

Funding the Plant Breeding Revolution

Perspective

Landscape and opportunities for the Integrated Breeding Platform

Innovation in plant breeding is imperative to meet the growing demand for food and feed due to global challenges such as population growth and climate change. We need to produce more quantity and higher quality from agricultural production and this is now possible thanks to improved cultivars adapted to local conditions. With proper channels of seed distribution and access to inputs (water and fertilisers), plant breeders are at the forefront of this food revolution, most particularly in the developing world.

Some of the challenges

- Net investments of US\$83 billion a year are needed in agriculture in developing countries to be prepared to feed 9 billion people by 2050 — a 50% increase from what was being invested in 2010. This includes some \$20 billion for crops production.¹
- Between 20 and 40 percent of global crop yields are reduced each year due to plant pests and diseases.²
- Fewer people are living in rural areas and even fewer are farmers. Producing more and better food will largely depend on increasing breeding efficiency, not farming more land.
- Many breeding programmes across the developing world are lagging behind in terms of implementing better practices and tools to deliver genetic gains to smallholder farmers.
- Progress is deferred mainly because of:
 - restricted financial resources and skilled workforce;
 - inadequate or insufficient infrastructure and equipment, such as access to large-scale genotyping facilities;
 - deficient technology for the management and analysis of breeding information;
 - limited access to information, expertise and networks.

Our offer to breeders

The Integrated Breeding Platform (IBP) provides access to the information, tools and services that breeders need to run their breeding programme. Access to IBP products, primarily in **Sub-Saharan Africa and South and South-East Asia**, will enable them to:

Modernise their breeding programmes thanks to:

- more effective and efficient selection, saving them time and money;
- improved data management by moving into the digital era;
- the adoption of best practices and procurement of quality certifications;
- access to service providers (e.g. genotyping laboratories), reducing the need for in-house investment.

Play an impactful role in Research for Development (R4D) by:

- showcasing local competence to secure international funds;
- defining market-driven breeding priorities as central decision makers;
- accessing international networks and sources of expertise;
- providing their own expertise and support in disseminating knowledge to partners.

We cannot wait 10 to 15 years to deliver varieties anymore! Both disciplines of breeding and bio-technology need to go hand in hand if we want a faster generation of high-powered material. The IBP will allow us to federate all our efforts nationally and across the West African sub-region, and thus shorten delays, have more efficient breeding processes and avoid losing money researching things that already exist. We want to see new varieties come out of our laboratories in shorter times, so that African producers may multiply their outputs, and work toward productivities that will let us feed Africa.

— Dr Alioune Fall, General Director, Senegalese Institute of Agricultural Research (ISRA)



A breeding revolution with better methodologies and support

By promoting the sustainable deployment of our products, services and networks at an institutional level, we believe that we can support and enable plant breeders to generate concrete outputs for smallholder farmers. Access to crop information, electronic data capture, advanced analytical methodologies, service laboratories, wider networks, and more educational and professional opportunities should empower breeders to bring about change on their own terms. Key drivers of this revolution are:

Data Management

80% of a scientist's effort is spent discovering, acquiring, documenting, transforming, and integrating data, whereas only 20% of the effort is devoted to more intellectually stimulating pursuits such as analysis, visualisation, and making new discoveries.³

The business **cost of poor quality data may be as high as 15-25% of an organisation's revenue**, and as much as 50% of the typical IT budget may be spent in "information scrap and rework".⁴

Better data quality at the source, and a 15% cost reduction thanks to better performing tools and processes, would considerably boost breeding programmes' efficiency. Reducing the time and resources required for each crop breeding cycle will increase their capacity to deliver more crop varieties to farmers locally.

“It used to take me up to three months before I could analyse the data I had collected in the field. Thanks to electronic data capture, I can now proceed with my analysis on the same day .

— Cyril Diatta, sorghum breeder and research assistant, ISRA, Senegal



Networks and local services

Developing technology is the easy part... making sure that would-be users are supported in taking it up is proven to be the primary success factor for growth and widespread adoption of new platforms:

An astounding **66% of information system projects fail**, are cancelled or a challenged due to failure of most IS/IT interventions to effectively integrate employee adoption issues.⁵

When leaders ensure that frontline staff members feel a sense of ownership, the results show a **70% success rate for transformations**. Furthermore, **60% of the extremely successful change initiatives focus mostly on changing mind-sets**.⁶

A clear success factor is to find efficient and scalable ways to engage employees and to focus on mind-sets and behavior.

“Training will prove very useful for young breeders to help them go digital in starting up their breeding programmes. IBP tools makes the breeding process a shorter one. It helps us become all-round breeders and more efficient in bringing products to end-users, i.e. families and farmers.

— Lilian Njeri Gichuru, maize breeder, Kenya Agricultural Research Institute



Molecular breeding

Phenotypic selection can be greatly enhanced by the use of markers, especially for complex traits easily affected by the environment. Their integration maximizes net value, making for an increasingly attractive economic proposition:

MABC⁷ is estimated to **have saved at least 2-3 years** in the development of the submergence gene for rice in Asia, resulting in significant incremental benefits in the range of **USD 300 to 800 million**⁸

In Nigeria, Ghana and Uganda, marker-assisted breeding is estimated to **have saved at least 4 years** in the breeding cycle for cassava varieties resistant to pests, which will result in incremental net benefits over 25 years in the range of **USD 34 to 800 million**⁹

“What we're seeing is a paradigm shift. Now, the developing-country programmes have the boldness and capacity to do molecular breeding and accurate phenotyping for themselves. We built an image for ourselves in Nigeria and in Africa (...) and other global actors, on seeing our ability to deliver results, are now choosing to invest in us.” — Chiedozi Egesi, molecular plant breeder, National Root Crops Research Institute (NRCRI), Nigeria



Our targeted outcome

Plant breeding programmes in national institutes, CGIAR centres and SMEs using IBP products and services are increasing the rate of genetic gain, productivity and quality in staple food crops for local farmers, contributing to food security and poverty alleviation.



“Seed technology has been shown to be more scalable than agronomy, and it is more readily taken up by farmers than changes in management techniques (...)”¹⁰

Our products and services

Technology

The **Breeding Management System (BMS)** is a suite of interoperable software applications specifically designed for breeders.

Breeding expertise

A **vast network of partners and providers** to access quality and affordable breeding services, including genotyping, pheno-typing, location analysis, climate maps and more.

Breeding resources

The **IBP Portal** provides access to crop databases, query tools, trait dictionaries, diagnostic markers and germplasm resources, as well as to the latest research and publications.

Networks & support

The IBP team provides training material and workshops, technical support and breeding expertise, mainly delivered by **7 IBP Regional Hubs** established at strategic partner institutions across the globe.

Public-private partnerships

Our strong relationship with **Leafnode** and **VNSi** lets us ensure reliability in software and market development, global sustainability beyond public funding, and accountability to stakeholders.

IBP users in numbers

250+

breeders in national programmes routinely using the IBP Breeding Management System (BMS)

5

CGIAR Centres undergoing institutional implementation of IBP tools

17

breeding institutes formally committed to undergo deployment

57

breeding programmes engaged in the adoption of IBP tools

12

SMEs interested after testing the pre-commercial version of the BMS

23

university lecturers using the BMS to teach



Investment portfolio

Investors can contribute and engage with us in a variety of ways. Contact us to see how we can align our approach with your priorities:

Global activities

We are tackling great challenges with what we hope will become a concrete and complete offer. We are invested in accelerating genetic gain and in bringing more coherence, sustainability and impact to plant breeding. Take part in this global effort by supporting our initiative across and beyond its mission.

Product development

We want to put a comprehensive solution in the hands of breeders. Help us keep up with technological advancements, and ensure the continuous, responsive and user-driven perfecting of our tools.

Deployment and local support

It is not enough to distribute free software. We want to ensure reasonable requirements are met in terms of knowledge, infrastructure and resources. Help us provide the tools and conditions that will best serve your existing partners and targeted countries in building a facilitative environment for sustainable adoption.

Genotyping support

Molecular breeding and genomics greatly shorten the time needed to develop new varieties. Help us support the next generation of breeders in using these methods to reach new levels of output.

We can achieve tangible impact at all levels

- Building solid and vibrant communities across and between fields of expertise to provide concrete solutions for a new, sustainable operational model in R4D.
- Fostering optimum crop research data management, breeding programme efficiency and breeding outputs.
- Igniting a crop breeding revolution in developing countries which will increase smallholder capacity and revenue. In time, their compounded effect will have substantially contributed to implementing sustainable food security systems.

¹ On horizon 2050 - billions needed for agriculture, FAO, <http://www.fao.org/news/story/en/item/36107/icode/>

² Plants vital to human diets but face growing risks from pests and diseases, FAO, <http://www.fao.org/news/story/en/item/409158/icode/>

³ Bill Michener, Director of DataOne, as published in "Value of Data Management" on the USGS website - <http://www.usgs.gov/datanagement/why-dm/value.php>

⁴ Larry English, Information Quality Applied: Best Practices for Improving Business Information, Processes and Systems (2009)

⁵ Henry Hornstein, Using a change management approach to implement IT programs, Ivey Business Journal (2008)

⁶ Scott Keller, Mary Meaney, Caroline Pung, Caroline Limet; McKinsey&Company - What successful transformations share: McKinsey Global Survey results (2010) <http://www.mckinsey.com/business-functions/organization/our-insights/what-successful-transformations-share-mckinsey-global-survey-results>

⁷ MABC: Marker-Assisted Backcrossing

⁸ Alpuerto VE, Norton GW, Alwang J, Ismail AM: Economic impact analysis of marker-assisted breeding for tolerance to salinity and phosphorous deficiency in rice. Rev Agr Econ 2009, 31:779-792

⁹ Rudi N, Norton G, Wang J, Asumugha G.: Economic impact analysis of marker-assisted breeding for resistance to pests and postharvest deterioration in cassava. AFJARE Vol 4 No2 June 2010

¹⁰ Dominik Klausner, Vivienne Anthony & Marco Ferroni: Syngenta Foundation for sustainable agriculture — Technology and Science to Meet Future Food Demand <https://www.oecd.org/tad/events/OECD%20Syngenta%20Foundation%20Position%20Paper.pdf>

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Integrated Breeding Platform (IBP)

Plant breeders are at the forefront of the next food revolution, most particularly in developing countries. The Integrated Breeding Platform (IBP) provides the tools and knowledge they need to rise to a new level of breeding innovation. It offers a suite of integrated software solutions (the IBP Breeding Management System); several breeding services such as genotyping; and breeding materials and related information for a broad range of crops, including germplasm, trait dictionaries and predictive markers. Furthermore, plant breeders are empowered through training, funding opportunities, dedicated support and community spaces, making it the most comprehensive source for best practices in plant breeding.

Breeding Management System (BMS)

The IBP Breeding Management System (BMS) is a comprehensive and easy-to-use software suite designed to help breeders conduct their routine activities with more efficiency, so that they may develop improved cultivars faster and at lower cost. It combines information management, data analysis and decision-support tools that accommodate common breeding schemes, from conventional breeding through increasing levels of marker use, providing all the tools they need in just one place.. Download directly from the IBP Portal: www.integratedbreeding.net