

# Plant-based protein sources

## Insight in the case of bambara groundnut and cowpea

**M**ost of the leguminous crops including bambara groundnut and cowpea have shown good adaptation to the diverse agro-ecological growing environments that include marginal lands beset with an array of biotic and abiotic stresses.

Although very little research work has helped mottle these crops as they are today farmers have continued stewarding them and there is a huge diversity among the landraces that are kept and trans-actioned among farmers from time to time. These encompass a huge genetic variability that can be exploited in crop improvement programs to improve their yields as well as their nutritional quality through biofortification.

Legumes are a source of plant-based proteins and amino acids which play important role in the quality of life of humankind and form a major crop for human food, animal feed, and forage. They can also play a great role as a health benefit in addressing obesity, as well as prevent and help manage chronic diseases such as diabetes, and cancer and effectively contribute to food, nutrition, and health security. Most legumes can be used as grains, immature fruits, and fresh leaves as well as dried leaves which are rich in protein, mineral oils, and starches. Legumes have the ability to establish a symbiotic interaction with soil bacteria, collectively termed rhizobia. These bacteria can enhance the growth and development of associated crops by converting the atmospheric nitrogen into a form that is available for plant growth via improving nutrient uptake through nodulation and improving the fertility of the soil towards promoting a sustainable agriculture production system in South Africa in particular and African continent at large.



Bambara groundnut field

**Breeding and genetic resource management with the focus on plant-based protein and nutrition-dense food crops** Malnutrition challenge is a reality, especially in most of our rural settings where people mainly depend on starchy, protein- and micronutrient-deficient cereal or tuber-based diets. This challenge is likely to exacerbate as time goes on due to an increase in population that is growing at a pace higher than production increases in food crops. One of the ways to help the rural communities cope with the demand for balanced diets is to encourage the incorporation and increase of the nutritive indigenous crops that have persisted in their farming systems for a long time. The increasing concerns about food security, together with a widespread "hidden hunger", have stimulated research on crop breeding biofortification, which, in many cases, has been translated into wide screenings of natural variability to identify donor genotypes with high nutritional value crops with reduced antinutritional traits in the plant. It is therefore envisaged that a properly targeted research work would

improve the utility of leguminous, fruit, and leafy vegetable crops and expand their scope of use beyond just subsistence to include them as a reliable source of income for the rural farming communities. There is a need to expand the collection of germplasm and to characterize the collection as to their productivity, source of resistance to biotic and abiotic stresses, source of nutritional quality as well as a special use of novel phenotypes that could be useful for various industrial purposes in the country. Hence, evaluation, characterization, and selection of leguminous, fruit, and leafy vegetables for the traits of interest is a basic technique in a breeding programme. The best-selected materials can be used for commercial production and make use of those traits as parents for breeding populations for future crop breeding programs to continuously feed the farming community with appropriate varieties and updated production research technologies. The management of plant genetic resources is the basis for agricultural research and development systems in terms of genetic resources maintenance in the in situ



Cowpea field

and ex situ conservation systems towards genetic characterization and evaluation in the breeding programmes for registration, population development and release. The crop plant genetic resources generally help in food, nutritional, health, shelter and income generation benefits for alarmingly increasing world population and adaptability for the current and future climate changes that affect the agricultural production system. The conservation of these crop species provides the basis for selecting suitable types with desirable traits for breeding programmes.

In the ARC gene bank, these species seeds are stored in temperature-regulated storage units. The seeds which are intended for both base and active collections are dried to 3-7 percent moisture content and are maintained at -10°C.

### Seed systems (quality assurance)

Seed is one of the most economical inputs for agriculture research and development as well as food security. It is the basic unit of agricultural crop production. Seed producers can select the varieties, which are adapted to their respective agro-ecological conditions. In addition, access to quality seeds by selection and improved seed through breeding is an important step in increasing smallholder production and productivity that would help in the understanding of the systems

### Commercialization and market assessment

Marketing is defined as the aggregate of functions involved in transferring and moving goods from producer to consumer. In South Africa, many livelihoods depend on the production and marketing of crops.

Marketers must be able to deliver products to consumers, at a profit, through the most appropriate channels. This includes the planning, pricing, promotion, and distribution of products and services for consumers, both present and potential. Bambara groundnut and Cowpea are extremely important crops to consumers in South Africa as it can be stored for long periods in the form of seeds and dried leaves for future use and it offers an impressive nutritional package per kilogram. Strong demand by all segments of the population makes cowpea attractive for value-added product diversification.

Despite the contribution and importance of this indigenous legume and leafy vegetables, statistics on the actual number of producers/harvesters, marketers, and consumers of these crop species are currently unknown. ■

### For more information:

Dr Abe Shegno Gerrano  
Senior Plant Breeder and Seed System Research  
Agricultural Research Council – Vegetable,  
Industrial and Medicinal Plants



Control of insects