Biotech Crop Adoption Leads to Greater Sustainability and Socioeconomic Opportunities for Global Farmers and Citizens

Two new studies show continued environmental and social benefits of biotech crop use and adoption

(June 26, 2018) – Today, the International Service for the Acquisition of Agri-biotech Applications (ISAAA) and PG Economics, Ltd. released new studies highlighting the continued social, environmental and economic benefits of the global adoption of biotechnology in agriculture.

The complementary studies – PG Economics' "GM Crops: Global Socio-Economic and Environmental Impacts 1996-2016" and ISAAA's "Global Status of Commercialized Biotech/GM Crops: 2017" – examine the continued widespread adoption of global crop biotechnology, and the significant positive socio-economic and environmental impacts of this adoption by farmers and communities around the globe.

"Biotech crops offer enormous benefits to the environment, health of humans and animals, and contributions to the improvement of socioeconomic conditions of farmers and the public," said ISAAA Chair of the Board, Paul S. Teng. "The recent production of next generation biotech crops – including apples and potatoes that are not likely to spoil or become damaged, anthocyanin-enriched super sweet pineapple, increased ear biomass and high amylose content maize, and soybeans with modified oil content, combined with the commercialization approval for an insect resistant sugarcane – provides more diverse offerings to consumers and food producers."

The ISAAA report shows the global biotech crop area increased in 2017 by 3 percent or 4.7 million hectares. This increase is due primarily to greater profitability stemming from higher commodity prices, increased market demand both domestically and internationally, and the presence of available seed technologies. As more developing countries, now 19 in total including India, Pakistan, Brazil, Bolivia, Sudan, Mexico, Colombia, Vietnam, Honduras, and Bangladesh have increased their biotech crop area and continue to allow farmers to adopt biotechnology in food production, smallholder farmers see the direct improvements this offers, allowing them to provide better lives for themselves and their families. In fact, developing countries now account for 53 percent of the global biotech area planted.

From 1996-2016, PG Economics reported biotech crops provided $186.1 billion in economic gains to some 17 million farmers, many of whom are female, smallholder farmers solely responsible for the livelihood of their families and communities.

"Global food insecurity is a huge problem in developing countries, with around 108 million people in food crisis-affected countries still at risk or experiencing food insecurity," said Graham Brookes, Director of PG Economics and co-author of the socio-economic and environmental impact paper. "We have seen for more than 20 years now how crop biotechnology adoption in developing countries has contributed to higher yields, more secure production, and increased incomes greatly contributing to decreasing poverty, hunger and malnutrition in some regions of the globe most prone to these challenges."

The PG Economics study also shows great strides have already been made to reduce the footprint of agriculture and in mitigating and adapting to climate change. The latest study highlights how biotech use in agriculture continues to contribute to reducing greenhouse gas emissions.

Coupled with the record 189.8 million hectares of biotech crops grown globally, the continued expansion of biotech adoption offers beneficial nutritional quality traits that may help offset the nutrition-draining impact of climate change on certain crops. Another aspect driving the increase may be related to research conducted by public sector institutions on rice, banana, potato, wheat, chickpea, pigeon pea and mustard with nutritional quality traits beneficial to food producers

and consumers in developing countries. Studies[1] show that climate change can considerably reduce the protein, zinc and iron content of staple crops, putting 1.4 billion children at risk of major iron deficiencies by 2050.

For 2017, ISAAA also reports that there were improvements in the commercial availability and planting of biotech fruits and vegetables with direct consumer benefits. Two generations of Innate® potatoes have been approved in the U.S and Canada, one with reduced bruising and browning and lower acrylamide and the other with these traits plus lower levels of reducing sugars and late blight protection, along with non-browning Arctic® apples in the USA, and Bt eggplant in Bangladesh. These are all more sustainable products for consumers and the environment alike.

Additional highlights from the PG Economics report include:

- In 2016, the GM crop-related carbon dioxide emission savings from reduced fuel use and additional soil carbon sequestration were equal to the removal of 16.75 million cars from the roads.
- Advances in biotech crops allow farmers to use insecticides and herbicides more strategically, reducing the environmental impact associated with their use by 18.4 percent on GM crop areas since 1996[2].
- In 2016, the direct global farm income benefit from GM crops was $18.2 billion, equal to an average increase in income of $102/hectare. Since 1996, farm incomes have increased by $186.1 billion.
- Biotechnology remains a strong investment for farmers. In terms of farmer investment, for each dollar invested in biotech crop seeds, farmers gained an average $3.49.
- In 2016, farmers in developing countries received $5.06 for each extra dollar invested in biotech crop seeds, whereas farmers in developed countries received $2.70 for each extra dollar invested in biotech crop seeds.
- Over 21 years, crop biotechnology has been responsible for the additional production of 213 million tons of soybeans, 405 million tons of maize, 27.5 million tons of cotton lint and 11.6 million tons of canola. This has allowed farmers to grow more without needing to use additional land, reducing pressure on typically high bio-diverse land to be converted for agricultural production.

Additional highlights from ISAAA's 2017 report include:

- Global area of biotech/GM crops continued to rise in 2017, reaching 189.8 million hectares compared to 185.1 million hectares in 2016.
- In 2017, 67 countries used biotech crops. This includes 24 countries in total that grew biotech crops, including 19 developing and five industrial countries; and an additional 43 non-planting countries that **formally regulate the importation and use of** biotech crops for food, feed and processing
- Biotech soybean varieties accounted for 50 percent of the global biotech crop area. In terms of the global area for individual crops, 77 percent of soybean, 80 percent of cotton, 32 percent of maize and 30 percent of canola were planted to biotech varieties in 2017.
- Countries with more than 90 percent adoption of biotech soybeans were USA, Brazil, Argentina, Paraguay, South Africa, Bolivia and Uruguay; close to or more than 90 percent adoption of biotech maize were USA, Brazil, Argentina, Canada, South Africa and Uruguay; close to or more than 90 percent adoption of biotech cotton were USA, Argentina, India, Paraguay, Pakistan, China, Mexico, South Africa and Australia; and with 90 percent or more of biotech canola were USA and Canada. More importantly, these are the same countries providing food exports needed by the rest of the world including large developing countries.
- Global food security depends on the inter-links between surplus food and feed-producing countries and those which in deficit production. Biotech soybean and maize in particular, have helped developing countries meet their requirements for feed to produce animal and fish protein.

For more information or the executive summary of the "Global Status of Commercialized Biotech/GM Crops: 2017" report, visit www.isaaa.org. To download a copy of the PG Economics study, visit: www.pgeconomics.co.uk. *The associated two papers in the peer review journal GM Crops and Food are available, with open access, at:* https://www.tandfonline.com/doi/full/10.1080/21645698.2018.1464866 *and* https://www.tandfonline.com/doi/full/10.1080/21645698.2018.1476792

[1] Smith, M. R., C. D. Golden, and S. Myers (2017), Potential rise in iron deficiency due to future anthropogenic carbon dioxide emissions, GeoHealth,1,248–257, https://doi.org/10.1002/2016GH000018 and D.E. Medek, S. Meyers, and J. Schwartz (2017), Estimated Effects of Future Atmospheric CO2 Concentrations on Protein Intake and the Risk of Protein Deficiency by Country and Region, https://doi.org/10.1289/EHP41

[2] As measured by Cornell University's Environmental Impact Quotient (EIQ) indicator.

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About ISAAA:
The International Service for the Acquisition of Agri-biotech Applications (ISAAA) is a not-for-profit organization with an international network of centers designed to contribute to the alleviation of hunger and poverty by sharing knowledge and crop biotechnology applications. Clive James, Emeritus Chairman and Founder of ISAAA, has lived and/or worked for the past 30 years in the developing countries of Asia, Latin America and Africa, devoting his efforts to agricultural research and development issues with a focus on crop biotechnology and global food security.

About PG Economics:
PG Economics is a specialist provider of advisory and consultancy services to agriculture and sectors that both service/supply agriculture and use agricultural raw materials. Its areas of specialization are new technology use in agriculture (eg, plant biotechnology, new breeding techniques), agricultural production systems, agricultural markets, policy, regulation and trade agreements. The authors of this report have been examining the global impact of biotech crops for 20 years and have published widely on the subject, including 28 papers in peer reviewed journals