

# More and better crops:

## Beyond the science and access to technology

*With hunger still a global problem, solutions to achieve food security are more important than ever. Plant breeding for crop improvement remains one of the answers, but the sector faces many issues that don't involve scientific innovations within breeding itself. Processes and mindsets need to be changed in order to maximise efficiency within the sector, and some organisations are doing just that through network building, knowledge sharing and entrepreneurship.*

Hunger is a pressing global issue, and population growth and urbanisation are generating growing food needs. One of the main challenges that developing countries face is that farm yields are much lower than they could be. Combating this problem are agricultural innovators using, for example, modern technologies to improve crop varieties for less favourable environments, increasing agricultural productivity and ensuring food security. Plant breeding, a process whereby plant characteristics can be selected and combined to make new varieties more suited to particular environments and local needs, is one answer to those looking to improve yields in less economically developed countries.

Since the start of the 21st century, plant breeding technology has seen unprecedented advances, developing crops that thrive in harsh environments. Unfortunately, this research remains unimplemented or poorly applied in many areas. While scientific advancements in breeding are needed, there are challenges within the sector that aren't specifically associated with genetic science. Fixing these could significantly help increase the chances of achieving global food security.

### THE ENGAGEMENT OF ALL ACTORS IS KEY

Many challenges facing the individuals and organisations involved in plant breeding are to do with *knowledge sharing and funding*. Agricultural research

involves a broad range of activities, from research at universities to on-the-ground data collection. However, as a result of the range in research, communication between different parties can become fragmented, which is counter-productive in improving agricultural activity. It would make sense if two groups of researchers working on improving a vegetable so that it needs less water to grow worked together instead of working in isolation or competing for grants, but this does not always happen. Often donors themselves are not aligned on a common strategy, allowing parallel research on comparable subjects, wasting time and brain power.

The best way to solve these problems is to link the right individuals and groups with others working on similar projects. Adequate financial and human resources are required to build and maintain such relationships. Everybody needs to be on the same page, sharing relevant research in a timely manner. Effective partnerships need to be cultivated. This can be implemented via initiatives that bring together people of varied geographical regions and expertise, that are properly funded and supported; but also by creating a sense of community, commitment and ownership among the different players. The governance of such initiatives should include representatives from each partner entity, and the budget be allocated not only on the basis of planned activities, but also in view of allowing local partners to grow. This would avoid the top-down approach

that can be seen in Ag development initiatives, ensuring more sustainability and ownership on the ground.

All of this can be facilitated by 'broker' or catalyst entities; i.e. third-party organisations with the expertise and connections to bring the right people together at the right time to share knowledge and resources and build on a common vision. Initiatives like CGIAR Generation Challenge Programme (GCP), or regional organisations like CORAF in West Africa who accompany various innovation platforms and Centres of Excellence, such as CERAAS in Senegal, have proven to be incredibly potent vectors of impact for better plant breeding in Africa over the last decade.

### CATALYSTS IN PLANT SCIENCE

GCP was one of three ten-year Challenge Programmes set up in 2003 by CGIAR. It focused on the exploitation of crop genetic diversity building on the use of new technologies to impact on crop breeding, ensuring that suitable knowledge is generated and that potential products are tested in target environments. The major strength of GCP was its involvement with a wide range of global actors, including Advanced Research Institutes, CGIAR Centers and National Programmes, allowing it to stream knowledge and resources wherever necessary. Its main focus was enabling the delivery of research outputs; there is still a wide gap in technology development, access and adoption in less-economically

developed countries. The strategy to counter this was to work only on products that responded to needs identified by users themselves; a 'delivery strategy' that aimed to change the mindset of upstream research communities, forcing research proposals to take into account users, constraints to success, and practical solutions to these problems. The programme proved that it is possible to overcome some of the traditional barriers to crop science innovation in the global

*Some of the challenges facing organisations involved in plant breeding can be mitigated by committing concretely to knowledge sharing and technology transfer.*

south, while creating a collaborative network animated by what is known as the "GCP Spirit".

Considering the value and potential for impact in developing countries of modernising breeding in general, and digitising crop information in particular, GCP created the Integrated Breeding Platform (IBP) in 2010 as an online portal to innovations for crop improvement. When GCP closed in 2014 – it was always meant to be a time-bound programme – it was agreed that the IBP would continue on as an independent initiative. And so it did, carrying forward the spirit and philosophy that had made GCP so successful in brokering knowledge and products to build stronger networks.

### GETTING THE DATA FLOWING

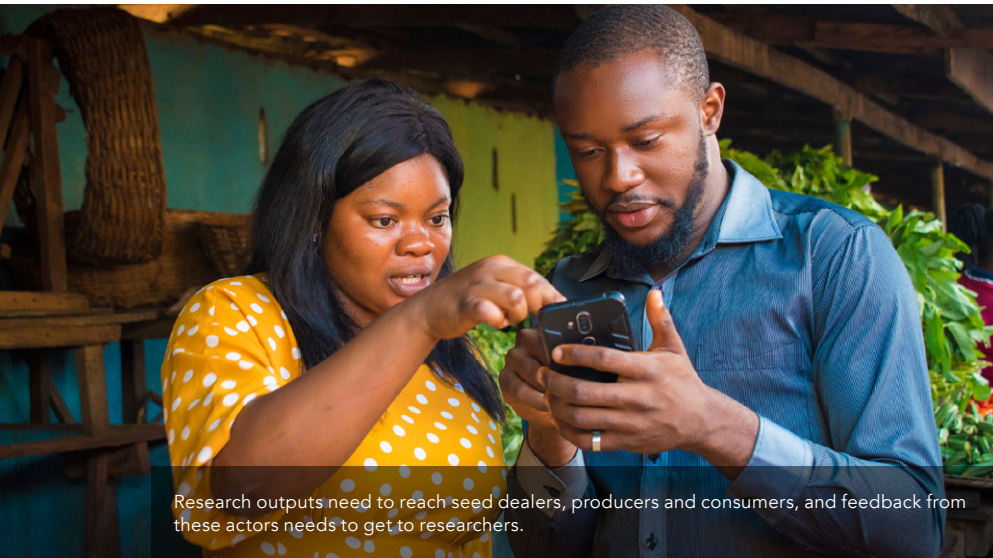
The IBP, now a not-for-profit entity entirely dedicated to helping breeders, especially in developing countries, is an organisation actively tackling the challenges mentioned above, by enabling local networks, knowledge sharing and better data management practices. They also assist institutions by introducing them to data sharing practices through the use of BMS Pro, their very own plant breeding software, with the belief that

breeders can succeed when they have access to the right tools, better data and the mindset to change the ways in which they collaborate with both their partners and their ultimate beneficiaries.

They know first-hand that increasing the efficiency of plant breeding programmes is only possible if the institutional, social and behavioural barriers that prevent change are also removed. Simply said, there is no point in creating ways of sharing information effectively by digitising data management if researchers aren't going to use the system or make their data available. In this case, leveraging early-adopters and champion users of technology has proven to be effective. 'Champions' are defined

Connecting the dots between key players, from the lab to the field, will play a key role in enabling more and better food production by and for farmers.





Research outputs need to reach seed dealers, producers and consumers, and feedback from these actors needs to get to researchers.

as those who have adopted new tools and practices and make themselves available to help their peers get on board. To obtain the full commitment of management in the process, building on the engagement and a willingness to change at all levels of an organisation, is also a must. In short, the challenge of technology transfer in the plant breeding sector is as much about gaining easier access to technology for knowledge sharing and better data management, as it is about creating a culture of change for their actual adoption.

This new generation of African breeders also presents a tremendous opportunity to empower such a cultural change. With an increase in the number of PhDs in crop improvement offered, the level of education and expertise has significantly increased. Although low salaries combined with limited opportunities are major challenges faced by young breeders in this part of the world, this can hopefully be mitigated by increasing access to the technologies they have learned to use in universities, by engaging in international initiatives, and by cultivating more open communication.

As IBP's Dr Ribaut explains: "The modernisation of plant breeding programmes is a change management process. It is not simply a matter of introducing a new technology or tools and expecting institutions to embrace change; a strong commitment from management, and the identification of champions as early adopters, are critical to succeed."



FROM THE GROUND UP

The next challenge is to get better at pushing the products of such collaborations out into the world to reach the hands of farmers and consumers and, what's more, to have them participate directly in the feedback loop of product creation. Institutions need to get better at branching out in all directions: horizontally to work with players in their own field as well as parallel ones (such as government agencies and academia), but also vertically by reaching out to potential partners across the crop value chain (from the lab to the field, and across the seed market). Indeed, an issue facing plant breeders is the fact that many farmers continue to use older and less adapted plant varieties, and therefore struggle to increase yields despite more effective varieties being available. This is mainly due to a lack of engagement with farmers (especially those most marginalised) to understand their needs and limitations in accessing new seeds, knowing what is available, their cost, and where to find them. Farmers are also sometimes attached to using an older variety because they feel they know it well and that it meets their needs so far; they may resist changing for new varieties that promise better yields but might not meet other requirements or preferences (e.g. grain colour or size, ease of harvesting, etc.). So, seed dealers need to be made aware of what new varieties are available, and breeding programmes need to better take into account the demands of farmers, preferences of consumers and their local imperatives. Where we used to invest in research for development, a new



approach of 'research for marketability' is also needed. Plant breeders have to fully come to grips with the fact that the output of their research will eventually have to be inscribed in a context of commercialisation as they make their way to other actors of the crop value chain; which is only possible if farmer feedback and consumer demand are considered from the very start of the plant breeding process. This is not a new concept, and many players are dedicated to tackling the challenges it raises (see *Detail* and *References*), but it needs to be implemented in a more rigorous way, to be better documented and supported with appropriate measures to evaluate success, and facilitated by modern technologies that will increase effectiveness in the selection process. It's time to run breeding programmes in developing countries around a Research for Sustainable Investment approach as the key driver for impact.

EVERYTHING HAS A PRICE

The solutions mentioned in this article – to enable technology adoption and network building, and improve farmer consultation and market linkages – have a price. As does the implementation, maintenance and running of effective technologies among researchers. While everyone can recognise the need for these solutions, unfortunately less are willing to invest in their development, and even less are willing to help pay to access them. It is generally the case that new technologies are provided for free in developing countries while supported by grants. This has little value and is not sustainable: the tools are only supported during the project's lifetime,

often with no clear purpose, and are then quickly discarded because they were never really embedded as part of a strategic shift within the organisation, or driven by a local demand.

Public donors and private funding entities should appreciate that their investment contributes to a long-term vision of impact, and could serve in new avenues of commitment to corporate social responsibility. In this regard, catalyst organisations like the IBP, who combine an entrepreneurial spirit with a proven record in working with vast networks of partners and advanced institutes in developing countries, can create profit and reinvest it back into creating vital solutions; namely thanks to public private partnership as essential partners for change and impact. The IBP for example has a longstanding partnership with VSNi, a UK private company specialised in software for bioscientists, which has allowed it to implement a sustainable income generation strategy that goes beyond relying solely on public support.

Issues that lie in the way of effective plant breeding are not only biological. Connecting the dots between key players, creating and implementing a culture of change within the sector, and bringing in the economics component, are all elements that play a key role in enabling more and better food production in farmers' field. Donors and national programmes and institutes have to realise that knowledge sharing and technology adoption need to be at the heart of their strategic plans to achieve more breeding

Detail

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**Bio**  
The IBP was launched in 2010 by CGIAR Generation Challenge Programme (GCP), as an online portal to innovations for crop improvement. In 2015, it registered as an independent and full-service non-profit organisation, providing tools and expertise to modernise breeding programs, including BMS Pro, its very own plant breeding software.

**Funders and partners**  
Bill & Melinda Gates Foundation;  
International Fund for Agricultural Development (IFAD);  
USAID Feed the Future Peanut Innovation Lab;  
CGIAR Excellence in Breeding Platform;  
European Commission;  
SDC (Switzerland);  
DFID (UK);  
World Bank

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Research Objectives

The IBP enables local networks and knowledge sharing for improved breeding in the developing world.

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efficiency, and thus should be reflected in their budgets accordingly. National governments also sense some urgency in addressing the issues of food security through formal policy frameworks, such as the African Union's Comprehensive Africa Agriculture Development Programme (CAADP). It is crucial that this commitment be translated into concrete national investment plans in support of the Ag sector.

Finally, beneficiaries have to be at the centre of this approach. Whilst GCP and the IBP have shown successful results in the area of plant research, and connections continue

to be made, nothing can move forwards without appropriate financial backing. Actors need to feel engaged and take ownership for things to keep working; there is a constant need to have the right people, at the right place, doing the right things, but the rewards are immeasurable. The possibility of life changing technologies for a lifetime of people.

The IBP works with a vast network of partners in academia and the public and private sectors around the world: visit <https://integratedbreeding.net/1833/our-work>