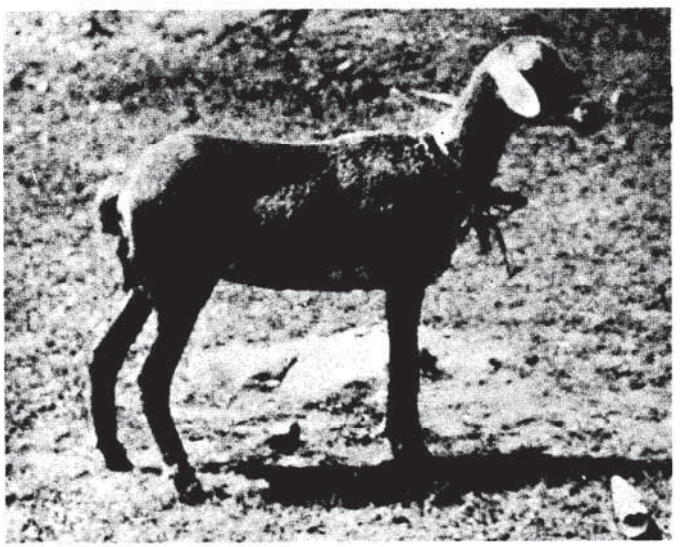
1. INTRODUCTION

The sheep population in Sri Lanka has been estimated to be around 28 000. Almost ninety percent of this population belongs to the native breed. Despite its obvious importance in sheep production in Sri Lanka, little attention has been given hitherto to identify and document the native sheep as a part of local animal genetic resources. This communication reports the results of a detailed survey conducted among 39 native sheep flocks during 1978-1980.

2. BREED DESCRIPTION

The native sheep is without exception hairy and small in size. The mean height at withers of adult rams and ewes is 52.4 and 49.2 cm, respectively (Table 1). It is believed to be a retrograde South Indian breed (Coop 1969). The sheep were brought from South India several hundred years ago and thence degenerated through generations of inbreeding. The native flocks are generally closed, although there is some movement of rams between flocks.

The sheep are of mixed colour. The predominant colour is white with varying amounts of tan and/or black patches. Pure white, pure tan and pure black are also seen. The face structure of the native breed closely resembles the Suffolk breed of England. In general the ewes are polled, but occasionally rudimentary horns may be present. Rams may be either horned or polled. The horn is short and averages around 10.8 cm in length. About 35 percent of the rams in the survey were found to be polled. The tail is extremely short. The ears are usually small and point somewhat sideways and forward; vestigal ears are also occasionally present.



3. NATIVE HABITAT

The native sheep are mostly concentrated in the northern and eastern regions of the island. The climate in these regions is hot and humid throughout the year. The rainfall is seasonal with more than 75 percent of the annual average precipitation of 1400 mm falling between the months of October and January. The rest of the year is dry, experiencing an unreliable monthly rainfall of less than 70 mm. During the rainy season, the sheep graze on poor quality native grasses (consisting primarily of Cynodon, *Panicum* and *Chloris* spp.) and shrubs, and during the dry season mostly on the stubble remaining after paddy harvest.

4. GROWTH PERFORMANCE

The mean weight of lambs at birth is 1.8 kg. The liveweights at various ages are also low (Table 2), demonstrating the late maturing nature of these sheep. The mean weights of adult rams and ewes were 24.5 and 18.7 kg, respectively. The heaviest ram recorded had a weight

of 35.4 kg. This ram was claimed to have been fed with *Glyricidia maculata* loppings and Jak *(Artocarpus heterophyllus)* leaves. This may be suggestive of the potential for improving the growth performance of native sheep through better nutrition.

The mean daily gain from birth to 12 months was 47.9 g for males and 37.6 g for females. While these growth rates are inferior to those achieved with most other tropical breeds, considering the poor husbandry level of nutrition and arid environment to which these sheep are exposed, they represent a reasonable level of production.

5. REPRODUCTIVE PERFORMANCE

In common with most tropical sheep, the native ewes are capable of breeding all the year round. Births were recorded throughout the year, but with a peak between the months of November and January during which 61 percent of the lambings occurred. This is a deliberate rather than natural phenomenon, as ewes are bred in July-August so that the lambing time coincides with a rising plane of nutrition following the heavy November-December monsoonal rains. Lamb losses are also heaviest during the rains due primarily to the exposure of newborns to cold and this results in a weaning survival of only 0.75.

The lambing percentage of different flocks ranged between 63 and 86 with a mean of 76 percent. Twinning is uncommon in the native sheep. The mean age of females at first lambing is about 16 months. Lambing occurs only once a year, though the ewes can be bred throughout the year. Lifetime production per ewe is about 4-5 lambs.

6. CONCLUSIONS

The native sheep of Sri Lanka is a product of natural selection in a semi-arid environment. These sheep are characterized by poor growth rates, late maturity and low reproductive rates. They are impressive, however, in their ability to grow and reproduce at these levels and to perform satisfactorily under the prevailing adverse conditions. There is evidence to suggest that the poor performance of the native sheep may in part reflect the substandard nutrition and husbandry. This point will have to be verified by evaluating this breed under optimal husbandry conditions.

The future of native sheep, however, will rest primarily on its use as the foundation stock for sheep upgrading in Sri Lanka. Because of its adaptability to local conditions and its availability in large numbers, the native sheep would be a certain choice in crossbreeding programmes. That growth performance can be improved and lamb losses minimized by crossbreeding is now well documented (Buvanendran 1978; Goonewardene et al. 1981; Goonewardene and Agalawatte 1983).

REFERENCES

Buvanendran V. Sheep in Sri Lanka. World Animal Review. FAO, Rome 27:13. 1978

Coop I.E. Report on sheep breeding programme in Ceylon. Mimeograph. 29 p. 1969

Goonewardene L.A., Agalawatte M., Marlowe T.J. and Buvanendran V. Crossbreeding trials
1981 with sheep - Effect of sire breed. World Review of Animal Production 17:73.

Goonewardene L.A. and Agalawatte M. A comparison of the performance of pure- and
1983 crossbred rams. Indian Journal of Animal Science 53:517.

Table 1 SOME BODY MEASUREMENTS OF THE ADULT NATIVE SHEEP (cm)

Parameter	Ram	Ewe
Length of head	20.6	19.3
Width of head	11.3	I0.8
Length of horn	10.8	
Length of ear	8.4	8.9
Width of ear	3.2	3.6
Length of neck	17.1	17.7
Heart girth	39.3	55.4
Barrel girth	71.1	62.3
Height at withers	52.4	49.2
Length of tail	1.9	1.8
Body length	83.2	75.3

Table 2 GROWTH PERFORMANCE OF THE NATIVE SHEEP (kg)

Parameter	Male	Female
Birth weight	1.8	1.8
3-month weight	6.6	5.2
6-month weight	II.8	9.6
Yearling weight	19.3	15.5
Adult weight	24.5	18.7

NEWS ITEMS

ANIMAL BREEDING AND GENETIC RESOURCES IN WORLD ANIMAL REVIEW

The FAO World Animal Review (WAR) is a quarterly journal carrying papers on animal production, health and products with particular reference to these spheres in Asia, Africa and Latin America; it is edited in the FAO Animal Production and Health Division and has an annual subscription of $10.

For the benefit of readers of AGRI, the papers on animal breeding and genetic resources, which have been published in the last three years (1981-83) are listed, together with those to be published in 1984. Copies of earlier issues of the WAR may be obtained from the official FAO Sales Agents in local currency or from Distribution and Sales, FAO, Rome, Italy.

WAR Issue No.	
38	Crossbreeding strategies for dairy cattle in Brazil, by F.E. Madalena
39	The Chios sheep in Cyprus, by P. Lysandrides
40	Damascus goats in Cyprus, by A. Constantinou
41	The Keddah-Kelantan cattle of Malaysia, by J.P. Maule
41	The indigenous cattle of Ethiopia, Part I, by M. Alberro and S. Haile-Mariam
42	The indigenous cattle of Ethiopia, Part II, by M. Alberro and S. Haile-Mariam
42	N'Dama cattle as draught animals in Sierra Leone, by P.H. Starkey
43	Beef cattle breeding systems in Botswana - the use of indigenous breeds, by N. Buck, D. Light, L. Lethola, T. Rennie, M. Mlambo, B. Muke
44	Anassi sheep, by H. Epstein
46	Carabaos in the Philippines - priorities for research and development, by S.K. Ranjhan
48	The indigenous cattle of Mozambique, by M. Alberro

The following papers will be published in 1984:

49	The Malawi zebu, by M.H. Butterworth and J.I. McNitt
49	Sheep breeds of China, by Cheng Peilieu
50	N'Dama cattle, by P.M. Starkey
51	The development of the Australian Friesian-Sahiwal, by G.I. Alexander, G.K. Reason, C.H. Clark

AVIAN GENETIC RESOURCES IN INDIA

A new Department of Avian Genetic Resources has been formed at the Central Avian Research Institute, Izatnager, UP, India. The activities are:

1. Search for and collection of diverse fowl genetic resources (exotic as well as indigenous) available in India.
2. Conservation of these germplasms for posterity.
3. Preparation of inventory of genetic resources available at various locations (with private breeders as well as Government institutions/agricultural universities).
4. Publication of information on the annual inventory of poultry genetic resources (both imported and those collected indigenously) as "Poultry Introduction Reporter".
5. Making available genetically diverse germplasm of various breeds/strain of fowls to the scientific community.
6. Extend assistance to poultry improvement programmes at Central/State Government institutes and at the agricultural universities in the country.

As a first step, arrangements are being made to prepare an inventory of genetic resources (poultry) available at various locations in India for the use of scientists so they can obtain genotypes of their choice for use in poultry improvement programmes.

Research to improve productivity in the indigenous fowl germplasm by selective breeding as well as by crossbreeding is also being conducted at this Department.

INTERNATIONAL CENTRE FOR GENETIC ENGINEERING AND BIOTECHNOLOGY

Earlier discussions reached a significant stage in September 1983 in Madrid, when 25 nations signed Statutes establishing an International Centre for Genetic Engineering and Biotechnology, which will promote international cooperation in developing and applying peaceful uses of genetic engineering and biotechnology especially for developing countries. It will assist in strengthening their scientific and technological capabilities in these fields and helping with activities at national and regional levels, The Centre is expected to be a focal point for a network of affiliated centres, and will also serve as a forum for the exchange of information, training of personnel from developing countries and advising on the development of national capabilities. The Board of Governors comprises a representative from each of the countries, with the Head of UNIDO (United Nations Industrial Development Organization), which has been responsible for organizing the formative meetings. Finance will come mainly from initial contributions for establishment, annual contributions from member countries and voluntary contributions.

A site has yet to be determined and is being investigated by a committee to report back early in 1984. The countries signing the Statutes are: Afghanistan, Algeria, Argentina, Bolivia, Bulgaria, Chile, China, Congo, Cuba, Ecuador, Egypt, Greece, India, Indonesia, Italy, Kuwait, Mauritania, Mexico, Nigeria, Spain, Sudan, Thailand, Trinidad and Tobago, Yugoslavia and Zaire.

CONSERVATION OF ANIMAL GENETIC RESOURCES IN EUROPE: Final Report of a Working Party of the Commission on Animal Genetics of the European Association for Animal Production (EAAP)

Following the FAO/UNEP Consultation on Animal Genetic resources (Rome, 1980), the Commission on Animal Genetics of the EAAP established a working party on animal genetic resources. A preliminary report of its activities was presented at the annual EAAP meeting in Leningrad in 1982. Its final report is now available and is to be published in Livestock Production Science.

After a short section on the reasons for conservation the report gives the results of a survey undertaken in 28 European countries. Three questionnaires were distributed asking for particulars (referring to cattle, goats, horses, pigs and sheep) of all the breeds, of the attitudes to conservation and of the endangered breeds within each country. Twenty-one countries responded; for the other eight information was obtained from the literature. This survey revealed that 81 out of a total of 181 breeds of cattle are endangered, 12 out of 77 breeds of goat, 51 out of 149 breeds of horses, 30 out of 60 breeds of pigs and 67 out of 264 breeds of sheep. "Breed" is used in its widest sense - all the local Friesian populations are treated as one breed and likewise all the local Saanen goats, Halfbred horses, Landrace pigs and Merino sheep. Endangered cattle breeds are defined as those with below 1000 females or between 1000 and 5000 but with numbers declining or with fewer than 20 males. These first two figures are reduced to 500 and 500-1000 for sheep and goats and to 200 and 200-500 for pigs. Brief mention is made of the State support for endangered breeds in Bulgaria, France, Germany (Federal Republic), Hungary, Italy, Poland and Spain and of the private organizations in France, the Netherlands and the United Kingdom.

It is pointed out that gene loss within breeds (due to intense selection or to import of foreign strains) is also important and should be studied. The question of which breeds to conserve is also raised and general advice is given on what criteria to use in making a choice if, as is usually the case, not all endangered breeds can be retained. It is emphasized that conservation must often come before evaluation since this latter can be delayed but the former cannot. Methods of conservation are listed. Priority should be given to semen storage, followed by storage of embryos. Live animals must be kept for proper breed evaluation and for maintaining interest in the breed. A central data bank on endangered breeds is recommended; cards rather than computers would be adequate. A proforma showing the information to be collected and stored is included in the appendix to the report.

With reference to FAO/UNEP the report states:

"The Working Party wholeheartedly supports the recommendations to FAO and member countries set out in the FAO/UNEP document (1980) entitled 'Animal Genetic Resources Conservation and Management'. However the level of coordination and advice to existing activities, of stimulation and documentation, evaluation and storage as well as of supported activities, expected by FAO, so far appears very low, so that the recommendations given in this report had to be worked out quite independently. FAO/UNEP must be encouraged to make greater efforts to put adequate resources into the various aspects, to avoid the loss of many resources in the interim."

For its part EAAP is recommended to take adequate steps both to continue the work of the Working Party and maintain close cooperation with FAO in the field of

conservation of animal genetic resources.

Appendixes to the report include lists of endangered breeds in the 21 countries which replied to the questionnaires, copies of the questionnaires sent out, a summary of the conservation activities in the 21 replying countries, a rotational mating system for reducing inbreeding in a small closed herd and a list of all breeds in all 28 countries. This last makes difficult reading. The countries are listed across the top of the page and the breeds down the side. To find the status of a given breed in a given country it is necessary to trace a single row (with no dividing lines) across all the columns. Perhaps this table will be clearer in the printed version.

This is an important document and hopefully it will stimulate European countries which have not yet done so to survey, describe, evaluate and conserve their local breeds. It will also provide a useful model for developing countries who wish to initiate such a study.

ASIAN ELEPHANTS

"Failure to manage the Asian elephant's habitat, keeping in view the patterns of herd movement, has endangered the species and created problems for humans too", said Mrs. Gandhi in a message to the Asian Elephant Specialist Group meeting at Jaldapara, West Bengal, in December 1982. "I hope", she went on, "that the Workshop will study this problem in detail and offer practicable suggestions that can be implemented with the full cooperation of the people in and near the forests".

Her message was reinforced during the meeting when elephants raided crops nearby and damaged houses, killing one man. The Australian fencing expert left the meeting to supervise the erection of a high-energy electric fence, and tame elephants were sent to drive away the marauders, which then moved to a nearby wildlife reserve. After Mr. Mohammed Khan bin Momin Khan, Director of West Malaysia's Wildlife Management Department, had reported how electric fencing had successfully minimized elephant damage to Malaysia's valuable oil-palm plantations, the meeting recommended the immediate setting up of pilot projects to test electric fencing in different habitats and conditions. The present total of Asian elephants is estimated at between 30 and 40 000, but the importance of getting reliable censuses was stressed, and also the need to establish viable sanctuaries and forest corridors to prevent fragmenting of the populations. Discussions are going on now to establish a forest corridor between India and Bhutan that would permit one of the largest elephant populations in Asia to move freely.

A practical side to the meeting were the demonstrations of management techniques, including capture, tranquilization, etc. Measures to repel marauding elephants included taped tiger calls combined with tiger-urine scented rags.

Representatives attended the meeting from Bangladesh, Bhutan, Malaysia, Sri Lanka and the Indian states that have elephant populations.

(Reported from the Species Survival Commission Newsletter of the IUCN. June 1983)

THE WATER BUFFALO RESEARCH AND DEVELOPMENT NETWORK IN ASIA

At the request of the United Nations Development Programme (UNDP), an FAO Preparatory Assistance Mission visited Burma, India, Indonesia, Malaysia, Nepal, Pakistan, Philippines, Sri Lanka and Thailand during 1982 to formulate a regional project for buffalo research and development in consultation with the governments and national institutions concerned. The project proposal which has now been approved by the Member Governments and the UNDP provides for the establishment of a regional network of national institutions to serve as the institutional framework for coordinating the region's buffalo research and development efforts. The regional network includes two institutions in Burma, five in India, four in Indonesia, three in Malaysia, one in Nepal, two in Pakistan, four in the Philippines, two in Sri Lanka and four in Thailand.

In his capacity as Regional Network Coordinator, the FAO Regional Animal Production and Health Officer in Bangkok will liaise and develop linkages with ongoing UNDP/FAO buffalo research and development projects (three in Pakistan and one in the Philippines), with the joint FAO/IAEA project on buffalo production in Asia, with the National Water Buffalo Research Project in Sri Lanka, with the International Buffalo Information Centre at Katsetsart University, Bangkok, with the Cooperative Buffalo Production Research Project in Thailand and with the All-India Coordinated Research Project on Buffalo Breeding.

The regional project itself will be concerned during Phase I with the organization of training courses on clinical aspects of reproduction, on the use of agro-industrial by-products in feeding and on smallholder buffalo production, with an expert consultation on research and extension, with a workshop to formulate Phase II of the project and with the publication of various results and reports.

The participating governments in this regional project have repeatedly stressed the need for a strong regional research and development effort to fill the vast gaps in knowledge that still exist in regard to the buffalo and to exploit to the full its potential as a milk, meat and draught animal. It is hoped that as more interest is generated, the project may expand the scope of its activities to include the evaluation and more effective utilization of the world's buffalo germ plasm resources. A pilot activity in the latter area is being undertaken at present in the UNDP/FAO national project PHI/78/017 - Strengthening of the Philippine Carabao Research and Development Centre. It involves the production of F_1 hybrids of the Philippine carabao with each of the Murrah, Nili Ravi and Thai breeds/strains. This is to be followed, within each crossbred group, by inter se mating of the F_1 to produce an F_2. Thereafter, the matings will involve the upgrading of all females to new crops of F_1 males of the relevant breed/strain cross. A control group of purebred Philippine carabao is maintained at all stages of implementation of the breeding programme. Both institutional herds and cooperating small farmer units are participating in this undertaking.

FORTHCOMING MEETING

INTERNATIONAL CONFERENCE ON MILK PRODUCTION IN DEVELOPING COUNTRIES. 2-6 April 1984. Edinburgh. Organizer: Dr. A.J. Smith, Centre for Tropical Veterinary Medicine, Easter Bush, Roslin, Midlothian, Scotland.

REPORTS OF MEETINGS

FAO/UNEP JOINT EXPERT PANEL ON ANIMAL GENETIC RESOURCES CONSERVATION AND MANAGEMENT

Meeting in Rome 24-27 October 1983

1. The Expert Panel was constituted in April 1983 by the Director-General of FAO and the Executive Director of UNEP. Its Terms of Reference are to advise them on animal genetic resources conservation and management. Thirty-six eminent scientists representing many separate disciplines of genetics and different regions of the world were appointed in their personal capacities. Their names are shown below.

2. Approximately half were invited to the first meeting. They were supplemented by observers and visitors, making a total of 30 participants, excluding FAO staff.

3. The Expert Panel was asked to address four subjects of current concern to FAO and UNEP in the development of the programme for the conservation and management of animal genetic resources:

a. Cryogenic Storage and Molecular Engineering.
b. Conservation by Management.
c. Data Banks.
d. Training

4. The meeting unanimously elected Dr. Helen Newton-Turner of Australia as Chairman and Dr. J. de Alba of Mexico as Vice-Chairman. Four rapporteurs were appointed, one for each subject area.

5. Experts presented 25 papers on the four subject areas; each subject area included a report on current FAO/UNEP activities; discussions followed each paper; general discussion on each subject was then led by a rapporteur; recommendations from the meeting were examined by specialist groups under the guidance of the subject rapporteurs, who then presented them to the Panel for final debate, amendment and approval.

6. Fifteen recommendations were made by the Panel, of which thirteen are to FAO/UNEP and two are to FAO/UNEP and Member Governments. They covered all four subject areas and form the basis of recommended actions with priorities. They also include an evaluation and affirmation of work already in progress by FAO/UNEP, and a recommendation that continuity in the creation of data banks should be maintained by avoiding delays in further development of existing programmes.

7. The Report of the Expert Panel Meeting, containing recommendations, summaries of the subjects, agenda, list of participants and Terms of Reference of the Expert Panel, will be published early in 1984. The Proceedings with all the papers will also be published later in 1984.

8. The Secretary of the Expert Panel is Dr. John Hodges, AGA, FAO, Rome, Italy, from whom copies of the Report can be obtained.

MEMBERS OF THE JOINT FAO/UNEP PANEL OF EXPERTS ON ANIMAL GENETIC RESOURCES AND MANAGEMENT

Dr. R.M. Acharya
Deputy Director-General
Indian Council of Agricultural Research
Krishi Bhavan
NEW DELHI 110 011, India

Mr. K.O. Adeniyi
Chief, Animal Production Section
Interafrican Bureau for Animal Resources
P.O. Box 30786
NAIROBI, Kenya

Professor J.S.F. Barker
Head, Department of Animal Science
University of New England
ARMIDALE, NSW, Australia

Dr. P.N. Bhat
Director
Central Institute for Research on Goats
P.O. Farah-281122
MATHURA (UP), India

Professor I. Bodó
Associate Professor
Department of Animal Husbandry
University of Veterinary Science
P.O. Box 2
H-1400 BUDAPEST 7, Hungary

Dr. E. Ceballos Bueno
Director, Division Ciencias Animales
Instituto Colombiano Agropecuaria
BOGOTA, Colombia

Professor Charan Chantalakhana
Department of Animal Science
Kasetsart University
BANGKOK 10900, Thailand

Professor Pei-Lieu Cheng
Chinese Academy of Agricultural Sciences
West Suburbs
BEIJING, China

Professor R.D. Crawford
Department of Animal and Poultry Science
University of Saskatchewan
SASKATOON S7N OWO, Canada

Professor E.P. Cunningham
Deputy Director
The Agricultural Institute
19 Sandymount Avenue
DUBLIN 4, Ireland

Dr. J. de Alba
Head, Animal Production
Ganaderia
CATIE
TURRIALBA
Costa Rica

Professor G.E. Dickerson
Research Geneticist, Roman L. Hruska US Meat Animal Research Centre, ARS, USDA; and Professor of Animal Science, University of Nebraska
225 Marvel Baker Hall
LINCOLN, Nebraska 68583, USA

Dr. H.A. Fitzhugh
Programme Officer
Winrock International Livestock and Training Centre
Route 3
MORRILTON, Arkansas 72110, USA

Dr. G.E. Joandet
Director National Asistente de Investigación Agropecuaria
Instituto Nacional de Tecnologia Agropecuaria
Rivadivia 1429
1033 BUENOS AIRES, Argentina

Professor J.W.B. King
Animal Breeding Liaison Group
School of Agriculture
:Jest Mains Road
EDINBURGH EH9 7PQ, UK

Dr. J.J. Lauvergne
Maitre de recherches
Laboratoire de Génétique factorielle
Centre National de recherches Zootechniques
F' 78350 JOUY-EN-JOSAS, France

K. Y. Madkolur
Agricultural Research Centre
Ministry of Agriculture
DOKKI, CAIRO, Egypt

Dr. L.O. Ngere
Senior Lecturer
Department of Animal Science
University of Ibadan
IBADAN, Nigeria

Professor A.H. Osman
Director
Institute of Animal Production
University of Khartoum
Shambat KHARTOUM, Sudan

Dr. C. Polge
Acting Director
Animal Research Station
Agricultural Research Council
307 Huntingdon Road
CAMBRIDGE CB3 OJQ, UK

Professor A. Robertson
Institute of Animal Genetics
University of Edinburgh
West Mains Road
EDINBURGH EH9 3JX, UK

Dr. S. Sivarajasingam
Research Scientist
Animal Science Division
Malaysian Agricultural Research and Development Institute (MARDI)
SERDANG, Selangor, Malaysia

Professor A. Lahlou-Kassi
Department of Reproduction
Agricultural and Veterinary Institute Hassan II
Agdal, RABAT, Morocco

Dr. F.E. Madalena
Animal Breeding Specialist
Centre Nacional de Pesquisa - Gado de Leite
Caixo Postal 151
CORONEL PACHECO 10, MG, Brazil

Professor R.E. McDowell
Department of Animal Science
Frank B. Morrison Hall
Cornell University
ITHACA, NY 14853, USA

Dr. C. Novoa
Instituto Veterinario de Investigaciones Tropicales y de Altura (INVITA)
LIMA, Peru

Professor D. Plasse
Facultad de Ciencias Veterinarias
Universidad Central de Venezuela
c/o Apartado 2196, Las Delicias
MARACAY, Venezuela

Professor J. Rendel
Department of Animal Breeding and Genetics
Swedish University of Agriculture
S-750 07 UPPSALA, Sweden

Professor Giuseppe Rognoni
Instituto di Zootecnica
Facoltà de Veterinaria
Università degli Studi di Milano
Via Celoria 10
20133 MILANO, Italy

Dr. A. Teixeira Primo
National Centre for Genetic Resources
EMBRAPA-CENARGEN
BRASILIA, Brazil

Dr. J.C.M. Trail
Senior Scientist
International Livestock Centre for Africa (ILCA)
P.O. Box 46847
NAIROBI, Kenya

Dr. H. Newton-Turner
Genetic Research Laboratories
Commonwealth Scientific Industrial Research Organization (CSIRO)
P.O. Box 184
NORTH RYDE 2113, NSW, Australia

Mr. J.D. Turton
Director
Commonwealth Bureau of Animal Breeding and Genetics
King's Building
West Mains Road
EDINBURGH EH9 3JX, UK

Professor J.H. Weniger
Institut fiir Tierziichtung und Haustiergenetik
Lentzealle 75
1 BERLIN 33 (Dahlem), FR Germany

Professor S. Wierzbowski
Department of Animal Reproduction and Artificial Insemination
Institute of Zootechnics
32-083 BALICE/KRAKOW, Poland

Professor Yukio Yamada
Professor of Animal Resources
Division of Tropical Medicine Kyoto University
KYOTO 606, Japan

2ND MEETING OF AFRICAN EXPERT COMMITTEE ON ANIMAL GENETIC RESOURCES

The Organization for African Unity (OAU) arranged the 2nd meeting of this Committee, in cooperation with FAO, which was held in Bulawayo, Zimbabwe, in November 1983. The main agenda item was to develop action programmes to create an African Data Bank on Animal Genetic Resources. The report of an FAO consultant, Dr. Jan Philippson (Sweden) was considered together with recommendations from the FAO/UNEP Expert Panel Meeting held in Rome in October 1983. Participants presented reviews of specific indigenous African breeds to facilitate discussion on the methodology of writing genetic and environmental characteristics for the data bank. Following the meeting, some participants agreed to produce preliminary lists of descriptions to be tested on these breeds. Participants were present from 12 African countries, OAU, FAO, ILCA, IEMVT, GTZ and the Zimbabwe Government. The report and proceedings of the meeting together with recommendations will be published and will be available in English and French from the Interafrican Bureau of Animal Resources (IBAR) of OAU, P.O. Box 30786, Nairobi, Kenya.

FIRST FAO/UNEP TRAINING COURSE ON ANIMAL GENETIC RESOURCES CONSERVATION AND MANAGEMENT

1. The First Training Course for scientists in developing countries was hosted by the Hungarian Government and the Hungarian FAO National Committee and mounted by the Hungarian University of Veterinary Science, Budapest, from 3 to 17 September 1983.

2. Eighteen scientists from fifteen developing countries participated. Lecturers were from Hungary, Finland, France, Nigeria, the United Kingdom and FAO, Rome. The language was English.

3. The subjects covered included the following:

a. The nature, needs, justification, benefits and prospects.

b. The approach which seeks to avoid total loss of genetic material will encompass the process of critically identifying breed resources at risk; and consideration of the alternative methodologies of preserving live animals and cellular material cryogenically.

c. The biotechnology, economics, and management of preserving cells cryogenically and consideration of the issues of how long to maintain such storage units and their subsequent use for re-establishing a live population.

d. The management of live animal units in natural environments, or artificial units such as zoos, livestock parks and display areas for public benefit and the advantages and disadvantages of such methodology.

e. The systems available for the genetic improvement of animal populations which have known value to society; the organization of practical programmes for improvement, including cooperation between different but related sub-populations in the same or different countries.

f. The economic aspects of conservation and the alternative ways of paying for it will be discussed and illustrated from existing practice in different countries.

g. The identification and creation of bodies with appropriate technical, financial and legal status to engage in conservation will be addressed, taking account of the responsibilities of government, livestock groups, scientists, users of domestic animals and consumers of products, the public, international organizations and the global approach to the subject.

4. The course included lectures, laboratory work, demonstrations, field visits, discussions and country reports by participants.

5. A manual is to be prepared with the detailed material of the course, and other aids, which may be of value in further courses which will be held when the need is identified. The possibility of courses in French or Spanish is being considered.

6. The Director of the Course was Professor Imre Bodó of the Hungarian University of Veterinary Science and the Co-Director was Dr. John Hodges, Animal Production and Health Division, FAO, Rome.

VTH WORLD CONFERENCE ON ANIMAL PRODUCTION, Tokyo. August 1983

All aspects of animal production were covered at this global meeting. This report concentrates upon the Plenary Session on Breeding Strategies for Livestock Production.

E.P. Cunningham (Ireland) reviewed modern developments in animal breeding. Increased productivity in animals has been brought about largely by genetic improvement, although it is really only in recent years that the principles of quantitative genetics have been developed and applied. Breeding strategies depend primarily upon selection and crossbreeding. Selection within a population has been efficient in achieving a steady rate of progress. Gains towards specific objectives of about 1 percent per annum can be predicted, achieved and expected to be linear for about 20 generations. But there are limits to selection and genetic variation may become exhausted. Also the efficiency of selection may not be so good when it is directed towards the achievement of multiple goals.

Gene flow between populations has been a major method of genetic change leading to population replacement. Such changes in population structure can be accepted in some circumstances without a significant reduction of the gene pool. In other circumstances, however, it may constitute a threat to the population and this may be particularly important in developing parts of the world.

Crossbreeding exploits heterosis; nevertheless, under some environmental influences, it can result in a drop in performance.

Reference was made to future developments in genetic engineering, particularly to interspecific DNA transfer. Will such developments at the molecular level replace programmes based on quantitative genetic principles.? There is a long way to go before we understand the molecular basis of inheritance characteristics of farm animals which are of economic importance. The horizon is expanding and advances can certainly be expected.

Most breeding strategy work has been done in the developed world. By contrast, most animals are in the developing world where the greatest need remains. Through major changes in population structure, there will be a significant decline in the genetic stock available for selection and improvement. There is urgent need for the evaluation and documentation of characteristics of many of the breeds of animals in the world. In the same way, there is a need for conservation before breeds carrying genes of potential economic advantage become too diluted or are lost entirely.

The breeding of livestock for stressful environments was reviewed by J.E. Vercoe (Australia). Animals in tropical or sub-tropical areas are faced not only with the stress of heat, but also with parasites and diseases not encountered in more benign climates. Research on this problem has been neglected for too long. There is a conflict between an animal's potential and its resistance to stresses. Indigenous breeds often have good natural resistance to environmental stresses but they are often unable to respond to improvements in the environment. Exotic breeds with a high genetic potential for production are unable to perform in stressful environments. What then is the best breeding strategy to adopt? How can high potential and high resistance to stress be put together? He suggested through analysis and assessment of physiological determinants with decisions taken regarding the balance of breeding policy or environmental control. There may be scope for embryo transfer and genetic manipulation in the future.

R.H. Foote (USA) discussed the technology of embryo transfer within the context of controlled animal breeding including artificial insemination and oestrous cycle control. Embryo transfer, first developed as a research tool, has been applied especially in cattle during the last 10 years. It is expected that 60 000 calves will be born this year as a result of embryo transfer in the USA alone.

Embryo transfer provides additional opportunities for the manipulation of early embryonic development. Cellular manipulation or 'embryo splitting' has already produced identical twins, quadruplets and chimaeric animals. In the absence of methods for the separation of X and Y bearing sperm, there is considerable interest in the sexing of embryos either by cytogenic or immunological techniques. In the future, also, it may be possible to clone animals by means of nuclear transfer - Dr. Foote predicted cloning by 1990.

J-P Renard (France) discussed the preservation of gametes and embryos for the conservation of genetic resources. More work is needed on the preservation of oocytes in anticipation that the techniques for in vitro fertilization will also be improved thus extending the potential for gamete preservation. Embryo banking is a realistic proposition for cattle, sheep, goats and rabbits. In pigs and horses the results are still unsatisfactory. Dr. Renard described what would be needed in an effective embryo bank. Embryos should be frozen from at least 25 pairs of any breed. Unfortunately techniques are only well developed and practicable in a few areas of the world at the present time.

The next World Conference on Animal Production will be held in Helsinki, Finland, in 1988.

PRIORITIES IN BIOTECHNOLOGY RESEARCH FOR INTERNATIONAL DEVELOPMENT

The Board of Science and Technology for International Development of the National Research Council convened this workshop on 26-30 July 1982 in Washington DC and Berkeley Springs, West Virginia, at the request of the US Agency for International Development. It was decided that the most appropriate and profitable subjects to discuss were: Vaccines, Animal production, Monoclonal antibodies, Energy, Biological nitrogen fixation and Plant cell and tissue culture. Approximately 35 scientists from developing countries and 25 from USA took part.

The Proceedings of the Workshop have now been published by the National Academy Press, Washington DC. Under the heading Genetics in the section on Animal Production the following priorities for research are recommended: germplasm transfer, identification of germplasm associated with disease resistance, genetic markers in indigenous species, identification of genetic factors related to production, storage and classification of germplasm on a worldwide species basis. Germplasm banks representing exotic and endangered species should be established as soon as possible in the different ecological zones. Under reproduction recommended topics are: ova transfer, reduction of ova wastage, semen preservation in artificial insemination, monoclonal antibodies, testicular hypertrophy, and reproductive management.

EAAP/RBST JOINT MEETING ON CONSERVATION OF EUROPEAN BREEDS OF LIVESTOCK

The Working Party of the European Association for Animal Production held its May 1983 meeting in England. Since 1983 is the 10th year of the Rare Breeds Survival Trust the opportunity was seized to hold a 10th Anniversary Symposium at which the EAAP delegates spoke. Each gave an account of the rare breed situation and the conservation measures being undertaken in his own country and neighbouring ones. The speakers were: K. Maijala (Scandinavia), D. Simon (Germany and the Netherlands), A. Finzi and G. Rognoni (Italy, Austria and Greece), J.-M. Devillard (France, Portugal and Spain), G.L.H. Alderson (Great Britain). Unfortunately there were no delegates from Eastern Europe. The general situation is exemplified by the following figures. In Spain there are 51 breeds of farm animal; 18 of these are endangered. This includes 9 out of the 21 cattle breeds, 4 of the 17 sheep breeds, 3 of the 10 goat breeds and 2 of the 3 pig breeds. For France the corresponding figures are: 31 out of 80 breeds are endangered, including 9 of the 28 cattle, 9 of 37 sheep, 3 of 5 goat, 6 of 12 pig, 3 of 17 horse and the only ass breed. The most striking generalization which emerged is that on the European Continent all, or nearly all, conversation measures are undertaken by the State while in the UK conservation is exclusively in private hands - namely the RBST and its individual members. The EAAP Working Group has now finalized its report which was presented to the EAAP Meeting in Madrid in October 1983 and is being published in Livestock Production Science early in 1984.

34TH ANNUAL MEETING OF THE EUROPEAN ASSOCIATION FOR ANIMAL PRODUCTION
Madrid, October 1983

In addition to the usual European countries, Morocco, Tunisia and Turkey were represented and Egypt became a full member. The whole field of animal production was open for papers and discussion. The Commission on Animal Genetics held a session on the Conservation of Animal Genetic Resources at which the final report of the Working Party chaired by K. Maijala (Finland) was presented and adopted. A review of the report is given under NEWS ITEMS. The next meeting of the EAAP will be held at The Hague, The Netherlands, 6-9 August 1984.

* * * * * *

BOOK REVIEWS

DAIRY CATTLE BREEDING IN THE HUMID TROPICS. Working papers presented at the FAO/GOI Expert Consultation held in Hissar, India, 12-17 February 1979. Daya Singh Balaine (ed). Published by Haryana Agricultural University, Hissar.

This book is a mine of up-to-date information on the cattle genetic resources of the wet tropics and their exploitation for milk production. It has contributions from India (on cattle by Soni and by Katpatal and on buffaloes by Nagarcenkar), East Africa (Kimenye), West Africa (Ngere), the Caribbean (Wellington) and tropical Latin America (Pearson). For each region there is an account of the local breeds and a summary of all research and development work. In addition there is a section devoted to cattle improvement in the tropics in more general terms in which the individual chapters discuss the improvement of local breeds by selection, the importation of temperate breeds, the use of these imported breeds in systematic crossbreeding systems and in the formation of new breeds from crossbred foundations. The final part of the book gets down to practical details and gives the resource requirements in terms of feed, housing, management, disease control, AI services and recording systems required to implement the programmes discussed earlier. Finally the recommendations of the Consultation are listed.

With such a wide coverage and so many different authors it is difficult to summarize. However, it does appear that the prevailing view of the participants at the meeting was that purebred European cattle do not have a place as milk producers *in* the wet tropics. The best overall results seem to be obtained by the use of some intermediate between the local adapted breed and an improved European dairy breed. The optimum proportion of genes from these two types and the best breeding system to maintain it will depend on the environment and the resources available.

It is very satisfactory that these working papers should be published even though we have had to wait so long. (There is no date of publication but the preface is dated 25.2.82 and the book was received in April 1983.) Effectively they form an excellent advanced textbook on the breeding and improvement of cattle for milk in the wet tropics, a book which should be in the hands of every government official, college teacher and research worker concerned with this field. Above all, it should be studied by those involved in the formulation and implementation of development plans and field projects in cattle breeding and production. It is just a pity that the book is marred by some misprints and by poor printing so that in some pages legibility is impaired by the print showing through the paper.

CATALOG0 DE RAZAS AUTOCTONAS ESPAÑOLAS. I. ESPECIES OVINA Y CAPRINA. Cayo Esteban Muñoz and Demetrio Tejon Tejon. 207 p. 1980. II. ESPECIE BOVINA. Antonio Sanchez Belda. 219 p, 1981. Ministerio de Agricultura, Dirección General de la Producción Agraria, Madrid.

"The present catalogue represents a contribution to the objective recommended by FAO, and directed to all governments, to intensify activity on the evaluation and management of their respective livestock patrimonies in face of the grave preoccupation felt throughout the world about the serious attrition of animal genetic resources during the last decade."

This is a literal translation of the opening paragraph of the introduction to the first volume. Later in this short introduction the reasons for this decline in the populations of indigenous breeds are mentioned - namely the importation of foreign breeds

and their use in crossbreeding (gradingup). Therefore the Ministry of Agriculture made an Order dated 30 June 1979 establishing the Catalogo Oficial de Razas de Ganado de España and these two books are the outcome of that Order.

That there are still plenty of breeds to conserve is indicated by the fact that these volumes describe 17 breeds of sheep, 9 of goat and 25 of cattle. These figures (and some breed names) may not correspond with those in previous catalogues of Spanish breeds because, as explained in the introductions, some names are now considered to be only geographical appellations or varieties of other breeds. The numbers of breeds are high even when compared with those in Britain or France which are usually considered to be the countries in Europe best endowed with local breeds. Furthermore in Spain the proportion of animals of local breeds in the total population compared with imported breeds is higher than in Britain or France. This is because there has been less influence of British sheep breeds than in France (not to mention the Merino) and less influence of the Friesian, Brown Swiss, Simmental and Charolais than among British and French cattle.

The present books are restricted to native breeds. For each breed there is a series of 3-10 coloured photographs, a distribution map and an account of the breed under the headings: description and history, numbers and distribution, qualities and performance. In the cattle volume there is some additional material as follows: For each breed there is a table showing the monthly temperature and rainfall figures for the area of distribution. For the major breeds there are detailed figures of the numbers in each province by sex and age according to the census of 1978 and also a chart showing the decline in numbers since 1970. For most breeds there is a table of body measurements and for the five concerned there are details of numbers of herdbook registrations by year.

It is most gratifying to find that at least one member government has taken to heart the FAO recommendation and has produced these excellent books which will form the essential starting point for all future work on the evaluation and conservation of animal genetic resources in Spain.

SHEEP AND GOAT BREEDS OF INDIA. R.M. Acharya. FAO Animal Health and Production Paper No. 30. Rome. 190 p. 1982

India has immense wealth in terms of sheep and goats both in numbers and variety. In 1978 there were 40 million sheep and 70 million goats. This publication describes 40 breeds of sheep and 20 breeds of goat, a breed being defined as "a population ..... in a given locality, with characters distinct from other populations in the vicinity and with a distinct local name". None has a breed society or flock book.

The country is divided into four regions, namely the northwestern and semi-arid region, the southern peninsular region, the eastern region and the northern temperate region, and the breeds are described within regions. None appears to occur in two regions. For each region there is a brief account of land use, topography, soil types, feed resources and management practices. For each breed the headings are distribution, numbers, climate, and breed characteristics (size conformation, flock structure, reproduction, mortality, breeding and performance). Maps show the distribution of breeds within each region. For each breed there are photographs of a male, a female and a flock.

In addition there is a short introduction which includes an account of the sheep and goat populations of India and of population trends. It also has a short paragraph on breeds requiring conservation which lists the following: native Kashmir sheep, Magra, Pugal, and Chokla sheep of Rajasthan, Mandya in Karnataka, Barbari and Jamnapari goats.

The final chapter describes research and development work.

One obvious conclusion which could be drawn from this survey is that, apart from the temperate regions such as Kashmir where crossbreeding with the Merino has apparently been successful, India has more to gain by conserving and improving its own breeds of sheep and goats than by importing "improved" breeds from temperate countries. It is important to value these local breeds and to list and describe them is a first step. What a commentary that the Jamnapari, which is valued as an improver of dairy goats in so many tropical countries, is reduced to a mere 5000 purebreds in its home tract!

FAO has earlier surveyed the sheep of the Mediterranean and of the Middle East. To complete the coverage of the important sheep-raising areas of the world it will now hopefully sponsor similar surveys in the large countries to the west and north of India - namely Pakistan, USSR and China.

BRITISH SHEEP. 6th edition. National Sheep Association. 211 p.

There is no date of publication but it must have been late in 1982 or early in 1983. Fifty-six breeds, seven recognized halfbreds and seven rare breeds are included. In addition to the native British breeds this 56 includes 7 breeds comparatively recently imported (4 from France, 1 from Holland and 2 from Germany) and 3 recent synthetic breeds - the Cambridge, Colbred and British Milk sheep. Unfortunately, for several of these no origin is given. The descriptions vary very much from one breed to another and are more in the nature of breed promotion pieces than systematic or scientific accounts. They were, in fact, supplied by the breed societies; the National Sheep Association claims only to have coordinated their contributions.

In addition to the breeds section there are about 16 pages of advertisements and 63 pages of general information. This includes short accounts of the British Wool Marketing Board, the Agricultural Research Council, the British Agricultural Export Council, the Rare Breeds Survival Trust, and the Meat and Livestock Commission (MLC) and miscellaneous information on such topics as British and world wool production, world sheep populations, sheep production in the EEC and a glossary of sheep terms.

Two tables give interesting comparisons between breeds. One shows the wool characters of 48 breeds and 5 crosses. The other gives the results of MLC recording of body weights and litter size of 32 breeds. The breed descriptions give no idea of the relative importance of each breed but the article on the EEC reveals that 30 percent of British sheep are Scottish Blackface and 25 percent Welsh Mountain. The next three breeds are North Country Cheviot, Swaledale and Clun Forest and they only account for 5-6 percent each.

LITTLE-KNOWN ASIAN ANIMALS WITH A PROMISING ECONOMIC FUTURE. Report of an Ad Hoc Panel of the Advisory Committee on Technology Innovation Board on Science and Technology for International Development, Office of International Affairs, National Research Council. National Academy Press, Washington DC. 131 p. 1983

To the farmer in Europe and North America "livestock" means cattle, sheep and pigs (and sometimes horses) and the major textbooks and research and development projects reflect this point of view. However, in the tropics, other species are equally important. FAO has recognized this and has produced significant books on the water buffalo and the goat. Nor has it neglected minor species as shown by the articles in World Animal Review

and in the proceedings of the Expert Consultation on Animal Genetic Resources held in Rome in 1980.

It is gratifying that other agencies are understanding the importance of some of these animals. The present book, sponsored by the National Research Council funded by USAID and realized by High Popenoe and Noel Vietmayer, is the latest in a series which has already included books on the water buffalo, crocodiles and butterfly farming, and which is contemplating books on other Asian animals and on little-known animals of Africa and of Latin America.

The animals included in this volume are as follows: Domestic bovines - Bali cattle, Mudura cattle, mithan, yak, yak-cat+-le hybrids; wild bovines - banteng, gaur, kouprey, tamaraw, anoas; pigs - bearded pig, Sulawesi warty pig, Javanese warty pig, pigmy hog, babirusa. Except for the yak they are all native to southeast Asia. Each species is described under the following headings: appearance and size, distribution, status, habitat and environment, biology, behaviour, uses, potential advantages, limitations, research and conservation needs. For the domestic species the emphasis is on wider and more efficient utilization. For the wild species - which are nearly all endangered - it is on conservation. An appendix lists references, scientists who contributed information, and zoos who keep specimens of the animals described.

This book is a real contribution to the literature on animal genetic resources. It draws attention to under-utilized animals and it is to be hoped that the many practical suggestions for use and conservation will be heeded by the agriculturalists and conservationists in southeast Asia as well as by the development agencies who may finance projects in that region.

LIVESTOCK RESOURCES OF ISLAMIC WORLD. Mohammad Yunus Ansari and Syed Nasir Hussain Shah. Hijra Publication, Pakistan Agricultural Research Council, Islamabad. 176 p. 1983

This is a literature review by two authors from the Directorate of Veterinary Research Institute, Government of North West Frontier Province, Peshawar, Pakistan. It clearly relies heavily on FAO publications.

No definition of an Islamic country is given. Forty-six countries are listed in the tables. Some of these countries are clearly only partly Islamic, e.g. Albania, Cameroon, Cyprus, Malawi, Nigeria, Tanzania, Uganda.

The booklet is divided into three parts. The first is an introduction which has sections on general livestock production, production of milk, meat, poultry and of hides, skins and wool, on the buffalo, on important breeds, and on animal health. The section on breeds gives short descriptions of only 18 breeds of cattle; 7 of these are Pakistan breeds and 9 are African. The sheep described are also mostly from Pakistan or Africa. In this section the breeds of eastern and southern Africa are listed, wrongly, under "wooled" instead of "hairy". There are also short accounts of buffalo and goat breeds. This section is very inadequate and confusing because of the misspellings of breed names and the mispunctuation of lists.

The second part describes the livestock resources of each of the 46 countries in turn (but Comoros now replaces Albania). For each country one table gives land use, human population and its activity (economic and agricultural), and supply of vegetable and animal protein per head per day. A second table gives the population of each livestock and poultry species (excluding pigs) and the production of meat and milk from each

species and of hen eggs and wool, for the years 1967-71, 1977, 1978 and 1979. There is also a very short comment on the geography and agriculture of the country and, in some cases, breeds are mentioned.

Part III is titled "Problems and Prospects". The subheadings include Nomadism and Transhumance, Rangeland Management, Feed and Fodder Production, Marketing, Education, Investigation and Research. Given such a varied range of countries it is difficult in this part **(as** in Part I) to come to any conclusions which are not the hackneyed statements commonly made about any of the developing countries of Africa and Asia.

HAIR SHEEP OF WESTERN AFRICA AND THE AMERICAS. A GENETIC RESOURCE FOR THE TROPICS. H.A. Fitzhugh and G.E. Bradford (eds). A Winrock International Study published by Westview Press, Boulder, Colorado. 319 p. 1983

It used to be thought that sheep could not be kept in the wet tropics. This was because European wooled breeds do not flourish there. The large populations of hair sheep in tropical Africa and southern India show that adapted sheep can thrive in hot humid zones. These sheep have been well described but until recently, the smaller and more recent populations in tropical America have been sadly neglected. They came originally from West Africa but exactly when, how or from which country is not recorded. Without the benefit of any breeding or development programme they have spread through several countries but again the time and means of expansion are not known. They have occasionally been mentioned in world literature but only the Barbados Blackbelly has been adequately described. The first attempt to give an overall picture of American hair sheep was in the FAO booklet "Prolific Tropical Sheep" (1980) but they were described only incidentally as relatives of the Barbados Blackbelly.

Thus the present book, which represents a project of the Winrock International Livestock Research and Training Center of Morrilton, Arkansas, USA, is the first overall account of the characteristics and performance of all the American hair sheep. It also describes some of the West African breeds from which they derived, with emphasis on performance. The book is divided into four parts. The first, which is written by the Editors, gives a general account of the characteristics and performance of hair sheep including a description of the breeds in West Africa and the Americas and a summary of the production figures in the rest of the book. Part II covers Latin America and the Caribbean. Six chapters are devoted to the Barbados Blackbelly, two to the Mexican Pelibiiey, two to hair sheep in Venezuela and one each to the Colombian Africana, Brazilian hair sheep and the Virgin Islands White. Unfortunately Cuba is not included; its population of hair sheep is, after Brazil and Colombia, one of the largest in the Americas. The third part is about West Africa. As in Part II each chapter is by a local expert. Two contributions are from Nigeria, and one each from Ivory Coast, Senegal and Mali. Part IV has five chapters on Barbado sheep and one on the St Croix (Virgin Islands) sheep, both in USA. The book is illustrated by 11 black-and-white and 40 excellent coloured photographs.

The conclusions of the Editors are worth quoting: "We believe hair sheep are a genetic resource with considerable potential for meat production in tropical and, perhaps, temperate environments. Realization of this potential will require sustained efforts on the part of producers, scientists, and public officials to develop more efficient production and marketing systems for hair sheep." Winrock International and the Editors are to be congratulated on this pioneering work which should indeed, as they hope, stimulate the recognition of hair sheep as an important source for food production.

M/Q7426/TRI/3.84/1/1500