OFFICIAL FEEDBACK FORM

DIALOGUE DATE	Tuesday, 24 August 2021 07:00 GMT -04:00
DIALOGUE TITLE	What Role Will Gene Edited Foods Play in Addressing Nutritional Insecurity?
CONVENED BY	Alliance for Science
DIALOGUE EVENT PAGE	https://summitdialogues.org/dialogue/41087/
DIALOGUE TYPE	Independent
GEOGRAPHICAL FOCUS	No borders

The outcomes from a Food Systems Summit Dialogue will be of use in developing the pathway to sustainable food systems within the locality in which they take place. They will be a valuable contribution to the national pathways and also of interest to the different workstreams preparing for the Summit: the Action Tracks, Scientific Groups and Champions as well as for other Dialogues.

1. PARTICIPATION

TOTAL NUMBER OF PARTICIPANTS

254

PARTICIPATION BY AGE RANGE

2	0-18	81	19-30	70	31-50	16	51-65	5	66-80		80+

PARTICIPATION BY GENDER

82	Male	83	Female	6	Prefer not to say or Other

NUMBER OF PARTICIPANTS IN EACH SECTOR

44	Agriculture/crops	34	Education		Health care
	Fish and aquaculture	14	Communication	35	Nutrition
	Livestock	1	Food processing	30	National or local government
	Agro-forestry	1	Food retail, markets		Utilities
5	Environment and ecology	4	Food industry		Industrial
3	Trade and commerce	1	Financial Services	25	Other

NUMBER OF PARTICIPANTS FROM EACH STAKEHOLDER GROUP

22	Small/medium enterprise/artisan	3	Workers and trade union
8	Large national business	1	Member of Parliament
7	Multi-national corporation	1	Local authority
10	Small-scale farmer	28	Government and national institution
4	Medium-scale farmer	1	Regional economic community
3	Large-scale farmer	3	United Nations
7	Local Non-Governmental Organization	1	International financial institution
12	International Non-Governmental Organization	13	Private Foundation / Partnership / Alliance
4	Indigenous People	4	Consumer group
34	Science and academia	54	Other

2. PRINCIPLES OF ENGAGEMENT

HOW DID YOU ORGANIZE THE DIALOGUE SO THAT THE PRINCIPLES WERE INCORPORATED, REINFORCED AND ENHANCED?

The Dialogue was organized and delivered by the Alliance for Science in accordance with years of experience in collaborating with global academies and research centers focusing on agricultural biotechnology and connecting them with relevant stakeholders. Expert speakers were selected in the field of genome editing in both consumer and ingredient crops, nutrition policy, and consumer adoption of new food technologies. The opening presentation and discussion topics were designed to highlight the potential of the technology for food systems and the specific actions needed for gene editing to help achieve action track one, "Ensure Access to Safe and Nutritious Food for All." The organizing team worked diligently to invite individuals from diverse stakeholder groups, sectors, genders, and countries to facilitate an engagement that reflects the multiple aspects and perspectives of food systems, as well as their complexity. The order of the discussion and engagement was designed to allow participants to react to the link between the potential of the technology and real-world applications to allow a systems-wide solution presented by the speakers for action track one.

HOW DID YOUR DIALOGUE REFLECT SPECIFIC ASPECTS OF THE PRINCIPLES?

The discussants in the Dialogue were chosen to reflect how the technology could navigate the complexity of food systems everywhere and allow global perspectives, in line with the principles of the Food System Summit. The Dialogue reflected this complexity by discussing not just the four traditional components of food security (availability, access, utilization, and stability) but also considered the nutritional value of food and the systemic factors that impact food systems. The Dialogue reflected the principle of inclusivity by engaging the Alliance for Science's broad network of diverse stakeholders across the globe for ample participation. The organizers also used social media and online tools to engage groups outside of common networks to further promote inclusive conversations. The Dialogue had participants from Africa, Southeast Asia, Central and South America, Europe, and the United States. All discussions focused on the principle of "acting with urgency." Discussants conveyed data that brought attention to the dire need for action across the globe. The need to prioritize access to safe and nutritious food was at the center of all discussions. The speakers' positions were designed to allow a clear link between existing technologies and their potential for achieving the goals of access track one with urgency.

DO YOU HAVE ADVICE FOR OTHER DIALOGUE CONVENORS ABOUT APPRECIATING THE PRINCIPLES OF ENGAGEMENT?

We recommend that other convenors plan with ample time so they can circulate materials to participants in advance of the Dialogue. They should use online functions as much as possible, such as Zoom's chat tool and breakout rooms, to facilitate discussions. It's also useful to focus on a specific topic of engagement. Don't just throw up a broad, blank check topic like, what can be done to transform food systems? In our case, we focused on genome editing's role in addressing nutritional security in global food systems, and that clear focus was crucial to the Dialogue's success.

3. METHOD

The outcomes of a Dialogue are influenced by the method that is used.

DID YOU USE THE SAME METHOD AS RECOMMENDED BY THE CONVENORS REFERENCE MANUAL?

	Yes	✓	**No**

4. DIALOGUE FOCUS & OUTCOMES

MAJOR FOCUS

The major focus of our Dialogue, "What Role Will Gene Edited Foods Play in Addressing Nutritional Insecurity?" was an exploration of action track one, which addresses "ensuring access to safe and nutritious food for all" and how to achieve this goal through innovation as a lever of change.

The Dialogue explored how to use innovations in crop and livestock breeding, such as CRISPR/Cas9 and other genome editing techniques, in ways that can add value to every process and person involved in growing, processing, and consuming food. Discussants presented and commented on the potential of genome editing and then looked at gaps and new approaches in the use of the technology to help us achieve SDG's Target 2.1 and 2.2; "Safe and universal access to safe and nutritious food" and "End all forms of malnutrition," respectively, in accordance with the general targets of action track one. Discussants also recognized that while genome editing and other new plant breeding technologies are an important component of food systems, there are many other aspects of food production and distribution, which must all work together to provide nutritional security.

Nutritional insecurity is a pressing topic around the globe. Some nations struggle with widespread lack of access to nutritious foods and related hunger, while other nations are facing significant challenges related to increasing levels of obesity due to diets high in fats, sugars, and processed carbohydrates. Data from the Global Alliance for Improved Nutrition (GAIN) show that 1 out of every 3 people in the world suffer from some type of malnutrition. An estimated 821 million people are unable to access enough calories to avoid chronic hunger. About 2 billion people globally do not consume enough of the vitamins and minerals they need to grow healthily. It is estimated that 1 out of every in 5 deaths globally are linked to poor diets. Every year, about 11% of the gross domestic product in Africa and Asia is lost to malnutrition. Also, overweight and obesity affect 2 billion people globally and the numbers are rising in virtually every country in the world.

The reason we need genome editing is because 3 billion people worldwide cannot afford a healthy diet, according to the United Nations State of Food Insecurity Report, and 1.5 billion cannot afford a diet that is minimally nutritious. Genome editing eliminates the randomness of breeding, making rapid advances in plant breeding possible. For example, it would take more than 100 years to develop pit-less cherries through traditional breeding, but less than five years with genome editing. A lot of ongoing research could be scaled up to make these rapid advancements a reality. For example, IRRI (International Rice Research Institute) is trying to ascertain the nutritional benefits that can be derived from rice varieties that are available in the gene bank. This research could help make the nutritional benefits of genome editing reach the general population sooner.

The upcoming Summit's goal is to produce concrete measures on how to deal with food and nutritional insecurity. Accordingly, it should be ready to acknowledge genome editing technology as one of the tools that can help improve agriculture. The Food Systems Summit is an opportunity for us all to voice the belief that genome editing has great potential to benefit the world, and Africa in particular. We can link production to nutrition because food scarcity typically contributes to malnutrition. Genome editing has the potential to produce crops that are nitrogen use-efficient, more successful at photosynthesis, climate-resilient, resistant to insect pests and plant diseases, more nutritionally robust, and higher-yielding. We need to assess and develop concrete actions to harness the power of the technology to help us ensure access to safe and nutritious food for all.

ACTION TRACKS

✓	Action Track 1: Ensure access to safe and nutritious food for all
✓	Action Track 2: Shift to sustainable consumption patterns
✓	Action Track 3: Boost nature-positive production
	Action Track 4: Advance equitable livelihoods
✓	Action Track 5: Build resilience to vulnerabilities, shocks and stress

KEYWORDS

	Finance	✓	Policy
✓	Innovation	✓	Data & Evidence
	Human rights	✓	Governance
	Women & Youth Empowerment		Trade-offs
		✓	Environment and Climate

MAIN FINDINGS

The potential seems limitless for what can be done to improve nutritional security using genome editing and CRISPR. Genome editing is an emerging technology that gives geneticists power in to take specific actions within the genome. It is an area of work that has the potential to deliver wide-ranging positive change beyond its immediate focus. It can be used to create healthier diets by boosting nutrient content, improve or ensure consistent flavor in fruits and vegetables, and remove seeds and pits, making healthy food more convenient and nutritious to eat. This technology can also be used for climate resilience by rapidly adapting crops to changing environments and increasing carbon sequestration. The technology can also benefit the agricultural value chain by extending the shelf life of fruits and vegetables, reducing food waste, and adapting varieties to enable year-round production and thus increase availability in all our food systems. It can also enable safer working conditions by helping breed to crops that can be picked and processed more easily.

Genome editing has important applications in fruits, vegetables, pulses, and whole grains, which are the foundation of nutritious diet. People in all countries do not consume enough of these foods, which can help to mitigate micronutrient deficiencies, non-communicable diseases, obesity, hypertension, and diabetes. Though these foods are potentially very affordable for everyone, they face challenges in terms of extended storage, wastage, palatability, and multi-season availability. Genome editing can improve crops to extend their shelf life, enable year-round production, and adapt to changing environments, among other benefits. Genome editing can arguably be used to improve the foods that people in all countries consume as part of a healthy diet. Overall, genome editing offers an accelerated pathway to more nutritious, safer, tastier, and more affordable fruits, vegetables, pulses, and grains.

It's going to take brave, bold, activist government actions for genome editing to reach its potential. Specifically, these actions should address the delays that hamper research progress and product development, such as an excessively stringent regulatory environment. Actions that promote science-based regulatory processes will support research and development of biofortified products. A regulatory environment that creates undue hurdles for biofortified products has impeded research on products that could really help deal with nutritional insecurity, such as a nutrient-dense eggplant. We need to act with urgency to remove regulatory barriers hindering the development of genome-edited crops. If we fail to support genome editing and instead rely upon conventional breeding, it will take us many more years to improve the nutritional value of our crops. Genome editing can ensure that healthy foods quickly reach consumers.

Further, to allow genome editing to fulfill its potential, we also need to strengthen institutions, policies, and processes. We need to foster accountability and transparency among all actors. We also need to look at priorities that are emerging from the national and independent dialogues. For example, a country may wish to prioritize doubling vegetable production over the next five years. We need to consider what genome editing can do to help them achieve this target. Countries are very pragmatic. They will do whatever it takes to make safe and nutritious food available to all their population. They don't have the luxury of choosing to eat organic or not organic, GMO or non-GMO, genome-edited or non-genome-edited. Their choice is to eat or not eat. So, we need to show how genome editing can efficiently and effectively respond to the needs and priorities of nations across the globe.

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OUTCOMES FOR EACH DISCUSSION TOPIC - 1/3

What needs to happen for genome editing to ensure access to safe and nutritious food for all?

Genome editing is a process that borrows Nature's tools. By following Nature's lead, we can empower farmers to feed their communities. However, enhanced nutrition is often the least important reason motivating food choices; people generally take a long list of other considerations into account, including cost, availability, cultural issues, impacts on nature, etc. Experiences in the summit action tracks shows that bold actions, which could be clustered under the three headings of a) desire; b) trust and c) access, are needed to confer gene editing with the social license to successfully integrate into the world's food supply.

In terms of desire, there is a need to communicate how consumers can benefit from genome editing, such as highlighting how these tools can produce fruits and vegetables with better taste, more stability, longer shelf life, lower price, etc. Consumers must want these products if they are to be successful. While farmer buy-in is critical to the widespread adoption of the technology, consumer acceptance is equally important. So, we must meet consumers where they are and communicate how this technology is linked to health and nutrition, as well as environmental benefits. Consumer desire is critical.

In terms of trust, based on observations of the food systems processes, many people are positively influenced by genome editing's potential to reduce agriculture's environmental footprint. They want to be assured that genome editing can reduce greenhouse gas emissions, promote biodiversity, improve the nitrogen-carbon-phosphorous cycles, take the pressure off expanding into wild lands, reduce water and energy use, and empower smallholder farmers and local food systems. Showing how genome editing can address these issues will help drive widespread social acceptance. There is a particular need to communicate how gene-edited foods are nature-positive. It is important to highlight how gene editing is essentially speeding up a natural process. In terms of language, the term "nutritionally-dense crops" or similar language appears to resonate more effectively with consumers than "biofortified crops."

In terms of access, it is important to address the issue of intellectually property. Seeds must be affordable to smallholder farmers and for small- and medium-sized enterprises, as they are the backbone of global food systems. In low- and middle-income homes, much of the food consumed is purchased, according to World Bank data. Low- and middle-income homes buy at least two-thirds of what they eat. If they are purchasing food, they are interacting with small- and medium-sized enterprises in the value chain. Those are being supplied with food by small- and medium-sized producers. To support this existing system, the products produced through genome editing must be accessible to small- and medium-sized enterprises, producers, marketers, distributers, suppliers, cold storage operators and others across the food value chain. Moreover, public-private models of operation should be encouraged wherever possible, so long as they are well-designed, governed justly, and acting in the interest of the public good. It is also advisable to work with the United Nations and its programs. For example, the World Food Program could be a great incentive for the advancement of genome editing because it is already procuring biofortified foods. While private sector and industry participation is good, public–private partnerships tend to work better.

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OUTCOMES FOR EACH DISCUSSION TOPIC - 2/3

How can gene editing help ensure access to safe and nutritious food for all in low- and middle-income countries?

Genome editing can help those working to improve nutritional security in low- and middle-income countries through research into and development of more nutritious and healthy staples. In addition to developing healthier fruits and vegetables through genome editing, it's important to also improve staple crops, which tend to comprise the bulk of the diets eaten in low- and middle-income countries. Additionally, the agricultural sectors in most low- and middle-income countries are centered around the production of staples. While it's true that even in rural communities, most of the food consumed is bought, it is important to consider that much of what is produced is also consumed by those who produce it. Such is the case in the Philippines, where the cost of a nutritious diet can be lowered by a third or a half if people are able to produce their own food. And if they produce enough to sell the extra, then the cost of a nutritious diet is reduced even more. So, one clear value of genome editing is supporting the development of healthier staples in low- and middle-income countries. Ultimately, the prioritization of genome-edited crops depends very much on the country context, weather considerations, and other factors. For countries like the Philippines, discussants considered it important to start with genome-edited staples like rice and corn, which are widely consumed by the population.

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OUTCOMES FOR EACH DISCUSSION TOPIC - 3/3

How can we keep genome editing technology available and give innovation a chance to help us achieve nutritional security?

Genome editing is an efficiency-increasing technology that has the potential to boost nature-positive production. We have a huge opportunity to apply genome editing technology to the genetic information about crops accumulated to date. Currently, we can determine the genome sequence of any crop, whereas ten years ago only a big corporations and institutions could access this information. Today, these sequences are relatively inexpensive and widely accessible, speaking to the ability of genome editing to democratize the process of plant breeding. Now that smaller institutions and companies are widely using the tools of genome editing, it will remain accessible and foster innovation in nutritional security.

Now, partly due to the COVID-19 pandemic, low- and middle-income countries have ramped up their capacities in molecular biology, thus expanding their ability to employ the tools of genome editing. Scientists may not be currently engaged in genome editing, but they have the basic equipment and manpower to do so. With a little more training, it will be possible for low- and middle-income countries to perform genome editing and apply these innovations to their country-specific challenges of providing safe and nutritious food for all.

Discussants agreed it is important to take a context-specific approach to all activities launched to address the key issues of trust, desire, and access. It is imperative that all local experts, and not just scientists, participate in determining how to meet their nation's unique needs and the role that genome editing can play in addressing these challenges. We have a tremendous opportunity to get it right and use genome editing to address the global challenges of nutritional insecurity. Further, the needs of the people, not economic gain or profit motivations, should guide research priorities to meet the basic human right to safe and nutritious food.

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AREAS OF DIVERGENCE

One area of divergence is that some participants think genome editing research should begin with fruits and vegetables, while others support an initial emphasis on staple crops. Both are important. However, the approach should be determined by country-specific context.

Participants from Nigeria said that since genome editing has the potential to produce crops that are nitrogen use-efficient and higher yielding, research should begin speedily in those areas. In Nigeria, linking production to nutrition is key because many people suffer from food scarcity and malnutrition. So, if genome editing can enhance Nigeria's crops and overall production, while fortifying foods with additional nutrients, then research and production should focus on crops that Nigerians consume. For instance, many Nigerians make a meal only of sweet potato. Their overall nutrition could be improved, and stunting reduced, if genome editing is used to fortify sweet potatoes with protein and/or vitamins.

Participants from the Philippines noted that genome editing could be useful in improving the nutrient content of rice. The IRRI (International Rice Research Institute) is trying to ascertain the nutritional benefits that can be derived from rice varieties available in its gene bank. With genome editing, these new beneficial rice varieties could reach farmers and consumers much faster. Participants commented that malnutrition is a pervasive problem in the Philippines and while existing interventions exist, we need additional tools to improve the health of Filipinos. They stated their belief in the value of working together to improve the nutritional status of those at risk. Genome editing has the potential to improve the nutritional value of food crops that can be made available and accessible to many in a sustainable way, some participants said.

Participants from Guatemala commented that record numbers of subsistence farming families are going hungry in their country. Health officials registered more than 15,300 cases of acute malnutrition in children under age five last year – up nearly 24% from 2018. It's the highest number of acute malnutrition cases since 2015, when a severe drought destroyed harvests across Central America. In Central America, genome editing might be the banana's only hope against a deadly fungus. Researchers are using the tool to naturally boost the fruit's defenses and prevent the extinction of a major commercial variety. However, in terms of supporting nutritional security, participants commented that researchers should focus on staple foods like corn.

Participants from the US wanted genome editing to focus on convenience and quality in fruits and vegetables, including pit-less cherries and non-browning apple. They noted the need to boost consumption of fruits and vegetables in the US to keep the population healthy, hence the push to prioritize those crops.

Participants from Mexico commented that genome editing, coupled with traditional knowledge, can help strengthen native corn varieties (landraces) and their ability to adaptat to climate change, while reducing the nation's dependence on corn imports. The indigenous people of Mexico have provided the guiding principles for research that can improve traditional varieties. They worked tirelessly to harness the power of nature to ensure the prosperity of their communities and Mexicans are proud to see modern scientists follow in their footsteps.

Participants from Ghana wanted genome editing research to focus on popular crops like sweet potato. It is estimated that thousands of children in Ghana and Africa go blind every year due to vitamin A deficiency, making it the world's leading preventable cause of childhood blindness. Some 50% of the afflicted children die within a year of losing their sight. Respiratory illnesses and infectious and diarrheal diseases in children also have been linked to vitamin A deficiency. Participants from Ghana noted that if sweet potato is improved with increased beta carotene (a precursor for vitamin A) content, it will help save the lives of millions of children.

Another area of divergence was on how the technology should be introduced in various countries. Some participants noted that genome editing will succeed when introduced in large parts of the developing world and most countries. Others opined that genome editing will have only limited impacts on efforts to ensure access to healthy foods unless other socioeconomic and political issues are simultaneously resolved.

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