Characteristics of indigenous chickens of Malawi

A.C.L. Safalaoh

Department of Animal and Wildlife Sciences, University of Pretoria, 0002 ***Pretoria****, Republic of South Africa*

Summary

Indigenous chickens (IC) are the commonest type of chickens raised in Malawi, especially in the rural areas. The management system is primarily of the free range type which is characterised by lack of supplementary feeding, minimal housing and little or no animal health services. This in turn results in low bird production in terms of egg and meat production when compared to modern breeds. Cross breeding the IC with improved breeds such as the Black Australorp is one avenue through which productivity of the indigenous chickens may be improved. The advantages of the indigenous Malawi chicken and issues for their conservation and genetic improvement are discussed.

Resumen

Los pollos autóctonos (IC) pertenecen al tipo de pollo más común que se cría en Malawi, sobre todo en las zonas rurales. El sistema de gestión principal se basa en la cría libre, sistema caracterizado por la falta de alimentación complementaria, un mínimo bajo cubierta y la poca o ninguna asistencia sanitaria. Todo esto tiene como resultado un bajo rendimiento en términos de huevos y producción de carne, en comparación con las razas modernas. El cruzamiento de IC con razas mejoradas, tales como la Black Australorp, sería un modo de aumentar la productividad de los pollos indígenas. Se presentan en el artículo las ventajas de la raza indígena de pollo Malawi y las posibilidades existentes para su conservación y mejora genética.

Key words: *Management system, Breeding, Improvement programme, Poultry diseases and health, Conservation*

Introduction

Indigenous chickens (IC) (*Gallus gallus domesticus*) form the largest proportion of chickens raised in Malawi. They are primarily raised in the rural areas or remote villages of most developing countries hence the name "village chickens". The IC have been reported to belong to a third class poultry industry by Spradbro (1993). Despite such a description, IC are also present in urban and periurban areas of Malawi and most developing countries. The actual number of IC available in Malawi cannot be mentioned with any degree of certainty due to lack of detailed livestock census. However, it is estimated that more than eight million ICs exist in Malawi (Safalaoh, 1992). Gondwe (1994) observed that almost 90% of farmers interviewed in Extension Planning Areas 11 and 12 of Lilongwe Agricultural Development Division own chickens of which the IC is the predominant breed.

Types and Common Characteristics of Indigenous Chickens

Indigenous chickens found in Malawi are of a non-descript type but three major categories are visibly present: *abathwa* (the dwarf type-DIC), *mmeta khosi* (the naked neck-NIC) and *mawanga* (spotted type-SIC). Common feather colours are waxy black, white, reddish brown, grey or spotted or a mixture of these. With the introduction of the Black Australorp (BA) to improve the productivity of the local chicken, cross breeds also exist and it is sometimes difficult to separate the two. Each of the three types of IC has its own specific attributes. The DIC is preferred for its prolificacy in egg laying while the SIC is renowned for being meatier. On the other hand, it is a common belief, especially in the rural areas of Malawi, that the NIC is more resistant to poultry diseases than the other IC types and imported breeds.

Resistance to ectoparasites such as lice has also been reported elsewhere (Ani *et al.*, 1989). The survival of the NIC in high temperature conditions is also highly acclaimed. Such resistance to heat stress is probably attributed to the reduced integument of the NIC where the zones separating the pterylae or apteria and areas surrounding the breast and thigh are entirely or partially devoid of down or feathers. Differences in bird characteristics and performance of indigenous chickens have also been reported in other countries (Oh, 1987).

Other positive attributes of IC are the yellow colour of the egg yolk, probably due to xanthophylls obtained through scavenging and foraging on green grass. Although Phoya and Whelehan (1982) reported that chicken meat is second to beef in terms of preference in Malawi, the taste of IC meat is preferred to that of modern broilers. This may be due to high contents of inosinic acid (Fujimura *et al.*, 1994).

Realising that the IC has an array of advantages and it is kept by almost every household, the need to preserve and conserve the IC genes through creation of a genome bank as done in other countries (Chen *et al.*, 1994, Valencia *et al.*, 1990) cannot be overemphasised.

Generally, productivity of the IC leaves a lot to be desired. They are characterised by slow growth rates, small body size, low egg production and low hatchability (Malawi Government, 1972; Mjojo, 1983). Egg size\weight is usually below 40 g (Malawi Government 1972; Safalaoh *et al.*, 1995) while total production is usually less than 120 eggs per annum. Other parameters such as egg length and diameter, albumen height and diameter and yolk height have also been reported to be lower in IC than other modern breeds in other countries (Yeasmin *et al.*, 1992). Market weights of more than 1 kg are attained at more than twenty weeks of age (Safalaoh *et al.*, 1996). Korean native chicken have been reported to have market weights of about 1.6 kg at sixteen weeks of age (Bay-Petersen, 1991) and 1.9 kg at 20 weeks of age (Kang *et al.*, 1993). As shown in table 1 and from other literature (Adebanjo and Oluyemi, 1981), age has a profound effect on meat yields of IC. Not many studies have been conducted to characterise the IC of Malawi. As such, there is a paucity of information in literature. Some characteristics of IC of Malawi are presented in table 1

Uses and/or advantages

Most IC are raised in the rural areas where the poor undernourished masses reside. Meat and eggs from IC therefore offer a good source of animal protein to most rural people. Johnston (1990) mentioned the ability to provide or generate protein in quantities that are convenient for local sale or for domestic consumption as one of the fundamental virtues of IC.

The smallness of carcasses precludes the need for refrigeration as is the case with goats or cattle meat. Chickens, particularly those white in colour, have been used for many years for medicinal or therapeutic purposes by traditional healers (*singangas*). This is also true for other countries (Oh, 1987). Sale of IC

to individuals or restaurants also brings extra income to the family. Provision of manure and use as gifts during traditional ceremonies such as weddings are other positive attributes. The advantage which is usually forgotten is that the IC provides a valuable service by keeping the surroundings clean through scavenging on insects, weeds and wastes that lie on the ground.

The returns to cost ratio in IC are also higher than in other breeds of chickens (Amin *et al*, 1992) when kept under the free range system. Furthermore, IC meet their nutritional requirements primarily from the environment thus reducing any competition with humans.

Management Systems

The major form of management is the free range or extensive system. Under this system, birds fend for themselves through scavenging. Under very rare circumstances chickens are kept under semi intensive or intensive management systems.

Housing and equipment

When housing is provided, structures are usually made of materials locally available. The pigeon type of house which is raised above the ground is the most popular. The locally available materials used are small tree branches or bamboo and grass for the walls or thatch. Roofs made of iron or aluminium sheets are exceptions from the norm. Chickens also share dwellings with humans in the main house or kitchens. It is not unusal to see birds roosting in trees or nearby grass bushes at night. Losses due to predators such as dogs and night owls or thieves are common under such circumstances.

Feed troughs, when provided, are made of local materials such as wooden planks, broken clay pots, old plastic and/or aluminium basins or old motor car tyres split into halves. The latter are also used as drinkers. In most situations, this equipment is not provided since birds fend for themselves. Supplementary feed such as cereal grains are usually just scattered on the ground for birds to pick.

Table 1. Selected characteristics of Indigenous Chickens of Malawi.

Characteristic	Indicator/Value	Source
Age at sexual maturity	154 d	Kadigi, 1996
Egg weight at sexual maturity	31 g	Kadigi, 1996
Egg weight (28 weeks)	38 g	Kadigi, 1996
Body weight at point of lay	1 376 g	Kadigi, 1996
Live weight (mixed sex, day old)	21 g	Safalaoh, 1996
Live weight (rooster 8 weeks)	615-623 g	Safalaoh *et al*., 1996; Safalaoh, 1996
Live weight (pullets, 8 weeks)	295 g	Kadigi, 1996
Live weight (roosters 20 weeks)	2 100 g	Safalaoh *et al*., 1996
Carcass weight (pullets 8 weeks)	299 g	Safalaoh, 1996
Carcass weight (roosters 20weeks)	1 485 g	Safalaoh *et al*., 1996
Colour	Multicoloured	*
Feed/day (0- 8 weeks)	30 g	Safalaoh, 1996

*Author's observation

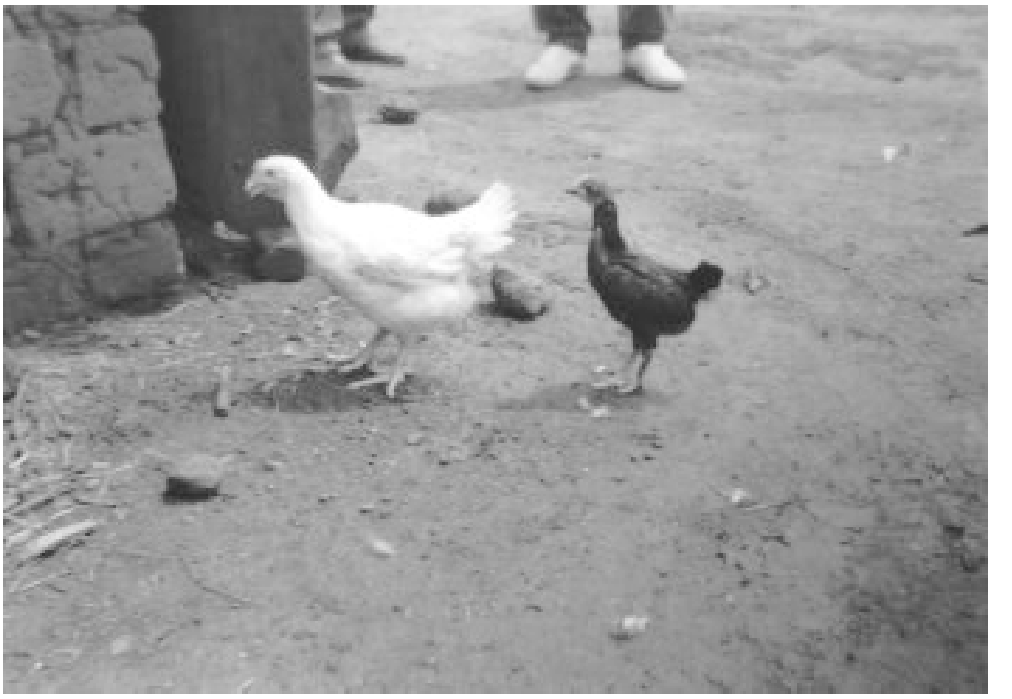


Figure 1. Comparison of Indian River (on the left) and an Indigenous Malawi Chicken at seven weeks of age

Nesting boxes for hens are hardly provided. Special shelters made of grass are sometimes provided for hens to lay eggs and brood in. Otherwise, birds lay eggs in the house or in any quiet place.

Feeding

Indigenous chickens are by nature and tradition scavengers and as such provision of feed or supplementary feeding is a rare occurrence. Birds scavenge for themselves from morning to evening. Insects, earth worms, green grass or young shoots, grains from wild grasses, wild fruits and fallen grains form part of the daily diet for IC. For supplementation, kitchen left overs or household scraps such as *nsima* (maize porridge) and rotten cereal grains such as maize, sorghum or rice bran are usually provided. Apart from recent experiments with IC (Safalaoh, 1996; Safalaoh *et al.*, 1996), no commercial diets are given to IC in Malawi. There is virtually little or no financial input at all with regard to feed costs, making the production costs low (Amin *et al.*, 1992).

Marketing

There is no established marketing system of IC in Malawi. Birds are sold by the roadsides, to individuals from house to house or at local markets. Chickens are carried in wicker baskets placed on the head, on bicycle panniers, in lorries, on carts and on top of buses on their way to the market. Better prices are fetched in urban and/or periurban areas. Chicken sales increase during festivities such as Christmas, weddings, family gatherings or celebrations. Outbreaks of diseases such as Newcastle also trigger forced sale of village chickens.

Indigenous Chicken Breeding

Natural mating

Apart from natural mating, no planned breeding programmes are followed under the free range management system. Aini (1990) also reported that there is no purposeful selective breeding in indigenous chickens in South East Asia. A lack of proper breeding

systems results in inbreeding. The prevalent genotypes and phenotypes have probably resulted from such breeding systems

Eggs from IC are naturally incubated and brooding is also natural using the hen's body heat. Eggs from a supposedly poor brooder and hatcher hen are placed under a hen renowned for its high brooding characteristics (DIC) to ensure high hatchability. Two to three clutches of 10-15 eggs are common. However, chick mortality is usually very high in early chick life due to predators and poor husbandry conditions. Chick mortality has been reported to be as high as 60-70 % in other countries (Oh, 1987).

Indigenous chicken improvement programme

The importance and benefits of improving productivity of the IC through cross breeding has been reported in many studies (Safalaoh *et al*, 1996; Kang *et al*, 1993; Amin *et al*, 1992; Bray and Moffat, 1990; Lee and Huang, 1989; Oluyemi, 1980). Due to the low production of the IC, the Malawi Government instituted the Smallholder Village Poultry Improvement Programme (SVPIP) in the 1950's. The SVPIP is aimed at improving productivity of IC in terms of meat and egg production through crossbreeding with the Black Australorp (BA). The BA breed was chosen for its dual purpose nature and its ability to survive the harsh tropical conditions. Under the SVPIP, BA pullets and cockrels are raised under controlled conditions at government breeding and multiplication centres spread out across the country. The birds are raised up to six weeks of age before they are sold to farmers at a subsidised price of MKI 10 000 (US$ 0.66) per bird. The transition from feeding balanced diets and proper management creates a stress for BA birds when sold to farmers in the rural areas and the bird usually performs below expected standards.

Figure 2. A black Australorp x Indigenous Chicken crossbred (on the left) and an Indigenous Chicken at twenty weeks of age

No proper training is given as to how the BA birds are to be managed and used for cross breeding with the ICs. As such, BA birds are just left loose and intermingle with the ICs. Buyers of BA birds prefer pullets to cockerels. Black Australorp pullets are naturally poor brooders and hatchers hence the difficulty to sustain a crossbreeding programme. Use of BA cockerels to cross with IC hens is a better alternative unless artificial incubation is used. Not surprisingly, despite the fact that this programme has been in existence for more than thirty years, the presence of BA chickens or crossbreds between BA and IC cannot be felt. The demand for BA birds is still high and is not being met. There is unequal distribution of birds and sale is biased. Recent studies and reports (Safalaoh *et al*, 1996; Kadigi, 1996) indicate that crossbreeding BA with IC can indeed improve the productivity of IC in terms of meat and egg production. Safalaoh *et al.* (1996) reported twenty-week-old body weights of 2 425 g, 2 250 g, 2 183 g and 2 100 g for BA x BA, IC x BA, BA x IC and IC x IC genotype roosters, respectively. Hen daily egg production (28 weeks of age) of 70 %, 56 % and 49 % for BA x BA, BA x IC and IC x IC, respectively (Kadigi, 1996).

Poultry Diseases and Health

Prevalence of diseases and lack of appropriate poultry health services are among the major constraints to poultry production in Malawi (Safalaoh, 1992). Newcastle Disease (NCD), Marek's Disease, Gumboro, Lymphoid leucosis, Urate nephritis, coccidiosis, Non-specific enteritis and lung congestion are some of the poultry health problems reported for indigenous fowls (Christiansen, 1986). Of

Figure 3. Indigenous Chickens feeding on grains being dried for human consumption

these, New Castle Disease is by far the most important disease (Malawi Government, 1995; Sagild and Haresnape, 1987).

There is virtually no poultry health programme followed when raising IC in Malawi. Provision of services such as free vaccines has long gone into oblivion. Due to high prices, farmers are unable to buy vaccines and curative drugs. With the majority of the rural farmers lacking proper knowledge in poultry husbandry and disease control, incidences where diseases can reach an advanced stage before recognition have been reported. Diagnostic facilities are far from the rural areas.

Conservation of Indigenous Chickens

Despite the aforementioned importance and advantages of the IC, no efforts have been undertaken to preserve the IC in Malawi. Current research by University and Government research institutions has focused on crossbreeding and performance of IC using balanced diets (Safalaoh, 1996; Jere *et al*, 1995). To prevent losing the important genetic traits of the IC, there is an urgent need to establish genome banks for preservation of the IC.

Conclusions

The indigenous chicken will remain the most prevalent breed of chicken in Malawi for years to come. Its importance as a provider of animal protein and income to the poor rural masses can not and should not be undermined. Every effort should therefore be made to improve its productivity through improved husbandry and nutrition. To preserve the important characteristics it possesses, there is need to conserve the IC genes through creation of genome banks. The government should provide adequate resources and policy in this direction.

References

Adebanjo, A. & Oluyemi, J.A. 1981. Studies on the meat production potential of the indigenous fowl of Nigeria: the effect of age on meat yield and quality. Bull. Anim. Health and Prod. Afric. 29: 389-392.

Aini, I. 1990 Indigenous chicken production in South East Asia. Wld. Poult. Sci. J., 46: 51.

Amin, R.M., Hoque, M.M., Islam, Q.M.S. & Khan, M.M.R. 1992. The performance of crossbred and indigenous chickens under scavenging system. Bangaladesh J. of Anim. Science 21: 77-81.

Al-Ani, I.A., Al-Soudi, K.A., Al-Obaidi, A.S.R. & Tarish, G.H. 1989. Dusting with chemicid and its effect on egg production and mortality of different breeds of chickens (local, Leghorn and New Hampshire) infested by yellow body louse (*M. stranineus*). J Agricultural and Water Resources Research, Animal Production 8: 11-21.

Bay-Petersen, J. 1991. Catalogue of the Native Poultry of South East Asia, Food and Fertilizer Technology Centre for the Asian and Pacific Region, FFTC Book Series No. 43, Kuo Thai Color printing Co., Ltd., Taiwan.

Bray, H & Moffat, B. 1990. A review of the Zambian poultry industry with special reference to the village chicken. Report prepared for the Australian International Development Assistance Bureau.

Chen, C.F., Lee, Y.P., Fan, Y.K., Huang, S.Y. & Huang, H.H. 1994. Conservation of native fowls in Taiwan. J of the Chinese Society of Anim. Science 23: 339-346.

Christiansen, N. H. 1986. Disease and mortality in poultry in the Shire Highlands of Southern Malawi. World Poult. Sci. J. 42: 243-247.

FAO. 1976. Poultry Feeding in Tropical and Subtropical Countries, Italy.

Fujimura, S., Muramoto, T., Katsukawa,M., Hatano, T. & Ishibashi, T. 1994. Chemical analysis and sensory evaluation of free amino acids and 5'-inosinic acid in meat of Hinai-dori, Japanese native chicken: comparision with broilers and layer pullets. Animal Science and Technology 65: 610-618.

Gondwe, T.N. 1994. Prevalence of Black Australorp chickens in Extension Planning Areas ll and 12 of Lilongwe ADD. Bsc Thesis Project Report, Bunda College of agriculture, University of Malawi, Lilongwe, Malawi.

Johnston, J. 1990. Health and productivity of village poultry in South East Asia. Economic impact of developing techniques to vaccinate birds orally against Newcastle disease. Working paper No 31, Australian Centre for International Agriculture Research, Canberra, pp 172.

Kadigi, H.J. S. 1996. A Study on the comparative perfomance of Black Australorp, Malawi local chicken and their crosses. Msc Thesis, Department of Animal Science, Bunda College of Agriculture, University of Malawi, Lilongwe.

Kang, B.S., Kim, C .D., Yang, C.B., Cheong, I.C. & Chung, S.B. 1993 Studies on the performance and carcass characteristics of Korean Native fowls and their crossbreds. RDA J. Agric. Science and Livestock 35: 549-553.

Lee, Y.P. & Huang, H.M. 1989. Improvement and utilisation of genetic resources in native chicken: reciprocal cross between Taiwan Country chicken and Single Comb White Leghorn. Asian Austr. J. Anim. Science 2: 103-114.

Malawi Government. 1995. A Guide to agriculture production. Department of Agriculture, Extension and Communication Services. Ministry of Agriculture.

Malawi Government. 1988. National Livestock Development Study, Final Report, Arup-Atkins International Ltd, Cambridge, England.

Malawi Government 1972. Veterinary Assistants Handbook. Ministry of Agriculture and Natural Resources.

Mjojo, D.P.K. 1983. Comparision of Reproductive and Productive Performance of Black Australorp and Local Chickens, Degree Projects, Bunda College of Agriculture, University of Malawi.

North, O. 1984. Commercial Chicken Production Manual, Third Edition, AVI Publishing Company, USA.

Oh, B.T. 1987. Malaysia: Economic importance In: Newcastle Disease in Poultry: a New Food Pellet vaccine (Ed. Copland, J.W.). ACIAR Monograph No.5, Canberra, 83-85.

Nyasulu, P.T. 1987. October Monthly Report, LEM/16/5/1/23, Lilongwe Egg Marketing, Malawi.

Oluyemi, J.A. 1980. Crossbreeding and upgrading of the indigenous fowl of Nigeria with improved breeeds. Zentralbl-Veterinarmed-Reihe-A. 27: 500-507.

Phoya, R.K.D. & Whelehan, O.P. 1982. An investigation into the meat preferences of Malawians. J. Consumer Studies and Home Economics. 6: 361-366.

Rao, G.V. 1986. Need to conserve and evaluate the indigenous fowl germplasm. Indian Farming. 35 (7): 19-21.

Safalaoh, A. 1996. In the tropics, commercial broilers do better than local breeds. World Poultry Misset 12 (8): 17-19.

Safalaoh, A.C.L., Kadigi, H.J.S. & Phoya,R.K.D. 1996. Growth performance and carcass characteristics of male black Australorp, dwarf Malawi local chicken and their crosses from 8 to 20 weeks of age. Uniswa Res. J. Agric. Sci and Tech. 1 (1): 61-67.

Sagild, I.K. & Haresnape, J.M. 1987. The status of New Castle Disease and V4 vaccine in Malawi. Avian Pathology 16: 165-176.

Valencia,L.N.F., Bethancourt, G.L.F., Munoz-Fje., Valencia, L.A & Santos, E. 1990. Origin, development and descriptions of some indigenous fowls in various towns in the Cauca Valley. Acta-Agronomica 40: 187-195.

Yeasmin, T., Husain, S.S. & Hamid, M.A. 1992. Investigation on the qualities of eggs of different genetic groups of birds in different seasons. Bangladesh J. of Anim. Sciences 21: 29-35.

The population of laying hens loses important genes: a case history

P. Sørensen

*Danish Institute of Agricultural Science, Dept. of Breeding and Genetics, Research Centre Foulum, DK-8830, **Tjele**, Denmark*

Summary

The switch from keeping laying hens in a floor or free range system into a cage system led to a considerable change in the way that breeding and selection took place. In the past 40-50 years up to the present date, the increase in genetic improvement of the egg laying trait was substantial. However, cage-adapted populations of laying hens seem to have lost some of their abilities to an adequate performance when returned to the old floor\free range systems. The strong concentration of all parts of the poultry production has meant that less than 10 international breeding companies supply most hens for laying purposes in the world and they have very little interest in developing genetic material for the West-European region where there are marked consumer preferences for eggs produced in non-cage systems. A particular Danish line, of White Leghorn origin named "The Skalborg hen" seems to have survived during an era of cage production system and they seems to have a production potential at farm level.

Resumen

El paso de la cría de gallinas en suelo o libres a la utilización del sistema de jaulas, ha llevado a un cambio importante en la cría y la selección. En los últimos 40-50 años el aumento en la mejora genética de los huevos ha sido sustancial. Estas poblaciones de gallinas ponedoras adaptadas al sistema de jaula parecen haber perdido algunas de sus habilidades de rendimiento cuando se las vuelve a colocar en el antiguo sistema libre. La alta concentración en la producción avícola ha llevado a que menos de 10 compañías internacionales provean la mayor parte de las gallinas ponedoras en el mundo. Estas compañías no están interesadas en desarrollar material genéticamente para Europa del oeste, donde las preferencias de consumo del mercado van hacia los huevos producidos con sistema tradicional sin jaula. Una línea danesa particular proveniente de la White Leghorn y llamada "The Skalborg Hen", parece haber sobrevivido sin una época en jaulas y mantiene un potencial de producción a nivel del de granja.

Key words: *Genetic stock, Floor system, Cages, Skalborg line*

Introduction

The introduction of the hen as a farm animal can be traced back to 2000 B.C., but systematic breeding did not take place until the beginning of the nineteenth century, at least in Europe and America. Thus for about 200 years hen breeding and selection has taken place in Europe and America with the purpose of developing specific breed characteristics and eventually to breed for an improved egg laying capacity.

Up to the middle of the twentieth century selection and breeding was mainly based on progeny testing of males, in which the progeny groups were tested in pens. Around

the 1950s an event of vital importance for housing layer hens occurred: the system of cages was introduced. The major impact of the change from the floor systems to the cage systems was that the "flock size" decreased dramatically, the "nesting behaviour" became non-interesting for the farmers and the hens were lifted out of the "manure environment". In this paper, some of the effects on the genotype as a result of such changes in the environment will be mentioned, as well as what happens when attempts are made to go back to the previous floor/free range system after a certain time The results of a search for genetic material which still has some of the ability to perform appropriately in floor/free range systems are reported.

The Effect of Switching from Floor Systems to Cages

The switch from keeping laying hens in a floor or free range system into a cage system also led to a change in the way that breeding and selection took place. Previously the breeders had kept their hens in floor systems in family groups of hens in small pens or in large pens with a trap nesting system to record the egg production of the individual hen. Breeders developed the new cage system very quickly in the form of single bird cages as it was then possible to identify the exact egg production of individual hens. The best illustration to document the rational of this came from a Californian research work (Lowry and Abplanalp, 1970) in which a considerably larger genetic improvement in egg yield was demonstrated, when selection and breeding were based on information from hens in individual cages compared to selection for high numbers of eggs laid by free range hens in a trapnest system. A considerable genotype-environmental interaction was recognised, as the difference in egg yield between the two breeding methods was three times as large when both experimental lines were tested in cage systems compared to a test of the two lines in a floor system. The authors concluded that a specific genetic adaptation had occurred to the system in which they were bred.

After 40 to 50 generations of selection for an efficient hen under the cage system, the laying hen has been genetically developed to produce more than 300 eggs during the first 12 months of their laying career, and using less than 2.2 kg feed per kg eggs. Part of this efficency is due to a reduced body weight. This substantial genetic improvement has taken place contemporary with a strong concentration and specialisation of the poultry production. On a world-wide basis less than 10 international breeding companies are presently supplying the majority of the breeding material which is behind the egg production in the developed world and they have a growing part of the market in the developing countries.

Correlated changes

When trying to assess the performance of a production system which allows hens to move around in larger flocks, observations and investigations on these cage-adapted hens have, during recent years, shown, that these genetically cage adapted hens:

1) have lost some of their ability to go to a nest before oviposition;
2) feather peck against each other;
3) tend to peck aggressively, sometimes ending in cannibalism.

These are all behaviour characteristics to which the hen is not exposed in an individual cage and therefore will not influence her egg laying record, but these three issues will always be of importance for a hen in a floor\free range system with many hens influencing her egg laying record and the chance to be selected as a parent.

Regarding nesting behaviour, some results and experiences were obtained from a selection experiment with laying hens. The base population was created in 1969 by crossing 7 international commercially bred laying stocks. After four generations of systematic crossing the base population was divided into 5 experimental lines which for the following 6 generation were selected as:

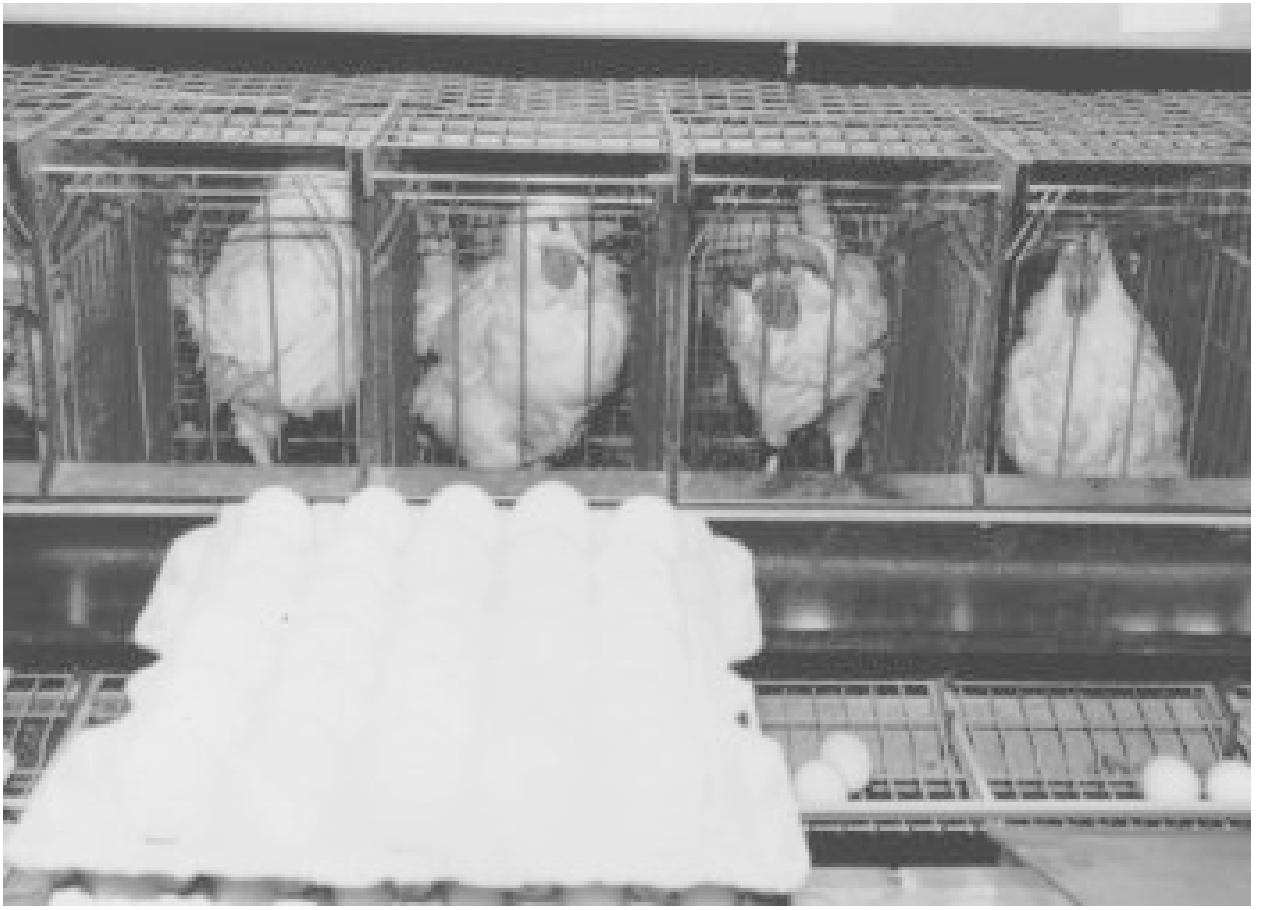


Figure 1 Frequency of floor eggs of the selected lines in proportion to the frequency of those in the control line.

- C-line. Control with complete random mating
- N-line. Selected for high egg number to 42 weeks of age
- E-line. Selected for high egg weight at the age of 38-40 weeks
- I_1-line. Selected for and index of high egg number and high egg weight
- I_2-line. Selected as line I_1

In each line, 400-500 hens were tested for egg laying traits. The hens were kept in floor pens with 30 to 200 hens and the eggs from the individual hens were recorded on the basis of those laid on the trap nest. (Sørensen *et al.* 1982; Sørensen, 1992). Figure 1 illustrates the change in eggs laid on floor for the various selected lines in relation to the control line. The decrease in the curves for lines N, I_1 and I_2 is substantial and could be interpreted that these lines have got a better ability or willingness to go to the nest when laying their egg, and this effect is genetic in origin, as these lines have been selected for a high number of eggs laid in the nest, while the selection in the E-line was based on egg weight. It was not possible to estimate the heritability but it is not negligible as the selected lines have reduced the frequency of floor eggs by 9% per generation compared to the control line. It has to be added that the 7 international laying stocks, who were the base for the control line, are supposed to have been

selected for high laying capacity in a cage system through several generations. The frequency of floor eggs in the control line fluctuated between 10 and 2 per cent during the experiment.

The conclusion was that a certain degree of inheritance exists for the nesting behaviour and breeding in a cage system. However, this does not necessarily imply that genes lie behind a good nesting behaviour.

Regarding feather pecking and cannibalism, there have been no reports demonstrating that selection for laying performance in individual cages has any correlated effect on feather pecking or cannibalism. On the other hand among flocks of hens in floor/free range systems there have been so many observations of defeathered flocks of hens and so many reports on flocks of hens in which cannibalism has been serious, that it is beyond just rare occasions.

During the last few years, there has been a growing interest in trying to test if there is any genetic variability which can be used to reduce these bad habits. Among those studies, the work by Craig and co-workers at Purdue University should be mentioned. For several years they have been working with problems related to the concept of aggressive pecking among hens or as they term it "beak-inflicted injuries" (BI). Over several years, they ran selection experiments based on seven generations, (Muir, 1996) in which the birds were kept in group cages with up to nine halfsib hens in each cage. The criteria for selection was a family based index which included survival rate. After 7 generations of selection. the mortality due to cannibalism was reduced to a third of what it was in the non-selected control line, 17% versus 48%, when tested in 12 bird cages and without beak trimming the hens (Craig and Muir, 1996). Thus there is obviously a considerable genetic potential in reducing the hens' disposition for cannibalistic behaviour, though it has not yet been tested if this change in genetic predisposition also would happen if the hens were tested under floor\free range conditions.

In Western Europe there has been much concern about the gentle feather pecking which leads to defeathered hens, but not necessarily to cannibalism. At Hohenheim University in Germany, developed equipments which can be used on a large scale to measure the birds' tendency to feather peck and he has recently presented a useful tool (Bessei *et al*. 1997). At Research Centre Foulum in Denmark, intensive studies have shown that the degree of inheritance is low (h^2=0.15), but there are prospects for genetic improvement through breeding and selection (Kjær and Sørensen, 1997).

From Cages to Floor/Free Range - the Consumer Appeal

Although the cage system from many rational points of view offers more advantages than any other systems of egg production, it must be admitted that the welfare of hens is generaly better in floor/free range systems (Figure 2). These arguments have been used by the general public and in particular some special animal protection groups to request a ban on the cage system in several countries in Western Europe. After 15-20 years of public debate on the subject, the situation is that a real ban on the cage system does not exist except in one country (Switzerland), but in many countries there is a certain market for eggs from non-caged hens. The market share of eggs from non-caged hens in Denmark was 30% in 1996 and has shown a rapid increase over the last 3 years; similar changes had occurred in the other Western European countries where such public pressure exists.

Genetic Stock to Be Used for the Floor/Free Range System

None of the few international breeding companies dealing with layer stock has shown real interest in developing a special hen for this floor/free range system as they argue that it is a small market for them, needs an expensive breeding programme and nobody knows if the existing genetic material is suitable to use. They also claim that future

consumer preferences are unpredictable, but above all they state that it does not fit into the large scale philosophy of the egg production.

Most of breeds developed by hobby breeders are poor layers because the main concern has been the exterior and not so much the laying efficiency. In spite of this there may be some original landraces which had formerly been bred to produce eggs.

Also there may also be some small scale breeders left in various countries who have had a particular interest in breeding for laying traits in special lines. These hens may not be as efficient as the ones from the international breeding companies but they have perhaps seen a particular possibilities to exist in a market of small holders or back yard hen farmers who obviously exist also in the developed world. The way these hens have been kept may differ substantially, but there may be some who have had their hens in floor systems for various reasons.

The particular situation in Denmark

For reasons which had nothing to do with animal welfare there was a ban against cage systems for laying hens right from the beginning of the cage era in the 1950s. The ban was abolished in 1979. Denmark had, as all other countries, large numbers of poultry breeders, a number which decreased down to 4 in 1970. During the next 10 years these 4 breeders worked hard to compete with the large international breeding companies which were in the Danish market during most of the time. As the ban on cages existed, the egg producers kept the hens in large flocks either in floor systems with litter or in wire netting systems, termed the "Pennsylvanian system".

The Skalborg hen

Among the four breeders, C. Christiansen, Skalborg has to be mentioned in particular. He had a long career as a poultry breeder and had already individual control over 3 000 hens in the middle of the 1960s under the floor system. They based the measuring of the laying of the individual hen on the trap nest 7 days a week in a 12 month period. The myth says that he always brought a small axe with him and hens he found with an egg outside the nest was immediately killed. Thus he had performed a most effective recording and a strong selection for hens which were well-behaved as to laying behaviour and relation to other hens in the house through

Table 1. Comparison of the Danish Skalborg hen with various international breeds, carried out in a floor system (Neergård, 1978) and in a cage system (Neergård, 1983).

Breeds	Country	Eggs in 365 days per placed hen*	Eggs in 365 days, hen day*	Eggs in 365 days per placed hen**	Eggs in 365 days, hen day**
Shaver	Canada	265	274	278	298
Babcock	USA	259	264		
Hisex	Netherlands	264	267		
Lohmann	Germany	259	268	276	285
Dekalb	USA			264	292
Skalborg	Denmark	262	267	240	266

*Test in floor system in 1978; **Test in cage system in 1982

Figure 2. Hens in floor/free range system.

30-40 generations. He and his successor continued in the same way up to 1980. The Skalborg hens which actually was a cross of two lines became well known to be high yielding, calm and well feathered hens weighing slightly more than average and laying large eggs. The Skalborg hen had to compete with others from two Danish poultry breeders as well as the large international breeding companies. Two others of the 4 breeders obtained special permission to keep hens in individual cages and they imported genetic material from some of the foreign breeders which meant that their special ability to the floor system was soon abandoned.

The Skalborg hen met her fate the day the ban on cages for laying hens was abolished, which is easily seen in table 1.
Denmark as most other countries ran a Random Sample Test station for laying hens, in which the genetic material available on the market was tested. Up to 1980 this test took place in a pen-based floor system with 30 hens per pen and 4 pens per breed. From 1981 the system was changed to a 4-bird cage system and 128 birds per entrance.

From table 1 it is seen that the Skalborg hen competed reasonably well with other international breeds when the test was carried out in a floor system, but later when changed to the cage system Skalborg was the loser, partly because the other produced better in cages and partly due to a higher mortality observed in the Skalborg hen. The latter had been observed in other comparisons already and is most probably caused by the fact that the Skalborg hen was not adapted to the cage system.

The Hellevad hatchery and the Skalborg line

Among the four breeding centres mentioned above, the Hellevad hatchery had a particular position as they had the policy to be a supplier for the small holder and back yards. They had since 1956 bred a line of New Hampshire derived from a breeding company in USA. The Hellevad hatchery has long been known to produce a cross of White Leghorn × New Hampshire which has proven to be particularly value in small-scale egg production under semi optimal conditions. The breeding programme is rather simple and as no multiplying units was in play they have run a low cost operation and been able to survive due to the interest from the small scale market. The important aspect to mention is that they use and have used all the time egg yield laid in a trap nest, good feather condition and persistency in egg production as the base for selection. Also it should be mentioned that they had never used vaccine for the breeding bird, nor had they used beak trimming.

Our particular interest for the Hellevad hatchery is that the White Leghorn line they use and have used for many years is the female line of the Skalborg hen or line 01. In former times the Hellevad hatchery each year bought day-old male chickens from this line at Skalborg. At the time of uncertainty for the Skalborg breeding centre, the Hellevad hatchery agreed with the Skalborgs to receive material from line 1 of the Skalborg hen so that they could continue the breeding with this line and have continued for 18 years.

Conclusion

The enormous concentration in the commercial poultry world has created a considerable degree of risk for monotypic populations as pointed out by Crawford (1990). The fact that these world-wide populations seem to have lost some of their ability to behave in a fully appropriate way in production systems which are still in use and preferred by consumers of the product should not be neglected. By discussing of the matter in Denmark it became clear that at least one line exists, the Skalborg line, which has not been through the process of a genetic alteration and adaptation to a system in which some behaviour traits could be harmful under other systems. It is important to identify these types of genetic material which may have a broader genetic variation and still have a production capacity at the farm level

References

Bessei, W., Reiter, K. & Schwazenberg, A. 1997. Measuring pecking towards a bunch of feathers in individually housed hens as a means to select against feather pecking. In:Proceedings of Fifth Europeans Symposium on Poultry Welfare 1997. Eds P. Koene and H.J. Blokhuis. ISBN 90-6754-486-8.

Crawford, R.D. 1990. Poultry genetic resources:evolution, diversity and conservation. In: Poultry Breeding and Genetics. Ed. R.D. Crawford. Elsevier Science Publisher ISBN 0-444-88557-9.

Craig, J.V. & Muir, W.M. 1996 Group selection for adaptation to multiple-hen cages: Beak-related mortality, feathering, and body weight responses. Poultry Science 75: 294-302.

Kjær, J. & Sørensen, P. 1997 Heritability of non-aggressive pecking at conspecifics in White Leghorn chickens. British Poultry Science. In print.

Lowry, D.C. & Abplanalp, H. 1970 Genetic adaptation of white Leghorn hens to life in single cage. British Poultry Science 11: 117-123.

Muir, W.M. 1996 Group selection for adaptation to multiple-hen cages: selection program and direct responses. Poultry Science 75: 447-458.

Neergård, J. 1978 Kontrolstationen for Høns 1977/78. Report No. 479 from National Institute of Animal Science, Denmark.

Neergård, J. 1982 Kontrolstationen for Høns 1979/82. Report No 541 from National Institute of Animal Science, Denmark.

Sørensen, P. 1992 Selection, environments of layers and response to nesting behaviour. In: Proceedings of XIX Worlds's Poultry Congress, Amsterdam. Vol.2: 409-412.

Sørensen, P. Ambrosen, T. & Petersen, A. 1982. Scandinavian selection and crossbreeding experiment with laying hens. IV Results from the Danish part of the experiments. Acta Agriculturæ Scandinavica. 30: 288-308.

A note on Indian farm animal genetic resources

S. C. Chopra

Indian Council of Agricultural Research, Krishi Bhavan, 110011 ***New Delhi****, India*

Summary

India has a rich diversity of cattle, buffalo, sheep and goat breeds which are not only important to the people of India, but have contributed significantly to livestock programmes in many other tropical and sub-tropical climatic areas of the world. Most important is the fact that our domestic animal genetic resources (AGR) are under threat. This paper highlights the main AGR of India; the threat to biodiversity and the efforts made for conserving and improving indigenous livestock breeds.

Resumen

La India posee una buena diversidad de razas bovinas, búfalos, ovinos y caprinos que no sólo son importantes para la población india, si no que han participado de forma significante en los programas ganaderos de muchas otras zonas climáticas tropicales y sub tropicales en el mundo. Un hecho importante es que nuestros recursos genéticos animales (AGR) se encuentran en peligro. Este artículo subraya los principales AGR en la India; el peligro para la biodiversidad y los esfuerzos realizados para conservar y mejorar las razas ganaderas indígenas.

Key words*: Biodiversity, Indigenous breeds, Conservation.*

Introduction

Biodiversity (biological diversity) is the variety and variability of plant, animal and micro-organisms. The fundamental relationship of diversity and germplasm is evident, the diversity of organisms being the source of all germplasm. Our planet's essential goods and services depend on the variety and variability of genes, species, populations and ecosystems. Biological resources feed, clothe, and provide housing, medicine and spiritual nourishment.

Rich Biodiversity

India is a vast country, rich in biodiversity.

With its geographical area of 329 million hectares, India has almost all the climatic conditions and ecological zones found in different parts of the world, ranging from perpetual snow cover to equatorial and tropical conditions, from mangroves to humid tropics and hot and cold deserts as well as all the intermediate conditions.

The animal wealth of India is of some 68 371 species which includes 60 000 insect, 1 693 fish and 372 mammal. The country is endowed with large genetic variability in most of the important domestic livestock species as is reflected by a number of described breeds and strains. Currently there are 26 described breeds of cattle, 7 buffalo, 40 sheep, 20 goat, 4 camel and 6 horse, 3 pig and 18 poultry breeds. In spite of such a large number of breeds, the majority of livestock and poultry have not been described. In the country there is a number of rare species viz. Yak, mithun and wild (arni) buffaloes, the ancestors of modern day buffaloes. In addition, several other forms like ducks, rabbits, donkeys, geese, quails etc. are also an important component of animal wealth and contribution to animal production.

Threat to Biological Diversity

Most of the breeds of livestock and poultry in India that exist today have evolved through natural selection for adaptation to the agro-ecological conditions and to a very limited extent through artificial selection based on the social or economic needs of the breeders. It has been contended that indigenous genetic resources are endowed with unique genetic attributes such as superior adaptability to hot-humid conditions, long migration, ability to subsist on inferior and scarce feed resources and highly brackish drinking water. They also have some resistance/lower susceptibility to tropical diseases.

There is very little appreciation of such valuable genetic resources available in many distinct types, species, breeds and forms. Some of these already face the danger of extinction and, as such, need to be conserved before it is too late. There is great concern among the officials in the Government of India that many of the unique breeds of animals will become extinct and a valuable resource will be lost. It has been recommended by several persons and groups that India make a concerted effort to describe its diverse species and breeds of livestock and that conservation measures be initiated at the earliest.

Among various reasons for the loss of indigenous genetic resources in India, the most important are:

a) introduction of exotic breeds. The improvement programmes, though expected to be restricted to crossing with non-described and low producing animals, have a spillover onto the described breeds, since initial increase in productivity of crossbreds is too large to be ignored;
b) large inter-mixture among breeds in the region where two or more breeds exist
c) no breeding societies or agencies as those existing in countries more agriculturally advanced to register animals of a particular breed to maintain herd/flock books and ensure purity of a breed or type;
d) decrease in population size resulting in inbreeding and its deleterious effects; and
e) changing preference towards a particular production trait over time.

Earlier Efforts for Maintaining and Improving Indigenous Livestock Breeds

Earlier the Government of India had initiated a herd registration scheme. The scheme did not make any serious impact on improvements of the breeds or maintenance of their purity, neither did it provide data on pedigree progeny which could be utilised for progeny testing of bulls nor did it assure the use of bulls conforming to the breed type. Even the pedigree information was not properly utilised in selection of prospective bulls.

The Indian Council of Agricultural Research has published bulletins containing breed characteristics of important breeds of buffalo and cattle and revised them from time to time. More recently, efforts to describe the breeds of sheep and goats along with their productivity and associated characteristics and those of other livestock and poultry has been made both by the Acharya and Bhat (1984).

Breeds Needing Conservation Efforts

Although very little information is available on the breeds needing priority attention for conservation, more recent work done shows that all the sheep breeds in Jammu and Kashmir, the Magra Pugal and Chokla breeds of Rajasthan and the Mandua breed of Karnataka, and the Barbari and Jamnaparti breeds of goats, the Sahiwal, Red Sindhi, Tharkpar, Vachur, and Punganur breeds of cattle; the Nili Ravi and Toda breeds of buffaloes, the Karknath and Naked Neck breeds of poultry need immediate attention for conservation.

Animal Genetic Resources

It said that Zebu cattle can stand heat better than the temperate cattle. They do perform better than *Bos taurus* under harsh climates. Perhaps the presence of more sweat glands in Zebus does not allow their body temperature to rise fast when the air becomes hot and dry. They do not pant in the heat and nor does their milk yield drop. Their milk yielding capacity is less and perhaps they are less distressed by tropical diseases and physical environment. They are multipurpose and are used for milking, ploughing and hauling. In the Indian sub-continent as many as 26 defined breeds, constitute germplasm resources.

Milk breeds: Gir, Sahiwal, Red Sindhi and Tharparkar.

Draught breeds: Nagori, Bachaur, Kenkatha, Malvi, Kherigarh, Hallikar, Amritmahal, Khillari, Bargur, Kangayam, Ponwar, Siri, Galao and Krishna Valley.

Dual-purpose: Nimari, Dangi, Hariana, Mewati (Kosi). Rath: Ongole, Kankre; and Deoni.

One of the best buffalo breeds of the world, Murrah, is found in India and is being used as an improved breed for increasing milk production potential in other countries. Other useful breeds like Nili-Ravi whose home tract is now in Pakistan, Surti, Mehsana, Jaffarabadi and Bhadwari, also play an important role in milk production.

A number of breeds of goats are available in the country. Some breeds like Lohi, Beetal, Marwari, Sirohi, Surti and Osmanabadi do well in semi-arid, arid and desert conditions of the North Western part of India; other types like Gaddi, Chegu and Changthangi live only in cold and mountainous areas. Other important breeds like Jamunapari and Barbari are found in Central India; Black Bengal, White Bengal and Assam Hill in the eastern part; and Sangamneri, Malabari and Konnai Adu and Deccani in coastal areas. The Jamunapari breed of the chambal ravines in the Etah district (UP) has been extensively used for improvement of native breeds in India and many other countries. The dwarf breeds of goats like Black Bengal, Barbari, Malabari and Assam Hill are famous for high prolificacy (multiple births), early sexual maturity and generally produce two crops in a period of 14 months. The Pashmina (Cashmere) goats of Leh-ladakh produce the fine quality Pashmina fibre which has no substitute so far.

A wide biodiversity exists among the sheep breeds of India. The Indian breeds of sheep are mostly of coarse carpet wool types except those in the northern temperate region which produce softer and slightly finer wool. As many as 40 distinct breeds are available in many geo-climatic conditions. Among the apparel wool types of breeds are Kashmir Merino. Nilgiri, Hissardale and Karnah: among carpet wool and meat type are Chokla, Nali, Patanwadi, Gaddi, Changthangi, Muzzafarnagri, Deccani, Marwari, Magra, Jaisalmeri, Malpura and Sonadi and among meat types are Nellor, Mandya, Hassan and Madras Red.

The Indian wild pig is found in the Shiwaliks and Tarai areas throughout northern India. All domestic varieties except the Chinese are the descendants of the Indian wild pig.

The one-humped camel known as 'dromedary' is the most common type available in desert areas in India especially the North-western region comprising the states of Rajasthan, Gujarat and Haryana. The Yak is another milk animal for people living in the high mountain regions of Himachal Pradesh. India is considered as the original home of the red jungle fowl. Aseel, Desi, Kadaknath, Naked Neck, Chittagong and Basara are still considered as the important indigenous breeds of India. They are active and can easily withstand adverse conditions. Aseel or Malay fowl are reported to have given rise to all the present day breeds of poultry in the world.

The National Bureau of Animal Genetic Resources (NBGAR) in India has established indigenous farm animal literature and a germplasm resources data bank. Strategies for the establishment of an animal gene bank *in-situ* and *ex-situ* conservation have been formulated. Pilot breed surveys for

characterisation of several farm animal breeds have been undertaken by the Bureau. These included surveys on Hariana, Rathi, Nagori and Suri Cattle, Bhadawari Buffaloes, Yak and Mithun. The field surveys led to the generation of information on population dynamics, utilisation and management practices vis-à-vis the conservation status of these breeds in their respective breeding tracts. Work plan monographs, a manual on the National Animal Gene Bank of India, characterisation and description of the Tharparkar and Rathi breeds of cattle have been published. Genetic evaluation of animal genetic resources through cytogenetic characterisation of several breeds of cattle, sheep, goats camels, equines, pigs and poultry is in progress. Intensification and expansion of a Network programme on evaluation and conservation of animal genetic resources and work on physical mapping of genes will be undertaken in the immediate future.

With a large number of species (both domesticated and wild relatives of some) that exist in India, as well as the different status of knowledge regarding their population size, location and composition of populations, some ordering of priorities for identification, characterisation etc. is necessary. In addition, some decision must be made regarding optimum technical procedures to be applied within each species for their characterisation, evaluation and conservation. NBAGR should prepare a Memorandum of Understanding to be carried out with each of the collaborating agencies specifying in each of the terms under which co-operative programmes it would be carried out including those of proprietary rights and management of data and information. While the proprietary rights to data of the originator must be respected, safeguards should be provided in the policy statement which would prevent undue delay in making such data available for Bureau use.

The International institution, the World Trade Organization (WTO) will form a strong instrument for international economic affairs. Now efforts need be concentrated on finding ways to utilise the new system to the maximum benefit. It would be prudent for Indian researchers to take out patents on their products/strains/breeds to prevent them from being misappropriated by outsiders. For Indians the real importance of WTO lies in the role that a dynamic export industry can play in the nation's development. This will inject a new dynamism into the economy by finding new markets to sell our best valued germplasm of livestock for entering into a new economic regime.

Selected References

Acharya, R.M. & Bhat, P.N. 1984 Livestock and Poultry Genetic Resources in India. Indian Veterinary Research Institute, Izatnagar, India.

ICAR 1979 Characteristics of Cattle and Buffalo Breeds Indian Council of Agricultural Research, New Delhi, India.

Recent advances in goat research

Ed.: P. Morand-Fehr
Collection of papers presented by members of the FAO-CIHEAM Network of Co-operative Research on Sheep and Goats at the 6th International Conference on Goats held in Beijing (China), 6-11 May 1996
Cah. Options Méditerr. 1997, Vol. 25,
CIHEAM, Ctra. Montanana 177, 50059 Zaragoza, Spain
ISSN 1022-1379

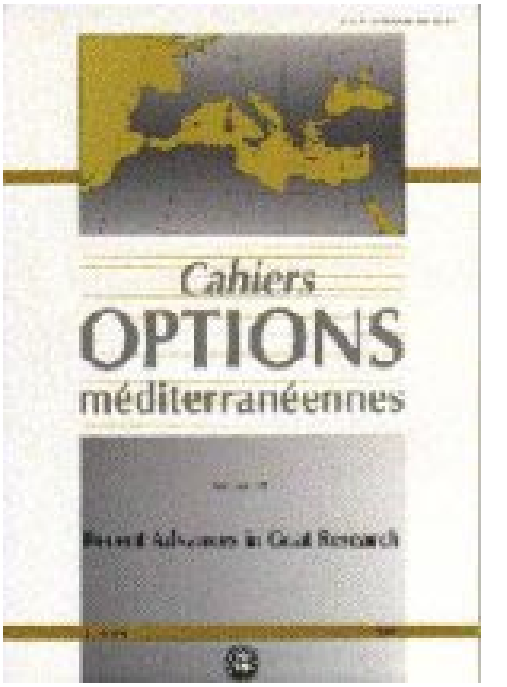
Since 1982, the International Conferences of the International Goat Association (IGA) (Tucson USA, Brasilia Brazil, New-Delhi India) played an important role to present the latest advances on goat research and development. At every conference, the FAO-CIHEAM co-operative network on sheep and goats has presented the activities and reflexions of its subnetworks and working groups. For the last conference held in Beijing the contribution of the network was particularly important: six invited papers presented in symposia, one invited paper presented in a round table, 29 short papers presented in sessions on production systems, nutrition, genetics, reproduction, products and environment.

All these subjects interest the main goat experts in Europe and Mediterranean region; this explains why this special issue of Options Méditerranéennes is published.
Unfortunately, all the papers written by network members could not be published. Consequently a selection of selected main papers was made.

In the first paper Rubino with Haenlein analysed the particularities of goat milk production systems in developed and developing countries, while at a round table on genetic resources, Gabina presented a paper on the management of European sheep and goat genetic resources. Chemineau *et al*. dealt with the control of goat reproduction particularly by analysing the new methods of the sector

Three important papers were presented in goat nutrition, which have been prepared with the contribution of all the members of the subnetwork Nutrition and Feeding Strategies (Coordinator E. Lindberg) . The diet selection is very important in goats, and Nastis mentioned in his paper that goats exhibited very rapid seasonal shifts between shrubs, grasses and forbs. Fibre and protein digestion in goats is a subject that raise controversies because the results principally depend on the experimental conditions. Lindberg and Gouda presented very objective conclusions on this subject. Recent interesting results on nitrogen and glucose metabolism in goats were clearly summarised by Landau *et al*.

The factors determining the quality of goat milk for cheese making are now more known. Jaubert analysed them in his paper.



Data collection and definition of objectives in sheep and goat breeding programmes: new prospects

Eds: D. Gabina & L. Bodin
Proceedings of a joint FAO-CIHEAM Network Congress on Sheep and Goats, Subnetwork on Animal Resources.
Toulouse (France) 9-11 March 1997
Série A. Options Méditerr. 1997, Vol. 33, pp. 247
CIHEAM, Ctra. Montanana 177, 50059 Zaragoza, Spain
ISSN 1016-121-X

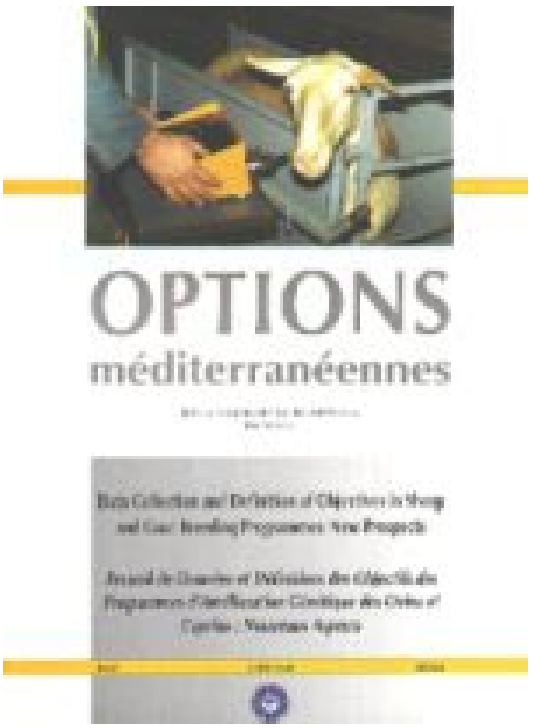
The use of advances in electronics and computer science is bringing important changes into the design and development of livestock breeding programmes. Electronic identification of animals has proved to be more reliable and economical than the conventional metallic or plastic ear-tags, making it possible to integrate this identification into the automated data collection systems in performance recording programmes. However, as often happens, the adaptation of these technological advances is not very widespread in sheep and goats due to the generally lower technological level of these production sectors.

The objective of the meeting was to obtain an updated and comprehensive view of the state of the art and the present research activities in the above mentioned subjects which are becoming key topics in sheep and goat breeding. Furthermore, it was the opportunity to present and discuss the results obtained by a FAO-Working Group of the Subnetwork on Standardization and Simplification of Weighing Protocols in Performance Recording Programmes for Lamb Growth Rate, which is a relevant subject in the simplification and reduction of costs in sheep breeding programmes.

The meeting was attended by 68 experts from Albania, Bulgaria, Cyprus, France, Greece, Hungary, Israel, Italy, Lebanon, Morocco, Poland, Spain, Tunisia and Turkey and 21 presentations were made.

During the meeting, it has been shown, that research concerning Electronic Identification and Automated Data Collection, is providing consistent results and it can be expected that these technologies will be ready to be used by most advanced farmers in the next years. In relation to the third point, Alternative Selection Objectives, it was shown during the meeting that important advances are being achieved in the held of the genetics of the resistance to some diseases in sheep. As a consequence, strategies to obtain genetically improved animals are starting to be designed.

Very interesting work has also been carried out in sheep in the methodology to select udder traits in order to improve their mechanical milking ability.



Fifth World Buffalo Congress

Eds: A. Borghese, S. Failla &V.L. Barile
Proceedings of the 5th World Buffalo Congress, organised by Associazione Nazionale Allevatori Specie Buffaline & Istituto Sperimentale per la Zootecnia
Caserta, Italy, 13-16 October 1997
ISZ, Via Salaria 31, 00016 Monterotondo, Rome, Italy
E-mail: isz@flashnet.it

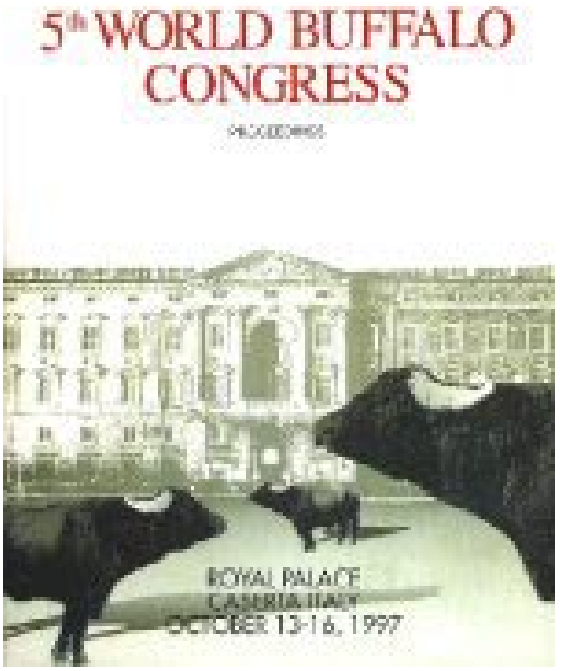
The 5th World Buffalo Congress was held at the Royal Palace la Reggia at Caserta and organized jointly by ANASB (Associazione Nazionale Allevatori Specie Buffaline) in Caserta and the Istituto Sperimentale per la Zootecnia (located in Monterotondo). The Congress registered more than 150 participants form more than 25 countries from Europe, Asia and South America. It was preceded by the 3rd Course on Biotechnology of Reproduction of Buffaloes which was attended by more than 70 participants.

The Scientific Programme comprised five Plenary Sessions with invited papers on: 1. Buffalo production in different environments; 2. Genetic improvement of buffaloes; 3. Reproduction; 4. Social and economic aspects of buffalo breeding and 5. Management processing and marketing problems and sessions with Short Communications in contemporary session.

The scientific presentations were very heterogeneous i.e. in reproduction varying from very basic aspects in reproduction in males over embryo transfer and OPU to recent advances in biotechnology.

In two evening sessions the country co-ordinators of the FAO Research Network at present headed by had its regular meeting. The Network has established itself very well and is very much appreciated by the countries. The Buffalo Newsletter helps to exchange information between the partners in the network and is very much appreciated. A 16 page summary of recent publications of Near Eastern European and European researchers on the Buffalo has been compiled. The Network is actively supported by REUR and RNEA. The meeting discussed amongst other things the venue for the next meeting of the Network: Turkey has expressed interest to host this meeting and the request of a number of countries to run a breed comparison trial using buffaloes from different origins. An outline of the theoretical requirements to run such a trial was given by Dr. Fabiola Canavesi (Italy). The following discussion centred on three main points: 1. Health requirements for the exchange of semen between the countries; 2. Testing of the different origins in one country only (proposed country Egypt) 3. Testing of the different origins in different countries. The meeting did not come to a conclusion, but decided to establish a small group to prepare a more detailed outline for such Programme with possible alternatives. The RO was asked to participate in the elaboration of the programme.

During the conference, discussions were held with Alpha Laval on aspects and problems of machine milking of buffaloes.



Etnobiologia e conservação do bovino Pantaneiro [Etnobiology and conservation of Pantaneiro cattle]

(in Portoguese)

Ed: M.C. Medeiros Mazza, C.A. da Silva Mazza, J. Robson Bezerra Sereno, S. Aparecida Santos, A. Oliveira Pellegrin

Empresa Brasileira de Pesquisa Agropecuária, Centro de Pesquisa Agropecuária do Pantanal

Rua 21 de Setembro, 1880 Cx. Postal 109 CEP 79320-900 Corumbá, MS, Brasil Tel. 067-231-1430

ISBN 85-85007-38-9

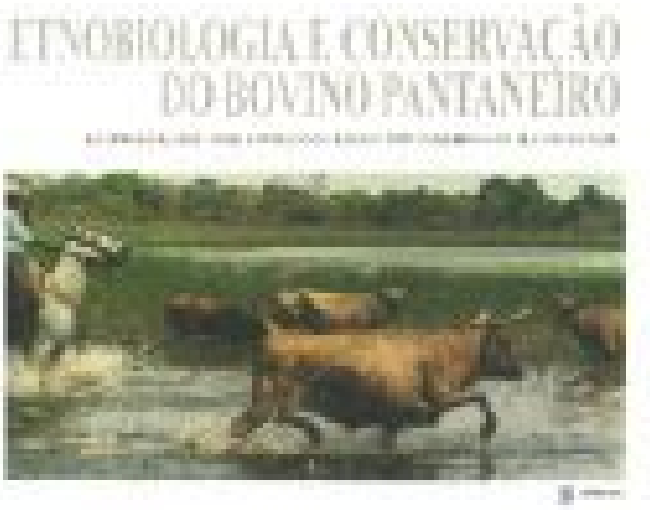
The subject of animal conservation is relatively new in Latin America. However, the high rate of substitution of "local" by exotic, less adapted, breeds has just recently awakened the consciousness of breeders and researchers who do not want to witness their complete disappearance. The establishment of national or regional programmes for the conservation of livestock breeds in danger of extinction are a must in order to avoid this imminent disappearance. Many Latin American countries, like Argentina, Bolivia, Brazil, Colombia, Peru and Venezuela have established National Conservation Programs for their animal genetic resources. In Brazil, the National Agricultural Research Corporation EMBRAPA has been co-ordinating research in this field since 1981.

The fast-growing of biotechnology may lead to new techniques of gene preservation. DNA-recombinant techniques, embryo manipulation, cloning of desirable genes from the same or other breed populations may one day become commonplace. In any case, we cannot risk the future of this important germplasm, which certainly will be utilised.

The initiative of writing this book, by a group of researchers, working with the Pantaneiro cattle at the Pantannal Agricultural Research Centre - CPAP is very important; it represents an attempt to define the historic origins of the breed, potentialities and an analysis of the production systems.

The book opens with a description of cattle-farming expansion in the Paraguay river basin, followed by a chapter on the history of the Iberian peninsula cattle introduced into the Americs during the time of Colonisation. Chapter three analyses the origin and the formation of the Pantaneiro cattle, its adaptation, acclimatization, and the probable contribution of other breeeds toward its development. The last part examines the ongoing programmes and measures for its conservation, together with a description of size and location of Pantaneiro cattle heards.

Finally, in order to increase the awareness of breeders and to inform the public about the state of the art of Pantaneiro cattle conservation programmes, this book, with its pleasant layout and excellent graphics -in Portuguese and in English- represents a good and informative contribution to the information of the initiative in progress for the conservation of the animal genetic resources.



Cibo biotecnologico [Biotechnology food]

(in Italian)

By C. Nardone

Hevelius Edizioni s.r.l., Via Vanvitelli, Pal. Ricciardi, 82100 Benevento
Tel.: xx-39-824-317558; fax: xx-39-824-51655
ISBN 88-86977-04-2

This book opens with the preface by Luciano Violante, the Chairman of the Italian Parliament and closes with a major technical contribution by Laura Conti. It rigorously analyses, in a very documented and exhaustive way, the problems arising from biotechnologies, with their scientific, technical and cultural implications, especially those related with biodiversity.

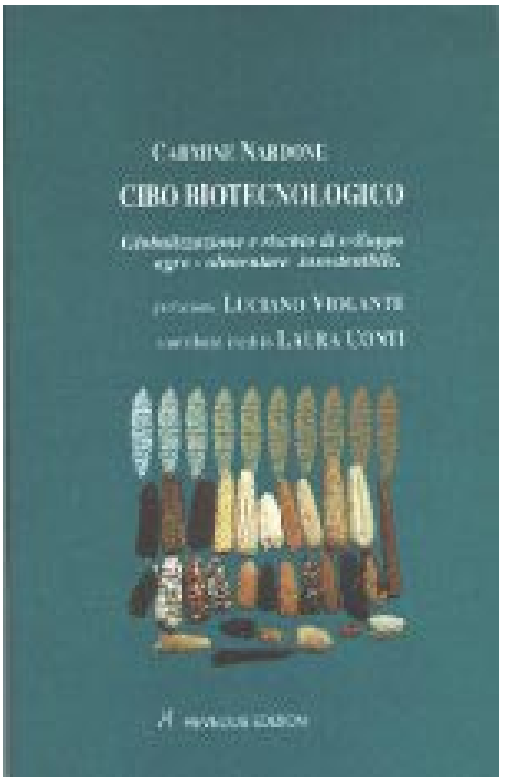
The analysis of the Author, an agronomist and member of the Italian Parlament, developed in seven chapters, starts from the globalisation processes in the agro-food system and follows with an analysis of the relationship between globalisation and biotechnologies, through the problems of food security and biodiversity conservation. After an analysis of the EU subsidies to the farmers and their impact on the continental and Mediterranean agriculture systems and on the quality of the production, Carmine Nardone deals with the attitude of the politicians regarding the agro-food problems.

Nardone researched and evaluated the global biotechnologies sector and produced a careful examination of what happened in the past, in order to obtain some indications for future developments.

This book underlines the irrationality of the present-day model of development that, beneath the differences between the rich and the poor places side by side the contradiction of a contemporary presence of over-production and food scarcity. An increasing reality together with the globalisation processes, actually in phase of achievement in most of the developed countries.

The "World-scale-economy" tends to produce a total separation between production and consumption, with the functional specialisation of the areas intended to the only supply of row materials, production or consumption

Nardone offers here a strong, clear, convincing definition, easy readable on a subject which dominates our time, particularly in Europe. It is a definitive evaluation from a man of principles with a strong western cultural approach. This book is meant to be read but it is also a honest and open discussion with oneself. The autocriticism also comes out clearly in a way that reveals a man of culture and of science who became a politician and not the other way around, as it happens in so many cases.



L'ovinicoltura nella gestione del territorio [Sheep production in land management]

(in Italian)
Proceedings of a Round table organised by Accademia dei Georgofili
Isola Capo Rizzuto, Italy, 7-8 June 1996
Suppl. to "I Georgofili. Acts of the Accademia dei Georgofili" 1996, Vol. XLIII
Logge Uffizi Corti, 50122 Florence, Italy, Tel.: +39-55-212114/213360
ISSN0367/4134

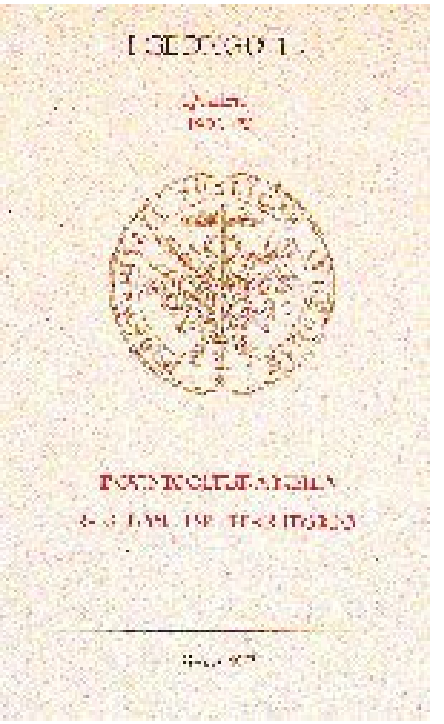
At the treshold of the 21th century, the commitment of scientists, technicians and agricultural operators turns towards the optimization of the ecosystem, according to the advanced technology evolution, the valorization of the natural resources, the protection of the environment, the security and specific needs of the consumers.

In this reality, that involves all the agricultural sectors for the definition of the modern concept of sustainable agriculture, sheep, thanks to their adaptability, can play a major and relevant role, supported by on technological innovations and/or the easy exploitation of rural resources that other animals are incapable to use.

According to this vision, the Accademia dei Georgofili organised in Isola Capo Rizzuto (in the Calabria region, in the Southern part of Italy, a very representative Mediterranean region for sheep production) a round table from the 7 to 8 June 1996, in order to define the state of the art regarding this kind of production.

During the two day debate, it was pointed out that:

- sheep production has a key role in the land and pasture management, role that must be increased with a rational management of the fodder resources;
- it is a necessity to conserve the agro-pastoral diversity, either for productive or ecological purposes;
- there is a necessity to help the modernization of the structure and the farm organisation, the realisation of an agro-industrial matrix and the interactions among the different levels of the productive network:
- public intervention is a priority in order to achieve a development that support the private intervention.



Editorial Policies and Procedures

The mission of the Animal Genetic Resources Information Bulletin (AGRI) is the promotion of information on the better use of animal genetic resources of interest to food and agriculture production, under the Global Strategy for the Management of Farm Animal Genetic Resources. All aspects of the characterization, conservation and utilization of these resources are included, in accordance with the Convention on Biological Diversity. AGRI will highlight information on the genetic, phenotypic and economic surveying and comparative description, use, development and maintenance of animal genetic resources; and on the development of operational strategies and procedures which enable their more cost-effective management. In doing this AGRI will give special attention to contributions dealing with breeds and procedures capable of contributing to the sustainable intensification of the world's medium to low input production environments (agro-ecosystems), which account for the substantial majority of the land area involved in livestock production; the total production of food and agriculture from livestock; and of our remaining farm animal genetic resources.

Views expressed in the paper published in AGRI represent the opinions of the author(s) and do not necessarily reflect those of the institutions which the authors are affiliated, FAO or the Editors.

The suitability of manuscripts for publication in AGRI is judged by the Editors and reviewers.

Electronic publication

AGRI is available in full electronically on the Internet, in addition to being published in hard copy, at:
<< http://www.fao-org/dad-is>>

Types of Articles

The following types of articles are published in AGRI.

Research articles

Findings of work on characterization, conservation and utilization of farm animal genetic resources (AnGR) in well described production environments, will be considered for publication in AGRI. Quality photographs of these genetic resources viewed in the primary production environment to which they are adapted, accompanying the manuscripts are encouraged.

Review articles

Unsolicited articles reviewing agro-ecosystems, country-level, regional or global developments on one or more aspects of the management of animal genetic resources, including state-of-the-art review articles on specific fields in AnGR, will be considered for publication in AGRI.

Position papers

Solicited papers on topical issues will also be published as deemed required.

Other published material

This includes book reviews, news and notes covering relevant meetings, training courses and major national, regional and international events and conclusions and recommendations associated with the outcomes of these major events. Readers are encouraged to send such items to the editors.

Guidelines for Authors

Manuscript submission

Manuscripts prepared in English, French or Spanish with an English summary and

another summary in either French or Spanish, should be submitted to AGRI Editor, AGAP, FAO, Viale delle Terme di Caracalla, 00100 Rome, Italy. Alternatively a manuscript may be sent as a WinWord Electronic Mail attachment to < agri@fao.org >. Photographs, coloured or black and white, and figures must be always sent by mail.

Manuscripts should be typed double-spaced and with lines numbered in the left margin. All pages, including those of references, tables etc., must be consecutively numbered. The corresponding author is notified of the receipt of a manuscript.

For manuscripts that are accepted after revision, authors are encouraged to submit a last version (3½" disc format) in Word 6.0 for Windows of their revised manuscript along with the printed copy.

Preparation of the manuscript

The first page of the manuscript must include the running head (abbreviated title), title, names of authors, institutions, full addresses including postal codes and telephone number and other communication details (fax, e-mail, etc.) of the corresponding author. The running head not exceeding 45 characters plus spaces, should appear at the top of page 1 of the manuscript entirely in capital letters. The title of the manuscript is typed in upper and lower case letters. The title should be as brief as possible not exceeding 150 characters (including spaces) with species names when applicable. Authors, institutions and addresses are in upper and lower case italics. There is one blank line between the title and the authors. Addresses are typed as footnotes to the authors after leaving one blank line. Footnotes are designated numerically. Two lines are left below the footnotes.

Headings

Headings of sections, for example Summary, Introduction, etc., are left-justified. Leave two blank lines between addresses footnotes and Summary and between the heading Summary and its text. Summary should not exceed 200 words . It should be an objective summary briefly describing the procedures and findings and not simply stating that the study was carried on such and such and results are presented, etc. Leave one line between the summary text and Keywords which is written in italics as well as the keywords themselves. All headings of sections (14 regular) and sub-sections (12 regular) are typed bold and preceded and succeeded by one blank line and their text begins with no indention. The heading of a sub-subsection is written in italics, and ends with a dot after which the text follows on the same line. Keywords come immediately after the summaries. They should be no more than six, with no "and" or "&".

Tables and figures

Tables and figures must be enclosed with the paper and attached at the end of the text according their citation in the document. Photos will not be returned

Tables

Tables, including footnotes, should be preceded and succeeded by 2 blank lines. Table number and caption are written, above the table, in italics (12) followed by a dot, then one blank line. For each column or line title or sub-title, only the 1st letter of the 1st word is capitalized. Tables should be numbered consecutively in Arabic numerals. Tables and captions should be left justified as is the text. Use horizontal or vertical lines only when necessary. Do not use tabs or space-bar to create a table but only the appropriate commands.

Figures

Figures including titles and legends should be preceded and succeeded by two blank lines. Figure number and title are written, below the figure, in italics (12) and end with a dot. The term figures includes photos, line drawings, maps, diagrams etc.

All the submitted diagrams, must be accompanied with the original matrix of the

data used to create them. It is strongly advised to submit diagrams in Word 6.0 or Excel 5.0. Figures should be numbered consecutively in Arabic numerals.

References

Every reference cited in the text should be included in the reference list and every reference in the reference list should have been mentioned in the text at least once. References should be ordered firstly alphabetically by the first author's surname and secondly by year.

Example for reference in a periodical is:

Köhler-Rollefson, I., 1992; The camel breeds of India in social and historical perspective. Animal Genetic Resources Information 10, 53-64.

When there are more than one author:

Matos, C.A.P., D.L. Thomas, D. Gianola, R.J. Tempelman & L.D. Young, 1997; Genetic analysis of discrete reproductive traits in sheep using linear and nonnlinear models: 1. Estimation of genetic parameters 75, 76-87.

For a book or an ad hoc publication, e.g., reports, theses, etc.:

Cockril, W.R., (Ed), 1994; The Husbandry and Health of the Domestic Buffalo. FAO, Rome, Italy, pp 993.

For an article in the proceedings of a meeting:

Hammond, K., 1996; FAO's programme for the management of farm animal genetic resources. In C. Devendra (Ed.) Proceedings of IGA/FAO Round Table on the Global Management of Small Ruminant Genetic Resources, Beijing, May 1996, FAO, Bangkok, Thailand, 4-13.

Where information included in the article has been obtained or derived from a World Wide Web site, then quote in the text, e.g. "derived from FAO. 1996" and in the References quote the URL standard form:

FAO, 1996; Domestic Animal Diversity Information System <http://www.fao.org/dad-is/>, FAO, Rome

Normes et règles éditoriales

L'objectif du Bulletin d'Information sur les Ressources Génétiques Animales (AGRI) est la vulgarisation de l'information disponible sur la meilleure gestion des ressources génétiques animales d'intérêt pour la production alimentaire et agricole, d'après les recommendations de la Stratégie Mondiale pour la Gestion des Ressources Génétiques des Animaux Domestiques. Tous les aspects relatifs à la caractérisation, la conservation et l'utilisation de ces ressources seront pris en considération, suivant les normes de la Convention pour la Biodiversité.

AGRI désire diffuser de l'information sur la génétique, les enquêtes phénotypiques et économiques et les desciptions comparatives, l'utilisation et la conservation des ressources génétiques animales, ainsi que toute information sur le développement de stratégies opérationnelles et de normes qui puissent permettre une meilleure gestion de la relation coût/efficacité. C'est pour cela que AGRI prendra spécialement en considération toutes les contributions référées aux races et aux normes capables de permettre une intensification durable des milieux (agroécosystèmes) à revenus moyens et bas dans le monde; qui comprennent la majeur partie des terres consacrées à l'élevage, à la production totale des aliments et l'agriculture provenants de l'élevage; et tout ce qui reste comme ressources génétiques des animaux domestiques.

Les opinions exprimées dans les articles publiés dans AGRI appartiennent seulement aux auteurs et donc ne représentent pas nécessairement l'opinion des instituts pour lesquels ils travaillent, la FAO ou les éditeurs.

L'opportunité ou non de publier un article dans AGRI sera jugée par les éditeurs et les réviseurs.

Publication électronique

En plus de sa version imprimée, la version totale de AGRI se trouve disponible sur Internet, sur le site:
<<http://www.fao-org/dad-is/>>

Types d'articles

Les articles suivants pourront être publiés sur AGRI:

Articles de recherche

Seront prises en considération pour leur publication sur AGRI les études sur la caractérisation, la conservation et l'utilisation des ressources génétiques des animaux domestiques (AnGR) accompagnées d'une bonne description du milieu. On encourage les auteurs à envoyer des photographies de bonne qualité qui montrent les races en question dans leur milieu naturel de production.

Révisions

Occasionnellement, des articles contenant une révision des agroécosystèmes, au niveau national, régional ou mondial, avec un ou plusieurs aspects se rapportant à la gestion des ressources génétiques animales, y comprises les mises à jour des différentes zones de AnGR, seront pris en considération.

Articles spécifiques

Ponctuellement, des articles sur des thèmes spécifiques pourront être demandés pour la publication d'éditions spéciales.

Autre matériel pour publication

Ceci comprend la révision de livres, nouvelles et notes de réunions importantes, cours de formation et principaux évènements nationaux, régionaux et internationaux; ainsi que les conclusions et recommendations par rapport aux objectifs des ces principaux évènements. Les auteurs sont priés d'envoyer ce genre de matériel aux éditeurs.

Guide pour les auteurs

Présentation du manuscript

Les articles se présenteront en anglais, français ou espagnol, avec un résumé en anglais et sa traduction en français ou en espagnol; et seront envoyés à l'éditeur de AGRI, AGAP, FAO, Viale delle Terme di Caracalla, 00100 Rome, Italie. L'autre possibilité est d'envoyer l'article par courrier électronique avec le document adjoint en version WinWord à <agri@fao.org>. Les photographies, en couleur ou en blanc et noir, seront toujours envoyées par courrier normal.

Les manuscripts se présenteront à double interligne et avec le numéro correspondant à chaque ligne sur la marge gauche. Toutes les pages seront numérotées, y comprises celles avec les références bibliographiques, les tableaux, etc. L'auteur recevra une lettre lui donnant bonne réception de son document.

Lorsqu'un article, après sa révision, sera accepté, on demandera à l'auteur d'envoyer la version finale révisée sur disquette (format 3 1/2") en Word 6.0 x Windows, ainsi qu'une copie sur papier.

Préparation du manuscript

Sur la première page du manuscript on indiquera le titre de l'article en abrégé, le titre et noms des auteurs, des institutions, les adresses complètes (y compris code postal et numéro de téléphone); ainsi que tout autre moyen de contact tel que fax, e-mail, etc. avec l'auteur principal. Le titre abrégé ne devra pas dépasser les 45 caractères, plus les espaces nécessaires, et s'écrira sur la partie supérieure de la page 1 du manuscript en majuscules. Le titre en entier du manuscript sera écrit en majuscules et minuscules; il devra être aussi bref que possible, sans dépasser les 150 caractères (y compris les espaces nécessaires), et avec l'indication des noms des espèces. Les noms des auteurs, des institutions et les adresses seront en italique et en lettres majuscules et minuscules. On laissera un espace en blanc entre le titre et les noms des auteurs. Les adresses seront indiquées comme des notes à pied de page pour chacun des auteurs après avoir laissé un espace en blanc après les noms. Chaque note de pied de page sera numérotée. On laissera deux espaces en blanc après les adresses.

Titres

Les titres de chaque chapitre, par example Résumé, Introduction, etc. seront alignés à gauche. Laisser deux espaces en blanc entre les notes de pied de page avec les adresses et le Résumé, et entre le titre Résumé et le texte qui suit. Le résumé ne devra pas dépasser les 200 mots. Il s'agira d'un résumé objectif qui fasse une brève description des processus utilisés et des résultats obtenus, et non pas une simple présentation du travail réalisé avec une description générale des résultats. Laisser un espace en blanc entre la fin du texte du résumé et les mots-clés, qui seront écrits en italique ainsi que le titre Mots-clés. Les mots-clés seront au maximum six et il ne devra pas y avoir de "et" ou "&". Tous les titres principaux de chapitre (14 regular) et sous-chapitre (12 regular) seront en gras avec un espace en blanc avant et après. Le texte commencera sans retrait. Un titre à l'intérieur d'un sous-chapitre s'écrira en italique, suivi d'un point, avec le texte à continuation.

Tableaux et figures

Les tableaux et les figures iront à la fin du texte en suivant l'ordre d'apparition dans le texte. Les photographies ne seront pas dévolues aux auteurs.

Tableaux

Les tableaux, y compris les notes de pied de page, devront avoir un espace en blanc avant et après. Le numéro du tableau et le titre s'écriront sur la partie supérieure en italique (12) avec un point à la fin et un espace en blanc en dessous. Sur chaque colonne, titre d'en-tête ou sous-titre, seulement la première lettre du premier mot sera en majuscule. Les tableaux et leur titre seront alignés à gauche, ainsi que le texte. Les lignes verticales et

horizontales seront utilisées seulement si nécessaires. Ne pas utiliser les tabs ou la barre de séparation pour créer un tableau.

Figures

Les figures, y compris les titres et les légendes, seront précédés et suivis de deux espaces en blanc. Le numéro de la figure et le titre s'écriront sur la partie supérieure en italique (12) avec un point à la fin. Sous la rubrique figure on trouvera les photographies, les graphiques, les cartes, les diagrammes, etc. Dans le cas des diagrammes, la matrice originale avec les données utilisées pour son élaboration devra être envoyée. On recommande l'utilisation de Word 6.0 ou Excel 5.0 pour la présentation des diagrammes.

Références

Toute référence présente dans le texte devra apparaître sur la liste des références, et chaque référence de la liste aura été citée au moins une fois dans le texte. Les références iront en ordre alphabétique du nom de l'auteur, suivi de l'année. Example dans le cas d'une référence sur une revue:

Köhler-Rollefson, I.,1992; The camel breeds of India in social and historical perspective. Animal Genetic Resources Information 10, 53-64.

Lorsqu'il s'agit de plus d'un auteur:

Matos, C.A.P., D.L. Thomas, D. Gianola, R.J. Tempelman & L.D. Young, 1997; Genetic analysis of discrete reproductive traits in sheep using linear and nonnlinear models: 1. Estimation of genetic parameters 75, 76-87.

Dans le cas d'un livre ou d'une publication ad hoc, par example un rapport, une thèse, etc.:

Cockril, W.R., (Ed), 1994; The Husbandry and Health of the Domestic Buffalo. FAO, Rome, Italy, pp 993.

S'il s'agit d'un acte d'une réunion:

Hammond, K., 1996; FAO's programme for the management of farm animal genetic resources. In C. Devendra (Ed.) Proceedings of IGA/FAO Round Table on the Global Management of Small Ruminant Genetic Resources, Beijing, May 1996, FAO, Bangkok, Thailand, 4-13.

Lorsque l'information contenue dans l'article ait été obtenue ou dérive d'un site World Wide Web, il faudra mettre le texte entre guillemets; par example "tiré de la FAO. 1996" et indiquer dans les Références la forme standard URL:

FAO, 1996; Domestic Animal Diversity Information System <http://www.fao.org/dad-is/>, FAO, Rome

Reglas y normas editoriales

El objetivo del Boletín de Información sobre Recursos Genéticos Animales (AGRI) es la divulgación de la información sobre una mejor gestión de los recursos genéticos animales de interés para la producción alimentaria y agrícola, siguiendo la Estrategia Mundial para la Gestión de los Recursos Genéticos de los Animales Domésticos. Todos los aspectos referidos a la caracterización, la conservación y el uso de estos recursos serán tomados en consideración, de acuerdo con la Convención sobre la Biodiversidad.

AGRI publicará información sobre genética, encuestas fenotípicas y económicas y descripciones comparativas, uso, desarrollo y conservación de los recursos genéticos animales, así como sobre el desarrollo de estrategias operacionales y normas que permitan una gestión más eficaz de la relación costo/eficacia. Por ello, AGRI prestará especial atención a las contribuciones referidas a razas y normas capaces de contribuir a la intensificación sostenible de los medios (agroecosistemas) con ingresos medio y bajos en el mundo, que comprenden casi la mayor parte de las tierras dedicadas a la producción ganadera; la producción total de alimentos y agricultura provenientes de la ganadería; y el resto de los recursos genéticos de animales domésticos.

Los puntos de vista expresados en los artículos publicados en AGRI son solamente las opiniones de los autores y, por tanto, no reflejan necesariamente la opinión de las instituciones para las cuales trabajan dichos autores, de la FAO o de los editores.

La oportunidad o no de publicar un artículo en AGRI será juzgada por los editores y revisores.

Publicación electrónica

Además de su publicación impresa, la versión íntegra de AGRI se encuentra disponible electrónicamente sobre Internet, en el sito: <<http://www.fao-org/dad-is/>>

Tipos de artículos

Serán publicados en AGRI los siguientes tipos de artículos:

Artículos sobre investigación

Se tomarán en consideración para su publicación en AGRI los estudios sobre la caracterización, conservación y uso de los recursos genéticos de los animales domésticos (AnGR) con una buena descripción del entorno. Se agradecerá el envío de fotografías de calidad que presenten a las razas en cuestión en su ambiente natural de producción.

Artículos de revisión

Se podrán tener en consideración ocasionalmente aquellos artículos que presenten una revisión de los agroecosistemas, a nivel nacional, regional o mundial, con el desarrollo de uno o más aspectos referidos a la gestión de los recursos genéticos animales, incluidas las revisiones sobre el estado actual de las distintas áreas de AnGR.

Artículos específicos

Se solicitarán puntualmente artículos sobre temas específicos para ediciones especiales.

Otro material para publicación

Incluye la revisión de libros, noticias y notas referidas a reuniones importantes, cursos de formación y principales eventos nacionales, regionales e internacionales, así como conclusiones y recomendaciones relacionadas con los objetivos de estos principales eventos. Se invita a los lectores a enviar este tipo de material a los editores.

Guía para los autores

Presentación del manuscrito

Los artículos se presentarán en inglés, francés o español, junto con un resumen en inglés y su traducción en francés o español, y se enviarán al editor de AGRI, AGAP, FAO, Viale delle Terme di Caracalla, 00100 Roma, Italia. Otra posibilidad es enviar el artículo por correo electrónico adjuntando el documento en versión WinWord a <agri@fao.org>. Las fotografías, a color o en blanco y negro, se enviarán siempre por correo normal.

Los manuscritos se presentarán con doble espacio y con el número correspondiente a cada línea en el margen izquierdo. Todas las páginas serán numeradas, incluidas las de las referencias bibliográficas, cuadros, etc. El autor recibirá una notificación sobre la recepción de su documento.

En el caso de aceptación de un artículo después de su revisión, se solicitará al autor una versión final de su artículo revisado en disquete (formato 3 1/2″) en Word 6.0 x Windows, así como una copia impresa del mismo.

Preparación del manuscrito

En la primera página del manuscrito se indicará el título abreviado del artículo, títulos y nombres de los autores, instituciones, direcciones completas (incluido código postal y número de teléfono); así como otros medios de contacto tales como fax, e-mail, etc., del autor principal. El título abreviado no deberá sobrepasar los 45 caracteres más los espacios correspondientes, y aparecerá en la parte superior de la página 1 del manuscrito en mayúsculas. El título entero del manuscrito viene escrito en mayúsculas y minúsculas. Dicho título debe ser lo más breve posible y no sobrepasar los 150 caracteres (incluidos los espacios necesarios), con los nombres de las especies, si necesario. Los nombres de los autores, instituciones y direcciones se escribirán en cursiva y en letras mayúsculas y minúsculas. Se dejará una línea en blanco entre el título y los nombres de los autores. Las direcciones se escribirán como notas de pie de página de cada autor después de dejar una línea en blanco entre los nombres y éstas. Cada nota de pie de página con la dirección vendrá indicada numéricamente. Se dejarán dos líneas en blanco después de las direcciones.

Títulos

Los títulos de cada sección, por ejemplo Resumen, Introducción, etc., vienen alineados a la izquierda. Dejar dos líneas en blanco entre las notas de pie de página con las direcciones y el Resumen y entre el título Resumen y el texto que sigue. El resumen no deberá exceder de 200 palabras. Deberá ser un resumen objetivo que describa brevemente los procesos y logros obtenidos, y no una presentación de cómo se ha llevado a cabo el estudio y una descripción genérica de los resultados. Dejar una línea en blanco entre el final del texto del resumen y las palabras clave, que se escribirán en cursiva así como el titulo Palabras clave. No deberán ser más de seis y no deberán contener “y” o “&”. Todos los títulos principales de capítulo (14 regular) y subcapítulo (12 regular) serán en negrita e irán precedidos y seguidos de una línea en blanco. El texto correspondiente empezará sin sangrado. Un título dentro de un subcapítulo se escribirá en cursiva e ira seguido de un punto con a continuación el texto correspondiente.

Cuadros y figuras

Los cuadros y las figuras se incluirán al final del texto siguiendo el orden de cita dentro del mismo. Las fotografías no serán devueltas a sus autores.

Cuadros

Los cuadros, incluidas las notas de pie de página, deberán ir precedidos y seguidos por dos líneas en blanco. El numero del cuadro y su título se escribirán en la parte superior en cursiva (12) con un punto al final y seguido de una línea en blanco. En cada columna o título

de encabezamiento o subtítulo, sólo la primera letra de la primera palabra irá en mayúscula. Los cuadros irán numerados de forma consecutiva con números árabes. Los cuadros y sus títulos se alinearán a la izquierda, así como el texto. Se utilizarán líneas horizontales o verticales sólo cuando sea necesario. No utilizar tabuladores o la barra espaciadora para crear un cuadro.

Figuras

Las figuras, incluidos los títulos y leyendas, irán precedidas y seguidas de dos líneas en blanco. El número de la figura y el título se escribirán en la parte superior en cursiva (12) con un punto al final. La palabra figura incluye las fotografías, los gráficos, los mapas, los diagramas, etc. En el caso del diagrama se enviará la matriz original con los datos utilizados para crearlo. Se recomienda encarecidamente la utilización de Word 6.0 o Excel 5.0 para la presentación de los diagramas.

Referencias

Toda referencia presente en el texto deberá aparecer en la lista de referencias y, de la misma manera, cada referencia de la lista deberá haber sido citada por lo menos una vez en el texto. Las referencias deben ir en orden alfabético del apellido del autor, seguido por el año.

Ejemplo en el caso de una referencia de una revista:

Köhler-Rollefson, I.,1992; The camel breeds of India in social and historical perspective. Animal Genetic Resources Information 10, 53-64.

Cuando se trata de más de un autor:

Matos, C.A.P., D.L. Thomas, D. Gianola, R.J. Tempelman & L.D. Young, 1997; Genetic analysis of discrete reproductive traits in sheep using linear and nonnlinear models: 1. Estimation of genetic parameters 75, 76-87.

En el caso de un libro o de una publicación ad hoc, por ejemplo informes, tesis, etc.:

Cockril, W.R., (Ed), 1994; The Husbandry and Health of the Domestic Buffalo. FAO, Rome, Italy, pp 993.

Cuando se trate de un artículo dentro de las actas de una reunión:

Hammond, K., 1996; FAO's programme for the management of farm animal genetic resources. In C. Devendra (Ed.) Proceedings of IGA/FAO Round Table on the Global Management of Small Ruminant Genetic Resources, Beijing, May 1996, FAO, Bangkok, Thailand, 4-13.

Cuando la información contenida en el artículo haya sido obtenida o derive de un sito World Wide Web, poner el texto entre comillas; por ejemplo "sacado de la FAO. 1996" e indicar en las Referencias la forma estándar URL:

FAO, 1996; Domestic Animal Diversity Information System <http://www.fao.org/dad-is/>, FAO, Rome