Report on the Zimbabwe National Workshop on Underutilized Crops with Emphasis on Bambara Nut and Grain Amaranth

Introduction

The project, "Strengthening capacities and informing policies for developing value chains of neglected and underutilized crops in Africa" supported by the EU-ACP Science and Technology program with co-financing by the project partners runs from 1st January 2014 to 31st December 2016. The overall aim of the project is "Enhanced value chains of neglected and underutilized species (NUS) in Africa contributing to improved food and national security, income of stallholder farmers and entrepreneurs and mitigating of, and adoption of climatic agronomic and economic risks." Zimbabwe is one of the countries that is the node of activities for the Southern African region. Among the activities for the first year is the conduct of a national workshop on NUS. This workshop was held on 23 to 25 June 2014 at the Holiday Inn, Harare, Zimbabwe. The overall objective was to determine the extent of utilization and research on NUS, the gaps and opportunities for scaling up of utilization for the two crops. These would then be used for informing policy on the valu and potential of underutilized crops in Zimbabwe and in the sub region.

Objectives

In view of the forgoing, the specific objectives of the workshop were as follows:

1. Identify and map out the centres and types of activity for Bambara nut and Grain amaranth.
2. Define and quantify the market development status of the crops.
3. Develop a consensus on the value of the two crops as NUS in Zimbabwe.
4. Map out the gaps in research and value chains for the crops.
5. Develop a pathway towards strengthening policy support for NUS.
6. Develop a national strategy towards value chain development for NUS to develop markets and increase utilization of NUS.

Workshop Programme

The workshop theme was "**Strengthening capacities and informing policies for developing value chains of neglected and underutilized crops of Africa."**

The workshop proceedings had presentations on the overview of NUS in Zimbabwe, situation analysis on grain amaranth in Zimbabwe, situation analysis, capacity building and the envisaged steps towards a national strategy on grain amaranth. The detailed program for the workshop is presented in Annex 1. The participants included individuals from key organizations that are involved in research on NUS, production, processing and marketing of products of Bambara nut and grain amaranth. A keynote address was presented by the Permanent Secretary of the Ministry of Agriculture, Mechanization and Irrigation Development, Mr R. J. Chitsiko. The full list of participants to the workshop is presented in Annex 2.

Day one: 23 June 2014

Opening session

Introductions

Participants introduced themselves to the group and the workshop objectives were presented by *Dr Z. A. Chiteka*. These have been lilted previously.

Opening speech by *Mr. R. J. Chitsiko* (Permanent Secretary of the Ministry of Agriculture Mechanization and Irrigation Development) summary

The workshop was officially opened by the Permanent Secretary for the Ministry of Agriculture, Mechanization and irrigation Development. In his remarks he outlined the government's position on underutilized crops. He underlined the importance of supporting research and production of Bambara nut and grain amaranth noting the importance of the nutritional advantages of the two crops. He indicated that research on Bambara nut is ongoing in the research department of the Ministry and that government stands ready to support stakeholders working on the value chain of the two crops. He also noted that support for the two crops started in the formative years of Zimbabwe's independence in 1980 with agronomic research that was conducted on groundnuts. He also pointed out that improved varieties of Bambara nut had been released by the Research Department of the Ministry. He summed up his opening speech by pledging government support for efforts to strengthen the value chains for Bambara nut and grain amaranth along with other underutilized crops.

Overview of NUS in Zimbabwe

Per Rudebjer

Global srategies towards increasing food production and the role of NUS, adaptation to climate change, highlighted that of the 7000 edible species only three crops maize, wheat, rice constitute 60% of the world calorie intake. The presentation highlighted the global value of NUS in widening the genetic base for crop production= 60%. The paper noted the growing interest in NUS as an important alternative and highlighted the weak link between agricultural research and food systems. Value chains were generally weak which leads to the weak value chains and poor linkages with research on Bambara nut and grain amaranth.

The four key results were:

1. National action plans for upscaling Bambara nut and grain amaranth in food systems,

2. Strategies for integrating NuS I higher education.

3. Enhancing capacity to design research on NUS and communicate results,

4. Strategies and tools for strengthening NUS research.

Gus Le Breton Bio Innovation Zimbabwe

Le Breton presented a paper on Perspectives on underutilized crops. He highlighted that there are more than 6000 underutilized species found in Zimbabwe. Some of these are extremely drought tolerant and can grow were no other known cereal grain crops can grow. These can be harvested on a sustainable basis with minimal inputs. He cited examples of the baobab tree and the baobab fruit which as been processed to produce baobab juice. A wide range of species with a high medicinal value remain underexploited. Emphasized the need for advocacy, research and investment into the value chain for the potential to be realized

Presenting the opening address at the National innovation workshop, Mr R. J. Chitsiko, Permanent Secretary, Ministry of Agriculture, Mechanization and Irrigation Development, Government of Zimbabwe

Dr Claid Mujaju Head Seed Services, Department of Research and Specialist Services, Ministry of Agriculture, Mechanization and Irrigation Development.

Dr Mujaju presented a paper on the national perspectives on NUS. He highlighted that the cultivation of underutilized crops is largely based on indigenous knowledge systems. There was inadequate attention paid to these crops. Consequently, there is little knowledge on the production of these crops. Documentation on the utilization and production of the crops is rather limited. Seed systems are almost non existent but the species include many species that are highly nutritious and some are of medicinal value. There are some species that are valuable for their drought tolerance e.g. water melons (*Citrullus*). Among the national initiatives are promotion of crop diversification, drafting of the policy on food and nutrition security, promotion of the conservation of genetic resources including NUS, and promotion of sustainable utilization of NUS.

Dr R. Mano Director International Relief and Development

Presented some highlights of work on development on the production, utilization and marketing of groundnut and common beans through value chain mechanisms. These led to small business development by stallholder farmers, sustaining support for groundnut shelling. The result was increased production of the two crops, improved prices of the commodities and increased income generation among the smallholder farmers that were supported in the Buhera District of Manicaland.

Situation Analysis

Ms Maidei Kutambura Ecologist, Bio-Innovation Zimbabwe

Presented a synopsis of the work on food products on selected underutililzed crops at B io-Innovation Zimbabwe. The limitations on the utilization of food products of nuts were presented. The importance of development and promotion of food products from nuts was highlighted.

Mrs C. Jaquet and Mrs C. Gumpo Bio-Innovation Zimbabwe

Presented a variety of food products developed from a range of NUS. Samples were provided for participants to sample. These included baobab juice, a range of snacks prepared from grain amaranth from grain amaranth. A wide variety of novel food products were presented. Some examples of food products produced from grain amaranth are presented in Figure 2.

Figure 2. A variety of food products produced from grain amaranth.

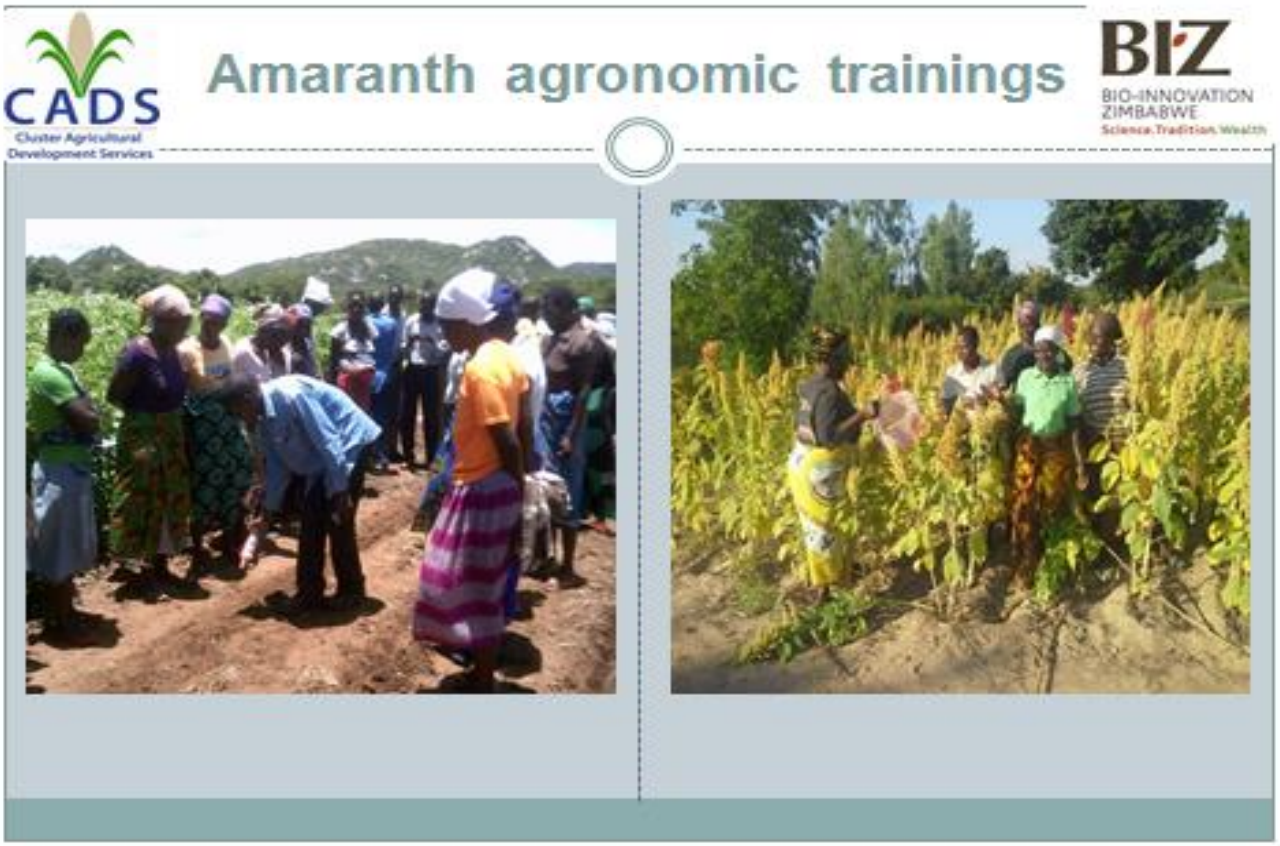
Maidei Kutambura Bio Innovation Zimbabwe

The value of grain amaranth as a source of dietary protein was highlighted. Amaranth was cited is Guatemala as a vegetable with the highest nutritive value. It is the only grain that was report to contain vitamin C. It contains lysine, an essential amino acid that is present in negligible quantities in grains. Molecular biologists in Mexico (2008) reported that grain amaranth contains a lunasine like peptide with properties that prevent cancer, heart disease diabetes and stroke. The amaranth grain is gluten free, and contains, phytosterols that have a cholesterol-lowering effect. These properties hade the effect of lowering the incidence of heart disease.

Ms Lilian Machiwenyika Cluster Agricultural Development Services

Ms Machiwenyika presented a paper on Production and marketing of grain amaranth, a pilot project in Mutoko Mudzi Districts. The paper presented work with farmers in these districts and emphasized the collaborative work with Bio-Innovation Zimbabwe. A group of 100 farmers was

involved in these districts. Demonstrations were conducted on farmers' fields in which some demonstrations with and without fertilizer were included. Results of the works showed that grain amaranth performed well under drought conditions. Of significance was that some farmers achieved a yield of 2.5 to 3t/ha of grain amaranth. Community mobilization has generated interest in growing of the crop. Marketing of the produce was noted to be presenting challenges and that there is a need to develop markets for the crop.



Kudzai Kusena National Gene Bank of Zimbabwe

Mr Kusena presented a paper on Conseration, characterization of germplasm of bambara nut and grain amaranth. He presented a brief history of the setting up of the National Gene Bank of Zimbabwe which is under the Ministry of Agriculture, Mechanization and Irrigation Development. It was opened in 1997 and became a standalone institute in 2007. A total of 145 accessions of bambara nut were collected however, work on the documentation of the lines collected was still limited. He highlighted the need for work on documentation and noted the challenges with manpower to conduct the evaluations. There were 20 accessions of grain

amaranth but none of these had been characterized yet. Collection of bambara nut and grain amaranth was noted to be incomplete and that further work was still required.

Towards a National Strategy on grain Amaranth

Gus Le Breton

Mr Le Breton presented the paper "Overview of Value Chain Upgrading Strategies." He facilitated the session in which the exercise was primarily based on group work. Mr Le Breton presented a paper entitled. The importance of credit, seed, feed, production, processing, storage, distribution, marketing and consumption were highlighted as key points in the value chain that lead to improved utilization and a growing awareness and value of the crop. He outlined the importance of value chain upgrading and how it leads to the involvement of rural communities towards improved production and utilization of the crop. The different forms of upgrading that are required for improved utilization were outline. These included, product upgrading, production level upgrading, quality upgrading and upgrading of the markets by development of different products that satisfy new niche markets.

The group discussions highlighted the various constraints that impact on upgrading of the value chains. Needs were generated which led to the formulation of strategies towards upgrading of value chains.

Day 2: 24 June, 2014Capacity Development for NUS value chains

Mr M. Hakutangwi Barefoot Education in Agriculture Trust

Mr Hakutangwi presented a paper on "Underutilized Crops, and value chains, perspectives from extension." He noted that value chains have not made part of main stream extension. The idea of value chains is not clearly understood and is poorly articulated in extension. He highlighted the need for the concept to be effectively communicated and to be integrated into extension training to improve the derivation of value from the production that is supported by extension. Research has encompassed value chain development to a limited extent. The need to integrate NUS in education curricula was highlighted.

Dr Richard Hall International Foundation for Science

A paper on "Opportunities for research on NUS was presented by Dr Richard Hall. He presented details on the upcoming workshop on proposal writing and the call for proposals. Details of eligibility for grantees for the International Foundation for Research were presented. The elements of a research proposal namely, the definition of the problem, the review of the literature, the justification, hypotheses and research questions, methodology, reporting of results and dissemination. Participants were appraised on how the research grant process is organized. Participants were advised to look out for the call for proposals for the workshop so that eligible candidates would prepare a proposal and submit. Preparation of a proposal was highlighted as a requirement for a participant in addition to meeting the criteria for IFS grantees.

Dr S. Chakeredza Deputy Director ANAFE

Dr Chakeredza presented a paper titled "Integration of underutilized crops in tertiary education curricula and the potential benefits, the case for ANAFE." He outlined the availability of identifiable new knowledge that exists in the subject of NUS. The challenges of climate change require new coping strategies. These need new media for delivering education. The utilization of the new knowledge requires that communities be aware of the new knowledge and how it can be used. He outlined the strategy of engaging the higher education sector in agriculture to champion the delivery of the new knowledge through inclusion of the material in the curricula of agriculture. He explained the linkage beween educational needs and society and how society is influenced by education.

Bambara nut situation analysis

Dr P. O'Riley Crops for the Future Center, Malaysia.

Dr O'Riley presented a paper on "Bambara nut research, current status and into the future." He outlined the role of the Crops for the Future Center that was recently establishes. He articulated the role of the centre on promoting food, feed, health, nutrition, energy, biomaterials product marketing opportunities and ccapacity-building. He noted the linkage between the various disciplines in the study of crops to the utilization of the final product. He outlined some of the current work currently conducted by the centre and indicated the current multiplication of 400-500 pure lines of Bambara nut. Current work is targeted at breeding for photoperiod insensitivity for pod- set and pod-filling, cooking characteristics, nutritional content and traits related to new food

products. The value of the crop to smallholder farmers is presently being evaluated along with development of support processes for value chains in bambara nut.

Dr Z. A. Chiteka Africa University

The paper presented was titled "Research work on Bambara nut, value chains and research at Africa University." Production of Bambara nut in Zimbabwe was at about 5000 tonnes per year on about but with yields estimated at 0.5 to 1.5t/ha with area per farmer set at around 0.25 ha. Early planted crops on fertile soils have been noted to yield over 4t/ha of air dried pods. The crop remained underutilized because of the historical context where it not included in the schedule of controlled crops. Although early work on Bambara nut dates back to the early 1920s, the seed system for the crop remained poorly developed. Some improved varieties, Mana and Kazuma were released by the government plant breeding station although multiplication and dissemination of the seed remained limited. Research work f rom Africa University showed that days to 50% flowering ranged from 22 to 38 days among a range of genotypes collected from Buhera District in Manicaland Province. Seed yield was noted to decline by 30 to 47% with delayed planting. Seed yield was also noted to decline from 5 to 60% as the earthing up dated was varied from 30 to 90 days after planting.

Ms Ivy Kapora Tulimara Foods

Ms Kapora presented the paper titled "Commercialization of Bambara nut products: A Case of Speciality Foods of Africa." The paper noted the low yields of the crop and that it is grown by smallholder farmers, mostly women with very low incomes. For these reason, it is planted without application of fertilizers. It is the third most important grain legume crop after groundnuts and common beans. It is notably nutritionally superior to many grain legume crops and is a good source of fibre, calcium, iron and potassium. It has the potential of providing a balanced diet in areas where animal protein is not readily available. The crop is prepared in various was for consumption and is mixed with cereals in different proportions to make various dishes. The crop has been prepared as canned Nyimo beans that have been boiled and preserved in salt water. Processing requires grading to remove stones, soil and other extraneous matter. Various canned products of bambara nut were developed such as chilli nyimo beans , baked nyimo beans (in a tomato sauce), mixed 3 bean salad, dried and salted nyimo beans (like salted peanuts), nyimo Bean Cereal etc but this was stopped after dollarization because the price was too high to be competitive on the market.

Mr P. Matova and S. N.Ngirazi Crop Breeding Institute, Harare Research Station, Ministry of Agriculture Mechanization and Irrigation Development.

The paper presented was titled, Pulse legume breeding, Bambara nut in the Crop Breeding Institute. Mr Maova highlighted the role of the Crop Breeding Institute and presented results of some of the work completed on Bambara nut. The central role of the Institute is to develop and release improved varieties of a number of annual crops including groundnut. This Institute then also provides technical information on the production of the various crops that are worked on, in particular information relating to improved varieties that are released. Some improved varieties namely Mana and Kazuma were released by the Crop Breeding Institute. Some results reported for the G webi Variety Testing Centre showed that yield of test varieties ranged from 200 to 950 kg/ha. Fusarium wilt was noted to be posing a serious threat to the production of Bambara nut in Zimbabwe. A challenge was also noted in hybridization of Bambara nut to the extent that not successful hybrids have yet been produced in the Institute. Mutation breeding has been attempted and the mutant lines are currently undergoing field testing.

CONCLUSIONS OF WORKSHOP

1. The development of NUS value chains in Zimbabwe offers a variety of potential economic, social and environmental benefits.
2. This is becoming recognised at the highest levels of government, but this has yet to filter down to other levels e.g. agricultural extension-workers.
3. Zimbabwe has underutilised research capacity which can be brought to bear in terms of developing NUS value chains.
4. The primary constraint in terms of developing these value chains is the relative lack of market interest.
5. Grain Amaranth and Bambara nut both represent pro-poor value chains with significant opportunities for upgrading in Zimbabwe.
6. Past efforts on these species have been fragmented and sporadic
7. Most of the research on Bambara nut has been on propagation. However, we still have only two commercially marketed seed varieties
8. Research on Grain Amaranth has included propagation and market development. However, still very early stage
9. Application of marketing principles is deficient in agricultural training and practice in Zimbabwe
10. NUS represents fertile ground for new research in Zimbabwe.

11. Our current education system for agriculturalists does not sufficiently promote innovation and innovative thinking

12. Lack of involvement of practitioners in the training/education system.

RECOMMENDATIONS

1. Policy level – needs to make explicit reference to NUS and take explicit steps to support NUS.

2. Link between health, NUS and "climate-smart" agriculture is a strong potential marketing area.

3. NUS value chains should be viewed especially in terms of their pro-poor benefits and their suitability for dryland areas.

4. Opportunity for integration of NUS (inc. marketing) into higher education curriculum with support of ANAFE.

5. Need to link with NUS researchers and support organisations outside Zimbabwe (e.g. CFFRC, Bioversity etc).

6. IFS support to Zimbabwean researchers on preparation of research proposals.

7. Need to learn from other countries with explicit NUS policies and market experiences – perhaps through exchange visits.

8. Need to create a culture of more genuinely participatory and collaborative research and extension around NUS.

9. Promote innovation amongst farmers and expand profile of NUS through linkages to existing awards etc.

10. NUS roll-out needs to be driven by market interests, but sometimes markets need to be developed from scratch

11. Scientists working on NUS need to learn how to popularise, disseminate and lobby with their scientific findings

12. Need to develop innovative seed funding mechanisms to support early stage NUS businesses

13. Need to explore EU novel foods approval for Bambara nut