

Antigua and Barbuda

Draft Report On The State Of The World's Animal Genetic Resources

GENERAL INFORMATION

The nation of Antigua/Barbuda is situated at the northern end of the Lesser Antilles arc of islands and is approximately 250 miles (400 km) east-south-east of Puerto Rico.

Antigua/Barbuda was discovered by Christopher Columbus in 1493 and was colonized by the British in 1632. The island nation was granted self-government in Association with Britain in 1967 and gained political independence in 1981. Antigua/Barbuda has been described touristically as the "Heart of The Caribbean", for its central location between the Greater and Lesser Antilles. The island nation's geographical position in the region has made it important historically, and now serves as the hub for regional airline connections.

Location

The approximate coordinates of Antigua/Barbuda on the Caribbean map are as follows:

- i) Antigua: 17° - 17° 10' North latitude; 61° 40' - 61° 55' West longitude
- ii) Barbuda 17° 35' North latitude; 61° 48' West longitude

Barbuda is situated approximately 28 miles due north of Antigua.

Area

The nation of Antigua/Barbuda is approximately 440 square kilometres with Antigua 280 sq. km and Barbuda 160 sq. km. Antigua is roughly elliptical in shape and is characteristic of many mangroves, swamps (lagoons) which fringe the western and southern coastal areas. Barbuda's dimension is approximately 29 km by 24 km (18 by 15 m).

Population

According to the 1991 population census, the number of persons residing in Antigua/Barbuda is 65,000. Prior the 1991 population census the estimated population of Antigua/Barbuda was 80,000 which was based on an average growth rate 1.5%. While the latter maybe so, there has been a significant migration of national to the US Virgin Islands, Canada, USA and the United Kingdom within the past (2) decades. The estimated population of 65,000 inhabitants have shown an increased per capita of some 7,000 US dollars which places Antigua/Barbuda in the context of developing countries. This in fact, has had negative effects in terms of qualification for international aid etc.

PHYSIOGRAPHICAL FEATURES

Antigua

Antigua is divided in three distinct topographical regions. (See figure 1 for details). These regions are as follows:

- i) Volcanic region in the south west
- ii) Central Plain
- iii) Limestone in the north and east

The volcanic region: The south-west consists of hilly terrain which averages approximately 1,000 feet (308 m) above sea level. The highest peak in this range is Boggy Peak, which is approximately 1,319 feet (406 m). The orientation of this range is south-west to south-east which does not readily intercept the north-east trade winds. This region is bounded on the south by a narrow coastal plain which contains several alluvial valleys where most of the agricultural activities are carried out. The central plain: This lies on a diagonal belt separated from the volcanic region by the flood plains of Bendals, Belvedere/Brecknock river valley and from the limestone region by a one (1) mile wide, low lying trough. The central plain is flat to undulating with some hills averaging 500 feet (154 m) above sea level. The limestone region: This region represents approximately 1/3 of Antigua and is located in the northern and eastern portions of the island. The topographical features of this region is characteristic of many small islands, islet and cays that are located on the northern fringes of Antigua. Within the limestone region, the flat, low elevation landscape is characteristic of the many conical hills averaging 400 feet (123 m) in height. Much of the limestone region is separated from the central plain by an abrupt, but discontinuous, escarpment rising in places to over 350 feet (108 m).

Barbuda

In comparison with Antigua, Barbuda's topography is relatively uniform and lower in elevation (see figure 2 for details). The major differences are the absence in Barbuda of volcanic mountains that define the western third of Antigua and the presence of sand dunes in Barbuda which constitute large tracks of sandy fields absent from Antigua (Morello, 1983). The Highlands represents the highest elevation in Barbuda reaching some 100 feet (30.8 m) above sea-level. The Highland region is characteristic of an abrupt escarpment on the north and west, a gentle slope on the south and sea cliffs on the east. Generally, Barbuda is relatively flat with many depressions. A lagoon, averaging 1½ miles (2.4 km) runs almost entirely along the western coast of the island. This lagoon is separated from the sea by a narrow sand bar only a few meters wide with a winding entry in the north (Martin-Kaye 1959; Hill 1966).

Soils

Soils of Antigua/Barbuda have been studied in details by Martin-Kaye (1959) and Hill (1966). In Antigua, soil types can be grouped within three (3) main topographic areas. The volcanic regions consist of igneous rocks with the derivative clay looms. These soils are mainly neutral to slightly acidic and well drained. Slopes within the volcanic region varies between 11-20 degrees. The central plains consist of heavy clay in some areas, but most of the areas have well-drained soils over tuffs (stratified volcanic detritus) and agglomerates. Slopes on the central plains vary between 2 - 5 degrees. On the

other hand, the limestone region consists of light soils over calcareous sandstone's, heavier soils over calcareous grits and deeper well-drained clays over calcareous marls. Some areas contain large amounts of almost pure calcium carbonate, and alkaline soils dominate throughout this region. Slopes are generally less than 10 degrees (Loveless 1960; Atkins, 1983). Barbuda soils are more homogenous and are most similar to those of the limestone regions of Antigua Martin-Kaye, 1959).

Rainfall

Rainfall in Antigua/Barbuda averages 45" (1,143 mm) and 30" (762 mm) per Annum respectively. This low rainfall precipitation is considered low in terms of tropical standards. Hence, Antigua/Barbuda is characteristic of semi-arid conditions extending from January to July whereas the wet season normally commences in August/September and taper off in December. Rainfall precipitation is influenced by the presence of tropical waves, storms and depressions in the region and have also contributed to the erratic rainfall pattern.

The south-west volcanic region receives an average rainfall precipitation of 55" (1,397 mm), and this is the area where the tropical forest species are found. On the other hand the North Eastern limestone region as well as the coastal fringes receive an average of 35" (889 mm) per annum. (See figure 3 for detail).

Temperature

The average temperature of Antigua/Barbuda is 29.0 C (84.20 F) during the summer month while the temperature for the winter months average 24.0 C (75.20F). The relatively high ambient temperature is tempered by the cooling effects of the north-east trade winds which blow constantly throughout the year. However, there is a marked increase in wind velocity during the period June to November.

Main Forest Types

There are five (5) major forest types in Antigua/Barbuda. These include the following:

- i) Humid Valley Forest
- ii) Slope forest
- iii) Mangrove
- iv) Scleromorphic forest of white cedar (*Tabeluia pallida*)
- v) Mangrove edge

Humid valley forest are the most complex of the insular ecosystem of Antigua, however, only small areas of this exists. The main species which dominate this forest type are 'ciba trees ceiba pentandir with several species of *Ficus* sp. *Delonix regia* and a number of fruit trees. The structure still consists of four layers or more of vegetation, although it is poor in vines, epiphytes and palm trees. This type of forest is found in the south-western volcanic regions of Antigua.

The Slope forest contains much of the deciduous forest trees and are found within the south-west volcanic region as well as the highlands of Barbuda. In a report described by (Morello 1983) indicated that the original vegetation has been greatly altered due to the production of charcoal.

The three types of mangrove forest species exist on both islands. These include red *Rhizophora* mangle, while *Laguncularia* spp. and black *Avicennia* spp. Scleromorphic forest of white cedar *Tabeuia pallida* exist on the island of Barbuda only.

Mangrove edge forest consist of a leguminous forest dominated by *Haematoxylon* (logwood) and *Pithecellobium* ("bread and cheese"). This type of forest is very extensive on Barbuda and to a lesser extent on Antigua. With the increasing dry weather, forest fires and the demand for fuel wood (Charcoal) as well as forage for livestock, both the humid valley and slope forest are constantly under threat. Within the context of the humid and slope forests, regular forest fires particularly during the dry season have resulted in a secondary vegetation of *Citronella* spp. (lemon grass) which dominates at least 10% of mountain slopes within the south-west volcanic region. The commercial value for the citronella grass sp is not realized, since the grass is not processed into oils etc. In Antigua/Barbuda the rate of decrease of forest species within the southwest volcanic region is approximately 1-2% per annum.

The third forest type mangrove is the most threatened in view of the increasing demand to construct hotel and marine infrastructure on beaches within the high water mark. This has lead to significant loss of the three (3) species of red, white and black mangrove forest species. This dilemma is most severe on Antigua and to a lesser extent on Barbuda. The rate of decrease of this mangrove forest is at least 3-5% per annum.

The Scleromorphic forest of white cedar *Tabeuia pallida* is decreasing at a rate of 3% in view of the increasing demand to use local cedar to construct boats used in the fishing industry. The problem is common both in Antigua as well as Barbuda.

AGRICULTURAL SECTOR

General Introduction to Farming Systems Antigua/Barbuda was once a monoculture crop economy that is, sugar cane production. However, within the past two (2) decades, there has been a significant shift from an agrarian society to a tourist oriented society. Agriculture's contribution to the GDP in the 1960 and early 1970 was 60%, whereas tourism was averaging 10-15%. With the abandonment of sugar cane production, there has been significant rise of small farming activities, particularly in the area of vegetable and food crop production as well as the rearing of ruminants, sheep, cattle, goats on the vast tracts of under-utilized agricultural lands which were former sugar estates. In addition, Antigua/Barbuda still produces the famous sea-island cotton and the Antigua black pineapple which is now on the increase in terms of acreage since these crops are on the priority list of the Ministry of Agriculture.

Sea-island cotton produce locally are exported mainly to Japan whereas all vegetables, fruits and food crops with the exception of minor exports of yam and sweet potato to UK are consumed locally. In fact, tourism has become the main foreign exchange earner contributing some 70% out towards the GDP (Gross Domestic Product). Tourism in fact is the engine of the Antigua/Barbuda's economy. Nationally, the main concern in Agriculture, is the increasing demand for water in view of the highly intensive nature of vegetable production activities.

This situation is further compounded by the outdated law in respect of water use and water legislation, hence, for the high prices of agricultural commodities on the local.

Agricultural activities in Antigua/Barbuda consist of the following:

- i) Vegetable and Food Crop Production
- ii) Sea Island Cotton Production
- iii) Fruit Crop Production
- iv) Livestock Production

With the abandonment of the sugar industry, large tracts of land became available for farmers who are currently engaged in the production of vegetables and food crops. Currently there are some 3,000 farmers in Antigua/Barbuda, however the majority of these farmers do not have title for the land. The current land tenure system is based on an annual rental of \$10.00 per acre, per annum/24.71/ha. Major crops grown by farmers are vegetables per se, solanaceous, cole crops, cucurbits, carrot, onions etc. More than 60% of crop is produced under irrigated or partially irrigated conditions. The size of farms are categorized as small, medium, large. The categories are as follows:

- i) small 0-5 ac (0-2 ha)
- ii) medium 6-10 ac (2.4-4 ha)
- iii) large over 11 ac (4.50 ha)

There is a Central Marketing Corporation which purchases farmers produce, however, in view of the differences in prices, farmers prefer to sell directly to householders, hotel, restaurants and supermarkets. Crops production activities is considered a lucrative business in Antigua/Barbuda. All vegetable and food crops grown is consumed locally with a minor export of yam and sweet potato to the U.K.

Cotton

Sea Island cotton production is becoming an increasing activity in view of the demand for this commodity particularly in Japan, where it fetches 5.25 US dollars per pound (45 kg) of lint. Because of the semi-arid nature of Antigua/Barbuda sea-island cotton has an ecological advantage compared to other regions of production. In addition, there are some 350 acres (141 ha) are currently under production and is expected to be doubled. Major limitation in sea-island cotton production is manual harvesting.

Fruits

Fruit Crop activities is centred around the production of pineapple variety - Antigua Black which has a great demand on the local market. The major limiting factor is the production of planting material. The Ministry of Agriculture is currently undertaking a project to address the situation. In addition, mango is the other major fruit crop production activities where a 500 acre of mango project is currently undertaken by the Ministry of Agriculture, with a view to tap niche markets in UK, USA and Canada.

Livestock

The population of livestock in Antigua and Barbuda may well represent the highest in the OECS islands, and is shown below.

| | |
|----------|-------|
| Cattle | 3362 |
| Sheep | 14215 |
| Goats | 29501 |
| Pigs | 3239 |
| Chickens | 32952 |

Most of the animal products produced from the above population are used for local consumption. This does not mean that Antigua/Barbuda is self sufficient in meat products; in fact on the contrary, there is a demand for heavy imports. However, farmers complain that they are not able to market enough of their produce although the potential is there. This was mainly due to poor government policies and lack of cohesion on the farmers in Antigua/Barbuda. In 2003, supermarkets, wholesalers and business enterprises imported: -

| | | |
|-----------------------------|--------------------------------|---------------------------|
| Beef 1,001,715lbs | Poultry 9,397,587lbs | Pork 784,941lbs |
| Lamb 415,869lbs | Goat 52,595lbs | |

It is clear that although Antigua and Barbuda cannot produce this amount of meat, we can surely tap into the market in a meaningful way thus providing a good source of income to the national farmers. The reality is, although former government had poor policies, no real strong farmer's organizations existed, with the exception of the poultry association. Through this association Antigua and Barbuda is now self sufficient in eggs but will approve imports at certain peak periods e.g. Christmas and home festivals.

The cattle breeds in Antigua and Barbuda are from the base stock of Zebu brought from West Africa in the 1800's. Later the Red Poll, Simmental, limousine and Holstein were introduced. There was a brief period in the 1970's when a milking industry had structure; however that collapsed in the mid 80's and is now nonexistent. Even pockets of Guernsey were once established.

Nubian, Toggenburg, Alpine, Sannen, and more recently the South African Boer represent established goat stocks.

Sheep stocks include Barbados Black Belly, Black head Persian, Dorper, Virgin island White, polled and horned Dorsette, West African and Kathadei the latter two not being very prevalent.

Pig stocks comprise the Large whites, Land races, Yorkshires, Durocs, Hamshires, Large Blacks, and in Barbuda the wild pig.

In the 1980's poultry layer farms were introduced and with them came various strains of chickens, ducks and turkeys. The Plymouth Rock broilers, leghorn layers and Road Island red are the predominant commercial chickens on Antigua and Barbuda. The yard fowl is still present but is slowly losing its predominance. It is worth noting that a Creole fowl known as the "sensay" fowl is almost extinct now. Ducks on the islands are the Peking, Muscovy and West Indian duck. Other poultry species include the African goose, guinea fowl and pigeons.

During the 1970's exotic breeds of rabbits such as the New Zealand White and Red, California, Chinchilla, Dutch and the English were introduced. Not many of the pure strains exist but evidence of their genes is seen in the Creole breeds on the islands.

1.1 Animal Production Systems

Across Antigua and Barbuda, livestock production systems include meat eggs, honey and breeding. The draft animal is practically obsolete. The donkey, which was the "Volkswagen" of draft animals, is now almost a nuisance. Farmers in Antigua and Barbuda have become more specialized and mechanized hence the donkey has lost its position with regard to farming. In the 70's and 80's its meat was exported to the French islands but was discontinued due to Euro sanctions. Another draft animal, the horse, is now used as a racer, a tourist attraction and even a domestic pet.

The function of the meats, eggs, and honey and breeding activity is to offer food and nutrition, financial, cultural and educational security. Antiguan and Barbudans have a high consumption of animal protein and although much of it is imported, a good amount of local meat is utilized. The following tables shows slaughter figures for the past three years and are expressed in the number of heads slaughtered.

Animal200220032004Cattle122514151103Sheep89119601859Goats47611621654Pigs122419652159Egg production enjoys a stable market, and Antigua and Barbuda is self sufficient in eggs, however on festival occasions e.g. carnival, easter, Christmas etc. importation of eggs is allowed as demand increases during these periods. The brown egg is the preferred type.

Honey has become an increasingly popular commodity and Antigua and Barbuda is able to produce some of the best unpasteurized honey in the world. The sting less Antigua bee is quite docile and has been crossed with the European bee. Unfortunately it does not appear that this sting less bee exists on its own anymore.

Cross animal breeding is a way of life for many Antiguan and Barbudan farmers. This twin island nation has no indigenous domestic breeds of animals. All animals were introduced at some point. Antigua being 280 sq. km And Barbuda 160 sq. km will indicate that the genetic pool can become very concentrated and efforts are always sought to relax inbreeding. Evidence of congenital birth defects is not uncommon and over the years farmers have been encouraged to inject "new blood" from time to time. This often results in new breeds being introduced; sometimes to the farmer's disadvantage, sometimes to his gain.

Production systems offer financial security. Many livestock producers view heir animals as "living banks" and are kept in reserve for emergencies such as school fees, weddings, home building etc. One cannot overlook the cultural view of a type of production system. In many instances food animals is a way of life...a source of well-being for the producer especially for the aged. His or her life has some meaning and usefulness just to attend to his or her livestock.

At many cultural functions e.g. carnival or independence it is customary to prepare the "goat water" "souse" and "bull foot soup" and this is prepared with a freshly slaughtered animal.

Production systems can be seen in the secondary schools and contribute to the educational syllabus of secondary students. Agricultural studies are offered at the primary level and many schools have sheep, goat and rabbit farms.

Production systems have the following species: cattle, sheep, goat chickens and bees. Over the years the farm producers have become more businesslike. Improved pastures, infrastructure, and an increase in animal population may be observed. A general change in types of farms is evident, change being more control and advanced practices.

1.2 Conservation Activities

Animals presently engaged in conservation in Antigua and Barbuda are:-

- Red poll cattle
- Persian Blackhead sheep
- Dorsett sheep
- Dorper sheep
- West African sheep
- Barbados Black belly sheep
- Nubian goat
- Boer goat
- Creole goat
- Large white pig
- Duroc pig
- Black pig.
- Wild pig (Barbuda)
- Wild deer “

The introduction of the Caribbean amblyoma programme has brought an increase in awareness and responsibility of animal owners along with the renewed drive to preserve species that would otherwise have been lost.

For many years Antigua and Barbuda was faced with the dilemma of stray and roaming animals with no identity. This had a negative impact on livestock especially cattle, for it was this species which caused the most damage to crops and life. In an effort to check the problem, the government implemented a shoot and destroy policy. There was such an outcry to this, that government was forced to discontinue the practice. Under the Caribbean amblyomma programme all animals and animal owners must be branded and registered respectively and entered into a database known as inter-trace. It is now hoped that animal owners will be held accountable for their livestock

Although donkeys are not permitted in the amblyomma programme, preservation of this species was accomplished by establishing a sanctuary, which is very operable and seems to be efficient.

The Caribbean amblyomma programme also addressed the amblyomma tick infestation crisis, which would have eventually caused the depletion of the bovine species on Antigua as it did on Nevis.

Established farmers see strength to conservation activities on Antigua and Barbuda in dedication and good business approach. Weakness is seen in a limited gene pool where there is always the search for new genetic material, which is often so costly, that farmers struggle to relax inbreeding.

Dissemination of information is carried out by the Ministry of Agriculture's news magazine, "What's up in Agriculture" and by government documentaries via television. Radio shows although rare, are also held to keep the public informed with livestock trends.

1.3 Description of breeds, their uses and Technologies employed.

See table.

All breeds are utilized for food production with the exception of the equine family.

Antigua's tourism industry dictates to some extent the quality of meat consumed. Tourists demand young tender flavourful meat, and farmers have become conscious of this demand, therefore the breeds they choose to invest in will reflect this. Choices of breeds indicate rapid growth rate and a lean towards meat rather than dairy.

The effects of this is an out breeding of most Creole breeds and introduction of exotic species which often get assimilated with the Creole breeds and then are sometimes difficult to detect. Another effect can be seen as to preference in poultry. Whereas the yard fowl *gallus gallus* for centuries was the staple in poultry meat, one sees a desire for broilers of the Plymouth Rock for example, brown eggs from road island red, preferred over white eggs shorthaired sheep over long haired due to climate etc.

Another effect worth looking at is the health effects. There has been a trend towards less red meat and fat so a shift towards poultry is statistically evident.

Previous government policies leaned towards milk importation rather than domestic production, hence farmers chose meat breeds of ruminants over dairy therefore milk production on a commercial basis was nil.

The type of technology used in breeding is cross breeding and natural breeding both being fairly active. Antigua and Barbuda has always utilized this method since it is most realistic and cost effective. Artificial insemination has also been utilized but not within the last decade due to certain constraints, one being financial.

1.4 Identification of problems in conservation and utilization as per the current situation in your country.

Land. The availability of this commodity is very limited. If farmers are going to be in a position to protect certain species then land to separate and breed specifically is a necessity.

The availability of genetic material can be another tremendous challenge. This is often expensive and environmental change can be traumatic if live animals are involved.

Labour is expensive and it is often very difficult to be able to pay workers to keep this charge. Infrastructure is also costly and only the enthusiast will be keen to attempt conservation activities.

Natural disasters are also problems to deal with. During the 1995 hurricane Luis, heavy losses were felt in the livestock industry, not to mention the other 4 that followed. Antigua and Barbuda is prone to drought conditions; in fact droughts are cyclical and occur every eight to ten years. Heavy losses are felt during this type of disaster and farmers get no compensation what so ever.

Disease can be another harsh reality of threat to conservation of AnGr. In the early 1990's there was an outbreak of tuberculosis in the red poll beef herd and since our policy is to slaughter all positive reactors the beef herd at the government stations had to be dealt with. Fortunately it was a localized outbreak and was quickly contained. Other diseases such as worm burden, dermatophylosis and heartwater can have a devastating effect on the AnGr on Antigua and Barbuda.

Part 2. Analyzing changing demands on national livestock production

2.1 Production and its implications for future national policies, strategies and programmes related to AnGR

Past policies were government controlled and very weak. Present policies are leaning towards private sector led with government lending full support. Farmers doing animal breeding and dissemination to other farmers will be encouraged. It is anticipated the government will still maintain the cattle Red Poll unit while private farms control small ruminants, poultry, pigs, rabbits and apiaries. Land is an issue which government must address. Government strictly controls availability of this commodity. and investigations are being carried out as to the feasibility of tenure to serious farmers. Antigua and Barbuda will continue to import breeding stock and offer AI when possible. Achieving all this would need greater strengthening in communication and information systems. Workshops and training programmes must also be strengthened.

2.2 Analyzing future demands and trends

AnGR Lost its importance in the national economy, reasons being political. Past government never took a serious look at livestock production and its advantages. As a result of government policies, farmers lost their cohesive power and interest

The future role of AnGR is important. A plan must be identified and put in place. Lands must be made available once again to farmers. Farmers must regroup and start co-operating with each other. Farmers must show serious commitment to their enterprise. Strong policies must be in place.

2.3 Discussion of alternative strategies in the conservation use and development of AnGR.

Development and maintenance strategy would include importation of breeding stock from time to time. As indicated previously, this relaxes in-breeding and improves vigor.

Market demands influence animals we produce e.g. beef animals to yield lean meat, more emphasis on poultry industry Vs beef since there is a definite swing away from red meat, broiler chickens Vs yard fowls.

Another up and coming trend is “organic meat”. Consumers, especially the tourist are showing preference to organic meat Vs stall fed animals. The idea of a naturally reared animal for food consumption is very appealing and many of the local animals are very well adapted to this type of production system, especially in times of stress such as drought.

2.4 Outlining future national policy, strategy and management plans for the conservation, use and development of AnGR.

The Government of Antigua and Barbuda used to be the pioneers in this venture; however efforts are taken to allow it to be private sector led, by small farmers doing their animal breeding and disseminating to other farmers. Recognition that this exercise is best done by the enthusiast, such farmers will have to be identified and given all possible encouragement.

National programme for AnGR will include the Red Poll cattle at the government station and small ruminants led by the private sector. Pigs will also fall into the programme.

Activities of AnGR rely on the importation of breeders.

Information and communication systems and management tools will be strengthened, workshops will be developed and implemented and media presentations are available.

Part 3. Reviewing the state of national capacities and assessing future capacity building requirements.

3.1 Livestock is facing major challenges in Antigua and Barbuda a few challenges being land, capital and water.

This nation has the capacity to revive its AnGR. This present government is committed to this activity; therefore AnGR will be maintained and augmented.

Data collection is poor but improving especially with the inter-trace programme soon to be completed.

Examination of Support mechanisms such as technical services human resources and legislation shows that all are in place and readily available.

Part 4. Identifying regional priorities for the conservation and utilization of AnGR

It seemed only practical and prudent to approach priorities for the national conservation and utilization of AnGR and recommendations for enhanced international co-operation from a regional stand point. This approach will bring strength and unity to enforce priority and co-operation in the field of farm animal biodiversity

Priorities

- Implementation of a national and regional network for AnGR
- Characterization of AnGR (recording systems, genetic evaluation, genetic distances, etc.)
- Breeding and conservation strategies for small populations (Barbados Blackbelly, T&T buffalypso, Jamaica Hope, creole populations,)
- Training on the management of AnGR (valuation of AnGR)
- Establish the Caribbean Society of Animal Production
- Establishment of national committees to provide advise to government in the development of national policies regarding the management of AnGR
- Inventory (census) of livestock
- Development of nucleus farms and multiplication units to supply breeding stock, for AnGR that contribute most to food security
- Ways to increase public awareness
- Evaluation of imported breeding stock
- Use of by-products from AnGR

International Co-operation

- Development of regional projects to look for financial and technical support
- Implementation of a regional network for AnGR
- Software (and training) used in animal breeding analyses
- Linkage between ecotourism and agriculture-AnGR utilization (changing consumer preferences)
- Regional branding of unique animal products from the region
- Exchange of learning experiences among countries
- Availability of AnGR for specific studies (buffalypso, Barbados Blackbelly, ...)