
PRESERVATION AND IMPROVEMENT OF ONGOLE CATTLE

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SUMMARY

The characteristics of the Ongole cattle of India are described, their distribution and numbers in India and other countries is given, and plans are outlined of the need to conserve and to improve the breed.

RESUME

Cette note décrit les caractéristiques des bovins de la race Ongole et donne des indications sur leur répartition et leur nombre en Inde et dans d'autres pays ainsi que sur les programmes de conservation et d'amélioration de la race.

RESUMEN

Se describen las características del vacuno Ongole de la India, se dan datos sobre su distribución y número en la India y otros países, y se sugieren planes para conservar y mejorar la raza.

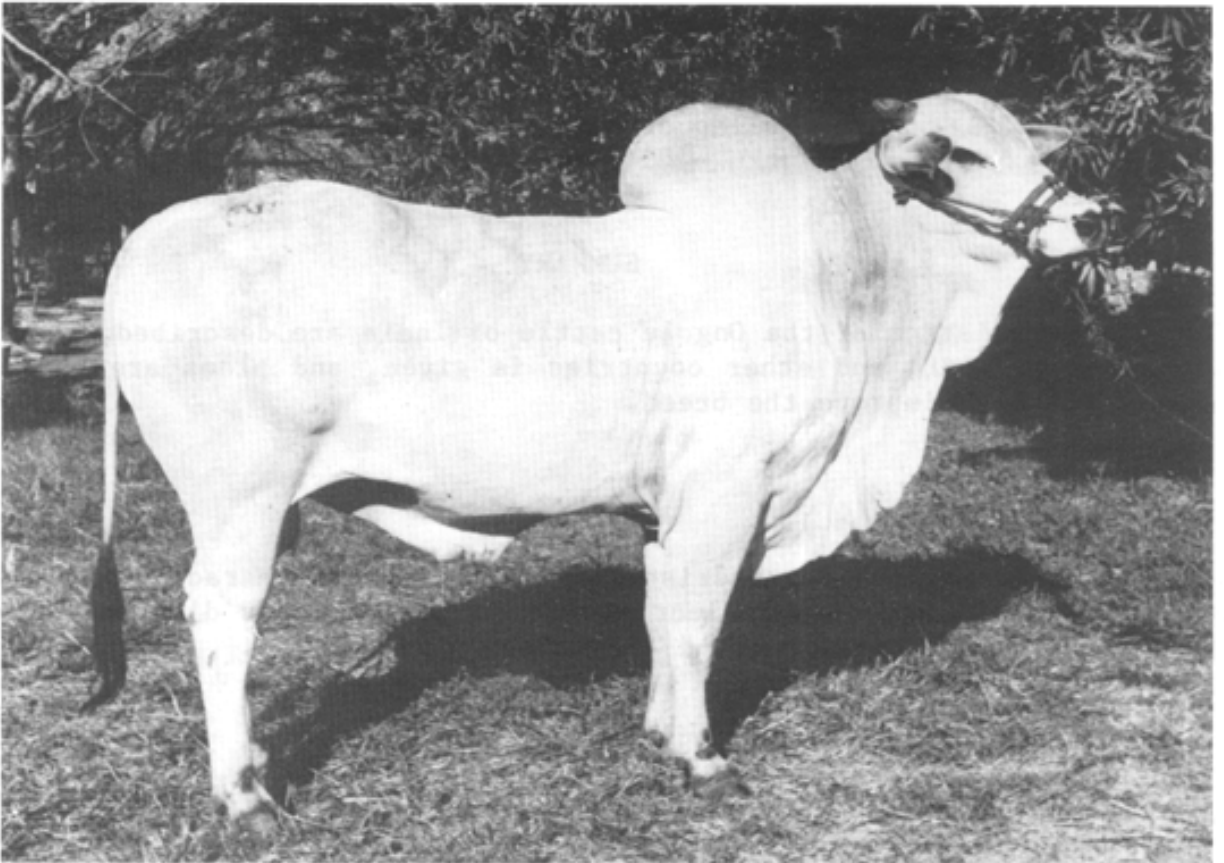
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The cattle of India (**Bos indicus**) have been in the service of mankind for many thousands of years. They have endured famine, insect pests, diseases and the hot and cold climates of India. They have been fortified by nature with an ability to preserve and perpetuate their life where other breeds have failed. The adaptation qualities of a few Indian cattle breeds have kept them in wide demand since the early days of history. In their expansion abroad, these cattle have helped improve cattle in their adopted countries.

Some thirty well defined breeds of cattle exist in India. They vary in type and characteristics according to the need of the regions where they originated. Only a few Indian cattle breeds have spread outside India. One is the Ongole which has spread to many other countries. The Ongole is one of the ancient breeds of Indian cattle originating from the coastal belt of Andhra Pradesh State, on the east coast of peninsular India. The best work type specimens of this breed were developed south of the river Krishna and north of the river Penna, covering the districts of Guntur, Prakasam and Nellore; the best dairy type specimens, capable of producing eight to ten litres per day peak yield, were developed in the delta of the river Godavari, covering the districts of East and West Godavari.

Ongoles are well adapted to warm climates. They are extremely heat tolerant. They do well in areas of high temperature and humidity, requiring little shade and will graze or rest in the hottest weather without any apparent discomfort. Ongoles are little affected by insect pests, and are strongly resistant to diseases spread by blood-sucking insects and external parasites.

Ongoles do well on the range because of their hardiness, thriftiness and rustling ability, being able to respond to good pasture, and also thrive under conditions of poor range and drought. They can range to greater distances than some breeds. Ongole cows make excellent mothers, giving milk with a butterfat content of over five percent, resulting in big, thrifty calves with considerable bloom at weaning. One very important characteristic of Ongole cows is their



mothering instinct. They stay with their calves and protect them from predatory animals and other dangers.

As feeders, Ongoles compare favourably with European breeds, are efficient users of roughage, and in the warm tropics, have attractions because of their heat tolerance.

Ongole cows can remain active producers until 15 years of age, which is often longer than the European cows. Occasionally one can find Ongole cows in regular production up to 20 years of age.

Ongole cattle were exported to many tropical regions of the Americas, West Indies, Southeast Asia and Australia up to the early 1900s and earned international recognition for their capacity to survive and perform well on tropical pastures, their hardiness, efficiency and resistance to various insect transmitted diseases of the tropics.

With improved irrigation facilities came commercial crops and mechanization of agriculture, in the homeland of the Ongole, where their numbers have dwindled and continue to drop further. With an increased demand for milk and introduction of crossbreeding with Jersey and Holstein breeds, to boost milk production, this drop in the numbers of Ongole cattle has been accelerated. Unless this trend is arrested, the world may lose an excellent breed of cattle that could contribute a lot to livestock production in the tropics. Ongole has some traits needed in the tropical cattle industry. Hence, it has become necessary in the interest of livestock production in the tropics to preserve and improve the Ongole in its homeland.

The well established Ongole herds at state and university farms that had five to ten generations' breeding were lost due to policy changes of the government in favour of crossbreeding with European exotics. Therefore, a farmers' organization has stepped in to avoid liquidation of a useful breed of cattle whose potential, they believe, has not been fully exploited.

The objectives of this project are:

- to maintain a good germplasm centre of Ongole cattle and to improve further the genetic potential of the herd;
- to conduct genetic analysis of the herd for growth, milk yield, reproductive efficiency and draught capacity;
- to establish a frozen semen and embryo bank to help in the spread of the breed; to help in the international spread of Ongole cattle.
- This project will consist of Preservation (Phase I) and Improvement (Phase II).

Phase II will be taken up only after Phase I is in an advanced stage of execution.

Phase I

Purebred Ongole cattle available at different livestock farms in the home breeding territory will be pooled and an initial herd of 100 breedable females will be established. This herd will be maintained under an extensive management system and the performance of the base population and progeny generations will be recorded on the following traits: growth, production, reproduction, and fitness.

Phase II

A herd of 100 purebred Ongole cows will be bred using frozen semen from selected Italian Chianina/Piedmontese bulls to produce half bloods. The resulting female progeny will be bred back to 7/8 Ongole blood level, using frozen semen from Ongole bulls, selecting for better conformation and muscling, while retaining the other traits of the Ongole cattle. The selected 7/8 Ongole progeny will be mated inter se and stabilized to produce an improved-version of the original Ongole.

Ultimately, the project will have a herd of about 200 purebred Ongole cattle under Phase I and a herd of about 200 improved Ongole cattle under Phase II. Phase I of the project will be self-supporting from the 8th year onwards. The project will, by this stage, be in a position to meet the semen requirements of the Indian Ongole cattle breeders and other international requirements.

THE CONSERVATION OF ANIMAL GENETIC RESOURCES IN GREAT BRITAIN

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SUMMARY

Resources available for animal genetic conservation should be used judiciously. Thus breeds qualifying for conservation should not only be numerically endangered but also possess genetic merit. In determining genetic merit, future changes in market requirements or production systems should be considered. There is an urgent need for an evaluation of the present commercial value of rare breeds in breeding programmes. Support for rare breed preservation in Great Britain is implemented through conservation programmes, evaluation studies and education at different levels.

RESUME

Les ressources disponibles pour la conservation du patrimoine zoogénétiques doivent être utilisées judicieusement. C'est ainsi que les races à conserver ne doivent pas être seulement menacées d'une réduction numérique mais doivent aussi posséder des caractéristiques génétiques intéressantes. En évaluant les qualités génétiques, il faut tenir compte de l'évolution future des besoins du marché et des systèmes de production. Il faut examiner d'urgence la valeur commerciale actuelle des races rares dans les programmes de sélection. Pour aider à préserver ces races en Grande-Bretagne, on exécute des programmes de conservation, on procède à des évaluations et on prend des mesures éducatives à différents niveaux.

RESUMEN

Es preciso utilizar con prudencia los recursos disponibles para la conservación genética animal. Por lo tanto, a fin de determinar qué razas deben conservarse, estas no sólo han de estar numéricamente en peligro sino también ser valiosas desde el punto de vista genético. Para determinar su valor genético, deberán tenerse en cuenta los futuros cambios en las necesidades del mercado o en los sistemas de producción. En los programas de mejora genética es urgente una evaluación del actual valor comercial de las razas raras. En Gran Bretaña, el apoyo para la conservación de esas razas se presta mediante programas de conservación, estudios de evaluación y educación a distintos niveles.

In Great Britain the conservation of animal genetic resources is achieved by maintaining pure breeds of domestic livestock, each with clearly defined and distinct characteristics.

The “gene pool” method of conservation is not used owing to the difficulty of identifying and utilizing specific characteristics in a large random-breeding population of diverse origins. There is also a danger of genetic drift and wastage unless sufficient “gene pool” populations are maintained in a variety of environments.

Genetic conservation in recorded breeds is more easily controlled and monitored, but there is also a danger of genetic drift within pure breeds owing to the small population size, and it is necessary to follow carefully planned breeding programmes to prevent this happening.

What is a Breed?

It is necessary to define a breed. It may be taken as a group of animals of similar characteristics which when mated together produce progeny of the same type, within the standards published by the registration organization.

New breeds are continually being created. In Britain the primitive Castlemilk Moorit was established in the early years of the present century, while the highperformance British Milk sheep was established in the 1970s. Meanwhile 23 British breeds of large livestock have become extinct in the twentieth century.

In some cases a breed may exist in separate locations and may have been recognized as sub-breeds. For example, the Friesian cow is seen in different types ranging from the extreme dairy North American Holstein to the beefier European Friesians, but from a conservation point of view they belong to the same breed, and provided each type is adequately represented in the total population, resources should not be allocated separately to each type.

Similarly in Britain the various varieties of Shorthorn, although they show marked divergent evolution, are all derived from the same genetic base. They include the. Beef Shorthorn, Whitebred Shorthorn, Dairy Shorthorn and Northern Dairy Shorthorn. In other cases one breed may have exerted such an influence on other breeds of similar type that they can be considered as one group within a conservation programme. For example, Lincoln Longwool, Cotswold and some other British longwool breeds are now almost identical to the Leicester Longwool.

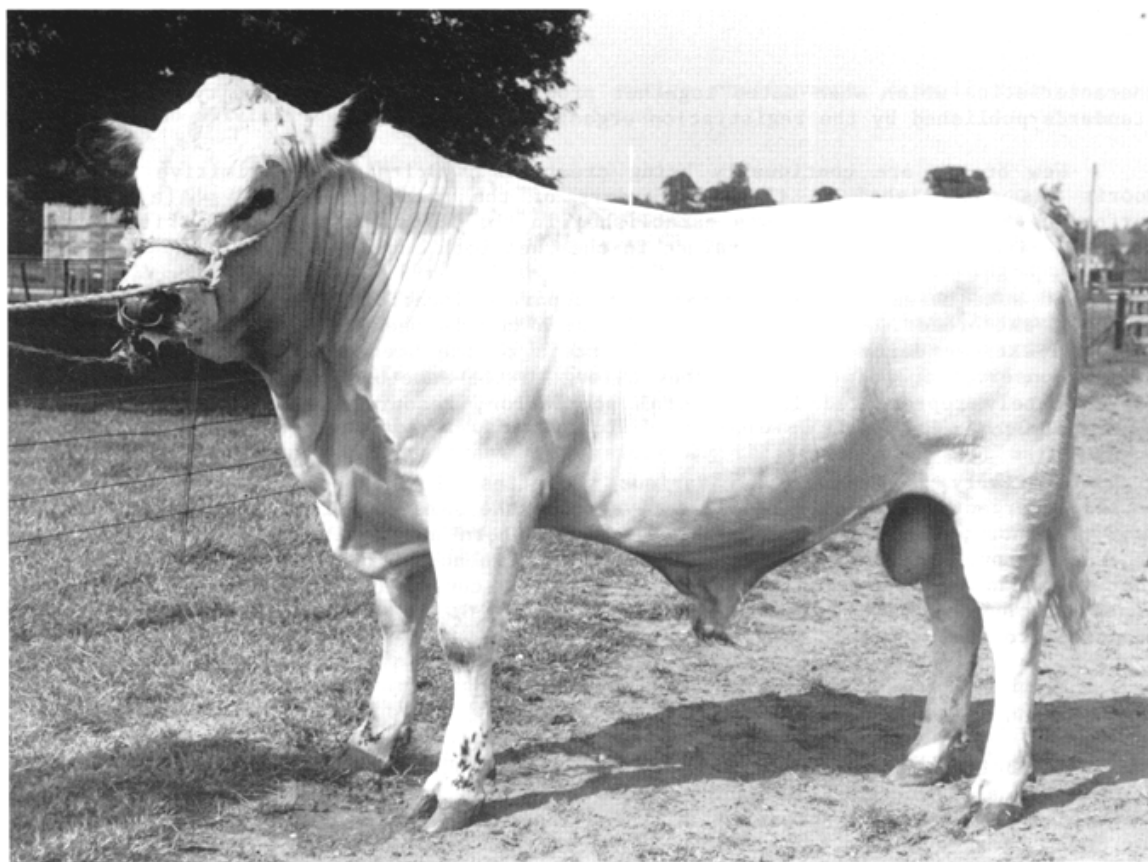
Organizations

In Britain, the various organizations which have initiated conservation programmes are all concerned with pure breeds. The Milk Marketing Board, whose commercial activities are based on wholesaling milk and the sale of semen, established a semen bank for bulls of rare breeds. Countrywide Livestock Limited, an animal breeding consultancy company, established a registration programme for breeds not administered by a breed society. The Rare Breeds Survival Trust, a specialist conservation organization, assists breed societies and breeds of rare breeds of domestic livestock.

Philosophy of Conservation

The philosophy on which the conservation of rare breeds is based in Britain places different priorities on each breed and on each method of conservation. For example, to qualify for the support of the Rare Breeds Survival Trust a breed must satisfy two criteria. It must be numerically endangered. Population size is based on the number of breeding females producing purebred progeny. For sheep the critical number is 1500 ewes, for horses 1000 mares, for cattle 750 cows, for goats 500 nannies, and for pigs 150 sows. These numbers are based on British standards of average herd or flock size, reproductive capacity and the ratio of males to females. Systems of management in other countries would give different standards.

The second criterion is that a breed must be of sufficient genetic value. Thus some breeds are



British White bull. This polled breed is particularly favoured for its ease of calving.



White Park cow. Animals of this type were found in pre-Christian Ireland more than two thousand years ago.

not supported by the Rare Breeds Survival Trust. For example, the Norfolk Horn, an old breed from eastern England, is not recognized because the purebred population became extinct and the present population is derived from graded-up animals. The Oxford Sandy and Black pig and Blue Albion cattle are not recognized for the same reason. However, the Milk Marketing Board stores semen from Blue Albion bulls, and Norfolk Horn sheep are registered in the Combined Flock Book set up by Countrywide Livestock Limited.

In other cases breeds are not supported because they are merely colour varieties of a popular breed. Examples of this are the Bolian Gwynion, a belted variety of the Welsh Black, and the White Galloway, a variety of the Galloway.

Some foreign breeds, which have become neglected or even extinct in their native country, have found a haven in Great Britain. For example, the Caspian Horse, which is almost extinct in Iran, is now being actively conserved in England and elsewhere.

Ideally a breed should be conserved in its native environment, but if this is not possible, then alternative locations must be found.

Fluctuating Population Size

It must be recognized that market requirements and breeding fashions are changing continuously, and as a result the fortunes of each breed fluctuate depending upon their suitability for the contemporary market or their appeal to succeeding generations of breeders. Within the last ten years several rare breeds in Britain have improved their numerical status sufficiently to be no longer classified as rare. These breeds include Jacob, Black Welsh Mountain, Teeswater and Southdown sheep, and Shire horses.

In contrast, the fortunes of other breeds have improved relatively slowly despite considerable support and it is relevant to consider why they are rare. Three main causes can be identified:

- No commercial value. Breeds such as Gloucester cattle, Portland sheep or Bagot goats have no obvious immediate or medium-term commercial value.
- Changing fashion. The Wensleydale, for example, was superseded by the Teeswater for reasons of fashion rather than genetic merit.
- Crossbreeding. Some rare and minority breeds have been seriously modified in an attempt to meet changing market conditions. Thus the Beef Shorthorn has attempted to regain size by crossing with the Maine-Anjou, while the Sussex may improve its carcass quality by using Limousin bulls.

Distinctive Qualities

There are at present 45-50 rare breeds of large farm livestock in Britain, and they can be classified according to their potential value within the livestock industry. A basic principle to be observed when assessing the value of a rare breed is that it must be conserved for its own distinctive qualities. If a breed needs to be changed too much it would be more relevant to use a different breed. It is more important to discover the conditions and systems of production in which a breed can be used most effectively. For example, Shetland cattle are well suited to marginal land, and as marginal land becomes increasingly important in the world economy, breeds and species adapted to this environment will have a greater role to play. Even wild species such as the bison might be utilized.

Categories for Conservation

Some rare breeds can contribute immediately to the livestock industry. They have been prevented from doing so by whims of fashion or by isolation. For example, North Ronaldsay sheep have the ability to exist exclusively on a diet of seaweed, and this could be of value in many parts of the world. British White bulls could be of great benefit when used on heifers of

dairy breeds as they cause minimum difficulties at parturition, and they could replace the Aberdeen Angus for this purpose. In these cases the main function of a conservation policy is to establish commercial units of these rare breeds to demonstrate their value.

Some other rare breeds possess characteristics which make them potentially valuable. White Park cattle are an ancient breed which has been relatively unaffected by changes in fashion and market requirements during the last three hundred years. Thus they have retained important characteristics lost by some other breeds. They have strong colour marking, good growth rate, longevity and great vigour. Wensleydale sheep, although used very little now in their original role as the sire breed of prolific sheep, could find another role by virtue of the special quality of their wool, their high growth rate and their heavily pigmented skin. For these breeds conservation programmes should give maximum publicity and promotion to advise breeders of their qualities.

Some breeds do not appear to possess characteristics which have any commercial relevance. Examples of these breeds were mentioned earlier, but perhaps the best example is Chillingham cattle. Despite their apparent lack of commercial value, such breeds should be provided with financial incentives to enable them to survive. It is possible that future market requirements, unforeseen at this time, may enable their unique genotype to make a significant contribution to the livestock industry. But even in the absence of this justification, their conservation on the grounds that they are an integral part of national heritage and history should be sufficient reason.

Methodology

In Great Britain the programme of rare breeds' support is implemented in three stages, namely conservation, evaluation and education.

1. Conservation is concerned mainly with the identification of problems and the implementation of both emergency and long-term solutions. The main aspects of this programme are:

- a. A survey of rare breed populations carried out triennially.
- b. Identification of immediate problems by liaison with breed societies and breeders.
- c. Identification of potential problems by monitoring the status of individual bloodlines and of levels of inbreeding within each breed.
- d. Immediate solutions provided mainly by financial incentives for specific activities including AI programmes, publication of herd and flock books, importation of livestock, and stud premiums.
- e. Long-term solutions provided by programmes such as:
 - (1) Gene bank of frozen semen and embryos
 - (2) Creation of new breeding units
 - (3) Approval of breeding centres

2. Evaluation is necessary if rare breeds are to be used in the future. It is necessary to know the characteristics of the breeds which are maintained either as live populations or in gene banks. Various evaluation projects and trials have been undertaken including the following:

- a. Multibreed trials at the Animal Breeding Research Organisation in Scotland to evaluate breeds for efficiency of production.
- b. White Park cattle trials by Livestock Improvement Services in England which showed White Park bulls to be superior to Welsh Black and Hereford for crossing with dairy cattle.
- c. Heavyweight lamb production trials by the Royal Agricultural Society of England which showed the Oxford Down to be superior for this performance characteristic.
- d. Evaluation of Soay sheep which showed their high efficiency of production when crossed with rams of a Down breed.

- e. Polyunsaturated fats. The carcasses of animals of unimproved primitive breeds appear to contain less saturated fat.
- f. Polymorphisms. A study of blood types and chromosome structure helps to show the relationship between breeds. For example, the British White has a high frequency of the 1,29 translocation, while it is absent from the White Park although the two breeds are the same colour.
- g. A Register of Congenital Defects is maintained. Defects are potentially much more dangerous in a small population and need to be monitored carefully. Several defects have been identified, including split eyelid in multihorned sheep (Jacob, Hebridean, Manx Loghtan) and entropion in Cotswold sheep.

3. Education is a necessary support for both the conservation and education programmes. Genetic conservation and the maintenance of native minority breeds have been neglected by livestock breeders and farmers in modern times, because they have been concerned with the intensive selection of a small number of breeds for high levels of production. With the realization that genetic variation is necessary for ongoing progress, and that efficiency of production is more important than total production, a programme of re-education to make breeders aware of the merits of minority breeds has been undertaken.

Education is provided in three main ways:

- a. Technical meetings and seminars which are held regularly throughout the year.
- b. Symposia and specialist conferences to discuss in detail major projects and new developments.
- c. A technical consultant who conducts a series of breeders' workshops, prepares breeding programmes, maintains an information bank, and designs the overall strategy of conservation policy.

The result of these programmes is that out of almost 50 rare breeds in Great Britain, only two have decreased in numbers in the past ten years.

RARE BREEDS OF LARGE LIVESTOCK IN GREAT BRITAIN

Cattle:

Belted Galloway, British White, Dexter, Gloucester, Irish Moyle, Kerry, Longhorn, Northern Dairy Shorthorn, Red Poll, Shetland, White Galloway, White Park, Whitebred Shorthorn.

Sheep:

Cotswold, Hebridean, Leicester Longwool, Lincoln Longwool, Manx Loghtan, North Ronaldsay, Oxford Down, Portland, Ryeland, Shetland, Shropshire, Soay, Wensleydale, Whitefaced Woodland, Wiltshire Horn.

Goats:

Bagot, Golden Guernsey.

Horses:

Caspian, Cleveland Bay, Clydesdale, Dales Pony, Exmoor Pony, Fell Pony, Suffolk.

Pigs:

Berkshire, British Lop, British Saddleback, Gloucester Old Spots, Large Black, Middle White, Tamworth.

NEWS ITEMS

FAO/UNEP ANIMAL GENETIC RESOURCES DATA BANKS - A PROGRESS REPORT

An outline of the work being undertaken on this subject was given in the last issue of *AGRI* (No. 3). This note briefly brings the latest news. The Pilot Trials to investigate a methodology for preparing genetic characterizations of indigenous breeds of livestock and poultry in Africa, Asia and Latin America were concluded at the end of 1984. Regional evaluation meetings were held in Bangkok for the trials in Malaysia, Sri Lanka and Thailand, and in Maracay for the trials in Mexico and Venezuela. The trials in Africa were of a different nature, since a regional planning meeting was held in 1983, which resulted in individual scientists working on the subject. Their reports were received in 1984.

A consultant expert in computer system analysis was present at the regional evaluation meetings. He subsequently worked on the experiences gained in each region, and made recommendations on the most suitable hardware and software for data banks on animal genetic resources.

The recommendations from the regional evaluations and from Africa were then studied, and compiled by two experts with the aim of taking all the desirable features from each trial and compiling them into a uniform system suitable for global use. FAO/UNEP have been committed to the definition of such a unified methodology for data banks for animal genetic resources. This is needed to achieve the objectives of making genetic characterizations available to users throughout the world in an easily accessible form, without loss of any important information. The two experts are Mr. John Turton, Director of the Commonwealth Bureau of Animal Breeding and Genetics in the UK, who worked with the mammalian species, and Dr. Roy Crawford, Professor in the University of Saskatchewan, Canada, who worked with domestic bird species.

These two experts produced draft Descriptor Lists for each species and also draft Descriptors for the Environments. With experience coming from 3 regions of the world and from the many scientists who had worked on the Pilot Trials, they had a wealth of information from many natural environments and different management systems. These, together with a recommended methodology for the Data Bank and the recommendations of the systems analyst, were presented to an FAO/UNEP Expert Consultation which was held in Rome from 17 to 21 June 1984. At this Consultation, experts in each species and with interests in different parts of the world, and connections with regional animal genetics and production professional societies, considered these draft descriptor lists and methodology with the aim of defining the approved FAO/UNEP methodology. A full report of the recommendations of the Expert Consultation will be given in the next issue of *AGRI*.

PRZEWALSKI'S HORSE

The Przewalski Horse (*Equus Przewalskii*), also known as the Mongolian Wild Horse, was first described by the Russian Zoologist Poliakov in 1881, who named the horse after Colonel Nikolai Przewalski, a Polish-born soldier in the Czar's army. Colonel Przewalski had obtained the skull and skin of a wild horse in the Mongolian District of Kobdo. Przewalski's Horse is the only true wild horse. The feral horses of the world are all derived from the domestic horses (*Equus caballus*). The last confirmed sightings of the Przewalski Horse in the wild in Mongolia were in the 1960s. Fortunately, living Przewalski's Horses were brought from the wild in Mongolia from 1899 onwards, and in 1980 there were 388 animals in captivity in some 70 institutions throughout the USSR, Europe and North America. Many of these are in zoos in small numbers. The largest group is at Askaniya Nova, a nature reserve in the Ukraine (USSR), comprising about 55 animals in a semi-wild state. A herdbook is maintained by Dr. Jiri Volf at the Prague

Zoo, and pedigree information exists on all animals. All the Przewalski Horses now in captivity derive from twelve *E. przewalski* and one *E. caballus*. The percentage contribution of each founder can be traced in each currently living animal.

The Government of the Mongolian People's Republic have requested restoration of the Przewalski's Horse to Mongolia in the area from which it came. FAO and UNEP are cooperating with the Government of the USSR to draw up an Action Plan to achieve this. Funding is being provided by UNEP and FAO is responsible, with the Centre for International Projects of the USSR for the organization of an Expert Consultation to design the Action Plan. IUCN, who have promoted much recent work with Przewalski's Horse, are also involved in the programme design. The Expert Consultation is planned for Moscow at the end of May 1985. A report of the Expert Consultation and the Action Plan will be given in the next issue of AGRI.

MOST THREATENED ANIMALS

According to a report in The Times of London of 17 November 1984, the International Union for Conservation of Nature (IUCN) at its meeting held recently in Madrid, highlighted the grave situation with regard to certain plant and animal species threatened with extinction. Among the six "most threatened" animals listed by them were the Kouprey wild ox of Southeast Asia and the Pygmy hog of the Himalayan foothills; others being the Sumatran rhinoceros, the Mediterranean monk seal, Orinoco crocodile and the Brazilian woolly spider monkey. The Kouprey ox, which has dwindled in numbers to only one small herd after Indo-China's various wars, is believed to be resistant to rinderpest. If this could be confirmed, the disappearance of this breed is a matter of genuine concern. It may interest AGRI readers to know that the Kouprey ox is a humpless animal which is classified in the sub-genus *Bibos* along with the Banteng - the wild ancestor of Bali cattle in Indonesia. When interbred with domestic cattle, the male hybrids will therefore be expected to be sterile.

INTERNATIONAL GENETIC RESOURCES PROGRAMME

The IGRP was founded by the Rural Advancement Fund International to address the problem of the loss of genetic resources in plants and animals. (The RAFI is a nonprofit organization chartered in the Netherlands.) Work to date includes the following:

- Initiation of educational campaigns on the loss of genetic diversity in agriculture.
- Promotion of the establishment of an international network of gene banks and a legal convention mandating the full exchange of genetic materials between countries.
- Support of national groups in several countries in their efforts to block legislative moves that would encourage the monopolization of genetic resources.
- Assistance to organizations around the world in their efforts to initiate genetic resources education and conservation programmes.
- Publication (shortly) of a book on the politics of genetic resources.
- Production of a slide show on the loss of genetic resources.

IGRP Report, Vol. 1, No. 2 was published in October 1984. Most of its 6 pages are devoted to plants. In fact there are only two references to animals - a short paragraph about the work of the Rare Breeds Survival Trust in the UK and a note about a herd of Belted Galloway cattle in the USA.

IGRP also has a speakers' bureau and undertakes consulting work on special projects.

For further information write to: IGRP, RRI (Beresford), Brandon, Manitoba R7A 5Y1, Canada, or P.O. Box 1029, Pittsboro, NC 27312, USA.

ANIMAL PRODUCTION IN ARID ZONES

The Animal Science Division of the Arab Centre for the Studies of Arid Zones and Dry Lands (ACSAD) is planning an international conference on animal production in dry zones to be held in its headquarters in Damascus from 7-12 September 1985. It will cover sheep, goats, cattle and camels and the disciplines of breeding, nutrition, reproduction, socio-economics, animal health and management. For further information write to: Dr. Ousama A. Awa, Director, Animal Science Division, ACSAD, P.O. Box 2440, Damascus, Syria.

N'DAMA CALVES BY EMBRYO TRANSFER

Embryo transfer technique has been successful in introducing the trypanotolerant N'dama breed to the International Laboratory for Research on Animal Diseases (ILRAD) located in Kenya. This technique was resorted to, because not only is live animal transfer expensive but animal health regulations also restrict the movement of animals from West Africa to Kenya. N'dama embryos were obtained from selected donors in The Gambia, frozen and then shipped to Kenya where they were surgically transferred to Boran recipient heifers. These animals will be used at ILRAD to elucidate the mechanisms underlying resistance to trypanosomiasis including a search for associated genetic markers.

INTERNATIONAL CENTRE FOR GENETIC ENGINEERING AND BIOTECHNOLOGY

Since our report in the Animal Genetic Resources Information issue 1/84 on the proposals for setting up an International Centre for Genetic Engineering and Biotechnology, further developments have taken place. At a plenipotentiary meeting of the United Nations Industrial Development Organization held in April 1984, it was decided to set up the centre with locations in Trieste, Italy and New Delhi, India. The Italian Government is providing US\$ 400 000 to a UNIDO trust fund to finance a number of preparatory research, training and development activities in addition to its offer of considerable financial assistance in the establishment of the centre.

FROZEN EMBRYOS AS CONTROLS IN A BEEF CATTLE BREEDING PROGRAMME

An interesting experiment has been designed using frozen embryos at the Wokalup Research Station in Western Australia to study the genetic response in a beef cattle selection programme. The first phase of this experiment which involves freezing embryos from 130 cattle of the Wokalup multi-breed and Hereford purebreds is now complete. These embryos will be kept frozen for 10 years and transferred to recipients to obtain calves in 1994. The frozen embryo calves which will be genetically similar to calves born in 1984, when compared with contemporary calves born in 1994 out of normal matings will give an estimate of the selection response during that period.

PRO SPECIE RARA

The foundation "Pro Specie Rara" was formed in December 1982. It has as its aim the maintenance of the cultural heritage of genetic resources of livestock and vegetation. At present its field of action is chiefly in eastern Switzerland. Its first annual report, for the year 1982/83, describes projects on the Stiefelgeiss (Booted goat) of St. Gallen, on the Hinterwalder cattle of Germany, on local sheep breeds (particularly the Tavetscherschaf which was believed extinct), on the Spitzhauben hen and on fruit and vegetables. Conservation herds of Stiefelgeiss and Hinterwiilder cattle are maintained. The address for further information is: Pro Specie Rara, Postfach 125, 9003 St. Gallen, Switzerland.

PIG NEWS

Two publications which may be of interest to animal breeders and geneticists working with pigs are: (i) Index of Current Research on Pigs; and (ii) Pig News and Information. Both are published by the Commonwealth Agricultural Bureaux in the UK. The Index is published annually, and the current issue (No. 31) covers the year 1984 and contains more than 6000 entries from 52 countries listing projects in progress and publications from about 450 institutions, including for the first time the People's Republic of China. Pig News and Information is published quarterly and has the pig abstracts from all the CAB abstracting journals, together with reviews and notes from correspondents. Although both publications cover all aspects of pigs, they include, of course, the breeding and genetic aspects.

REPORTS OF MEETINGS

WORKSHOP ON GENETIC MANAGEMENT OF CAPTIVE POPULATIONS

The purpose of this workshop, held at the Smithsonian Institution's National Zoological Park, Front Royal, Virginia, USA, from 7 to 10 August 1984, was to discuss and disseminate information on genetic management of captive populations with particular relevance to populations of zoo animals. It was specifically concerned with several controversial subjects which emerged at the 1982 Man and Biosphere Conference on "The Application of Genetics to the Management of Wild Plant and Animal Populations" (published as Schonewald-Cox et al. (eds.) 1983. "Genetics and Conservation". Benjamin/Cummings Publishing Co.). The topics covered overlap the field of interest of the FAO/UNEP Joint Panel of Experts on Animal Genetic Resources Conservation and Management. A major emphasis was on the genetic management of captive populations of endangered species.

There were 38 invited participants at the workshop, representing a mixture of geneticists and zoo personnel. The participants were predominantly from the USA, but included people from Australia, United Kingdom and Federal Republic of Germany.

The meeting consisted of five Current Issue Panel sessions and several Research Reports. Flesness set the scene by describing the "Background and Perspectives" of the workshop.

Under the heading "Coadapted Gene Complexes and Population Boundaries" the first panel dealt with the questions:

How important is local adaptation in vertebrates?

How can we define population boundaries?

What are the Probable consequences of management at various taxonomic levels?

A highlight of this session was Templeton's contribution describing methods for distinguishing between outbreeding depression and inbreeding depression.

The second panel considered "Fitness/Genetic Diversity Relationship", addressing the questions:

Is individual fitness a function of heterozygosity?

Is future population fitness a function of the number of alleles preserved?

There was considerable controversy on these points and little in the way of consensus emerged. "Selection in Captive Populations" was the topic for the third panel. They discussed the questions:

What kind of unconscious selection occurs? What are its effects?

Should we select for inbreeding tolerance? If so, when?

Should we select for genetic diversity?

Should we select for phenotype?

Should we minimize known selection?

A high degree of agreement was reached on these subjects. This was a result of recognizing that genetic management of populations depends crucially on the types of populations being managed and the objectives of the management. Consequently, the answers to the above questions depended on the type of population being considered, whether a common species for display, an endangered species for long term conservation, a rare species for multiplication and immediate release back into the wild, or a species not yet capable of self-sustaining reproduction in captivity.

"The Zoo Ark: Population Size and Time Frame of Consideration" was the topic for the fourth panel. The questions addressed were:

How long is the voyage?

How many animals per cabin?

The main issue here was the vexing problem of setting priorities in assigning space to species in zoos.

“Breeding Plans” was the subject considered by the fifth panel. They discussed the questions: What breeding plans are available for captive populations?

How do goals affect breeding plans?

How do practical constraints limit breeding plans?

A feature of this session was Lande’s reassessment of the population size required to maintain genetic variation. He also recommended that some inbred matings be allowed in order to control the genetic load.

Research Reports dealt with recent evidence relevant to genetic management of captive populations. Ryder spoke about “Mitochondrial DNA and chromosomal analyses”, with major emphasis on the use of these techniques to resolve cases of taxonomic confusion. Cothran described “Genetic variation and inbreeding in Standardbred horses” and Murray documented the “Effects of inbreeding in Australian budgerigars”. The most novel of the research reports was that by Newman from S.J. O’Brien’s laboratory, describing the extremely low levels of genetic variation in S. African cheetahs. Papers of a mainly theoretical nature were given by Dyke, MacCluer, Thompson and Meyers.

The meeting was well organized and stimulating with contributions being of a very high quality. A notable feature of the workshop was the excellent rapport between geneticists and zoo personnel.

The proceedings of the meeting are due to appear in *Zoo Biology* in mid 1985, probably as a supplementary issue. They should be of interest to anyone with an interest in conservation genetics.

RECENT PUBLICATIONS

PROCEEDINGS OF INTERNATIONAL SEMINAR ON SHEEP AND WOOL, 14-16 MARCH 1982, ISLAMABAD. PAKISTAN AGRICULTURAL RESEARCH COUNCIL, 1983.

A reference to this seminar has already been made in AGRI 1/83 where the recommendation to collect information on local sheep breeds was highlighted. The proceedings have now been published and they include, in addition to the recommendations, the full text of the technical papers and discussions. The whole range of breeding, feeding, management, health, research, extension and training was covered by the seminar, but the papers of most interest to readers of AGRI are: General patterns of production, breeds, management, disease, nutrition, performance and problems, by Abdul Wahid; Breeding plans, by Helen Newton Turner.

It should be mentioned that a 30-page pamphlet describing the sheep breeds of Pakistan was distributed at the meeting but not included in the proceedings.

CAMEL NEWSLETTER (CNL)

In April 1984, the Arab Centre for the Studies of Arid Zones and Dry Lands (ACSAD) published the first issue of "Camel Newsletter". Apart from introduction and editorial matter the newsletter contains the following material:

1. News and notes. News of five participants at the Camel Workshop held in-Khartoum in 1979 and of research in a number of countries.

2. Book reviews. the following recent books are reviewed:

Bulliet R.W. 1975. The Camel and the Wheel. Harvard University Press, Cambridge, Mass.

IFS. 1980. Workshop on Camels, Khartoum 18-20 December 1979. Provisional Report. International Foundation for Science (Stockholm) and National Council for Research (Khartoum).

Mukasa-Mugerwa E. 1981. The Camel (*Camelus dromedarius*): a bibliographical review. International Livestock Centre for Africa, Addis Ababa, Ethiopia.

Gauthier-Pilters H. and Dagg A.I. 1981. The Camel: its evolution, ecology, behaviour and relationship to man. Chicago University Press.

Farid M.F.A. 1981. Camelids Bibliography. ACSAD, Damascus.

Wilson R.T. 1984. The Camel. Longman, London and New York.

The last book was reviewed in AGRI 2/84.

3. Work on camels at ACSAD. A study of the potential for development of camels in seven Arab countries has been published in Arabic. Likewise a pre-feasibility study of camel ranching in the Sudan. A study on forage preferences of camels and other animals in three Arab countries has been started. The bibliography mentioned above has been published and will be updated in the successive issues of CNL.
4. Scientific article on camel diseases in northern Kenya.
5. Updating of the Camelids Bibliography. Eightyfour new articles are listed.
6. French and Arabic summaries.

This is an extremely timely addition to the world's publications which should be in the hands of everyone concerned with or interested in camels. It is to be published twice a year and can be obtained at a price of US\$ 5 per year from: The Arab Centre for the Studies of Arid Zones and Dry Lands, P.O. Box 2440, Damascus.

CONSERVATION OF THE KENANA AND BUTANA BREEDS (CONSULTANT'S REPORT TO FAO).

The FAO/UNEP Technical Consultation of 1980 recommended that Member Governments should include in their development programme a component for the development and conservation of local breeds. One of the first to be included in such a programme is the Kenana cattle breed of the Sudan. Dr. E.P. Cunningham of the Agricultural Institute of Ireland was appointed as a consultant by FAO. The Kenana and Butana are zebu breeds found chiefly in the Kassala, Blue Nile, Gezira and White Nile provinces. This is a low rainfall savanna region which includes some irrigated areas. There are about 3 million Kenana and 1.7 million Butana cattle. The consultant's first decision was that any scheme should be restricted to the Kenana which is more numerous and which is the breed involved in the urban areas and on the main irrigation schemes. Resources should not at this stage be spread over two breeds. The various production systems are classified. At one end of the scale are nomadic and transhumant systems. It is concluded that interference with the breeding patterns in these sectors is neither feasible nor desirable. At the other end of the scale, Kenana cattle are involved in crossbreeding and upgrading programmes related to the developing commercial dairy sector. This section of the breed is therefore not suitable for a conservation programme. The conservation scheme should be concentrated on those sections of the breed which are maintained in relatively settled conditions but which are not involved in commercial milk production. Conservation without improvement is self-defeating so an improvement programme, mainly-for milk production, is outlined. The essence of the scheme is an open nucleus breeding structure, with an annual round of selection in a government station based on careful and extensive recording, and supplemented by an annual round of selection in village herds. The field selection would drift in annually about 20 females to the nucleus herd. The station selection would be based primarily on fat-corrected milk production; that in the field would depend on eye evaluation by an expert inspector combined with body measurement and trial milking. The feeding level at the station must be sufficient to allow an effective selection programme. Such a scheme, if consistently applied, should create a nucleus and a surrounding zone of improved Kenana cattle which would enhance the competitive position of the breed and therefore be a strong guarantee of its conservation in the long term. This scheme could well be a pilot development which could be followed in other developing countries where conditions are similar.

PRODUCTION POTENTIAL OF THE LIVESTOCK INDUSTRY: HAVE GENETIC LIMITS BEEN REACHED?

A symposium with this title was presented at the Canadian Society of Animal Science (Western Branch) on 14 June 1983. Three papers were published in the Canadian Journal of Animal Science, Vol. 64 (1984) as follows.

In "Selection limits: Have they been reached with the dairy cow?" (pp. 207-215), B.W. Kennedy concludes that selection limits for increased milk production have not been reached nor will they be in the foreseeable future. In fact the rate of genetic improvement for milk production is actually accelerating, contrary to genetic theory, apparently due to the increased genetic variability caused by improved management. Genetic antagonism between milk yield and fitness traits could eventually impose a limit to selection for milk production but can probably be overcome by further improvements in management.

In "Selection limits: Have they been reached in the poultry industry?" (pp. 217-221), Peter Hunton points out that selection for growth and conformation in turkeys has been so effective that they can no longer mate naturally. In chickens reproduction has not been so badly affected but there is room for improvement. Increased fat deposition is another unwanted side effect of selection for growth rate. Selection programmes for egg production are concerned with multiple

objectives; therefore selection intensity for any one has not been so high as for meat birds. Rate of egg production at time of maximum lay is approaching a physiological limit but not necessarily a genetic one.

Persistency of lay still shows potential for further improvement. No genetic limit has been reached for egg weight, egg interval, or shell quality. Genetic resistance to Marek's disease affords scope for further improvement. In general, genetic variability is not exhausted.

In "Selection limits: Have they been reached with pigs?" (pp. 223-234), H.T. Fredeen states that no insurmountable genetic or physiological limits have been encountered in unidirectional experiments with pigs. While selection limits appear unlikely to compromise within-herd responses to sustained unidirectional selection, the universal adoption of specific criteria of performance merit, by fostering the progressive elimination of individual herds and breeds, diminishes the genetic flexibility of the population and restricts its potential to respond rapidly to changing production requirements.

ASSESSMENT AND CONSERVATION OF ANIMAL GENETIC RESOURCES IN CANADA, BY R.D. CRAWFORD. CANADIAN JOURNAL OF ANIMAL SCIENCE 64:235-251. (1984)

This review is based on two surveys made by the author, one during 1979-80 of purebred poultry breeding stocks maintained in Canada, the other, in 1980, of rare and feral domestic animal stocks in Canada and the United States. Both have been updated to 1983. Use is also made of the inventory of avian and mammalian breeding stocks held at universities and research laboratories in Canada and published annually by the Canadian Council on Animal Care. A large part of this review is devoted to poultry. The six industrial poultry breeders in Canada in 1979-80 are listed. Two breed ducks, three turkeys and one chickens. Seven middle-level chicken breeders are listed together with one turkey breeder and four breeders of ducks and/or geese. There are many hobbyists with fancy breeds of chicken but they contribute little to conservation since they are more concerned with perpetuation of the phenotype than of the genotype. Loss of poultry genetic resources has been extreme: industrial stocks are dangerously close to being monotypic and middle-level stocks have nearly disappeared. Three conservation collections exist at public institutions - Japanese quail at the University of British Columbia, fancy chicken breeds at the Nova Scotia Agricultural College and middle-level stocks and single-gene mutations at the University of Saskatchewan.

There are three rare breeds of horse - the feral horse of Sable Island, the native Newfoundland pony and the Canadian horse. There are two cattle breeds of interest, namely the Texas Longhorn used as a range sire to reduce the incidence of dystocia in first-calf heifers, and the Canadian breed for which the official policy of the breed society is to grade up to the Brown Swiss. There is tremendous genetic diversity in beef breed resources but erosion of dairy breeds has been extreme and monotypy of Holsteins is approaching. There are many sheep breeds available but the sheep industry is not large. Goats are not numerous but include many unimproved goats and feral populations on islands as well as the Swiss breeds. Among pigs the monopoly of the Yorkshire has been broken but an increasing proportion of breeding animals comes from the industrial breeding companies. Minor breeds such as the Berkshire and Tamworth have become very rare. The Canadian Eskimo Dog has been saved from extinction. Public agencies must assume increasing responsibility for conservation and their interest is shown by the establishment of an ad hoc Committee on Preservation of Animal Genetic Resources.

GOAT PRODUCTION IN THE TROPICS. 2nd edition. C. Devendra and Marca Burns. Commonwealth Agricultural Bureaux, Farnham Royal, Bucks., England. 183 pp. 1983

Since the publication of the first edition of this book in 1970 there has been increasing interest in the goat and a vast amount of research on this species has been published. The extensive bibliography (25 pp), while not excluding important earlier papers, is largely devoted to this more recent material and it is all carefully summarized in the text. However, the book is not merely a review of published papers; it draws heavily on the authors' personal experiences and the chapters on feeding, husbandry, genetics and economics include a series of practical conclusions. The scope of the book is wider than the title indicates - it covers the subtropics as well as the tropics - and the extent of the subjects included is shown by the chapter headings: Classification, distribution and importance; Breeds; Variation in size; Meat production; Milk production; Reproductive performance; Feeding and nutrition; Skin and hair production; Husbandry for improved production; Genetic improvement; Economic potential and prospects. The chapter on breeds includes short descriptions and photographs of 11 breeds in Africa, 6 in the Near and Middle East, 17 in the Indo-Pakistan sub-continent, 5 in eastern Asia and the Pacific, 3 in tropical America and 4 from Europe which are bred in the tropics. In the subsequent chapters their productive performances are compared. The chapter on economics makes a convincing case for the goat as a more economic animal than the cow for milk production in many tropical situations. Altogether an invaluable reference and textbook.

FUTURE DEVELOPMENTS IN THE GENETIC IMPROVEMENT OF ANIMALS. Edited by J.S.F. Barker, Keith Hammond and A.E. McClintock. Academic Press, Sydney, New York and London. 228 pp. 1982

This book consists of the 12 invited papers presented by 15 invited scientists from Australia, New Zealand, Norway and UK at a symposium held at the University of New England, Armidale, Australia, in February 1982. It also includes short summaries of the discussions. The scope of the papers and discussions is indicated by the titles of the sections of the meeting, namely: A general view of animal breeding, Molecular genetics, Immunogenetics, Reproductive biology, Economic aspects of developing breeding objectives, Mixed model theory, Population size and Electronics. The objective of the symposium was to project, from current knowledge, those areas where the most important developments in the application of genetics and associated disciplines could and should take place. Some exciting possibilities are considered in the various papers and discussions but there are few recipes which can be applied at once in animal breeding programmes. Most of the conclusions suggest important lines of research rather than immediate applications of current knowledge. Areas which show the most immediate promise are: the application of molecular genetics to gene manipulation in the rumen microflora, breeding for disease resistance, selection for specific components of the reproductive cycle, a reconsideration of the effect of population size - more smaller programmes may be preferable to few large ones. Definitely a book for research workers rather than for those concerned with development programmes.

SHEEP AND MAN. M.L. Ryder. Duckworth, London. 846 pp. 1983

This is a truly stupendous collection of facts about sheep in relation to man. It is an encyclopaedic history of domestic-sheep from the time of first domestication up to the present and with a glance into the future. The first part ("Ancient Times") is treated chronologically and the four chapters deal with: The biology of sheep and their domestication, Prehistoric sheep, Ancient civilizations and the Early Middle Ages. The second part, which occupies half the book, covers the Middle Ages to modern times. It is dealt with geographically, region by region.

The third part which is titled “The association of man with sheep” integrates various topics in the rest of the book under the headings “Sheep husbandry”, “Sheep products” and “The sheep legacy”. The list of references occupies 28 pages.

The book is lavishly illustrated with over 350 figures including maps, diagrams, photographs and illustrations of sheep in the form of sculptures, MS illuminations, paintings, etc. This last group (or most of them) are listed, together with many not reproduced in this book, in an appendix which gives details of sheep illustrations from prehistory, ancient civilizations and Europe.

With such a wide scope and with such detailed accounts the book is an excellent source of information about breeds of sheep, as well as husbandry methods and trade, in many times and places. Given the author’s special field it is naturally strongest on all aspects of fleece and wool. Of course, a few errors have crept in and sometimes the source of information has not been the most recent but it would be churlish to complain about minor details in a work of this magnitude. However perhaps the publisher and printer should be criticized for the poor standard of reproduction of some of the figures.

EVOLUTION OF DOMESTICATED ANIMALS. Edited by I.L. Mason. Longman, London. 1984.

This is a reference book intended to be a companion volume to that on evolution of crop plants. It is an authoritative reference book with contributions from authors of varied interests. There are zoologists, veterinarians, anthropologists, geneticists and animal husbandry specialists among the authors. Although having different interests and backgrounds, the authors have attempted to maintain a certain amount of uniformity in presentation. Thus, the chapters dealing with the major livestock species have sections on taxonomy and distribution of the wild ancestors followed by the archaeology, history, genetics and breeding of the domestic descendants. Naturally the coverage is far more extensive for the livestock species and others of importance to man, such as poultry, dogs, bees and silkworms than for animals of lesser economic importance. Thus of the 69 chapters, mostly on individual species and a few groups, the thirteen chapters on the important species occupy nearly forty percent of the book.

Domesticated animals in the context of this book include a greater variety of animals than those usually relevant in animal production. The criteria considered to characterize domestication were human control of breeding, usefulness to man, tameness and selection away from the wild type. However as the editor points out, not all animals included in the book satisfied these criteria. Regulation of breeding is perhaps the most important aspect of domestication, but in a number of species such as the reindeer, elephant, crocodile or even the cat, there is hardly any control of breeding although with some as in the elephant, some attempts are being made at controlled breeding.

The arrangement of the book with chapters devoted to species within families, orders and phyla does not permit a discussion of the general pattern of domestication or the changes that occur with domestication in species belonging to different orders or even phyla. However, an aspect of domestication that occurred in most species whose breeding was controlled, was that of reproductive isolation of a “founder” group from the wild population. The restriction imposed by sampling limited the genetic variability of the founder group which thus possessed only a complement of the total genetic diversity of the wild population. Selection by man decreased this variability even further which led to the creation of species leading in some cases, such as the dog, to changes very much different from the morphology and behaviour of the wild ancestor.

Another feature that seems to have occurred in the mammalian species that underwent domestication is reduction in size. Thus, one finds a progressive reduction in size of cattle from the Neolithic age through the Copper and Bronze ages to the Iron age. Similar decline in size occurred with the Bali cattle domesticated from the Banteng and the mithan from the gaur.

Presumably, the decline in size was a result of selection for animals that were easily manageable and also less demanding in their feed requirements which is important when animals which were freely roaming were kept in captivity.

Conservationists would find it interesting to note that the reasons adduced for an increase or decrease in population of some breeds even during the early days of domestication were economic which is true even today for breeds threatened with extinction. It is sobering to learn that had France and Italy decided to use machinery for traction earlier than they did, their draught breeds would probably have become extinct and we would not have the large beef breeds such as the French Charolais and the Limousine or the Italian Marchigiana and Romagnola which are so much in demand today for terminal crossing in beef breeding programmes. Another interesting example of an animal that is in demand today but was nearly extinct some time ago is the Pietrain pig from Belgium. This lean animal was not valuable commercially when fat was at a premium, as during the second world war. However, it is highly valued today as a crossing sire due to its extremely muscular carcass. Other pig breeds, which though not endangered but possess valuable traits that can be exploited in other regions, are those of central and southern China which are adapted to converting water plants and other vegetables to fat.

The coverage of this book is very wide and most people concerned with animals and their evolution to domestication will find material of interest. Animal scientists will perhaps not find much new material on the general biology of the domestic animals but will find several interesting pieces of information on other species. Each chapter ends with a section devoted to future prospects and it was interesting for the reviewer to find that genetic engineering techniques have reached an advanced stage in the silkworm moth whose fibroin gene had been successfully cloned in bacterial cells.

The book covers mammals, rodents, birds, reptiles, amphibians, fishes, insects, crustaceans and molluscs. Understandably, most of the book is devoted to mammals with 41 chapters while on birds there are 15, 6 on fishes, 2 each on insects and molluscs and 1 each on reptiles, amphibians and crustaceans. The introductory chapter on "The beginnings of animal domestication" provides an interesting account of the reasons for domestication and also attempts to look into the future. Taxonomy and nomenclature which are confusing at present because of the existence of different scientific names for wild and domestic forms of some animals but not for others are treated in an appendix and some suggestions made.

The book does not have any photographs but there are a number of maps and diagrams illustrating the distribution and migratory pattern of animals. There are two separate indices, one for common and the other for scientific names of animals.

The book may be too expensive for individual pockets. However, it is certainly an important reference book for zoologists, anthropologists and animal scientists and should therefore be available in libraries.