

## High Yield Programs

The intent of this summary is to disclose and inform interested parties about already existing programs that increase the agricultural crop yield by investing in farmer productivity, market access, science and technology, and policy. Each of these categories are broken into further sections to cover aspects needed to improve the yield of crops. The farmer productivity section includes: seeds, soil health, irrigation and water management, education and training of farmers and scientists, and fertilizers. Simply increasing yield in the field will not have the desired impact if the crop is unable to go to market or there is no market. Thus, access to a market is essential and this category includes infrastructure, communication, linking to new and existing markets to secure demand, and making market-pricing information available. An additional way to increase crop yield is to continue developing disease and weed resistant, high yielding crops. The science and technology category includes crop improvement and management specifically in 'orphan crops'<sup>1</sup>. This report analyzes 10 pre-existing programs, including:

- AATF- African Agriculture Technology Foundation
- ACCI- African Center for Crop Improvement
- AGRA- Alliance for Green Revolution in Africa\*\*
  - *ASIF- African Seed Investment Fund*
  - *PASS- Program for African Seed Systems*
- CAADP- Comprehensive Africa Agriculture Development Program
- CGIAR- Consultative Group on International Agriculture Research\*\*
  - *CMMYT- International Maize & Wheat Improvement Center*
  - *ICRISAT- International Crop Research Institute for the Semi-Arid Tropics*
  - *IFPRI- International Food Policy Research Institute*
- IDE- International Development Enterprises
- IIED- International Institute for Environment and Development
- IFAD- International Fund for Agricultural Development
- NARI- National Agriculture Research Organization
- WACCI- West Africa Center for Crop Improvement

An overview of each program will include: a summary, focus area, funding and quantifiable data of yield increase. The information in the overviews are from the programs website, unless stated.

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<sup>1</sup> A major limitation to plant breeding in sub-Saharan Africa is that most of the crops in the region such as sorghum, millet, cassava, yam, plantain, cocoyam, taro, bambara groundnut and cowpea are of little or no importance to the researchers in developed world and have been research-neglected (so called "orphan crops")\* WACCI- <http://wacci.edu.gh/background.html>

## **History of Green Revolution:**

From the 1940s to the 1970s, nations, funders and scientists tried to increase the crop yields of farmers in the developing worlds of Latin America and Asia. The particular focus was on increasing the yields of two staple crops: rice and wheat. The Green Revolution succeeded in saving hundreds of millions of lives, some say billions<sup>2</sup>, but not without some negative consequences, including environmental damage. Today a new revolution is needed, but this time the stakes are higher. Higher yields are required to feed countless millions, better market access is necessary, while improvements in science and technology need be continual, all the while this effort cannot have adverse effects on the surrounding environment. All this is necessary to help smallholder farmers grow most of the poorer continent's food. These smallholder farmers need the resources of better seeds, soil, and government support to increase their current yield of one-quarter the global average.

## **AATF- African Agriculture Technology Foundation**

**Summary:** The African Agriculture Technology Foundation is a not-for-profit organization designed to facilitate and promote public/private partnerships for the access and delivery of appropriate agricultural technologies for use by resource-poor smallholder farmers in Sub-Saharan Africa

### **Focus Areas:** Seed & Crop Improvement

- Disease resistant and water efficient varieties of maize
- Higher yielding Cowpeas- legume (nitrogen fixing)
- Bananas and plantain bacterial wilt protection
- Sorghum nutrient improvement

**Funding:** AATF's main funding partners are the Bill & Melinda Gates Foundation, The Rockefeller Foundation, the Howard G. Buffett Foundation, the UK's Department for International Development (DFID) and The US Agency for International Development (USAID).

### **Results: Potential**

- Creating maize that is resistant to *Striga*, which infests as much as 40 million hectares of smallholder farmland in the region and causes yield losses ranging from 20–80%.
- Cowpeas are considered the most important food grain legume in the dry savannas of tropical Africa, where it is grown on more than 12.5 million hectares of land and consumed by nearly

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<sup>2</sup> The phrase "over a billion lives saved" is often cited by others in reference to Norman Borlaug's work in the Green Revolution. The source of this number is Gregg Easterbrook's 1997 article "Forgotten Benefactor of Humanity" The article states that the "form of agriculture that Borlaug preaches may have prevented a billion deaths." <http://www.theatlantic.com/issues/97jan/borlaug/borlaug.htm>

200 million people. The pod borer infestations cause yield losses of between 70–80%. Thus research in developing a resistant yield improved cowpea is necessary.

- Bananas and plantains are an important food source for over 100 million people in Sub-Saharan Africa. East Africa produces 16.4 million metric tons per year – about 20% of the world output. An outbreak of banana bacterial wilt caused economic loss of US\$ 200 million in Uganda alone. Bacterial wilt resistant bananas are also a research focus.
- Maize is the most widely grown staple crop in Africa – more than 300 million Africans depend on it as their main food source – and it is severely affected by frequent drought.

**Website:** <http://www.aatf-africa.org/>

### **ACCI- African Center for Crop Improvement**

**Summary:** The ACCI aims to train African plant breeders in Eastern and Southern Africa, on African crops, to breed better crops using conventional and molecular breeding tools. The focus is on the breeding of African and African grown Crops (cereals, roots and tubers and pulses) for increased drought tolerance and improved food security for the poor in Africa.

#### **Focus Area: Education and Training :**

##### **Crop Focus**

- Cereals: sorghum, pearl millet, finger millet, rice and maize.
- Roots: Cassava, sweet potato.
- Pulses: dry beans, cowpea, pigeon pea, groundnuts, soybean.
- Durum wheat, barley and teff

##### **Country Focus**

ACCI students are drawn from African countries where their research can be expected to lead to impact: Ethiopia, Kenya, Malawi, Mozambique, Rwanda, Tanzania, Uganda and Zambia.

##### **Funding:**

In Phase I, the ACCI was funded by the Rockefeller foundation. In Phase II, the funds come from the PASS- Program for Africa's Seed Systems program in AGRA-Alliance for a Green Revolution in Africa

##### **Results:**

19 PhD graduates and 42 PhD students in the program.

**Website:** <http://www.acci.org.za/main.asp?nav=13>

## **AGRA- Alliance for Green Revolution in Africa**

**Summary:** AGRA's partnerships and programs in four integrated areas: seeds, soil health, markets and policies. This work has aimed to generate change across the agricultural system and ensure that smallholder farmers have what they need to succeed, and to create a food secure and prosperous Africa.

**Focus Areas:** Seed systems, soil health, market access, policy, extension services, water management education & training of plant breeders

**Funding:** AGRA's main funding partners are the Bill & Melinda Gates Foundation (\$264.6 million), The Rockefeller Foundation, and the UK's Department for International Development (DFID).

**Partnerships:** A number of additional partners have joined to launch complementary initiatives. The Consultative Group to Assist the Poor (CGAP), IFAD, and The Netherlands Ministry of Foreign Affairs (NMFA) joined with AGRA to launch the African Enterprise Challenge Fund (AECF). JICA is a strategic partner with AGRA on the Coalition for African Rice Development (CARD). Each of these alliances has its own goals and focus, whether that is doubling the productivity of rice farming (CARD), investing in private companies committed to improving rural welfare (AECF), or transforming smallholder agriculture in targeted breadbasket areas. All of these partnerships work toward achieving an African Green Revolution that puts smallholder farmers first, attains gender equity, and is economically and environmentally sustainable.

### **Specific Programs:** *PASS- Program for Africa's Seed Systems*

PASS includes the following five projects which have a total cost of \$150 million over five years, of which the Rockefeller contribution will be \$50 million and the BMGF contribution is \$100 million.

1. **The Fund for the Improvement and Adoption of African Crops (FIAAC)** funds crop breeding in Africa to improve African crop varieties and promote their distribution and adoption by small holder farmers. This grant should result in the development of 200 new improved crop varieties in five years. Total project cost: \$43 million, of which Rockefeller contribution will be \$14.3 million.
2. **Education for African Crop Improvement** provides training for the new generation of crop breeders and agricultural scientists upon which the seed system depends for growth and productivity. This grant should result in an additional 170 M.Sc. and 50 Ph.D. plant scientists trained and productively employed in African agricultural development. Total project cost: \$20 million, of which Rockefeller contribution will be \$6.7 million.

3. **The Seed Production for Africa Initiative** will ensure that improved crop varieties are produced and distributed through private and public channels (including seed companies, public community seed systems and public extension) so that farmers can adopt these varieties. In five years, this grant should result in improved seed varieties distributed through SEPA projects planted on 1.3 million hectares with retail value of \$58 million, an increase of 13% in the supply of improved seed. Total project cost: \$24 million, of which Rockefeller contribution will be \$8 million.
4. **The Agro-Dealer Development Program** provides training, capital and credit to establish small agro-dealers who are a primary conduit of seeds, fertilizers, chemicals and knowledge to smallholder farmers to increase their productivity and incomes. In five years, this grant should result in 10,000 highly functioning agro-dealers in order to support a significant increase in the adoption of improved crop varieties. Total project cost: \$37 million, of which Rockefeller contribution will be \$12.3 million.
5. **PASS General Operating and Monitoring and Evaluation.** This division will oversee sub-granting and implementation of all PASS activities, carry out advocacy and financial management activities, and conduct monitoring and evaluation of PASS projects. Total project cost: \$26 million (including \$15 million for monitoring and evaluation). Rockefeller contribution will be \$8.7 million, as well as significant in-kind contributions, to be determined as implementation plans are completed.

### Results: Yield improvements from PASS programs

#### Seed & Fertilizer Improvement<sup>3</sup>

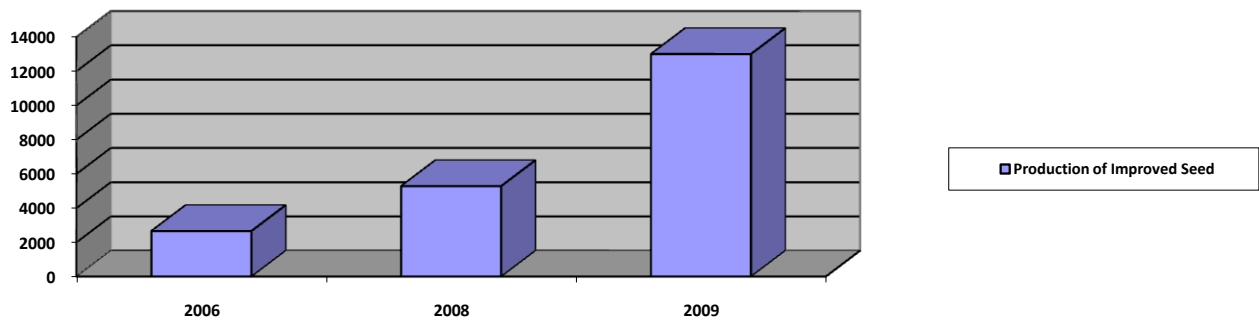
<i>Kenya: Crop Type</i>	Current farming practices	Improved seeds & fertilizer	<i>% Yield Increase</i>
<i>Finger Millet</i>	500-700 kilograms per hectare	2,500-3,000 kilograms per hectare	<b>360%</b>
<i>Beans</i>	400 kilograms per hectare	1,500-2,500 kilograms per hectare	<b>400%</b>

#### Agrodealer Improvement

<i>Crop Production in relation to Agrodealer</i>	Kenya-Maize Production in area served by AG.D	Uganda-Bean production in area served by AG.D	<i>Kenya-Distance Traveled to find inputs (agrodealer)</i>
<i>Served by Agrodealer 2004</i>	<b>2.6</b> metric tons per hectare	<b>1</b> ton per acre	<b>17 km</b>
<i>Served by Agrodealer 2007</i>	<b>5.6</b> metric tons per hectare	<b>2.5</b> tons per acre	<b>4 km</b>
<i>% Yield Increase</i>	<b>115%</b>	<b>150%</b>	

<sup>3</sup> <http://www.gatesfoundation.org/agriculturaldevelopment/Documents/good-seeds-better-lives-gates-foundation-pass-agra.pdf> pg 2,5,6,7

AGRA's support has enhanced and improved the production of quality seed. <sup>4</sup>



**Results:** AGRA has accomplished many accolades in its short life of existence. A full 29 page report can be viewed in PDF format from this specific website.

<http://www.agra-alliance.org/section/about/earlyaccomplishments>

#### *ASIF- African Seed Investment Fund*

AGRA & AAC (African Agriculture Capital) invested an initial \$12 million into ASIF to fund at least 20 small-and medium-size seed companies in Southern and Eastern Africa. ASIF is infusing equity and expertise into an industry that has languished for decades, and paving the way for raising the productivity

<http://www.agra-alliance.org/content/news/detail/920>

#### **CAADP- Comprehensive Africa Agriculture Development Program**

**Summary:** CAADP is the agricultural program of the New Partnership for Africa's Development (NEPAD), which in turn is a program of the African Union (AU). CAADP focuses on improving food security, nutrition, and increasing incomes in Africa's largely farming based economies.

**Focus Areas:** CAADP's work falls under 4 pillars

- Land & water management- extend the area under sustainable land management and reliable water control systems
- Market Access- increase access through improved rural infrastructure and other trade-related interventions.
- Food supply - increase food supply and reduce hunger across the region by raising smallholder productivity
- Agricultural research- improve Ag research and systems in order to disseminate appropriate new technologies

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<sup>4</sup> <http://www.agra-alliance.org/section/about/earlyaccomplishments> Pg 9

### Land & water management:

*TerrAfrica* – An initiative has mobilized (US\$1 billion) to address regional constraints and for investing in country programs for sustainable land and water management.

### Market Access:

Improve local infrastructure so that African farmers have better connections to markets, addressing issues including:

- transportation, (road, rail, marine and air freight)
- storage, packaging and handling systems
- retail facilities
- information technology,
- overall supply chains.

### Food Supply Programs:

- **Regional Enhanced Livelihoods for Pastoral Areas (RELPA)**, funded by USAID (\$19.8 million). This Horn of Africa program for enhancing livelihoods of pastoralists across three countries has been launched.
- **Regional Food Security and Risk Management Program for Eastern and Southern Africa (REFORM)**, funded by the European Union (€10 million). This program is mostly capacity building (i.e., skills transfer, technical studies, documentation of best practice, information sharing, policy dialogue, etc.).
- **Making Markets Work for the Poor: Enhancing Food Security and Productivity Growth in Eastern and Southern Africa (MMWP)**, funded by World Bank/DFID-UK (\$3.8 million). This project involves a three-year program of practical analysis, policy outreach, consensus building, and capacity strengthening to promote the goals of national and regional food security, poverty reduction, and agricultural productivity growth.
- **Improved Regional Trade in Food Staples (RTFS)**, total \$5 million, with start-up funding by the World Bank. This program of work aims to assemble spatial evidence on existing regional production and trade in food staples and to develop predictive analytical tools that will enable spatial mapping of the outcomes resulting from common natural and policy shocks.
- **Home-Grown School Feeding (HGSEF)**, funded by the World Food Program and DFID-UK (\$25 million). NEPAD, WFP and the Millennium Hunger Task Force (MHTF) launched a pilot Home-Grown School Feeding and Health Program designed to link school feeding to agricultural development through the purchase and use of locally and domestically produced food.

### Agricultural research:

- **Cassava Transformation in Southern Africa (CATISA)**, total \$2 million, with start up funded by SIDA. The CATISA project aims to analyze and help accelerate cassava commercialization in Southern Africa in order to help improve food security in the region.

The work is to boost agricultural research and ensure that the results are disseminated, is that it ties in strongly with the DFID UK Research Into Use (RIU) Program

**Website:** <http://www.nepad-caadp.net/>

### **CGIAR- Consultative Group on International Agriculture Research**















**Summary:** CGIAR try's to achieve sustainable food security and reduce poverty in developing countries through scientific research and research-related activities in the fields of agriculture, forestry, fisheries, policy, and environment

#### **Focuses:**

- Seed & Crop improvement- producing more and better food through genetic improvement
- Market Access-Promoting opportunities for economic development and through agricultural diversification and high-value commodities and products
- Land & Water Management-Ensuring sustainable management and conservation of water, land and forests.
- Policies- Improving policies and facilitating institutional innovation

#### **Partnerships:**

Collectively the Alliance of CGIAR Centers harness:

- More than 2000 scientists in 100 countries with over US\$500 million invested per year for research for development
- CGIAR's Research Centers : [Africa Rice Center](#)  [Bioversity International](#)  [CIAT - Centro Internacional de Agricultura Tropical](#)  [CIFOR - Center for International Forestry Research](#)  [CIMMYT - Centro Internacional de Mejoramiento de Maiz y Trigo](#)  [CIP - Centro Internacional de la Papa](#)  [ICARDA - International Center for Agricultural Research in the Dry Areas](#)  [ICRISAT - International Crops Research Institute for the Semi-Arid Tropics](#)  [IFPRI - International Food Policy Research Institute](#)  [IITA - International Institute of Tropical Agriculture](#)  [ILRI - International Livestock Research Institute](#)  [IRRI - International Rice Research Institute](#)  [IWMI - International Water Management Institute](#)  [World Agroforestry Centre \(ICRAF\)](#)  [WorldFish Center](#)

**Results:** For every \$1 invested in CGIAR research, \$9 worth of additional food is produced in developing countries, where it is needed most. The evidence is clear: agricultural growth alleviates poverty and hunger.

**Website:** <http://www.cgiar.org/index.html>

*CMMYT (Centro Internacional de Mejoramiento de Maiz y Trigo) - International Maize & Wheat Improvement Center [Daughter of CGIAR]*

**Summary:** CMMYT is a non-profit research and training institution dedicated to both the development of improved varieties of wheat and maize, and introducing improved agricultural practices to farmers.

**Website:** <http://www.cimmyt.org/>

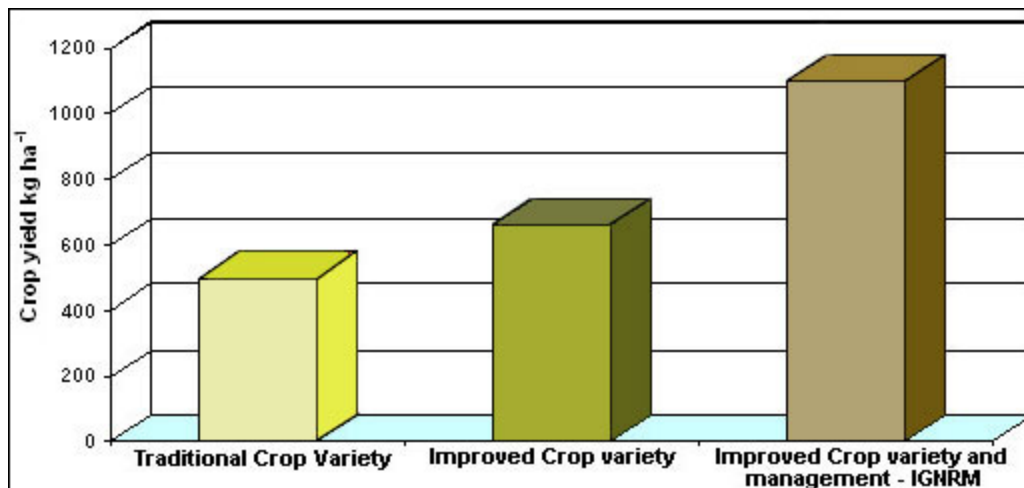
*ICRISAT- International Crop Research Institute for the Semi-Arid Tropics [Daughter of CGIAR]*

**Summary:** ICRISAT is a nonprofit, non-political organization that does innovative agricultural research and capacity building for sustainable development

**Focus:** Crop Research, total crop management and educating /training scientists.

Crops

- Chickpea
- Pigeonpea
- Groundnut
- Pearl millet
- Sorghum
- Small millets



<http://www.icrisat.org/icrisat-impacts.htm> 42 Impact Stories of Crop yield increase projects

**Website:** <http://www.icrisat.org/>

*IRRI - International Rice Research Institute [Daughter of CGIAR]*

**Summary:** IRRI's mission is to reduce poverty and hunger, improve the health of rice farmers and consumers, and ensure that rice production is environmentally sustainable.

**Focus:** Seed and Crop Improvement- Rice

**Website:** <http://beta.irri.org/index.php/Home/Welcome/Frontpage.html>

*IFPRI- International Food Policy Research Institute [Daughter of CGIAR]*

**Summary:** (IFPRI) seeks sustainable solutions for ending hunger and poverty.

**Focus:** Policy & Communication infrastructure

- Policy-Sound and appropriate local, national, and international public policies are essential to achieving sustainable food security and nutritional improvement.
- Education/Research- Research and the dissemination of its results are critical inputs into the process of raising the quality of food policy debate and formulating sound and appropriate policies.

**Website:** <http://www.ifpri.org>

### **IDE- International Development Enterprises**

**Summary:** IDE was formed to help create income opportunities for poor rural households

**Focus:** Irrigation products and water storage techniques

- Water pumps- leg operated
- Water storage bags

**Results:** \*For every dollar that is invested into IDE's global projects, their customers generate an average of \$10 additional household income.

**Website:** [www.ideorg.org/](http://www.ideorg.org/)

### **International Institute for Environmental and Development**

**Summary:** The International Institute for Environment and Development is a global leader in sustainable development. Our mission is to build a fairer, more sustainable world, using evidence, action and influence in partnership with others. As an independent international research organization, we are specialists in linking local to global.

**Focus:**

**Website:** <http://www.iied.org/>

## **IFAD-International Fund for Agriculture Development**

**Summary:** The International Fund for Agricultural Development (IFAD), a specialized agency of the United Nations, was established as an international financial institution. IFAD was established to finance agricultural development projects primarily for food production in the developing countries. IFAD's objectives are to increase their food production, raise their incomes, improve their health, nutrition, education standards and general well-being on a sustainable basis.

**Focus:** Nine major areas are supported: agricultural development, financial services, rural infrastructure, livestock, fisheries, capacity-and institution-building, storage/food-processing/marketing, research/extension/training, and small and medium scale enterprise development

**Funding:** Initial breeding work was supported by the Rockefeller Foundation, and later by the governments of Japan and the United States.

**Website:** <http://www.ifad.org/>

## **NARI- National Agriculture Research Organization**

**Summary:** To enhance the contribution of agricultural research to sustainable agricultural productivity, economic growth, food security and poverty eradication through generation and dissemination of appropriate technologies, knowledge and information

**Focus:** Agricultural Research- Crop Improvement, Soil Health

**Website:** <http://www.naro.go.ug/index.html>

## **West Africa Center for Crop Improvement**

**Summary:** It has been estimated that most of the crops which feed and clothe the people of the region are realizing only 20% of their yield potential. The low yields are due mainly to abiotic (such as unsuitable soils, drought) and biotic (diseases, insect pests and weeds) stresses in areas where fertilizer, chemicals and irrigation are often too costly or unavailable

**Focus:**

Education/Training of Plant Breeders (PhD) - equip plant breeders with the knowledge and skills to develop superior varieties of indigenous crops, using both conventional and modern technologies.

**Website:** <http://www.wacci.edu.gh/>

## Overarching themes from the programs

- Easy access and dispersion of technological advances for crop production, including seed yield and resistance improvements, increasing soil health and water quality methods. As well as educating and training farmers, agrodealers, and plant breeders overall.
- Improving market access opportunities through the development of sustainable market information systems, the provision of adequate market infrastructure and the removal of domestic, regional and international trade barriers.
- Strengthening the infrastructure (such as energy, water, roads and communications) in the areas of greatest industrial potential for crops, so as to improve the competitiveness of emerging agricultural-based industries and to attract industrial investors, both local and foreign into this sector.
- Setting up of funding facilities and financial incentives for crop enterprises development.
- Giving full regard to environmental protection, waste management and the utilization of by-products while taking steps to improve the competitiveness of African industries in the context of globalization.

## Other Programs for investigation

- Department for International Development (DFID)
- Research Into use
- Forum for Agricultural Research in Africa (FARA)
- SURUDE- Foundation for Sustainable Rural Development
- SRI- Sustainable Rice Intensification

## REFERENCES

<http://wacci.edu.gh/background.html> ‘Orphan Crops’

<http://www.theatlantic.com/issues/97jan/borlaug/borlaug.htm> “Billions saved in Green Revolution”

<http://www.gatesfoundation.org/agriculturaldevelopment/Documents/good-seeds-better-lives-gates-foundation-pass-agra.pdf> pg 2,5,6,7 - Statics of Yield Improvements”

<http://www.agra-alliance.org/section/about/earlyaccomplishments> Pg 9 “AGRA accomplishments”