5th WCGALP/FAO SYMPOSIUM
Conservation of Domestic Animal Diversity
Guelph, Canada, August 11, 1994

CURRENT DEVELOPMENTS IN THE CONSERVATION OF DOMESTIC ANIMAL DIVERSITY - THE ASIA AND PACIFIC REGION

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SUMMARY

The region is highly populated (56% of world) with a high agricultural population (72.5%) and this exists in 30% of the worlds arable land. Animal genetic resources are considerable - with some 30% of worlds' known breeds in the region.

Different countries are at very different stages of development of animal production which serves many deficient needs. There is considerable pressure on breeds in many countries - often due to crossbreeding with exotic breeds. While F1 animals offer benefits in many situations there is no clear programme for sustainable use in all species.

Countries differ widely in their policy for the maintenance of genetic diversity - some of these differences are discussed.

A new regional "umbrella" project, funded by a Japanese Trust fund and covering 12 countries in the region, aims to improve the database on population size, on performance and environmental aspects relevant to each breed and to develop, when necessary, national policy documents on animal genetic resources in line with the Biodiversity Convention and Agenda 21. The project will provide for the formation of an Asian Network on Domestic Animal Diversity as well as being the regional node of a Global programme. It will develop proposals for the essential and pressing additional activities in the best present use and longer term maintenance (conservation) of animal genetic resources.

These are several aspects which need further consideration - for example the criteria for conserving a breed, the study of sustainable breeding systems which increase efficiency of food production and the manner in which national policy development can be assisted.

INTRODUCTION

The Asia and Pacific region covers 29 countries and a large range of ecological zones. These extend from the arid desert areas of India and China to the highlands of the Himalayas and to the small islands of the Pacific. Over half the world's population (56%) and almost three quarters of the agricultural population (72.5%) exist on 30% of the world's arable land (FAO 1993b). As consequence

of this great reliance on agriculture and livestock as a major component (46% of world's livestock), a greater diversity of domesticated livestock breeds has been developed relative to other regions.

Animal production is mainly carried out in small scale (family) units although large scale units are developing particularly near urban areas. The emphasis on different types of livestock varies between countries with China, Vietnam and Philippines placing more on pigs while Australia, India, Japan, Rep. of Korea and Pakistan emphasising dairy production.

The relative contribution of livestock to food production will continue to increase over the region as a whole. Draught power from animals features highly in this region while in many countries the value of manure is considered as one of the main values of livestock (whether the manure is as fertilizer or as fuel). Cultural/religious aspects continue to play an important role in the use of livestock in the region. These, often uncosted, contributions of livestock will remain important in the foreseeable future.

The number of breeds known in the region is always open to question - the number of breeds in a country can vary considerably dependent upon definition - for example, Jiang (1992) considers China has 421 breeds over 7 species whereas the World Watch List (WWL) (FAO 1993) includes only 270 breeds for the same species. Jiang also shows variation for Indian breeds quoting Acharya 1990 reporting 139 breeds over 8 species while Nivsankar and Malik (1992) report only 130.

For the Asia and Pacific countries, the World Watch List includes 822 "breeds" over the seven species included - 16 Ass : 59 Buffalo : 206 Cattle : 111 Goats : 81 Horses : 162 Pigs : 187 Sheep. This is 30% of the total number of breeds in the Global Databank, comprising the vast array of diversity - at least, as it is defined to date.

Jiang (1992) provides a useful review of the activities with the region in the context of maintenance of animal genetic resources within many of the developing countries. It is not the purpose of this paper simply to repeat these activities but to indicate the changes occurring, the possible implications and the present, new activities just starting.

The countries of the region are at different stages of " development" and exhibit considerable diversity in the approach to the conservation ie " best present use and long term maintenance" of domestic animal genetic resources. Countries range from those using sophisticated animal breeding technology in schemes to generate 'improvement' (however defined) to those which have no organised schemes and natural selection operates within each of the local environments. It is not obvious which system provides the most efficient and sustainable use of the genetic resource - in highly controlled environments the ability to aim for a specific (often simple) objective and hence to make rapid genetic gain is obvious whereas in many situations, particularly more harsh conditions, the ability to cope with these is of prime importance and performance objectives are many. The solution to the challenge of sustainable conservation is not singular but it is one which, in many places including the 'developed' world, has not been given proper and adequate consideration.

THE CHANGING PROBLEM

As population pressures increase and urbanisation expands so the pressure on animal production mounts - primarily to produce more and secondly, from less land. More efficient use of all the resources, land, water, feed and genetic will be required if Asia is to feed its population in 25 years time. However different countries will have different pressures and priorities and these will affect their ability to adopt both short and longer term policies which will ensure sustainable livestock production.

In identifying some of the changes with major implications for genetic resources, there are several countries which are of major significance - China, India and Pakistan respectively have 270,190 and 90 known breeds listed in the WWL (the next numerous is Australia with 44 - but with no indigenous breeds of domesticated livestock). However this is not to say that these three countries contribute most to genetic diversity - many Chinese breeds have already been grouped together by Chinese experts (FAO 1993b). The various contributions to genetic diversity are not known and will not be known for some years ahead. A global programme for establishing the genetic relationships among breeds of each species has been proposed (FAO 1993a) and this, once achieved, will provide much better objective measures of the contribution to overall diversity within species.

China has, to date, probably one of the world's most enviable records in terms of its care and maintenance of its domestic animal diversity. Jiang (1993) indicates some 12.5% are at risk - a proportion well below that is most parts of the world. Many years ago, China established nucleus breeding units for the vast majority of its breeds and these have ensured the survival of several which, as purebreeds, are no longer attractive economically. While the breeds of China have been reported following a massive survey effort in the early 1980's - the detailed information is, so far, in Chinese only and therefore full information not easily available although some has been published by FAO (1984). The ability of the Meishan pig is well known - that of another Taihu breed, the Erhualian, less so. The Min pigs ability to cope with large variation in temperature (-30 to 30°c), its good prolificacy and lower fat level than Taihu pigs is not widely known - nor is the ability of Hu sheep to breed aseasonally as well as be highly prolific. Jiang points out that in the last 40 years, 27 breeds have been exported - several to make most useful contributions in the production environments, elsewhere in the world.

However the particular circumstances which now exist in China (with 20% of the global human population) have brought matters to a crucial point is the history of genetic resources in that country. Several years of high economic growth (average 12%) has led to a shortage of operational funds and rapid privatisation is intensifying competition and emphasising is short term policies aimed initially at business survival. This has brought China to a crisis point in the context of the maintenance of biodiversity since state farms, now required to produce profitably, are no longer willing to be the custodians of purebreeding of indigenous populations. The previous excellent policy appears to have brought the world's largest national resource (in terms of the number of breeds) to the edge of a precipice. The national policy requires urgent consideration, redirection and assistance if the world is not to lose a significant portion of its domestic animal diversity.

India has a very different culture, religious and wealth status and structure. India has for a long time developed a policy for its animal genetic resources, being one of the first countries to establish a specific institute. Nevertheless India still appears to have a number of breeds at serious

risk - the WWL lists seven, whereas Jiang quotes two different authors listing 16 and 20 respectively for the same species. A small but very positive start has been made with the Animal Genetic Resources Institute carrying out some characterisation work and has a cryogenic store operating. However, with the large number of breeds available, resources are severely restricted and seriously deficient. Nevertheless Nivsankar and Malik (1992) outline a programme for laying down semen from 10 - 15 cattle breeds and efforts for ex situ conservation which could be made for some breeds of buffalo, camel, cattle, equines, goats and poultry. In situ conservation takes place for the more important dairy cattle breeds by each being kept on 8 - 10 farms providing a population of 1500 - 2000 breeding females per breed.

Of the developed countries within the region, Australia has the most breeds recorded but takes no formal action in the context of the maintenance of these. The "current market" appears to be the sole criterion with the clearly implied policy of reliance on other countries to maintain the genetic diversity which might be needed by Australia in the longer term. There is a non governmental organisation (NGO) - the Australian Rare Breeds Trust which was formed some three years ago and has involvement with 40 -50 breeds (Barker, pers. comm.).

With high feed costs and the pressure of free trade agreements, animal production itself is under question in Japan. The country has some 21 breeds listed in WWL of which 12 are in the high risk categories (Critical: Endangered). The government initiated a genebank project in 1985 - banks are located at several of the major institutions. By 1992, the project had collected a large number of resources - 15 cattle breeds, 1 buffalo, 8 horse, 28 pig, 4 sheep, and 4 goat breeds together with 96 poultry, 5 rabbit, 34 laboratory animal breeds, 2 bees and 477 silkworm varieties.

The region is one in which, because livestock production is so important, these has been much use of exotic breeds - sometimes referred to as 'improved' breeds. While the description is valid, it would be more helpful if the environmental aspects, management inputs and precise breeding objectives for such 'improvement' were clearly identified to would be users. There are good biological reasons why a Holstein Friesian can neither produce high output and regular calving nor live long on a diet of highly fibrous grasses and waste products - the same reasons are behind the small local breed being what it is. However it is important that the useful genes from such exotics are exploited when ever and where ever they are shown to improve the efficiency of resource use - the crucial element is to ensure it is in a sustainable, systematic manner. There are several countries which have successfully used 'exotic' crossing and reaped the benefits of the F1 only to find real problems in deciding how best to maintain the initial gains. This is particularly true for the uniparous species - the logistics of maintaining sustainable crossbreeding structures is virtually impracticable even in countries with excellent infrastructure and well developed economies.

The Philippines has developed a crossbreeding programme for the Carabao (swamp buffalo) but now is having to tackle the problem of different objectives (milk, meat, draught power) and the level of infertility which comes when crossing animals with different numbers of chromosomes. Nepal too faces the backcrossing problem - which way will provide the best use of resources and improve efficiency? How much exotic contribution will provide the optimum system of production in the local environment? Bangladesh having tried a range of dairy breeds and crosses has now concluded that with an environment reknown for heat and ticks, combinations not exceeding 50% Holstein in urban

conditions and 25% in rural areas can most effectively provide the industry with its needs and with a central scheme coupled to a basic AI structure this can be successfully achieved. Laos has done very little crossing so far but, like many other countries, has not been doing any real selection of its local breeds. It now has to improve its productivity (and its production) and needs to develop its livestock production but has elected to do this mainly by selecting and using its indigenous populations. However at normal rates of within breed genetic change the farmers could be a long time seeing a 10% improvement from genetic selection. However with good cooperation with local farmers and an effective central nucleus, this could be increased considerably in the early years. Nevertheless methods still have to be developed to exploit all genetic aspects for improved efficiency in a sustainable manner. This question has basically been neglected by most of those involved in modern improvement programmes.

THE FUTURE

The pressures on livestock to produce more from less are increasing. At the same time, modern technologies add to the pressure either by some of the 'developed' world trying to push semen and embryos to those in need of short term improvements in output or by some of the developing countries considering the use of such technologies as an indication of their becoming more developed. Neither of these extremes considers the implications of their actions on the demands for improved feed availability, better disease control, better management and infrastructure (for farm and marketing operations). However, there now appears to be a move to consider the overall effect and the longer term sustainability of systems. The value of indigenous breeds in terms of overall production appears to be increasingly recognised and, with this, the need to maintain genetic diversity as such - not necessarily all existing breeds but certainly as sample which will allow rapid changes to be made (whatever the direction required).

While FAO has been active in the conservation of animal genetic resources for many years and has been responsible for genebanks being established in China and India, there has never, until now, been a specific programme addressed at Asia and the Pacific. As a result of the increasing realisation of the importance of maintaining biological resources, FAO held Expert Consultations on this subject in 1989 and again in 1992 - the latter culminating in a major set of recommendations for the management of a global programme (FAO - 1992). At the same time, the Japanese government proposed a Trust fund project on "the conservation of animal genetic resources in Asia and the Pacific" with FAO as the executing agency. This project, initially for four years covers twelve countries - Bhutan, China, India, Indonesia, Laos, Malaysia, Myanmar, Nepal, Pakistan, Philippines, Thailand and Vietnam.

The objectives include :

(1) the identification, characterisation and conservation of animal genetic resources so as to maintain biological diversity for sustainable agriculture

(2) the enhancement of in situ productivity of those indigenous breeds at risk and their simultaneous preservation.

(3) the training of lead persons in the techniques relevant to breed surveys, characterisation, in situ and ex situ live populations and cryogenic storage, and data handling as well as strategic livestock development planning, breed improvement systems/methods and cost effective dissemination

(4) the publication of all information collected or produced related to animal genetic resources.

(5) the establishment of the Asian Network for Domestic Animal Diversity.

The initial activities will be concerned with attempting to fill the gaps and update the information held in the Global Databank. The data for the region will be dealt with at regional level in terms of updating and checking and then will be entered into the Global system (and hence the regional system) only in Rome - the central focal point.

The improvement of the basic data is crucial to the second major of activity which, where necessary, is to establish a national policy and workplan for the conservation of animal genetic resources. Such a policy and workplan should also become the plan required from a country as part of Agenda 21 - the action plan following the Biodiversity Convention. The project will do this by tackling four countries in each of the first three years thus providing phased workplans in a regional programme.

From the workplans, a series of project proposals will be developed - some of which should be immediately operational within the country, others will need external funding or loans and funding agencies/governments will be approached as appropriate. These proposals will be limited to the essential and pressing activities.

Each country will have a National Coordinator (NC) for the project - the breed surveys, policy discussions, and drafting the project proposal outlines and costings will all need inputs from many different sources within a country. This role is similar to that proposed by Barker (1992) who preferred to the role as National Animal Genetic Resources officer. The NC will be located at a specific institution which will be the national focal point and at which the Network node for the country will be based.

While nothing in the project will itself provide answers to the genetic problems of sustainable improvement, utilization of hybrid vigour, maintenance of diversity etc., it will provide a small amount of funds to cover the immediate operating costs of the NC and the training workshops. More importantly, it is considered that the availability of advice, of direct assistance and the catalytic effect of a regional focal point with its continued interaction coupled to regular visits will provide the necessary impetus to achieve national policy documentation and a workplan.

While the project is a useful, positive start, it is only a basis for further action. Much more needs to be done both within the project countries and within the region as a whole. The changing situation has brought the problem to a head with a real and immediate threat to a large number of

breeds about which little is really known. Without good knowledge, proper and sensible decisions about the maintenance of domestic animal diversity become a matter of chance. The global resources is too valuable to allow it to be a matter of chance-the investment, in terms of human survivability, is too great.

DISCUSSION POINTS

One of the dilemmas, in a situation where many breeds are at risk, is the basis for decisions on investment in a breed. Some have traits which clearly could be useful in their own right (e.g. prolificacy in Erhualian pigs, aseasonal breeding of the Hu sheep) whereas others do not. Genetic distancing offers an objective criterion for diversity but does not indicate value for specific genes. Other criteria such as social and religious practices, banking etc. are rarely considered and remain unquantified.

The efforts of applied animal breeders have understandably been directed at the relatively easy systems in which data is easily available and both infrastructure and finance are available. Serious efforts are needed to study systems which can optimise and sustain genetic gain in the developing country environment ***without*** the tacit assumption of all other resources being readily available , i.e. the development of breeding schemes in situ is needed.

Clearly, countries have shouldered their responsibilities to differing degrees in the context of maintaining diversity. How can this be further developed by technical cooperation and at the same time, rationalise genetic exchanges /trade in the context of sustainable breeding systems which optimise the use of all local resources in order to provide for human needs.

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