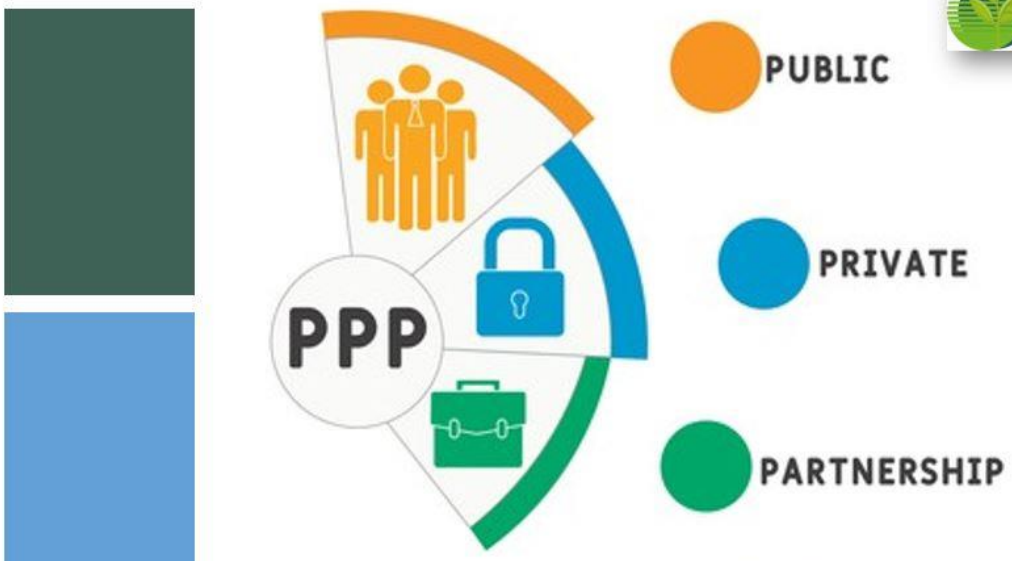

Agri Innovation Post Edition 35
Agri-Biotech News & Views November 2021

The below abstract has been taken from the research work *The role of public-private partnerships in improving global food security* by Stuart J.Smyth, Steven R.Webb, Peter W.B.Phillips and can be accessed from ScienceDirect.

The increase in population globally is not an unknown fact. For many decades, agriculture industry has been successful at increasing crop yields, improving crops to withstand insect and disease by ensuring not to create more farmlands to produce crops. This has been possible only with the investments in R&D over these years. However, public sector funding for such research has been declining in recent years. These declines have partially been balanced with private sector funding rising from US$5 billion in 1990 to over US$15 billion in 2014. Given this trend, agriculture is increasingly witnessing the utilization of public-private partnerships (P3s) to increase food security related research.

The objective of P3s is to share risks, costs and resources in pursuit of shared goals. In agriculture, the shared goal is the improved development of crop varieties that contribute to food security and address nutrition requirements of the population. When P3s are created within the agricultural sector, they help in decreasing the cost for new technology development, improve the technology transfer processes and allows the innovative products into the hands of farmers more quickly. Without the contributions from P3s, R&D would be isolated and efforts would be scaled back that require greater amounts of funding and time to release new products.

There are several examples to show how P3 has advanced and improved the agriculture sector. One of the earliest examples began in 1943 when the Rockefeller Foundation partnered with the government of Mexico to create the International Agriculture Program, led by Normal Borlaug, to improve yields of beans, corn, wheat and potatoes. In 1960, the Ford and Rockefeller Foundations collaborated with the government of the Philippines to create the International Rice Research Institute (IRRI). Together, these two centers introduced higher-yielding, semi-dwarf wheat and rice varieties that drove the Green Revolution, during which perennial food-insecure countries such as Mexico and India gained basic self-sufficiency. These efforts and other research for better varieties of crops have only expanded.

This and many more examples present the fact that P3 collaborations improve global food security and increase R&D investment towards a shared goal that benefits the people at large. Without these partnerships the number of food insecure would be expected to rise over the coming decade. The benefits of past P3s, both in terms of improved food security and rural development confirms the crucial contributions.

We have also covered news around several important developments on agriculture across India, globally and in the area of research. We hope you find the newsletter a good read!

Shivendra Bajaj
Executive Director
Federation of Seed Industry of India-Alliance for Agri Innovation

News from India and Around the World

No scientific basis to GM crops' regulation
(The Hindu Business Line)
It is odd that the GEAC should undermine its own role, by seeking States' go-ahead before giving its approval for field trials. The successful Covid vaccine drive and use of Bt Cotton technology for the economic benefit of the cotton farmers are great examples of using science and technology to solve problems in the health and agriculture fields. However, agri biotechnology continues to get the cold shoulder.

How a desert plant's DNA could help save Arizona's farm crops in a changing climate
(AZ Central)
Drought and heat stress is an urgent problem for Arizona, where farmers are already seeing the effects of significant water shortages. Cushman's approach is just one effort at using biotechnology to fix the problem. Some researchers use DNA analysis to assist with selective breeding, honing in on desirable plant traits and creating better crop varieties in just a fraction of the time of traditional breeding methods. Others use newer technologies like CRISPR, commonly described as a pair of "genetic scissors," to snip out undesirable traits and replace them with better ones without using DNA from another plant and without the controversy associated with GMOs. No matter the methods, many of these plant engineers have a common goal: to maintain or even increase yields with fewer resources. And they want to do it quickly. Studies suggest global crop production will need to more than double by 2050 to meet the needs of a growing population.

USDA, NABDA, others canvass biotech for food security
(Sun News Online)
The Foreign Agricultural Service (FAS) of the US Department of Agriculture (USDA), Nigeria's National Biotechnology Development Agency (NABDA), as well as agriculture and biotech experts have called on African governments to proactively embrace biotechnology in strengthening food and nutrition security on the continent even as they hailed the introduction of biotech cowpea in Nigeria. In his remarks at a workshop, "PBR Cowpea (Beans): A Model Public Private Partnership (PPP) for Food and Nutrition Security in Nigeria," which was held in Abuja, Counsellor for Agricultural Affairs, US Mission Nigeria, Smith Gerald, noted that advances in agricultural biotechnology will help to improve crop yields.

Misinformation Key Factor Hindering Adoption Of Agricultural Biotechnology In Nigeria — NABDA DG
(Nigerian Tribune)

The National Biotechnology Development Agency (NABDA) has lamented that misinformation is one of the key factors that have hindered the adoption of agricultural biotechnology in Nigeria. It said the decades of negative news about biotechnology is responsible for the current scepticism among farmers. Director-General /CEO of NABDA, Professor Abdullahi Mustapha stated this in Abuja during a programme on PBR Cowpea (beans) with the theme: A Model Private Public Partnership (PPP) for Food and Nutrition Security in Africa.

GMO bean benefits Brazil's consumers and smallholder farmers
(GLP)
In a win for smallholder farmers and public sector research, Brazil grocery stores are now selling a genetically modified (GM) bean that is resistant to a destructive plant disease. The bean developed by the government-funded Embrapa can successfully resist the troublesome Bean Golden Mosaic Virus (BGMV), which causes losses estimated at 300,000 tons per year — enough to feed 15 million people.

Opinion: African farmers can benefit from co-existence of agroecology and biotechnology
(Alliance for Science)
In an effort to avoid replicating the mistakes of Western countries, where agroecologists often take hostile and antagonistic stances towards modern biotechnology and the green revolution, African countries are urged to separate themselves from such division for the sake of ending extreme hunger and poverty and meeting the United Nation's 2030 goal of zero hunger. African policymakers and world food system leaders are also urged to implement measures that will help African farmers benefit from both agroecology and modern biotechnology. The situation of food production in Africa is so fragile that African smallholder farmers and their communities can't afford any more divisions in their food systems due to the agroecology movement's antagonism towards modern biotechnology.

GM wheat takes a 136,000-acre step forward
(Western Producer)
Hundreds of farmers in Argentina are growing genetically modified wheat this year. A total of 225 producers planted a drought-tolerant wheat developed by Bioceres Crop Solutions on 135,850 acres of land earlier this summer. Growers are expected to harvest about 200,000 tonnes of the HB4 wheat this growing season. The drought-tolerance trait comes from sunflowers and is also being used in soybeans. Bioceres believes its GM wheat will eventually account for one-third or 6.8 million acres of the country's wheat crop. The company says HB4 wheat delivers yields under drought conditions that are 20 percent better than varieties currently on the market. Cherilyn Jolly-Nagel, director of the Western Canadian Wheat Growers, wishes she had access to that technology on her farm near Mossbank, Sask., this year.

Mexican biologist outlines multiple benefits of crop biotechnology to a skeptical nation
(Reporte Indigo)
According to the molecular biologist Francisco G. Bolívar Zapata, one of the measures that must be taken urgently is the scientific and technical evidence that has been accumulated and used in relation to Genetically Modified Organisms (GMOs) and their multiple benefits, since the information that has been disseminated on transgenics and their products is partial, incomplete and, in some cases, false. "Regrettably false and irresponsible, transgenic organisms and their products continue to be reviled and demonized without scientific support, as if it were a harmful technology," said Bolívar Zapata. He also recalled that, despite the fact that some groups do not accept this scientific truth, another of the benefits of modern biotechnology are drugs is there are currently more than a hundred drugs of transgenic origin in pharmacies. "In Mexico, thanks to these organisms we have medicines against metabolic diseases, human insulin, anticoagulant factors and interferons, which help the immune system. Transgenic organisms are living beings like us humans that are part of nature and that we have to take care of. Cultivars of this type, in addition to controlling pests and weeds, allow increasing the productivity of plants and crops," he emphasized.

Scientists seek Karnataka govt permission to conduct biosafety field trials for new BT crops
(The Print)

The experts have also pointed out that despite the success of Bt Cotton (the experts are now seeking permission for trial for other variants of Bt cotton) in India, no other crop enhanced by biotechnological methods has been released in the country since 2002. Bt cotton is the only genetically modified crop that was approved for commercial cultivation by the Indian government. That was way back in 2002. Since then, there have been many field trials of GM crops, including Bt crops, but commercial cultivation hasn't started for any of them. In their communication to the Karnataka government, the experts have argued that farmers have been demanding technological advancements that will improve crop productivity and resist pest attacks. They have also pointed out that regulatory field trials are an integral part of the research and development process to evaluate the efficacy of newly developed biotech crops.

Mexico promises science-based decision on biotech corn

(Farm Progress)

Following up on a meeting between Mexican Secretary of Agriculture and Rural Development Victor Villalobos and United States Secretary of Agriculture Tom Vilsack the week prior, agricultural leaders from North America convened Oct. 25-27 at the Tri-National Agricultural Accord to continue to discuss shared priorities among the three countries. State delegates from the U.S. and Mexico discussed concerns regarding recent decisions by Mexico's federal government to impose arbitrary prohibitions on agricultural biotechnology and certain pesticides. Delegates reaffirmed their commitment that the regulation, import and use of these critical tools be based on science and established a work group to promote this goal. "When we base our assessment of agricultural tools and technology on the highest quality science, we can ensure the viability of farms and ensure farmers and workers' safety remains uncompromised," says National Association of State Departments of Agriculture President, New York State Commissioner of Agriculture and Markets Richard A. Ball. "The U.S. and Mexican food supply chain is intricately connected as we are each other's largest trading partners. We must work hand-in-hand to encourage the free flow of food across our borders and the continued development of technology that supports global climate resiliency."

Farmers in Bono East ready to grow GM cowpea

(Modern Ghana)

More than 200 Ghanaian farmers have expressed their readiness to plant Bt cowpea, Ghana's first genetically modified food crop as soon as possible. The crop, which was developed by Ghanaian scientists, has been genetically modified (GM) to resist the destructive pod-borer insect pest. As a result, farmers will be able to significantly reduce the use of pesticides and subsequent increases in yield and income. The crop is also expected to support the nation's economic development and food security while improving farmers' livelihoods. Farmers from the Atebubu-Amantin Municipality of the Bono East Region of Ghana very positive about the technology and say it is good for them. They asked the scientists at CSIR to ensure farmers get the pod borer resistant (PBR) cowpea (GM) Cowpea seeds as soon as possible.

Roundup: Kenya says genetically modified cassava set for launch

(China.org)

Kenya and several African countries will soon launch a genetically modified (GM) cassava variety that is resistant to brown streak disease after more than ten years of research, officials have said. Eliud Kireger, Director General, Kenya Agricultural and Livestock Research Organization (KALRO) said research on improved cassava variety has recorded breakthroughs as the crop is now one step closer to commercialization. Kireger said the VIRCA Plus project has already successfully developed cassava with robust and durable resistance to the brown streak disease. "This cassava has been validated over multiple cropping cycles in several locations in the agro-ecological zones in Kenya," Kireger told journalists during a field visit in the coastal city of Mombasa.

Ugandan students push biotechnology outreach and biosafety law

(Alliance for Science)

After growing frustrated with legislative inaction, biotechnology students in Uganda have started an initiative to advocate for biotechnology, gene editing and the passage of a biosafety law. The Biotechnology Online Series features students and researchers using Zoom and other social media

channels to discuss how biotechnology and newer tools such as CRISPR-Cas9 and genetic engineering could improve the country's food production and quality of life. Perez Mweine, third-year student and president of the Makerere University Biotechnology Society, said the learners started the initiative to "create a whole new awareness" about biotechnology and what it can do to advance society.

Union minister Dr Jitendra Singh inaugurates new Biotechnology centre in Arunachal Pradesh

(Devdicourse)

Union Minister Dr Jitendra Singh said Prime Minister Narendra Modi has laid special focus on the North-east to develop the neglected region at par with most developed states like Gujarat and Maharashtra. Inaugurating a Centre of Excellence for Bio-Resources and Sustainable Development and a Rural Technology Demonstration Centre at Kimin in Papum Pare district of Arunachal Pradesh, the Union Minister of State for Science and Technology said the facility has been established in the North-eastern state as it will greatly help in improving the socioeconomic status of tribal people in the state. Dr Singh expressed hope that the centre would open new avenues of livelihood and self-employment for the youth besides facilitating the development of biodiversity and related sectors like horticulture and agriculture.

Biotech, gene editing will be key to addressing agriculture's future challenges

(Ag Week)

Members of the two subcommittees holding the hearing appeared to support the use of biotech, and gene editing in particular, to develop new plants and animals resistant to disease and able to help farming adapt to climate change. Plant breeding is not new; rather it dates back thousands of years to when people first domesticated wild plant varieties, noted Fan-Li Chou, the American Seed Trade Association's vice president for scientific affairs and policy in her written testimony. "Over time, plant breeders have accumulated an impressive collection of tools, such as cross breeding, selection, hybridization, induced mutagenesis, biotechnology and molecular markers to unlock the genetic potential of plant crops. Using these breeding tools, the plant breeding community, both the public and private sides, have safely and reliably introduced to the food system hundreds of thousands of new plant varieties over the past century," she added.

Viewpoint: Global climate talks could expand agricultural research and genetic innovation to better address warming concerns

(GLP)

The worst-case consequences of rising temperatures and drought played out this year in Madagascar with the first famine induced by climate change. Research suggests an additional 600 million people could be facing hunger by 2050 with a 2°C increase in global temperatures. The international community needs new policies, technologies, and institutions to drive changes in the way we feed ourselves, adapt farming to the consequences of climate change, and mitigate the third of total greenhouse gas emissions caused by food production, distribution, and consumption. With investment in both conventional breeding and genetic innovation, scientists can develop crop varieties and livestock breeds that also have a lower environmental footprint and require fewer resources like water and land.

New Research

Gene-editing discovery yields high promise for wheat fertility in a changing climate

(Phys.org)

A gene which has profound effects on the production of seeds has been identified by researchers from the John Innes Centre. Gene-editing techniques helped to identify and explain the key gene, ZIP4, in wheat which is responsible for maintaining 50% of yield in this global crop. The discovery presents an exciting new opportunity to breed high-yield, elite wheat varieties using a novel mutation of the gene, whilst also allowing the introduction of critically important traits such as heat resilience and disease resistance. In the study, which appears in Scientific Reports, Professor Graham Moore's research group took advantage of recent developments in wheat research technology to explain genetic elements which have puzzled scientists for more than 60 years.

New Targets for Crop Genetic Improvement Found

(SeedWorld)

Rothamsted scientists have made a series of unexpected discoveries within the wheat genome which they say should lead to new wheat varieties over the coming years. Looking at almost 1,300 of the "promoter" regions that regulate the activity of genes in 95 different commercial, landrace and ancestral wheats, the team have shown that these promoter regions are remarkably similar when different wheat varieties are compared. That these promoter regions have remained mostly unchanged means that they are likely to be as important as the part of the gene coding for proteins – and that when slight differences between individual varieties are seen these could have significant impacts on plant traits. Such traits include grain quality, nutrient use efficiency, disease resistance and adaptation to climate change.

Ugandan scientists developing drought tolerant coffee varieties to save valuable cash crop

(GLP)

Dr. Godfrey Sseremba, senior research officer at the NaCORI in Kituuza, said the scientists are using molecular or marker assisted selection to develop the drought-tolerant varieties. "We have identified materials from wild coffee varieties that are drought-tolerant and have studied them to understand their composition," he explained. "The materials naturally grow in Ugandan forests…and within their germplasm there is diversity which is drought-tolerant." So, the scientists are carefully crossing the wild varieties with the improved coffee wilt disease-resistant Robusta varieties. The hybrids are then grown in greenhouses and in other water-stressed areas to observe their performance. "We use molecular or marker-assisted selection to determine the new varieties contain materials that are drought-tolerant," Sseremba said. "Because we already know which genes are drought-tolerant, we simply take samples from leaves of these hybrids and test them in a lab to ascertain that they contain DNA that is drought-tolerant," he continued. After this, the scientists will use tissue culture to multiply the desired varieties that have both disease resistance and drought tolerance traits.

US companies announce plans for gene-edited strawberries

(Phys.org)

An Idaho company that successfully brought genetically modified potatoes to the market announced an agreement to help a California-based plant breeding company grow strawberries they say will stay fresh longer and have a longer growing season. J.R. Simplot Company and Plant Sciences Inc., both privately held companies, said they expect to launch the first commercially available, gene-edited strawberries within a few years. U.S. growers produced $2.2 billion in strawberries in 2020, mostly in California, according to the U.S. Department of Agriculture. But consumers discarded an estimated 35% of the crop due to spoilage. Simplot and Plant Sciences officials said genetically modified strawberries will help reduce waste and make them available to consumers much of the year. The strawberries will contain genes from only strawberries, selecting desirable traits that have been cultivated over decades.

Research finds key advances towards reducing the cost of plant improvement

(Science Daily)

Crop improvement often involves the transfer of genetic material from one organism to another to produce a valuable trait. Some major examples of crops with these so-called 'transgenes' include disease-resistant cotton and beta-carotene-enhanced golden rice. However, when foreign DNA is introduced into a host organism, a natural defensive response in plants is to repress or silence the expression of the unfamiliar genetic material. This 'silencing,' a process known to involve DNA methylation, is a multimillion-dollar problem in the global agricultural improvement industry.

The role of public-private partnerships in improving global food security

(Science Direct)

Global food security is at a tipping point. After decades of both absolute and relative improvement in food security worldwide, climate change, market disruptions and declining productivity have reversed the trend. After four decades of improving food security, both more people and a larger portion of the global population are hungry today than in 2015. In response, researchers and their funders, governments, industries and interest groups are urging renewed collaboration and partnerships to

recover and return to accelerate food production and to improve food distribution. Recently some public academics and civil society organizations are opposing these public-private partnerships (P3s). The article reviews the context, discusses the logic for P3s and explores the range of P3s that have been used and their impacts on the global agri-food system. We conclude that rather than reversing direction, the use of both strategic and tactical partnerships should be accelerated in order to improve global food security.

Largest plant genome sequencing effort gives chickpea pan-genome

(Telangana Today)

An international team of researchers from 41 organisations has assembled chickpea's (chana) pan-genome by sequencing the genomes of 3,366 chickpea lines from 60 countries. Led by the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), the team identified 29,870 genes that include 1,582 previously unreported novel genes. The research is the largest effort of its kind for any plant, putting chickpea in a small group of crops with such an extensive genome map. "By employing whole-genome sequencing, we have been able to affirm the history of chickpea's origin in the Fertile Crescent and identify two paths of diffusion or migration of chickpea to the rest of the world. One path indicates diffusion to South Asia and East Africa, and the other suggests diffusion to the Mediterranean region (probably through Turkey) as well as to the Black Sea and Central Asia (up to Afghanistan)," said Prof Rajeev Varshney, a Research Program Director at ICRISAT and leader of the study. He said that more importantly, this research provides a complete picture of genetic variation within chickpea and a validated roadmap for using the knowledge and genomic resources to improve the crop.

***