



# NEWS

Volume 1, No. 3, August 18, 2004 Idah Sithole-Niang & Larry Murdock, editors

---

This newsletter is our informal way of keeping you up-to-date on developments relevant to our Network for the Genetic Improvement of Cowpea for Africa (NGICA). We'll include news, announcements about people, meetings, publications, achievements, and other useful information. We'll try to keep it short, because all of us are awash in a sea of information, but, on the other hand, there are a lot of us and many interesting things are going on! If you have something to share, please send it to us and we'll pass it along in the next newsletter.

\*\*\*\*\*

## NGICANs

**Ousmane Boukar** has returned to his post in Maroua, Cameroon, where he is working as cowpea breeder with IRAD. He was recently named Scientific Director of the IRAD Maroua Station. He has just published a paper from his PhD work at Purdue: O. Boukar et al. (2004), AFLP and AFLP-derived SCAR markers associated with *Striga gesnerioides* resistance in cowpea, *Crop Science* 44: 1260-1264. Ousmane's achievement was to identify an AFLP marker closely linked to type 3 *Striga* resistance and to develop a SCAR marker (a sequence characterized amplified region) which is co-dominant and can be used in breeding and selection for *Striga* resistance.

**Ndiaga Cisse** of the Department of ISRA, Bambey, Senegal was recently elected Chair of the Bean/Cowpea CRSP West Africa Regional Committee; he also serves on the CRSP Technical Committee. Congratulations to Ndiaga on his election to this influential position.

**Deborah Delmer** of the Rockefeller Foundation has been elected to the U.S. National Academy of Sciences. Membership in the U.S. National Academy is a great honor, and few attain it. We wish Debby our hearty congratulations.

**Fred Erbisch** recently completed a book for Michigan State University (MSU) titled *Basic Workbook for Intellectual Property Management*. This was designed for those not familiar with the types of agreements and procedures used in intellectual property management. One chapter covers the development of an intellectual property policy for an organization. This book is available free of charge at: <http://www.ija.msu.edu/iprworkbook.htm>

**T.J. Higgins** was elected to the membership in the Australian Academy of Science. This adds to the growing list of honors T.J. has received, which includes the Rivett Medal from the Officer's Association of the CSIRO, the Pharmacia-LKB Biotechnology Medal from the Australian

Society of Biochemistry and Molecular Biology and the Goldacre Medal from the Australian Society of Plant Scientists. He also has received the Centenary Medal for his service to Australian society in plant biotechnology and is a Fellow of the Australian Academy of Technological Sciences and Engineering. When he is not off receiving awards, T.J. bides his time as Chief Research Scientist and Deputy Chief of CSIRO Plant Industry. And he still finds some time every day to pursue his work on cowpea transformation.

**Joe Huesing** is currently working as a Research Entomologist, Intellectual Property, in the Biotechnology Organization of Monsanto Company .

**Laurie Kitch**, has left Zimbabwe after 6 years of service as Plant Production and Protection officer with FAO's Regional Office for Eastern and Southern Africa. Laurie's new post is as FAO Country Representative for Qatar, but he will continue to have duties dealing with crop production and retains his long interest in cowpeas.

**Dogo Seck** has been named Director of CERAAS (Centre d'Etude Régional pour l'Amélioration de l'Adaptation à la Sécheresse). He began his duties on August 1, 2004. Formerly he was research entomologist working on cowpea in a Bean/Cowpea CRSP project with ISRA-Senegal, later becoming Chef de Centre of the ISRA/CNRA Bambey Station from February 1996 to March 2000. The cowpea storage research he did led to the widely adopted drum storage technology now found on 90 percent of the cowpea farms in Senegal. For the last four years Dogo has worked as Conseiller Scientifique with the Fonds National de Recherches Agricoles et Agro-Alimentaires (FNRAA), administering a competitive grants program for agricultural and Agro-industries research under the auspices of the World Bank. CERAAS, based in Thiès, Senegal, carries out multi-disciplinary research to improve productivity of several crops adapted to the dry savannah: cowpea, groundnut, millet and sorghum. Our best to Dogo in his new position.

\*\*\*\*\*

## Progress

### NGICA partners with AATF!

The African Agriculture Technology Foundation was created to facilitate access to technology for the low resource African farmer. It works through partnerships to remove the constraints on transfer and use of appropriate agricultural technologies. NGICA and AATF began forging links when Larry Murdock and Idah Sithole-Niang met Eugene Terry in Entebbe, Uganda, at the Rockefeller Foundation meeting on **Biotechnology, Breeding and Seed Systems for African Crops** in November, 2002. Over the next several months Larry and Idah worked with Eugene, the Implementing Director of AATF, with various documents, arguments and statistics in support of cowpea becoming one of AATF's projects. In due course, Larry was tasked by AATF to organize a Small Group Meeting of key cowpea stakeholders, which occurred July 12-13, 2003 at ILRI, Nairobi, Kenya. Attending were Ousmane Coulibaly, ag economist with IITA-Cotonou, Mohammad Ishiyaku, cowpea breeder with IAR-Nigeria, Ndiaga Cisse, cowpea breeder with ISRA-Senegal, Morag Furguson, molecular biologist with ICRISAT-IITA, Laurie Kitch, cowpea breeder with FAO, Idah Sithole-Niang, molecular biologist with the University of Zimbabwe-

Harare, Rose Ndegwa, IP specialist with ILRI, Eugenia Barros, molecular biologist with CSIR/Bio/Chemtek, South Africa, and Eugene Terry. In brief, outcomes of the meeting were:

1. NGICA and AATF will work in partnership to develop a project focusing on cowpea productivity and utilization in Africa;
2. Idah Sithole-Niang will serve as liaison between NGICA, cowpea scientists, and AATF;
3. A large cowpea stakeholders meeting will be organized by Larry Murdock and Idah Sithole-Niang in consultation with Eugene Terry and colleagues at AATF. The meeting was initially set for Accra in November, but was later postponed until February, 2004.
4. Those participating in the Small Group Meeting constitute the Technical Steering Committee, which helped develop the agenda for the large stakeholder meeting. Members were later added to strengthen and broaden the Committee, including George Bruening, molecular biologist at the University of California/Davis, Muffy Koch, biosafety specialist with Golden Genetics, and Esther Sakyi-Dawson, food scientist with the University of Ghana/Legon.
5. Five cowpea production and utilization constraints were identified: (i) seed production and access; (ii) field production; (iii) storage/utilization; (iv) marketing; and (v) intellectual property.

### **Accra Cowpea Stakeholders Meeting -- Report**

The Cowpea Stakeholders Workshop was organized at the M Plaza Hotel in Accra, Ghana, from February 10 – 12, 2004. Larry Murdock, developed the agenda and helped mobilize the participants. Katy Ibrahim and Jacob Quay handled the logistics. Overall objective of the workshop was to develop a process and to formulate a plan for a cowpea improvement in sub-Saharan Africa, taking into account existing partners and projects as well as new ones. Cowpea project activities will use modern plant improvement technologies in the form of superior-performing cowpea cultivars with novel traits as well as ancillary cowpea production, utilization and marketing technologies to bring the benefits of modern technologies to African cowpea farmers and consumers. Thirty eight participants at the workshop included specialists from National Agricultural Research Systems, the CGIAR (IITA, ICRASAT), Purdue University, University of California, University of Virginia, Michigan State University, Bean/Cowpea CRSP project, the PRONAF project, University of Ghana, University of Zimbabwe, USAID, The Kirkhouse Trust, the private sector such as biotechnology companies, AATF and NGICA. The Forum for Agricultural Research in Africa, FARA, provided local logistic support for the workshop. Plenary presentations by various participants provided the background, updates of Task Force activities since the Nairobi meeting, as well as the technical framework to guide deliberations.

With major stakeholder input, the workshop successfully:

- Laid the foundation for a cowpea technology transfer project that would be jointly implemented by AATF, NGICA and other development partners.
- Outlined a cowpea project that would be implemented to improve cowpea production, utilization and marketing in sub-Saharan Africa; the project would take advantage of

modern technologies that would be developed and disseminated in a manner to bring long term benefits to African cowpea producers and consumers.

- Formulated a funding plan for the project, identified potential sources of funding for project activities and
- Established a management structure for implementation of the cowpea project.

\*\*\*\*\*

## **New Technology**

### **From Michael Timko's Lab**

In collaboration with Orion Genomics, LLC. (St. Louis, MO), Mike's laboratory at the University of Virginia initiated a pilot study to assess the efficacy of the GeneThresher sequencing technology in cowpea genomics. GeneThresher is a methylation filtering technique in which hypomethylated regions of the plant nuclear genome are selectively cloned and their nucleotide sequences determined. In the nuclear genome of vascular plants, repetitive elements are heavily methylated (hypermethylated). By contrast, expressed genes reside in islands of hypomethylated space. GeneThresher has been demonstrated to enrich for genes in a dozen species of flowering, non-flowering, and even nonvascular plant species.

Analysis of the results of the pilot study indicated that GeneThresher technology enriched for genes at a four-fold rate. This reduces the estimated genome size of cowpea from 620 Mb (total size) to a hypomethylated, gene-rich space of 151 Mb (about the size of the *Arabidopsis* genome). Now that the approximate size of the hypomethylated genespace has been determined, the gene discovery rate can be estimated. Using empirically derived results from other GeneThresher projects and a simulation conducted on finished *Arabidopsis* sequence, we estimate that ~95% of all cowpea genes would be tagged by 1x raw sequence coverage of cowpea genespace. To achieve 1x coverage of the cowpea genespace, approximately 252,000 sequences (of 600 bp reads and a 151 Mb genespace) would be necessary. As part of the pilot study, Mike and colleagues have generated approximately 2000 new genomic sequences. Within the methylation filtered library, 92% of the gene sequences generated matched genes of known or unknown function after BLAST analysis. Mike's lab is in the process of further annotating these clones. The studies demonstrate the power of methylation filtering as a rapid means for gene discovery in cowpea that could be subsequently used for construction of a physical map and marker development. They also show that the relative small genome size of cowpea make it a valuable potential research tool for all legumes.

\*\*\*\*\*

## **Reports**

## **Cowpea Processing Study in Senegal**

With funding from the Bean/Cowpea CRSP, researchers from the Senegalese Agricultural Research Institute (ISRA) and Purdue University collaborated in a pilot study of cowpea processing in May, 2004. ISRA socio-economist, Mbene Faye; Purdue Agricultural Economics, Professor Joan Fulton and Purdue Agricultural Economics PhD student Kathryn Boys, interviewed a wide range of people who use cowpea grain as a raw material, including industrial millers making cowpea and composite flours, women who make akara (cowpea fritters), and restaurateurs. One interesting finding was the number of akara vendors who had switched to making wheat flour “beignet” (like doughnuts, but without the hole) because of the labor demanded by traditional wet milling for akara. This suggests an opportunity for using the technology developed by Bean/Cowpea CRSP food scientists to reduce labor requirements, while maintaining product quality.

\*\*\*\*\*

## **UPDATE on PRONAF**

PRONAF (Projet Niebe pour l’Afrique) is a participatory cowpea technology development and diffusion framework. Its Regional Coordinator is Ousmane Coulibaly, who is with the International Institute of Tropical Agriculture (IITA), Cotonou Benin. Ousmane shares the following report:

PRONAF operates with its partners through a participatory and multidisciplinary research and technology diffusion in the 5 member countries (Benin, Burkina Faso, Mali, Niger and Nigeria) with a strong backstopping from various disciplines from the International Institute of Tropical Agriculture. The core country teams are made up of researchers, extension agents, and NGO representatives. Collaboration and partnership are developed with national research team members, farmers, farmer associations, private sector and IFAD (International Fund for Agricultural Development)-funded rural development projects.

The on-going collaboration between IITA, NARES (National Agricultural Research and Extension Systems), NGOs, IFAD-supported development projects, private sector and farmers’ organizations serves as a model for participatory technology development and diffusion for non-PRONAF countries.

At country level, a multi-disciplinary team has been established to ensure the development, testing and validation of cowpea technologies in various agro-ecological zones.

### **Sustainable Cowpea Technologies Developed and Diffused**

The major improved technologies developed and diffused to farmers include improved varieties, bio-insecticides from plant-based extracts, and storage techniques like solar drying, double and triple bagging developed by Bean/Cowpea CRSP in collaboration with national research systems.

Participatory (farmers and scientists) screening trials have facilitated the identification of the varieties most appreciated by the farmers and include IT 89DE-58-6 and KVx542-119 resistant to Striga; Kvx741-16, Kvx741-16 resistant to aphids in Burkina Faso; CZ11-94-5C and CZ11-94-32 are drought- and Striga-resistant in Mali; IAR-1696 can yield up to 1655kg/ha in Northern Nigeria while HTR and TN 27-80 are among the major pest resistant varieties in Niger.

### **Farmers' Empowerment through Farmers' Field Fora (FFF)**

PRONAF makes substantial contribution to farmers and farmers' organizations empowerment using Farmers' field schools (FFS) which have evolved to FFF (Farmer Field Fora). Producers, extension agents, technicians from NGOs have been trained as facilitators to diffuse cowpea technologies and process of empowerment and participatory technology diffusion.. The basic and driving principle of FFF is learning by doing. Participating farmers conduct their own field studies and learn about the major pests and their predators. Besides the development and dissemination of technologies, PRONAF strengthens technical and managerial capacity of farmers for optimal insecticide spray schedule. PRONAF has trained through FFF about 3000 farmers and 185 extension agents, NGOs, research and development projects over the last four years.

Since 2003, PRONAF has started some dialogue with policy makers and other investors for an effective functioning of the input and output markets and the linkages between research and development with the involvement of private sector for seed supply and diversified cowpea products.

### **Factors Affecting the Adoption of Cowpea Technology**

Results from adoption surveys in the five member countries show that the main factors affecting the choice of a variety are: high yielding and early maturing (drought escape), especially in semi-arid agro-ecological zones where drought occurred at the beginning and end of the rainy season. The major constraints to a wide diffusion of improved cowpea varieties are: poor availability and access to good quality seed, and high costs of imported inputs like pesticides and fertilizers. The use of neem and papaya extracts by the farmers is constrained by labor and water availability. Large cowpea fields require a substantial amount of labor for hand pounding of leaves and water to produce botanical extracts. Cost-benefit analysis carried-out by PRONAF show that cowpea-based systems are profitable only if they include an improved technology like high yielding variety (Aïtchedji, 2001). Access to capital becomes important in adopting improved technologies calling for an appropriate supply of cost effective credit schemes.

### **The Way Forward**

Like the Bean/Cowpea CRSP, PRONAF makes a substantial contribution to developing and disseminating sustainable improved cowpea technologies in West and Central Africa. These efforts lead to food security, poverty reduction and environmental protection. More efforts are required for NARES capacity building and farmers' empowerment for a wider diffusion of technology and substantial impact on target beneficiaries. A key challenge to be addressed is the improvement in effectiveness and efficiency of cowpea technology dissemination and mainly of Farmer Field Fora compared to other extension alternatives. Strengthening the participatory development and diffusion of cowpea technologies and building the capacity at all levels from national scientists to community and farmers organizations is the way forward. A special focus

will be on equity and women and women groups' access to cowpea technologies and incomes. PRONAF will have also to foster opportunities for access to input and diversified cowpea products by linking farmers to and output markets with the involvement of the private sector.

**Acknowledgements:** This work was supported by grants from the International Fund for Agricultural Development (IFAD) and Swiss Agency for Development and Cooperation (SDC). Thanks to all coordinators of PRONAF countries for their collaboration. **Contact:** [u.coulibaly@cgiar.org](mailto:u.coulibaly@cgiar.org)

\*\*\*\*\*

## Status of Ongoing Work on Cowpea Transformation

### An Update on Cowpea Transformation

**Carlos Popelka and TJ Higgins**

**CSIRO Plant Industry, Canberra, Australia**

Our work is supported by The Rockefeller Foundation and we are focused on the development of a genetic transformation system for cowpea, with the longer-term goal of introducing insect resistance genes into this legume. Our road plan is to:

1. Establish a reliable regeneration protocol based on genotype screening and optimization of tissue culture media
2. Transfer DNA into regenerable cowpea tissue (ideally via *Agrobacterium tumefaciens*)
3. Establish a stringent selection protocol to identify transgenic cowpea tissue (expressing a selectable marker gene)
4. Regenerate transgenic cowpea plants
5. Demonstrate transmission and expression of the transgene in the following generation.

We have identified three genotypes with excellent capacity for multiple shoot formation, which we consider to be a basic requirement for transformation experiments. After analyzing a wide range of tissue culture media and conditions, MS medium supplemented with benzylaminopurine (BAP) showed the highest frequency of multiple shoot formation and is a good platform for transformation experiments.

Different procedures to enhance infection frequency were tested and transient GUS expression was detected in cotyledonary nodes as well as apical meristems. Stable transformation was inferred when a small proportion of shoots survived selection on phosphinotricin (PPT) over more than six weeks. PPT tolerant multiple shoots were transferred every two weeks to fresh selection medium after removing callus and other not regenerating tissues. Although these shoots did not develop robust roots we have successfully grafted in vitro-derived shoots onto rootstocks from germinated seedlings. Currently, over 50 grafted shoots are in the glasshouse and in the process of flower and seed development.

In summary, our current tissue culture and transformation process requires about five months. A further six months is needed for the plants to mature and produce seed. At present, we obtain about one transformed shoot per 1000 explants.

## **Progress Towards Cowpea Transformation.**

**Jamie Youness and Richard F. Allison, Department of Plant Biology,  
Michigan State University, East Lansing, MI 48824 [allison@msu.edu](mailto:allison@msu.edu)**

Electrotransformation is a novel method of plant transformation that appears capable of introducing foreign DNA into large seeded legumes including cowpeas. The method relies on an electrical current which delivers DNA to seedlings. Ideally, selected DNA enters young cowpea cells and is incorporated into a chromosome providing for stable transformation of that cell. To ensure that the transforming DNA is inherited by the progeny of the seedling, the cell incorporating the foreign DNA must be a cell that is destined for meiosis. Since the electrotransformation process is unable to target such cells specifically, routine inheritable transformation will rely on the ability to transform numerous cells within the target seedling. Our goal is to establish a set of electrotransformation conditions that maximize transformation events within a seedling, thus increasing the chance of transforming a cell destined for meiosis.

Since electrotransformation relies on neither tissue culture selection nor antibiotic resistance, recognition of transformed cells requires a marker gene that provides for their identification. To date, we have relied on the  $\beta$ -glucuronidase (GUS) gene as a marker. One series of experiments testing a unique set of transformation parameters on 20 cowpea seedlings yielded nine plants with at least one leaf sector demonstrating GUS expression. In one instance, one leaf had four distinct GUS positive sectors. This result suggests that electrotransformation resulted in four independent transformation events within that leaf's primordial cells and each transformed cell was responsible for a sector of the adult leaf thus providing a mosaic pattern of GUS expression in that leaf.

Successful PCR amplification of the GUS gene from plants demonstrating GUS activity complemented the observed GUS phenotype. Total leaf DNA from these plants was cut with a restriction enzyme, distributed within an agarose gel and Southern blotted. A  $P^{32}$  labeled probe specific for the GUS gene detected the presence of the marker gene in these transformants and positive controls. These data indicate that electrotransformation introduced foreign DNA into cowpea cells where it became stably integrated into chromosomes. With this basal level of transformation in hand, current experiments focus on increasing transformation efficiency thus increasing the likelihood of transforming cells destined to contribute to the plant's progeny.

\*\*\*\*\*

## **West Africa Cowpea Economics Group**

Researchers from Purdue University, the International Institute for Tropical Agriculture (IITA), the National Agronomic Research Institute of Niger (INRAN) and Aboubakar Talewa Balewa University (ATBU), Bauchi, Nigeria are collaborating on studies of farm level and consumer response to the proposed Bt cowpea. Saket Kushwaha and Shehu Musa, ATBU, and Joan Fulton and Jess Lowenberg-DeBoer Purdue presented a paper at the American Agricultural Economics Association (AAEA) annual meeting in Denver, CO, in July on the consumer response to the idea of genetically modified (GM) crops. In the northern Nigerian cities surveyed, almost 90% participants were aware of GM crops and about two thirds of them disapproved. The most



commonly articulated objection was that GM crops are unethical. This survey makes clear that regardless of the political support for GM in Nigeria, consumer education and information will be needed before a GM cowpea is accepted by most Nigerians. With funding from the Bean/Cowpea CRSP, Purdue student Sika Gbegbelebe will be collecting data on farms in Niger, Benin and Nigeria to estimate the potential economic benefit of a Bt cowpea in areas where *Maruca vitrata* (legume pod borer) is a pest.

\*\*\*\*\*

## Other Items:

**Idah Sithole-Niang** participated in several meetings and initiatives mentioned below. **IITA**, under the leadership of Dr. Jim Whyte, has funding from the USAID Regional Centre for Southern Africa (RCSA) located in Botswana to fund key activities under their “Improving Rural Livelihoods Project”. The biotechnology component is coordinated by Dr. Morag Ferguson of the Plant Biodiversity and Genomics Facility, IITA, Nairobi, Kenya. The RCSA and USAID bilateral Missions in Southern Africa have agreed to pool their resources into a single fund at RCSA to help support a few biotechnology research and biosafety policy development activities in the region. To this end IITA and USAID convened a meeting April, 5-7, 2004 in Lilongwe, Malawi to help identify key priority areas for research. Background materials were prepared by key researchers in Angola, Mozambique, Tanzania, Malawi, Zambia and Zimbabwe, which were then used to develop the priority setting process. The inventory on key crops is still under development, and Idah has assisted with providing background material on cowpea. Previously IITA had also convened another consultative meeting at the same venue to identify key intervention areas, and cowpea was identified as one of crops in the legume module. The follow-up meeting to the one held in Malawi (April 5-7) was held in Zambia July 20-24. This time other key resource persons (South Africa, the AATF and ABSPII) and key stakeholders from the participating countries were also invited. The main output was a synthesis and prioritization of the 17 research themes into 5 broad areas that could be developed further for funding, and the lead countries are shown in brackets:

- Breeding for maize streak virus and larger grain borer (Zambia)
- Striga resistance in sorghum (ICRISAT)
- Cassava mosaic and cassava brown streak diseases and improvement (Malawi)
- Insect tolerant vegetables (tomato and cabbage) and (Tanzania)
- Cowpea resistance to viruses (Mozambique)

USAID has awarded Program for Biosafety Programs (PBS) US\$ 14.8 m for five years to assist developing countries enhance their biosafety policy, research and capacity. It is run by a consortium of partners who, in collaboration with regional and national partners, will:

- Provide information for informed decision making
- in-country collaboration and technical assistance for policy formulation
- improved national policies through regional dialogue and policy analysis
- assist with outreach and communication strategies.

The PBS, through the Biotechnology and Biodiversity Interface (BBI) program, a competitive grants program has devoted half of its budget, US\$ 7.5 m, to research in areas such as gene flow and impact on biodiversity. Funding for these projects was to begin in May, 2004. This is an area where cowpea research related to the development and deployment of transgenic cowpea could be funded. A newsletter, Bio Bulletin published in collaboration with AfricaBio and the FAO sub-regional office for Eastern and Southern Africa (SAFR) will be available shortly. Idah is PBS coordinator for Southern Africa.

\*\*\*\*\*

**NGICA Website:** We are working steadily on putting up an NGICA web-site; hopefully it will be ready to put up in August. The website will provide easy access to (1) NGICA documents (2) information about cowpeas (3) announcements of relevant meetings (4) trip and meeting reports (5) a bulletin board of general interest items; (6) limited access bulletin boards for specialty groups; (7) public progress reports on NGICA projects (8) and recommended cowpea-relevant websites, and (9) more.

Appendix 1: Needs and Opportunities for a formalized NGICA

The following statement was drafted by Larry Murdock with input from numerous NGICAn's. Readers should feel free to comment. The statement will undoubtedly evolve and improve as momentum is gathered toward formalizing NGICA.

\*\*\*\*\*

## **IDEAS for DISCUSSION**

One of the recommendations of the task force dealing with project management issues at the Accra Stakeholders meeting was that NGICA work toward becoming a formal, legal entity. This would enable NGICA – as an organization – to receive and disburse funding, have formal, legal status and recognition, and would in general call additional attention to cowpea and the efforts to improve production and utilization. Several people contributed to the following DRAFT concept note, which is presented here for information and discussion. Your editors will keep NGICANs informed as this develops – please feel free to share your thoughts about the process. If you have some ideas about what a formal NGICA ought to do, how it might be structured, etc., please let Idah or Larry know.

### **Towards an Institutional Innovation to Benefit Africans through Cowpea (DRAFT/July 14, 2004)**

Cowpea is an indigenous crop of sub-Saharan Africa. It is grown by millions of low resource farmers in semi-arid zones and serves as a quality protein food for as many as 200 million rural and urban consumers. Despite decades of research, cowpea productivity is sharply lower than it should be, mostly because of biotic constraints that have not yielded to conventional crop improvement through plant breeding. The tools of biotechnology offer a solution. However, there are barriers to mobilizing biotechnology to improve cowpea. First, conventional

institutions – developed in other eras and designed on simpler models, are insufficient for the task. Indeed, institutional development to foster biotechnology in Africa has already begun; for example, the African Agriculture Technology Foundation was recently formed to facilitate access to intellectual property now in the hands of private-sector and public institutions. A second barrier to progress relates to project design, leadership and management. New players who can contribute to crop development, namely private-sector scientists with experience in developing and applying the new technology, and academic scientists who helped create the tools that are the bases of the biotechnology industry – people and institutions not traditionally involved in African crop improvement, must become more heavily engaged. A way needs to be found to identify, engage and link these new players and their experience with the more traditional participants in crop development. In the case of cowpea – the challenge is to create an institutional mechanism that will provide a coordinated and comprehensive arrangement for project leadership and implementation.

**The Challenge: There is a need for a novel institution to lead and coordinate cowpea productivity enhancement and market development through technological and policy interventions.**

An informal association of cowpea stakeholders, the Network for the Genetic Improvement of Cowpea for Africa (NGICA), has already been active for more than three years and may serve as a model. NGICA has helped to link the new tools of biotechnology with traditional tools and approaches of cowpea improvement and has helped provide a framework for engaging the cowpea community and mobilize human and financial resources to sustain that effort.

NGICA was formed in early 2001 as an informal organization composed of volunteers who believe that there are new opportunities for cowpea to: (i) increase the food supply and so provide better nutrition for the people of Africa; (ii) increase incomes for low-resource farmers, and; (iii) stimulate cowpea marketing, trade and utilization in the sub-continent. In NGICA, a well-trained and dedicated community of experts in cowpea has coalesced to exploit the advances in science and technology to realize the great promise that cowpea holds for Africa. Unfortunately, this informal community of experts has received inadequate attention and investment over the years. One of the unique accomplishments of NGICA has been the creation of an intellectual framework for a comprehensive approach to improving this crop. It has helped promote the crop with donors, scientists and administrators, identified research and development needs, as well as engaged the stakeholder community. Recently it has entered into a partnership with the African Agriculture Technology Foundation (AATF) to initiate a project for increasing cowpea productivity and utilization in Africa.

The limitations of a voluntary/informal association like NGICA are that it (1) must rely on the donation of time and effort of individual stakeholders, (2) depends entirely upon resources that must be obtained ad hoc, and (3) has no official status so that it cannot receive or disburse funds as an organization, nor can it enter into legal agreements. These limitations constrain efforts to effectively compete for the technical, intellectual and economic resources necessary to produce and make available to Africans the very technologies that could rapidly improve their livelihoods.

A formalized NGICA (through whatever institutional arrangement) would:

- Continue to create and implement a comprehensive strategy for increased cowpea production and utilization in Africa, taking into account the potentials for economic, nutritional and social impacts;
- Determine whether an “Open Source” model such as the current but informal NGICA, a business model, or another model (e.g., existing institutions) is appropriate;
- Serve as an information resource and advocate for cowpea to the general public, the media, growers, governments, donors, extension groups, public and private research organizations, and the scientific community;
- Emphasize the tools of biotechnology (marker-assisted selection, genetic transformation) in the context of traditional crop improvement approaches and in the larger context of the cowpea sub-sector;
- Work with other stakeholders (IITA, Bean/Cowpea CRSP, National Programs scientists, NGO’s), as advocates to realize the benefits of cowpea by African producers, consumers, and agribusiness organizations, the general public, the media, governments, donors, extension groups, public and private research organizations, and the scientific community;
- Identify and articulate research and development needs and opportunities;
- Assist scientists in obtaining funding for research and development projects;
- Contribute, through training, to human and institutional capacity building;
- Link participants in the cowpea sub-sector (producers, traders, retailers, processors) into a commodity group;
- Foster the creation of African private-sector enterprises related to cowpea;
- Participate in knowledge-sharing activities;
- Work with public institutions such as AATF to acquire physical and intellectual property from private sector technology/biotechnology companies;
- NGICA would work with AATF as well as other partners, but pursue cowpea development activities over and above its relationship to AATF or other partners.

**Possible Structure of a Formalized NGICA:** A corporate NGICA (or equivalent entity) would be led by a Director, an individual with administrative talent, a vision of the future of cowpea in sub-Saharan Africa, and the skills and energy necessary to lead the cowpea community to achieve the goals set out above. The Director would be paid a competitive international salary, with a secretary, vehicle, and travel and project development funds for pursuing NGICA goals. NGICA headquarters would be housed in association with an existing regional project or institution such as CORAF, FARA, or IITA, which would provide infrastructure for this small, independent, but linked activity. Budget is estimated to be USD \$350,000/annum with an initial 3-year commitment by donors. The NGICA office would work with the cowpea stakeholder community, play an appropriate advocacy role for cowpea in the media and at all appropriate fora, foster linkages with stakeholders, the press and general public, AATF, IITA and the CRSPs. The office would also engage in strategic planning, be responsible for resource mobilization, and work with the private sector as partners if appropriate. It would promote capacity building in African institutions, collaborate with commodity groups, provide market information, and liaise with NGO’s and National Programs. NGICA would be governed by a Board of Directors comprised of leading senior experts in agricultural science, including

scientists who have worked extensively on cowpeas, scientific administration, and project management.

**Steps toward Implementation:**

1. With donor funds (est. \$15,000) contract two experts for a consultation, including travel to meet stakeholders, to review all elements of the formalization of an institutionalized NGICA-like business model; to set the boundary principles that will guide the operations of a formalized NGICA (or equivalent entity); and to develop a project concept note for the formalization process.
2. Mobilize donor financing for an initial three years of the new entity.
3. Initiate project activities.