

CROPS FOR THE FUTURE RESEARCH CENTRE

PROGRAMME CONCEPT NOTE

BAMYIELD

Developing bambara groundnut as an exemplar underutilised crop species

Problem Statements

- There are many reasons why underutilised crops remain underutilised. These may include issues such as basic genetics, agronomy, physiology, nutritional issues, unresolved processing challenges, socio-cultural issues, lack of functional markets, the absence of viable value added products and the politics of agriculture. However, without a functional breeding programme, research to address fundamental crop issues can often not be translated into practical steps forward.
- Crop improvement programmes for major species have attracted significant investment from national governments, international and national breeding companies over many decades. In contrast, support for research and breeding on underutilised crops has been insignificant.
- Applying data and expertise from major crops and model species to promising underutilised species is an effective use of previous research investment, but is a difficult and largely untested strategy.
- Bambara groundnut has potential due to its drought tolerance and good nutritional composition. However, pod yields can be low and/or erratic. This may be due to its photoperiod requirement for pod-set, problems with fertility in some landraces and the lack of improved varieties.
- The development of crop varieties of bambara groundnut with desirable agronomic traits for different environments is an essential prerequisite for its greater uptake and use, but requires a concerted national and international effort to overcome problems such as those listed above.
- Most underutilised crops are grown under sub-optimal conditions and management regimes. This makes yield prediction and modelling difficult. Understanding the basis for plant to crop canopy transition is important to identify the most promising agronomic practices in different environments.
- Researchers at the University of Nottingham and partners in Africa, Asia and Europe have collaborated in research on bambara groundnut for many years. Integrating and evaluating this collective experience within a wider sociocultural context can allow us to develop generic approaches for multidisciplinary research into the improvement of many other underutilised species that face similar challenges.
- The available and proposed research on bambara groundnut provides an excellent opportunity to develop and test generic multidisciplinary approaches to enhancing the take up of underutilised crops among user groups.

Objective

To develop multidisciplinary approaches, tools, methodologies, machinery and matching genetic resources to address the limiting factors in the adoption of underutilised crops using bambara groundnut as an exemplar crop.

Outcomes

- New understanding of technical, sociocultural and economic constraints to greater uptake of bambara groundnut.
- Development of appropriate machinery and processing technology and dissemination/extension strategies to facilitate uptake of bambara groundnut.
- An international crop improvement and breeding programme on bambara groundnut as a generic model for other underutilised species.
- Development of translational methodologies to use data from major and model species to work in underutilised species, using bambara groundnut as an exemplar.
- Application of data from bambara groundnut for the construction of the CropBase prototype.

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- Development of 'clusters' of related underutilised species linked through sequence and sequence-anchored data, extending the exemplar species to additional underutilised crop species.
- Development of tools to enhance the understanding and co-ordination of multidisciplinary research initiatives to facilitate the replication of this strategy with additional underutilised crops.

Programme Concept

In country, field-based breeding selection will be supported by focused research to address specific issues. BamYield will address issues of fertility, translation of data from major to minor species with the use of Next Generation Sequencing approaches, mathematical modelling of canopy development for prediction and selection and a novel approach to crop breeding. Sociocultural and transdisciplinary issues in the research and uptake of bambara groundnut by different communities will be addressed as part of the research process to identify transferable approaches to other underutilised crops.

Potential CFFRC Partners

University of Nottingham, Reading University (UK), Diversity Arrays Technology Pty Ltd. (Canberra, Australia) with collaborators in Malaysia, Indonesia, Thailand, Ghana, Nigeria, Burkina Faso, Sierra Leone, Botswana and South Africa.

Programme Activities

Whilst the initial focus will be on genetics and breeding, transdisciplinary activities, end-user participation and existing knowledge on bambara groundnut will be integrated into each stage of the programme for longer term sustainability and to improve outcomes.

The *process* of the research activities will provide a mechanism for the development of a general methodology for application to other underutilised crops. For this reason this process itself will also be the subject of in-depth analysis.

The programme will serve as an exemplar in devising strategies to incorporate data into the CFFRC CropBase web-based platform.