

- 9 Indigenous chickens: an important part of rural livelihoods in the **LAO PEOPLE'S DEMOCRATIC REPUBLIC**
- 10 Tamberma's Somba cattle breed at risk of extinction in **TOGO**
- 11 Co duck genetic resources: the pillar of traditional mixed farming systems in **VIETNAM**



CHAPTER 4

SPECIFIC FEATURES OF RAISING LIVESTOCK IN HUMID TROPICAL AREAS

Tropical humid ecosystems are typified by a pronounced dry season that can last up to six months, combined with a single rainy season. Annual rainfall varies between 800 and 2000 mm. The natural vegetation is mostly monsoon forest.

Case studies from Laos and Viet Nam demonstrate the efficiency of traditionally integrated and closed production systems, focusing on the integration of rice cultivation with poultry and aquaculture. The study in Togo depicts a slightly more complex system, integrating ruminants (large and small) with chickens and crops such as sorghum and groundnuts.

The by-products of rice contribute largely to improving the quality of the feed for local chickens and ducks in Southeast Asia. In northern Togo, however, it is not customary to use crop by-products. An important common feature of the livestock described in these case studies is their resistance to disease.



Map below:

Study areas of indigenous chicken farming, Laos



INDIGENOUS CHICKENS: AN IMPORTANT PART OF RURAL LIVELIHOODS IN THE LAO PEOPLE'S DEMOCRATIC REPUBLIC

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SUMMARY

Local chickens are kept for subsistence, sport and income. Flocks are small and raised on scavenging; productivity is low. Chick mortality is particularly high, because of diseases and poor feeding. Most are indigenous breeds, but these are threatened by expansion of industrial commercial hybrids. Conservation of local genetic resources should be supported and communities assisted to find sustainable ways to improve chicken performance including better health, feeding and husbandry. Areas for improvement include chick rearing protein supplementation and egg production.

ECOSYSTEM CHARACTERIZATION

This case study looks at how rural communities manage chickens in two ecologically distinct zones: the lowland, tropical, moist, deciduous forests of Savannakhet and Champassack and the highland tropical, dry forests of Luang Prabang province.

INDIGENOUS CHICKENS IN THE LOWLANDS

Climate and biophysical characteristics. Savannakhet has a moist tropical climate with annual rainfall between 1 500 and 2 000 mm. The floodplain and levees have recent, shallow, acidic, alluvial deposits with low organic matter and low fertility. Young alluvial soils on the floodplain are more fertile than older terraces, but are subject to flooding. Altitude ranges from 100 to 200 metres and slopes are less than 8 percent. Land is primarily used for rainfed rice, irrigated rice, vegetables and livestock.

Lowland farming systems. In the Mekong corridor, farmers grow rice in the rainy season; irrigation, allows a second crop; 90 000 ha (or 15 percent) of the rice is irrigated. Livestock and crops are complementary:



PHOTO 1. Indigenous chickens in their natural habitat

farmers keep buffaloes, cattle, pigs and poultry for draught, meat, income, sport and savings. Indigenous chickens are important in the livelihoods of the rural poor. Birds and eggs are for home consumption, but sold when cash is needed. During the day chickens scavenge for earthworms, insects, termites, kitchen

wastes and agricultural and industrial residues. At night they are fed rice bran or broken rice.

INDIGENOUS CHICKENS IN THE HIGHLANDS

The mountainous northern region, above 800 metres, has a moist to dry subtropical climate with an annual rainfall between 1 500 and 2 000 mm. It has a cooler dry season and greater annual temperature variations than the rest of the country. Slopes range from 30 to 60 percent. Crop production is for subsistence. Incomes are low with poverty and food insecurity. Rural credit is rarely available. Households are vulnerable to natural disasters, crop failures and ill health. Rural infrastructure and access to goods and services are poor. Livestock feed conversion and production are low, because animals are raised under poor conditions. Rugged terrain and poor soils leaves little scope for intensive agriculture and limits animal production based on large- and medium-sized species.

Highland farming systems. Highland farmers use slash-and-burn. Traditionally, several years of cultivation were followed by long fallows, but increasing population pressure has shortened fallow cycles, leading to land degradation. As in the lowlands, indigenous chickens scavenge, but the variety of feeds is wider and includes earthworms, termites, kitchen wastes, agricultural residues, feed from the forest such as insects, other arthropods, soil vegetation and fungi. Farmers may use rice bran and broken rice as a supplement for their chickens.

LOCAL CHICKEN BREEDS

In both areas five types of indigenous chickens were identified.

Kai Ou is the largest indigenous chicken; cocks weigh about 2.7 kg and hens 1.6 kg; they are mainly raised in the Hmong villages of Luang Prabang province. Body feathers are predominantly black, but red feathers can be found around the neck and wings. Kai Ou has the lowest egg production of indigenous breeds with only 55 eggs per year. The hens' hatching capacity is relatively low (67 percent).

Black bone chickens, originally from China, are raised in Luang Prabang and Oudomxay. They are

believed to have qualities that can extend life expectancy and can be sold at a high price. Its numbers are below 1 000 head so it is at risk of extinction. Two distinct types are recorded. The less common is small with an entirely black skin covered with white feathers and its meat is also black. The second is larger with dark brown to black plumage. The weight of a mature cock is 2 to 2.3 kg, while hens weigh 1.5 kg. Average annual egg production is 76 eggs per hen per year with a hatching capacity of 80 percent.

Kai Horn Chou chickens are widely distributed and are phenotypically very similar to Kai Chae, but distinguished by a greater body size and a pea comb. Cocks weigh 1.3 to 1.7 kg, hens between 1.2 and 1.5 kg. Hens produce 70 eggs per year on average and have a hatching capacity of about 75 percent.



PHOTO 2. Kai Ou Rooster



PHOTO 3. Kai Ou Hen

B. Bouahom

B. Bouahom

Kai Yolk. Fighting cocks come from this breed. Farmers in Champassack and Savannakhet prefer Kai Yolk chickens; Yolk meaning tall in Lao. The Kai Yolk is relatively large, well adapted to the lowland ecosystem and has good feed conversion. Mature cocks weigh 1.5 to 1.8 kg and hens between 1.3 and 1.5 kg. Hens only produce 56 eggs per year, with a hatching capacity of about 70 percent.

Kai Chae chickens are widely distributed; they are small and known for the colour patterns of their feathers. Two types can be distinguished – one with white and the other with red wattles. Mature cocks weigh under 1 kg and mature hens between 0.8 and 0.9 kg. These chickens are well adapted to the environment and easy to raise. Hens have a relatively high annual egg production of about 78 eggs, while their hatching

capacity is 80 percent. Their mothering qualities are excellent. The breed is famous for its high-quality meat.

GENERAL CHARACTERISTICS OF INDIGENOUS CHICKENS

The average flock composition is 25 to 30 percent of mature cocks and hens, 30 to 33 percent of young chickens and 40 to 45 percent of chicks. The sex ratio is high, ranging from 2.5 to 3:1 so farmers keep a surplus of males. Since feed supply is limited, hens often suffer from insufficient feeding, leading to lower egg yields.

Egg production is 55 to 78 eggs per hen annually. Hens lay during five distinct periods per year, during which they produce 11 to 14 eggs. Egg weights range from 35 to 40 g. Chickens begin laying at 30 weeks, at a body weight of 1.2 kg. Hens of indigenous breeds take



PHOTO 4. Black Bone Rooster



PHOTO 6. Kai Horn Chou Rooster



PHOTO 5. Black Bone Hen



PHOTO 7. Kai Horn Chou Hen



PHOTO 8. Kai Yolk Rooster

B. Bouahom



PHOTO 10. Kai Chae Rooster

B. Bouahom



PHOTO 9. Kai Yolk Hen

B. Bouahom



PHOTO 11. Kai Chae Hen

B. Bouahom

more time to rear their chicks, lowering egg production. Some indigenous breeds are notoriously poor mothers.

Mortality is primarily due to disease and poor feed; under two months it reaches 75 percent; in young chickens and more mature birds it ranges from 25 to 35 percent, depending on the region. The main diseases are Fowl cholera and Newcastle disease which mainly occur at the beginning of the rainy season in May and in winter.

Chicken pens are simple and vary from small cages to permanent houses; often chickens roost in trees. Farmers usually give supplementary feed: rice bran, broken rice, maize and cassava. Manufactured feed is rarely used. The price of indigenous chickens is about 50 percent higher than industrial broilers. In some areas, farmers organize a market which is small and

not commercial. Consumers prefer chickens aged between four and five months but rural farmers sell or eat them at seven to nine months or even older. Farmers in peri-urban areas adapt sales to consumer demand.

According to the Department of Livestock and Fisheries (2004), the poultry population is about 20 million head: 95 percent are indigenous chickens. The other 5 percent includes ducks, geese and turkeys, as well as exotic ducks and chickens in the broiler and layer industries.

FARMER INVOLVEMENT

Rural farmers keep 10 to 20 chickens. Local ethnoveterinary practices are common. Medicinal plants are applied to the wounds of fighting cocks. Hot peppers are sometimes burned to cure birds through



PHOTO 12. Backyard chicken farming

inhalation. Women and children give feed and look for nests. Men make chicken pens and select cocks for fighting.

For breeding, farmers use birds that best suit their goals and select on phenotype (or “nice” appearance). Nice-looking birds are relatively large, with brightly coloured feathers and strong, preferably yellow legs. This last characteristic is specifically important when selecting cocks. Farmers provide chickens to relatives and friends for breeding. Usually one or two cocks are kept for mating. In some areas, farmers will not buy or transport cooked chickens or their parts from elsewhere to prevent the transmission of diseases to their own chickens.

Indigenous chickens are particularly important in livelihoods of rural people, in more than 80 percent of the population, and in traditional weddings wherein the bride and groom share an egg as a symbol of love and solidarity. Poor farmers (with an income, equivalent in kind, under 85 000 kips at 2001 prices – about US\$ 10 per person per month) cannot afford large ruminants or pigs. Poultry should be promoted to help them get out of poverty. Better use of local chickens is needed, as indiscriminate cross-breeding between indigenous breeds, and with exotic breeds, is becoming widespread.

INVOLVEMENT OF THE GOVERNMENT AND OTHER PARTIES

The Department of Livestock and Fisheries, at national,



PHOTO 13. Child playing with indigenous fighting cock

provincial and district levels formulates policies and provides support services such as vaccination against the main diseases. Fowl cholera and Newcastle disease vaccines are produced locally. Vaccination covers about 25 to 30 percent of indigenous chickens but is unsuccessful in remote highland areas because of insufficient cooling and a lack of electricity. About 6 000 Village Veterinary Workers cover 60 percent of villages. More intense and regular interaction between government agencies, NGOs and rural communities is required. Some NGOs provide technical support, mainly advice on management, and assistance with vaccination programmes.

The National Agriculture and Forestry Research Institute deals with livestock. The National Agriculture and Forestry Extension Service is responsible for agricultural development including chickens. In 1996, the Lao People's Democratic Republic ratified the Convention on Biological Diversity.

Livestock development lags far behind the crop sector, despite their importance. Large gaps exist in the understanding of the roles, values and characteristics of local animal genetic resources, which impairs their management. Little is known about production performance and potential; understanding of diversity within livestock species is poor. More information on both issues is necessary to plan the sector's development. Financial support for animal genetic work is limited. Donors are more interested in wildlife than



FAO/18278/H.Wagner

PHOTO 14. Village veterinary worker vaccinating indigenous chicken

domestic animal diversity-related projects. The Agricultural Promotion Bank can provide credit to farmers, but the amounts they can borrow are extremely limited.

RECOMMENDATIONS

To improve indigenous chicken production, community-based management strategies for local breeds have to be developed. This would need support from government agencies, policy-makers and NGOs. Possible actions could be the following:

- > Introduction of husbandry and breeding techniques compatible with traditional practices to improve the efficiency of farming systems.
- > Promotion of mixed farming and diversified production.
- > Enhancing livestock yields through community-based capacity building in:
 - *Housing.*
 - *Feed quality.* Little is known about the nutritive value of local feeds.
 - *Breeding stock selection* and the establishment of

structured breeding strategies.

- *Veterinary* support services.

- > Facilitating the exchange of experience and knowledge between farmers. Livestock fairs could be organized to increase farmer interaction.
- > The following technical areas should be addressed with priority:
 - egg production;
 - formulation of management strategies to reduce the chick rearing period, possibly by supplementing chick feed with extra protein other than fish meal;
 - vaccination against Fowl cholera and Newcastle disease;
 - husbandry techniques.

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Map below:

Geographical distribution of the Somba bovine



TAMBERMA'S SOMBA CATTLE BREED AT RISK OF EXTINCTION IN TOGO

Bonfoh Bèdibètè, Adoméfa Kossi and Bassowa Habrè

SUMMARY

Somba cattle are small, hardy, trypanotolerant taurins which are traditionally reared in a mixed farming system. Pure somba are important in traditional ceremonies. For a time, development policy was to import larger West African taurins for “upgrading”; more recently farmers have begun to group herds and lease them to Peulh immigrants who have brought their zebus with them. The number of purebred Somba is falling sharply. Their conservation is desirable since they suit the production system, disease challenge and climate; they have original genetic characteristics for trypanotolerance.

Some authors think that sedentary groups in the Gulf of Guinea are not cattle raisers. However, the Tambermas of Togo and Benin co-exist with their livestock and share their castle-like dwellings. Livestock, in particular cattle, have a social and cultural role that is profoundly embedded in the people’s spiritual life (N’Poh et N’Guissan, 1998).

Somba cattle have often been overlooked by development projects because they are small. Larger breeds such as the N’Dama and Baoulé were favoured and imported between 1954 and 1986 (Mawena, 1988). Decline, even extinction, is impending for the local Somba and Lagunaire breeds. The Somba is now threatened by zebu incursion and indiscriminate crossbreeding (Adoméfa *et al.*, 2002). The Somba has original genetic characteristics for trypanotolerance, it shows adaptability and good productivity under low input conditions and is interesting study material for genotype-environment interaction; it must be conserved for future generations.

This paper surveys the breed, production systems,

zotechnical abilities and its genetic characteristics. It outlines its social and cultural role and indicates measures to be taken to ensure its conservation and development.

The Somba is from Atacora, a mountainous area in the North East of Togo of about 2 700 km², between 9° 38’ N and 10° 38’ N and 1° 30’ E and 2° E. (Adanléhoussi *et al.*, 2003).

ENVIRONMENTAL CONDITIONS

This zone has a Sudanian climate, quasi semi-Saharan, with the Harmattan blowing from November to February. The rainy season is May to October. Annual average rainfall is 1 200 mm (Cornevin, 1973). Minimum temperatures are around 19 °C in January, with maximums of 30 °C in April. Relative humidity ranges from 20 percent in January to 70 percent in August. Potential evaporation is 1 700 mm, so for much of the year crops can not be grown. The vegetation is a form of derived parkland savanna with useful trees like *Vitellaria paradoxa* and *Parkia biglobosa*. Long linear



PHOTO 1. Tamberma castle

forests, now gradually receding, grow along the rivers (Jeune Afrique Editions, 1981).

THE SOMBA OR TAMBERMA PEOPLE

The Somba is a sub-tribe of the Volta Nigerian group. In 1957, their number was estimated at 8 614 (Cornevin, 1973); in 2000, it was 16 300, with a density of 75 habitants per km² (Adoméfa *et al.*, 2002). Their picturesque, castle-like, two-storied dwellings are built close to each other on hills close to the Benin-Togo border, to the North of the Koumongou river (Photo 1).

TAMBERMA ANIMAL HUSBANDRY

The Tamberma are agropastoralists by tradition. Creation and accumulation of capital heritage is based on chickens, their primary livestock. Poultry are sold or exchanged for sheep or goats which may then be commercialized to buy cattle (N’Poh and N’Guissan, 1998).

THE SOMBA BREED

The Somba, typical of the tropical subhumid area, is a shorthorn derived from *Bos taurus brachyceros*, within which it belongs to the Savanna type (not the dwarf Lagoon type) (Meyer, 1998). It is thought to be the mother of the locally adapted cattle breeds in the Gulf of Guinea (Adoméfa *et al.*, 2002). The Somba is classified among hardy, trypanotolerant West African cattle. (Morkramer and Dékpo, 1984). The Somba varies from 0.90 up to 1 metre at shoulder height; adult weight is



PHOTO 2. Somba cattle breed

172 ± 13 kg. It usually has a black-and-white coat (Photo 2), although some are entirely black, red, or red-and-white (Adanléhoussi *et al.*, 2003).

Indigenous breeds of the tsetse zone have a degree of tolerance to pathogenic trypanosomes. (Karbe *et al.*, 1981 and Karbe and Freitas, 1981). The Somba habitat is infested with *Glossina tachinoides* and *Glossina palpalis*. The trypanosomes are: *Trypanosoma vivax*, *T. brucei* and *T. congolense*. Ticks are mainly *Amblyoma variagnetum*. Tick-transmitted diseases are Babesiosis and Theileriosis. Among the gastro-intestinal parasites, Filariae and Coccidia are predominant (Adoméfa *et al.*, 2002).

POPULATION AND HERD STRUCTURE

Somba cattle were estimated at 75 000 head in 1977; in 1997, there were 26 000 pure-breds in Togo and Benin (8 500 in Togo). Each household keeps 3.17 cows; the average holding is between 1.92 to 2.85 ha (Adoméfa *et al.*, 2002 and Moazani-Goudarzi *et al.*, 2001). Herd structure has 70 percent females of which 43 percent are cows, and 13 percent heifers. The cows’ reproduction rate is below 80 percent. The percentage of bull calves and heifers versus the total number of cows is 72. This percentage is 115 for Zebus and 150 for crossbreds which seems to confirm that the breed is heading towards extinction (Adoméfa *et al.*, 2002).

ZOOTECNICAL PERFORMANCE

First calving is between 3 and 5 years; 87 percent of calvings are between October and February. The

average calving interval is 18 months (Adanléhoussi *et al.*, 2003). Calving rates vary from 75 to 78 percent, despite a scarcity of bulls. Natural mortality is estimated at 3.4 percent yearly (Adoméfa *et al.*, 2002).

Daily milk production is estimated at 0.71 ± 0.18 litres per cow during 235 ± 25 days. Milk production, which can reach up to a litre per day, peaks when females are aged around 9. While active, a cow goes through 5 or 6 lactations (Adanléhoussi *et al.*, 2003). Lactoprotein studies show that Somba milk is suitable for cheese making (Moazani-Goudarzi *et al.*, 2001). Calves weigh 12 ± 3 kg at birth. During the first two years, calves gain 93 grams daily. Between 2 and 3 years, weight gain is about 104 grams/day. They are fully grown at the age of 6.

SOCIO – CULTURAL AND ECONOMIC QUALITIES OF THE SOMBA BREED

The size of a family's herd is a sign of its wealth. Livestock are for security and play a role in the community's spiritual life (N'Poh et N'Guissan, 1998). Eighty percent of animals are raised for socio-cultural purposes (52 percent for funerals and 28 percent as dowries), leaving only 20 percent for sale (N'Poh and N'Guissan, 1998). Hides are used to make dresses for folklore ceremonies (Cornevin, 1973).

MIXED FARMING

Crops grown are: sorghum, groundnuts, fonio (*Digitaria exilis*), millet and more recently, maize. Thirty-four percent of farmers use some form of crop residues as cattle feed (Adoméfa *et al.*, 2002 and N'Poh and N'Guissan, 1998). Manure is collected as fertilizer. Crops generate 16 000 CFA (32 US\$) per farm per year, while cattle, which used to be capital savings, generate 40 000 CFA (80 US\$) (Adoméfa *et al.*, 2002). Livestock are clearly the farmer's main source of income.

TRADITIONAL CONSERVATION AND GENETIC IMPROVEMENT STRATEGIES

The traditional breeding system of Tamberma is a way of protecting the Somba breed. They do not trade or

slaughter cattle randomly; their main use is for rituals. They take good care of their cattle and follow other activities to meet their needs. Small stock is used for regular trade and consumption (N'Poh and N'Guissan, 1998).

SELECTION PROGRAMMES:

MATING AND REPRODUCTION OF PURE-BREDS AND CROSS-BREDS

Livestock graze freely, especially in the dry season. In an environment free of migrating cattle, mating took place naturally between animals from different herds which favoured the reduction of inbreeding. Reproduction was under control because the animals were housed overnight.

Nowadays 38 percent of households select Somba bulls for Somba cows (Adoméfa *et al.*, 2002), but with the zebu incursion, uncontrolled herds lead to cross-breeding. The breed's extinction is further exacerbated by ritual sacrifice. About 1.5 bulls are slaughtered in 27 percent of all households per year (Adanléhoussi *et al.*, 2003).

EVOLUTION OF TRADITIONAL BREEDING AND MANAGEMENT OF THE SOMBA BREED

Two decades ago all cattle were privately owned; now collectivization is a trend and two cattle raising systems are being used.

Traditional Somba system: Cattle are housed in the castle to reduce the risk of theft. A castle can house up to ten cows (Adanléhoussi *et al.*, 2003 and Adoméfa *et al.*, 2002). Adolescents used to herd them (N'Poh and N'Guissan, 1998). Mating took place at pasture within the herd and between herds. Milking was rare since milk is not part of the local diet.

Cattle raising through tenancy or lease to the Peulh: This system, which only appeared recently, consists of joining several herds and leasing them to Peulh (Fulani, cattle herders by tradition,) who migrated to Tamberma country and now look after large herds of cattle which mix with other breeds, notably zebu, introduced by the Peulh and mainly kept for milk which is important in their diet (Photo 3). (Adoméfa *et al.*, 2002 and N'Poh et

N'Guissan, 1998).

TRANSMISSION OF INDIGENOUS KNOWLEDGE AND RESPONSIBILITIES FROM GENERATION TO GENERATION

Men look after cattle; women tend goats and poultry. The size of the Somba cow matches the castle where it is kept. A change in size would require a readjustment in terms of housing (N'Poh and N'Guissan, 1998). For dowries and ritual sacrifice, only the Somba breed is used. A Tamberma, on reaching a certain age, sacrifices a bull to his ancestors (N'Poh and N'Guissan, 1998).

CAUSES OF GENETIC EROSION OF THE SOMBA BREED

Uncontrolled grazing favours mating between Somba and zebus; using the best bulls for ritual purposes results in counterproductive selection (Adoméfa *et al.*, 2002). Next to savings, the Somba breed used to play a key role in maintaining the spiritual balance of a family. The need for money to satisfy demands related to education, medical care etc. has increased, and has influenced the original function of cattle keeping (N'Poh and N'Guissan, 1998).

INVOLVEMENT AND ACTIONS BY GOVERNMENT, UNIVERSITIES AND RESEARCH INSTITUTIONS

Larger villages have a veterinary post. Livestock services in Togo and Benin implemented, from 1997 to 2000, "The Somba cattle breed: characterization and research in view of its improvement" (Adoméfa *et al.*, 2002 and Moazani-Goudarzi *et al.*, 2001). The conclusions of this research have been put into practice throughout the Tamberma region; awareness-raising meetings on the risk of extinction of the Somba breed as well as promoting activities were organized. (Adoméfa *et al.*,



PHOTO 3. Collective cattle herds grazing in Tamberma country

promoting activities were organized. (Adoméfa *et al.*, 2002). In 2002, an international workshop on the Somba breed emphasized the urgency of conservation (Adoméfa *et al.*, 2002). Characterization of the Somba breed through molecular markers (Moazani-Goudarzi *et al.*, 2001) has been undertaken by the Institut National de Recherche Agronomique of France and showed the Somba to differ from other local breeds.

INTERACTION BETWEEN THE TAMBERMA COMMUNITY, THE GOVERNMENT AND OTHER PARTNERS

- > A traditional professional organization in the Tamberma area coordinates interaction between farmers and enhances joint farming activities (N'Poh et N'Guissan, 1998).
- > Associations have been set up to promote sanitary, educational and farming activities.
- > In larger villages, pharmacies have been set up by The French Organisme de Solidarité Internationale who have established groups to improve wells dug by the government with the help of the FED. Many of these groups are no longer operational since their approach to cattle raising clashed with the farmers' way of life and the techniques recommended by projects and NGOs (N'Poh et N'Guissan, 1998).

APPROPRIATE STRATEGIES TO IMPROVE THE MANAGEMENT OF THE SOMBA BREED WITHIN THE TAMBERMA FARMING SYSTEM

Farmers' concerns mainly relate to sanitary protection, cattle theft, the shortage of grazing and bush fire management. Those who have entrusted their livestock to third parties are vulnerable as they are exposed to different techniques and ways of managing their cattle. Theft has worsened by keeping them outside the castle. Approximately 5 percent of animals are stolen every year (Adoméfa *et al.*, 2002).

The following strategic actions could improve the management of the Somba breed within local farming systems:

- > Improvement of feed, veterinary services and water availability.
- > Better extension and enhancement of mixed farming.

- > Breed improvement through open nucleus selection and characterization of breeds morphologically close to the Somba.

CONCLUSIONS

The main concerns relate to avoiding cross-breeding with zebu (Adoméfa *et al.*, 2002 and Moazani-Goudarzi *et al.*, 2001; Adoméfa *et al.*, 2002). A key question is: how to justify conserving and developing the Somba in its own environment? Conserving the breed fits the framework of sustainable agricultural production. Agrotourism should be underlined, as Tamberma castles are on the UNESCO World Heritage List since 2004. A programme of *in situ* conservation should ensure the breed's role in the economy and address its rapid decline through cross-breeding.

Somba are perceived to be less profitable than other breeds, therefore research on market outlets and economic incentives is needed (Adoméfa *et al.*, 2002). Appropriate management strategies will limit genetic drift and allow the setting up of selection programmes to preserve genetic variability. In collaboration with development partners, the Togolese Government has proposed to work out a specific project to achieve the conservation and sustainable development of the Somba breed.

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Map below:

Location of mixed farming systems as described in case study, Vietnam



CO DUCK GENETIC RESOURCES: THE PILLAR OF TRADITIONAL MIXED FARMING SYSTEMS IN VIET NAM

Nguyen Thi Minh and Nguyen Duc Trong

SUMMARY

Co ducks are traditionally related to rainfed rice farming and can forage nearly half of their feed requirements while maintaining high reproduction levels. No other breed could take on the Co ducks' role in rainfed rice areas. They are hardy and resistant to local diseases. In Ha Tay and the Mekong River delta Co ducks are still the main source of livelihood for a large number of poor farmers. To maintain Co duck numbers, a breeding system has been developed based on: selection, breeding and stabilizing of egg production; improvement of egg production and; supplying selected ducks to integrative systems in rural areas with the aim of conserving agricultural biodiversity and enhancing sustainable agriculture

The duck population of Viet Nam, nearly 64 million (General Statistics Office, 2002), is second only to China's. Duck-cum-rice and duck-cum-fish are common mixed farming systems. In the Mekong delta, where more than half of the country's ducks are, these systems are the most effective ways of farming. By integrating animals and crops, resources are more efficiently utilized; diversified production allows farmers to increase their income and provides a more balanced diet. This paper describes ducks in integrated farming systems in the provinces of Tien Giang, Dong Nai and Ha Tay and draws attention to their social and cultural importance in the lives of rural communities.

Viet Nam extends along the south-eastern coastline of Asia for 3 260 km, covering 330 541 km², with a population of 80 million at a growth rate of 1.5 percent per year and has about 220 persons per km². It stretches from 8°30' to 23°30' N, giving wide climatic variation; North Viet Nam, while in the tropical zone,

has cold winters caused by monsoon influences; and subtropical features, while high mountainous areas have a temperate character. Annual humidity is about 80 percent and average annual rainfall 1 950 mm.

Viet Nam has 2 800 rivers; the water area is about 394 000 ha, of which 56 000 ha are lakes. A coastline of more than 3 000 km creates favourable conditions for transport and fishing. Natural calamities, such as storms, occur annually. Land resources are limited; with slightly less than 9.5 million ha of arable land – under 30 percent of the territory. Seventy-five percent of the country's surface is mountains.

The livestock sector, which contributes 20.5 percent of agricultural income (General Statistics Office, 2002), is in the hands of smallholders who raise pigs, cattle, buffaloes, goats, chickens and ducks. Animal production has developed steadily during the last decade. Farming integrates rice and other crops with livestock and aquaculture. To maximize benefits there must be simultaneous development of crop, fish and



PHOTO 1 and 2. Interviewing duck farmers in Tien Giang

animal production. The efficiency of this integrated, closed production cycle is obvious. Animals provide draught and manure while crops and their by-products provide animals, including fish, with feed.

Duck rearing is popular as it is closely linked to paddy, and rice is the staple food. The Mekong delta has more than half the country's flock. In traditional systems ducks mainly feed on snails, small fish, shrimps, weeds and shed grain. They are reared extensively, in small groups, with few supplements, taking maximum advantage of available feed resources. In 1990 Viet Nam produced 23 000 tonnes of duck meat; by 2003, this was over 93 000 tonnes. In traditional systems ducks lay an average of 170 eggs per year.

Viet Nam can be divided into eight eco-agricultural zones: northeast, northwest, Red River delta, north central coast, south central coast, central highland, southeast and the Mekong River delta. Surveys were carried out in the provinces of Tien Giang, Dong Nai and Hay Tay, involving five districts and ten communities.

TIEN GIANG

1. Chau Thanh district with Nhi Binh, Long Dinh and Dien Hy communities.
2. Tan Phuoc district with Phuoc Lap community.
3. Cai Lay district with My Hanh Trung community.

DONG NAI

Long Thanh district with Long Phuoc and Phuoc Binh

communities and the small town of Long Thanh.

HA TAY

Phu Xuyen district with Phuc Tien and Chuyen My communities.

Tien Giang in the Mekong delta has perfect conditions for traditional duck production. Floods occur from April to November. The main agricultural activities are rice, fish and duck production. Duck-fish-rice systems are popular. All ducks are of the Co type and the egg price is only VND 800 each (or US\$ 0.05).

Dong Nai in the east of South Viet Nam, among rice fields and hills, has a climate similar to Tien Giang. It produces rice – harvested twice a year – cassava, sweet potatoes, nuts, beans, fruit, fish and ducks. Duck eggs fetch about VND 1 200 each.

Ha Tay is west of Hanoi. Farmers grow rice in the lowlands, and maize, cassava and potatoes in hilly areas. Temperatures range from 17.5 to 29.3 °C.

Phu Xuyen lowlands are water-rich. Until recently, Co duck was the major breed and mainly kept for eggs. Since the introduction of more productive exotic breeds and Muscovy ducks the existence of the Co duck is severely threatened. In the district only two farmers still keep Co ducks (1 050 in total). At the time of the survey egg prices were VND 1 050 each.

CO DUCKS AND THE SCAVENGING FEEDING SYSTEM



PHOTO 3. Surveying duck farmers



M. Marzot

PHOTO 4. Rice field in the Mekong River delta

Arable land is scarce; integration of crop and livestock needs to be enhanced. Ducks grazing harvested rice fields, receiving a supplement of only 1 kg of paddy, produce a gain of 1 kg of body weight. In South Viet Nam rice is harvested the whole year round so this system can be applied continuously. Many poor farmers depend on ducks for income. With fish and rice, Co ducks are an integral component of traditional farming. They provide households with meat and eggs, their main source of protein. Surplus products are sold. The tradition of duck rearing has been handed down for generations in all three provinces.

FLOCK SIZE

In North Viet Nam most Co ducks are kept for eggs. Flocks vary from a few birds to several hundred. In South Viet Nam flocks are never less than 500 head. The male:female ratio in the north is 1:10; in the south it varies between 1:20 and 1:30. In both areas fertility rates are about 95 percent; even where the ratio between males and females is low (Table 1).

FEATHER COLOUR

The coat of Co ducks can vary from black to white; 80 percent are sparrow-coloured which is often categorized as the pure breed type.

TABLE 1. FLOCK SIZE OF CO DUCKS

No.	TRAITS	PROVINCE		
		Tien Giang	Dong Nai	Ha Tay
1	No. of communities surveyed	5	3	2
2	Number of Co ducks surveyed	47 850	14 300	1 150
	Flock size	550–15 200	1 300–2 000	400–750
	Average (bird/flock)	2 080	1 788	575
	Male:female	1:27.7	1:20	1:10



PHOTO 5 and 6. During daytime Co ducks roam around freely scavenging for worms, insects etc.

APPEARANCE AND HABITS

Co ducks derive from wild ducks (*Anas platyrhynchos platyrhynchos*) (Dong, 1994; Minh, 2001; Ly *et al.*, 2001) and resemble their ancestors. They have a small body, a delicate head, witty eyes, a flattened beak and a long neck. Their body size and short legs allow them to walk briskly and thread their way through rice fields without difficulty. They forage well, have high egg yields, can survive hardship and are resistant to a number of diseases such as Duck plague and Duck cholera. Females not in their reproductive period can survive on a very poor diet. Once the reproductive season starts they recover rapidly and fully. Co ducks are gregarious; males are very possessive of their

females and never share them with others and are indifferent towards females other than their own.

THE SCAVENGING FEEDING SYSTEM

Co ducks in Tien Giang and Dong Nai scavenge all day and eat a little paddy at night. In Ha Tay they are reared in semi-intensive systems with a feed supplement of 80 percent paddy and 20 percent concentrate.

Farmers prepare ducklings for the post-harvest season; a month before rice harvest they are released into the fields without being fed any supplements.

Figure 1 shows the dynamics of an integrated fish-duck-vegetable system.

REPRODUCTIVE CHARACTERISTICS OF CO DUCKS

Feed supplements in flocking systems vary from 60 to 65 kg of feed, while foraging Co ducks only need 35 to 37 kg to obtain the same egg production (Dong, 1994).

BENEFITS FROM CO DUCK REARING

Table 5 shows the economic benefits of Co duck production which vary significantly across regions, mainly because of differences in egg prices. The income from duck production remains noteworthy in all three

FIGURE 1. INTEGRATED FISH-DUCK-VEGETABLE FARMING SYSTEM

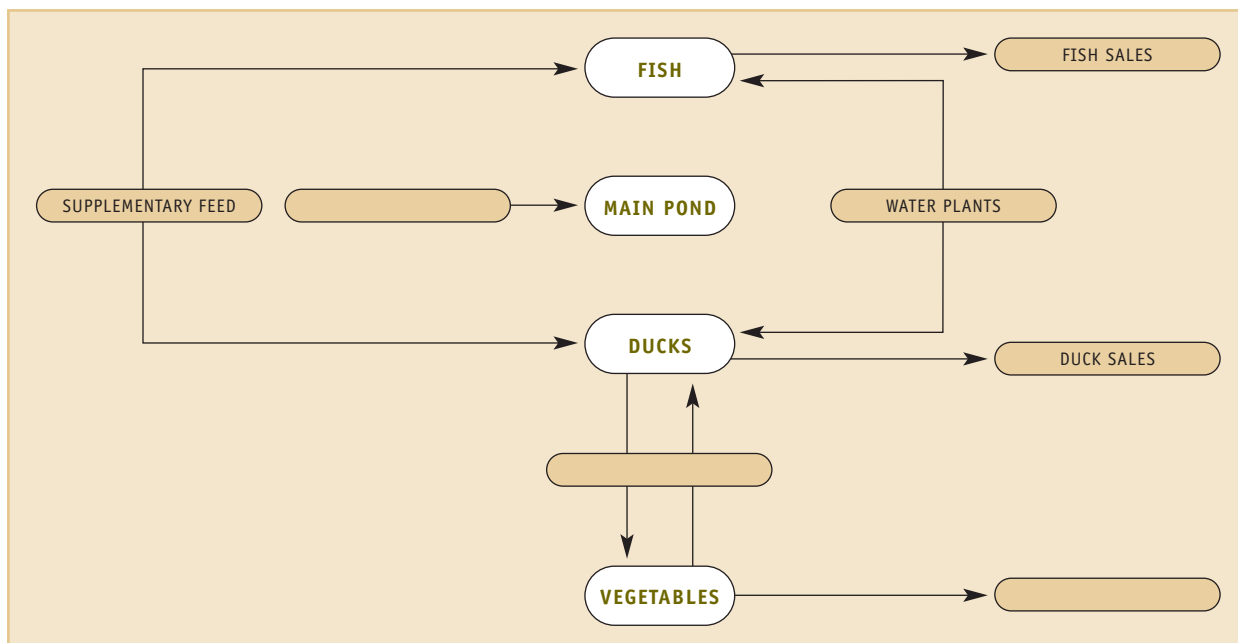


FIGURE 2. EGG LAYING DIAGRAM IN HERDING AND CONFINEMENT SYSTEMS

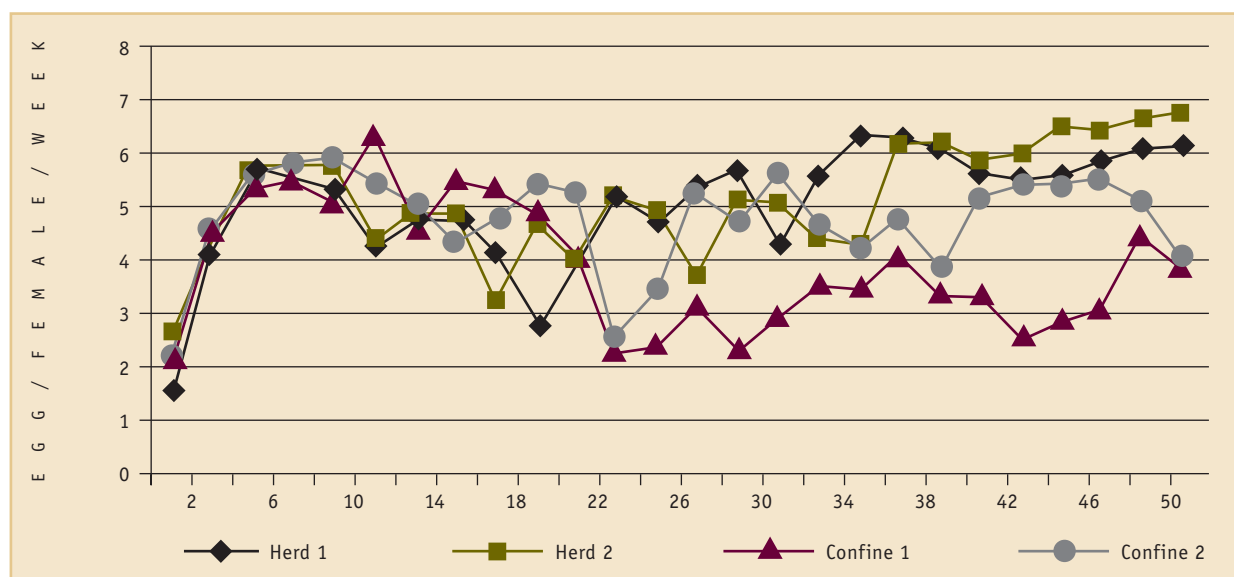


TABLE 2. COAT COLOUR OF CO DUCKS

COAT COLOUR (%)	TIEN GIANG	DONG NAI	HA TAY
Sparrow	85.0	82.4	89.0
Pink brown	7.0	9.3	5.5
Grey brown	6.5	5.3	4.5
White	1.0	2.1	0
Black and other	0.5	0.9	1.0

TABLE 3. CO DUCK PERFORMANCE IN TRADITIONAL FARMING SYSTEMS IN THE SURVEY AREAS

TRAITS	UNIT	PROVINCE		
		Tien Giang	Dong Nai	Ha Tay
Households rear ducks for:				
- meat	%	-	12.5	-
- eggs	%	95.7	12.5	100
- meat and eggs	%	-	75.0	-
- ducklings	%	4.3	-	-
System households rear ducks in:				
- duck-rice	%	95.7	62.5	-
- duck-fish	%	-	12.5	-
- duck-rice-fish	%	4.3	12.5	100
- duck-tree garden	%	-	12.5	-
Households where income from duck production is the:				
- main income	%	43.5	75.0	50.0
- sub-income	%	52.2	25.0	50.0
- commercial	%	4.3	-	-
Sexual maturity weight:				
- male	g	1 800	1 800	1 500
- female	g	1 600	1 600	1 300
Egg production/female/year	-		271.5	230.0

TABLE 4. SEVERAL REPRODUCTIVE CHARACTERISTICS OF CO DUCKS

CHARACTERISTICS	UNIT	QUANTITY	
		Male	Female
Day-old body weight	g	41.6 ± 2.7	40.1 ± 3.2
Body weight at eight weeks	g	1 052 ± 34.0	987 ± 28.5
Sexual maturity weight	g	1 500	1 300
Body length	cm	22.9	22.3
Chest circumference	cm	27.3	25.5
Breast length	cm	7.5	7.3
Leg height	cm	5.1	4.9
Fourth wing feather length	cm	8.0	8.6
Egg production/female/year		233.7 ± 3.7	
Survival rate at eight weeks	%	97.8	
Age at first egg	days	140–145	
Egg weight	g	64.4	
Fertility	%	95.2	
Hatchability	%	85– 90	
Malformed duckling	%	1–2	
Feed conversion	g/egg	190.6–224.1	
	g/b/d	122.5–140.0	

g/b/d: gram/bird/day

Source: Minh, 2000; 2001.

regions.

Profits were calculated with egg prices at the time of the survey. The smallest flock owner in Dong Nai (1 300 birds) can earn VND 663 000 per day. In comparison, flock owners in Tien Giang and Ha Tay would only earn VND 222 000 and 306 000 respectively, should

they rear the same number of birds.

BREEDING SYSTEM OF CO DUCKS AT VILLAGE LEVEL

Co ducks are kept in flocks or confined. Eggs are collected daily and every five days are sold to hatcheries or exchanged for ducklings to restock the

TABLE 5. ECONOMIC BENEFITS FROM CO DUCK PRODUCTION

TRAITS	UNIT	TIEN GIANG PROVINCE	DONG NAI PROVINCE	HA TAY PROVINCE
Input				
Feed consumption	g/b/d	155.4	157.5	154.0
Cost	VND/b/d	373.0	378.0	426.6
Output				
Egg production	Egg/female/day	0.68	0.74	0.63
Egg unit price	VND/egg	800.0	1 200	1 050
By currency	VND/b/d	544.0	888.0	661.5
Benefit	VND/female/day	171.0	510.0	234.9

Paddy rice: VND 2 400/kg; concentration feed: VND 4 250/kg.
g/b/d: gram/bird/day

Source: Minh *et al.*, 2005.

laying flocks.

There are two main hatching methods; one uses artificial means and the other uses an apparatus. The artificial method is relatively rare: in the south, eggs are heated by other eggs, while in the north, warm rice or oil lamps are used to brood eggs. This technology is neither efficient nor hygienic and often results in broken eggs and low hatching. Home-made incubators with capacities from 8 000 to 14 000 eggs are used in all three provinces; these are easy to manage and improve hatching efficiency.



PHOTO 7. As the sun is rising, a duck-rice farmer walks to his rice field

Day-old ducklings are either sold directly from the owner to the farmer or, often in more remote areas, via intermediaries. Sufficient day-old ducklings are sexed for breeding while the rest are sold or raised for meat. Farmers often select ducklings from high egg-yielding flocks. Eggs not needed for incubation are sold or used for “balut” eggs (incubated 18 to 19 days for human consumption).

SOCIAL AND CULTURAL ACTIVITIES

Co ducks figure in social and cultural activities; usually simple games, which are easy to organize, are enjoyed by farmers and are an important part of the daily lives of communities in rainfed rice areas. “Catching ducks” is often played during festivals: a pond, a healthy Co duck and a group of people are needed. The duck is released on the pond and the people have to catch it. The game is difficult, the duck dives extremely well and easily escapes; whoever catches the duck is the winner. During this event the noise of drums and cheering people is overwhelming. Farmers in Dong Nai play “duck neck with ring”; players are given a ring which they throw into a dense flock of Co ducks. If a ring slides over a duck’s neck the player wins the duck. The final winner is the person who has “ringed” the largest number of ducks.

RECOMMENDATIONS

To maintain and develop traditional Co duck flocking systems, policy-makers should provide support to farmers in the following fields:

Promote the conservation of Co ducks to preserve agrobiodiversity and more importantly, to alleviate poverty. Farmers need to be informed about the competitive advantage of Co ducks over exotic breeds. In the market system, exotic breeds often raise expectations of higher profits among farmers who do not realize that the link between Co ducks and paddy results in high egg yields with low inputs. Farmers underestimate the importance of Co ducks in achieving sustainable development. Exotic ducks are being imported and even smuggled into Viet Nam which is causing a severe reduction in the number of pure Co ducks.

Facilitate the confinement of Co ducks and limit



M. Marzot

PHOTO 8. Duck-cum-rice: an effective integrated farming system in the provinces of the Mekong River Delta

egg and duckling distribution to reduce the danger of Avian influenza; continuous veterinary health control is imperative. If duck raising is prohibited, the fate of 1.5 million ducks in the Mekong River delta is at stake (VTV news, 4 April 2005). For farmers' livelihoods it can only be hoped that the existence of Co ducks and their traditional flocking system will not be drastically affected by the virus.

Increase veterinary health coverage. A veterinary network from central level to the rural communities is necessary. Ducks should be vaccinated periodically against Duck plague, Duck cholera and others.

Review government policies. The Government should look into the needs and expectations of

farmers, then review and further develop its policies.

Most farmers expressed a need for:

- > credit with low interest rates for recovering duck production;
- > improvement of health care for ducks throughout the year;
- > urgent measures to prevent Avian influenza and to help further development of the duck sector.

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