African Orphan Crops Consortium: a NEPAD-led initiative

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One of the primary thematic areas of the New Partnership for Africa's Development (NEPAD), the development arm of the African Union, is agriculture, food security and nutrition because of the value of agriculture in eliminating poverty, hunger and malnutrition. The Comprehensive African Agricultural Development Programme (CAADP), an integral part of the NEPAD Agency, is Africa's agriculture development policy framework. CAADP's aim is to accelerate the annual agricultural productivity growth rate to at least 6 per cent by 2015. Member states are implementing CAADP with technical support from the NEPAD Agency.

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The challenge

Hunger and malnutrition are both real issues for Africa's population, with compounding consequences on livelihoods and socio-economic advancement. About 200 million of the continent's children under five years of age are stunted as a result of inadequate diet.[1] This places huge responsibilities on agriculture to produce not just the volumes, but also the nutritional diversity required for the continent's food basket. Africa needs to harness its biodiversity potential more actively to provide the desired quantity and quality of food.

African orphan crops: potential contributions to food and nutritional security in Africa

Africa's biodiversity is rich, with a wide range of fauna and flora including plant (crop/tree) materials highly adapted to local agro-ecological conditions. However, most of these crops remain underused and scientifically unimproved[2]. They are not economically important at global level and hence are largely ignored by scientists. Such crops, generally referred to as "orphan crops", are vitally important in meeting Africa's food needs and providing industrial raw materials.

More than 250 million smallholder households in Africa depend significantly on orphan crops for food security, nutrition and income. These crops are important because of their potential role in mitigating risk in agricultural production systems, as well as maintaining ecosystem health and promoting cultural diversity.[3]

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In this regard, the NEPAD Agency is leading a multi-partner initiative to bring increased scientific and economic attention to orphan crops. This is focusing on expanding and

accelerating the development of higher-yielding varieties while at the same time ensuring protection of the genome base of these crops. This has led to the establishment of the African Orphan Crops Consortium (AOCC) involving the NEPAD Agency; Mars, Incorporated; the World Agroforestry Centre (ICRAF); Beijing Genomics Institute (BGI); Life Technologies; the World Wildlife Fund; University of California, Davis; The iPlant Collaborative; and Biosciences eastern and central Africa International Livestock Research Institute.

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The AOCC: strategies, goals and expected outputs

The AOCC was officially launched at the Clinton Global Initiative (CGI) annual meeting in 2011 by its two founding partners, Dr Ibrahim Mayaki, CEO of the NEPAD Agency and Dr Howard-Yana Shapiro of Mars, Incorporated as an effort to improve the nutrition, productivity and climatic adaptability of some of Africa's most important food crops. The initial AOCC work programme is supported through in-kind partner contributions worth US$ 40 million.

The AOCC's strategic approach is twofold: first to train 250 African plant breeders and technicians in genomics and marker-assisted selection for crop improvement over a five-year period. For this purpose, the African Plant Breeding Academy (AfPBA) has been set up at ICRAF in Nairobi, Kenya. The training session involves a six-week programme that will be delivered in three two-week classes; the first session started on 2 December, 2013. The second strategic approach is to use the latest scientific techniques to genetically sequence, assemble and annotate the genomes of 100 traditional African food crops to guide the development of more robust produce with higher

nutritional content. It is also expected that the products of this initiative will be better able to withstand climate changes, pests and diseases through marker-assisted breeding and/or genetic engineering.

The genetic data gathered will be made available to the public with the endorsement of the NEPAD Agency. This will be done through a process managed by PIPRA (Public Intellectual Property Resource for Agriculture), which provides intellectual property rights and commercialisation strategy services to increase the impact of innovation, particularly for developing countries and speciality markets, on the condition that the data will not be patented.

Why sequence orphan crops?

The scientific basis of all crop improvement is identification of the genes that encode and regulate specific phenotypic characteristics or traits of benefit. This has been exploited in marker-assisted selection and genetic engineering technology, which has primarily been used to improve production of major world crops such as maize, soybean and cotton. These technologies can be adapted to improve African orphan crops, particularly the many – including banana, cassava, potato, sweet potato and yam – that cannot be improved by conventional breeding because they are vegetatively propagated. However, such improvements can only happen if the appropriate genetic data are made available through sequencing. Molecular approaches such as marker-assisted selection and genetic engineering have the potential to speed up breeding and domestication; they are more precise and faster.

Orphan crops to be sequenced: the case of baobab as an iconic crop

The first batch of orphan crops and trees identified under this initiative includes but is not limited to the following: African plum, allanblackia, amaranth, baobab, cashew, cocoyam, finger/pearl millet, fonio, groundnut,

horned and water melon, marula, moringa, okra, peppers, plantains, teff, shea butter and sweet potato. The work will start with the baobab tree. The fruit of this non-timber forest product is used as food and for medicinal purposes. Baobab is known as the wonder tree in Africa because its fruit has 10 times the antioxidant level of oranges, twice the amount of calcium as spinach, three times the vitamin C of oranges and four times more potassium than banana, has antiviral properties and is gluten-free – to mention a few.[4]

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Links with other agricultural NEPAD programmes

Within the CAADP framework the AOCC will support efforts to expand agricultural production and productivity potential including broadening the nutritional value of the continent's food basket. Through CAADP, the AOCC will be able to embrace and respond to local needs and aspirations. The national CAADP implementation processes provide the central framework to raise public awareness and stimulate public-private partnerships for the desired expanded investments in and work on orphan crops. A number of African national agricultural research centres, universities and sub-regional research organizations will participate in this initiative.

Concluding thoughts

The new, improved varieties of orphan crops will mean increased yields and greater disease resistance. However, such varieties could be unaffordable by the target group. It is therefore critical that the NEPAD Agency in liaison with national governments support the design of policies to give smallholders access to the improved seed. The NEPAD Agency will assist member states to

formulate policy guidelines on African orphan crops, underlining African (local) ownership and investment in relevant science, and will help them maintain meaningful partnerships and build the required capacity for African scientists.

References

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