GENETIC DIVERSITY

Genetic diversity is the total number of genetic characteristics in the genetic makeup of a species. It is distinguished from genetic variability, which describes the tendency of genetic characteristics to vary.

Genetic diversity serves as a way for populations to adapt to changing environments. With more variation, it is more likely that some individuals in a population will posses variations of alleles that are suited for the environment. Those individuals are more likely to survive to produce offspring bearing that allele. The population will continue for more generations because of the success of these individuals.

Humans often work with small, select populations of plants and animals in order to artificially construct specific genetic combinations that are useful or desirable. This is true of plants and animals used for food. If we can produce domesticated animals and plants with genetic characteristics for rapid growth, high reproductive capacity, resistance to disease, and other desirable characteristics, we can supply ourselves with energy in the form of food.

Humans can bring together specific genetic combinations in either plants or animals by selective breeding. Because sexual reproduction tends to generate new genetic combinations rather than preserve desirable combinations, the mating of individual organisms must be controlled to obtain the desirable combination of characteristics. Selective breeding involves the careful selection of individuals with specific desirable characteristics and their controlled mating, with the goal of producing a population that has a high proportion of individuals with the desired characteristics.

Through selective breeding, some varieties of chickens have been developed that grow rapidly and are good for meat. Others have been developed to produce large numbers of eggs. Often, the development of new varieties of domesticated animals and plants involves the crossing of individuals from different populations.

Past efforts in collecting and storing germ plasm material by Gambian agronomists, foresters etc. have not been systematic. Institutions such as crops Research Institute (ICRISAT) and International Institute of Tropical Agriculture (IITA) have however complemented such efforts by organizing collection missions to the Gambia. Collections of sorghum, millet, groundnut and rice cultivars were carried out between the periods 1970 to 1994 (IITA Germ Plasm Mission Report; ICRISAT Germ Plasm Collection Mission to the Gambia Report, 1980).

Recent collection efforts for local cultivars from various geographic divisions in the Gambia were carried by the National Agricultural Research Institute (NARI). Samples of crop species collected include maize, sorghum and millet. These cultivars have been characterized so far as observed by farmers. Quite recently too, Gambian Horticultural staff have also collected local cultivars of vegetables such as okra, hot peppers, tomatoes, sweet potatoes and cassava.

In general, germ plasm collection in the Gambia has not been properly classified. The bulk of the germ plasm is being kept as seed (static conservation) by various organizations such as NARI, NGOs and private farms. The extent of variability of early collection, by external missions is uncertain since most of the collections obtained have been done through selective and sometimes ad-hoc sampling procedures regardless of population structurThe livestock

sub-sector contributes approximately 30% of the agricultural GDP. This contribution is becoming more and more important because of an increased integration of livestock into agriculture. Genetic resources are among the most valuable and strategically important assets that a country possesses. Many countries have indigenous animal species and breeds that could potentially contribute far more to food and agriculture production than they are currently contributing in order to meet much wider human needs. It is estimated that about one third of the world's recognized 5000 livestock and poultry breeds are endangered and that breeds become extinct at the rate of one per week. Nevertheless, the subject has received much less attention than plant genetic diversity and hardly any awareness appears to exist about the problem of animal genetic resource erosion.

The overall purpose of the genetic improvement programme at International Trypanotolerance Centre (ITC) and in its mandate, countries is to increase animal output per head among trypanotolerant N'Dama cattle, Djallonke sheep and West African Dwarf goats while retaining their resistance to diseases. The improvement schemes are designed as a three-tier scheme: nucleus – multiplier – village production /farmer. Breeding goals have been set to increase milk and meat production for cattle and goats, and to increase meat production in sheep. Statistical methodologies are used, and selection is based on a model, which includes all available information of relatives and considers all (measurable) environmental factors. The breeding programme tailored to involve stakeholders participation, including the definition of breeding goals, uses simple infrastructure and logistics which is deemed inexpensive for implementation by National Agricultural Research System (NARS).

The Gambia, the breeding stock is at any time about 400 adult females and 5 breeding males. About 200 calves are located at ITC's station Keneba and 450 young animals are located at Bansang in a high tsetse challenge area. Selection of males and females is based on total breeding value being the sum of breeding value for daily weight gain and breeding value for milk yield. Each of the sheep and goats breeding flocks is made up of about 200 breeding females, six breeding males and 200 suckling and young animals. The cattle breeding programme is complemented by an annual screening of village cows with respect to milk yield. For both cattle and small ruminants, village multiplication herds and flocks have been established to receive breeding males from the nucleus and to sell rams, bucks and bulls to village producers.

Several projects/programmes have been launched to address problems
associated with stock feeding. These include the Mixed Farming and Resource Management Project, Pasture Improvement Programme and the Livestock Development Project. These programmes/projects had initiated activities aimed at collecting and storing plant genetic materials. Unfortunately, there is little to show for these activities. Collections and accessions have been left to deteriorate or simply abandoned. Efforts directed towards collection must be intensified at the national level as a matter of urgency.

Other wild species with economic potential but not yet developed commercially include the following: - Wild yam (Dioscorea praehensalis),
common edible leafy weeds (Assia tora, Marselia senegalensis), fruit trees (Spondias monbiun, Zizyphus Mauretania, Cordilia africana, Detarium senegalensis, Dialium guinense,

Vitex doniana, Diosphyros mesphiliformis, Landophia spp., Parinari excelsa and Parinari macrophylla) , medicinal (Combretum micranthum), food/medicinal (Parkia biglobosa), and exotic - medicinal/insecticidal (Azadirachta indica). Some other wild flora grow naturally in nature reserves and such species include: Adansonia digitata, Guiera senegalensis, Parinari macrophylla, Ceiba pentandra, Pseudospondias microcarpa, Detarium senegalensis, Dialium guineense, Lannea acida, Elaeis guineensis, Phoenix reclinata, Parkia biglobosa, Cola cordifolia, Vitex doniana, Calamus deeratus and Landolphia heudelotii.

Improving the genetic diversity of cultivated plants and domesticated animals will ensure the realisation of SDG 2: End hunger, achieve food security and improved nutrition and promote sustainable agriculture & SDG 3: Ensure healthy lives and promote well-being for all at all ages; Through selective breeding, some varieties of chickens have been developed that grow rapidly and are good for meat, others have been developed to produce large numbers of eggs. Collections of sorghum, millet, groundnut and rice cultivars were carried out as well as cultivars of vegetables such as okra, hot peppers, tomatoes, sweet potatoes and cassava. Increase animal output per head among trypanotolerant N'Dama cattle, Djallonke sheep and West African Dwarf goats while retaining their resistance to diseases. The improvement schemes are designed as a three-tier scheme: nucleus – multiplier – village production /farmer. Breeding goals have been set to increase milk and meat production for cattle and goats, and to increase meat production in sheep.

To what extent is the genetic diversity of cultivated plants being maintained, how and for which species?

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• To what extent is the genetic diversity of farmed and domesticated animals being maintained, how and for which species?

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• To what extent is the genetic diversity of wild relatives being maintained, how and for which species?

The Management Strategy for the Production of forests was to protect the economic timber tree species for the provision of fence posts, poles and building materials particularly for roofing.

• To what extent is the genetic diversity of socio-economically as well as culturally valuable species being maintained, how and for which species?

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• What strategies have you developed and/or implemented for minimizing genetic erosion and safeguarding genetic diversity?

Mixed farming and resource management project, pasture improvement programme and the livestock development project are the strategies put in place to minimizing genetic erosion and safeguarding genetic diversity. Also seed bank and botanical garden has been established.

• What actions are being taken to safeguard the genetic diversity of species of cultivated plants and farmed and domesticated animals, their wild relatives and socio-economically or culturally valuable species?

Several projects/programmes have been launched to address problems associated with stock feeding. The establishment of the plant protection unit under the department of Agriculture is to serve as monitoring unit

• Are species being maintained in situ or ex situ, and which ones?

Species are maintained ex situ such as sorghum, millet, groundnut and rice cultivars were carried out as well as cultivars of vegetables such as okra, hot peppers, tomatoes, sweet potatoes and cassava. Livestock species such as trypanotolerant N'Dama cattle, Djallonke sheep and West African Dwarf goats are maintained ex situ.

• Have plans to safeguard genetic diversity been developed and which groups are involved?

A project proposal has been developed by DPWM that was submitted to the early warning to climate change project (DWR) to established seed and animal banks to safeguard their genetic materials

• What species management plans or strategies are in place to maintain genetic diversity in situ and ex situ?

As at now there is no specific species management plan in place in cultivated plants and domesticated animals, but there are species management plans in there wild relatives such as sitatunga, turtle, flamingo among others.