CGIAR
Independent Science for Development Council

Foresight and Trade-off Implications for One CGIAR

June 2020

About the Independent Science for Development Council

CGIAR is a global scientific research-for-development partnership consisting of the System Organization, Centers, CGIAR Funders, and Partners to implement its Strategy and Results Framework. The Independent Science for Development Council (ISDC) is a standing panel of impartial, world-class scientific experts who provide rigorous, independent strategic advice to the CGIAR System Council and other stakeholders. Membership was established in October 2019 and is comprised of Holger Meinke (chair), Andrew Ash, Chris Barrett, Nighisty Ghezae, Suneetha Kadiyala, Mandefro Nigussie, and Lesley Torrance. In order to operate, ISDC receives the operational support of CGIAR Advisory Services Shared Secretariat (CAS Secretariat), hosted at the Rome, Italy, office of the Alliance of Bioversity International and the International Tropical Agricultural Research Center.

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Executive Summary

In early 2020 the CGIAR Independent Science for Development Council (ISDC) commissioned foresight reviews and a trade-off analysis report. The goal of the research was to provide ISDC members with an evidence base that would allow them to build foresight reflections and identify key challenges to consider in developing the CGIAR 2030 Research Strategy. As a first step, ISDC commissioned two expert reviews that synthesized a broad sample of existing foresight literature on the five One CGIAR impact areas. The foresight reviews were the initial phase in a stepwise approach to providing a grounding for consensus building, followed by a trade-off analysis report. This research concluded in June 2020 and was presented to CGIAR leadership.

One CGIAR Impact Areas

- Nutrition and food security
- Poverty reduction, livelihoods, and jobs
- Gender equality, youth, and social inclusion
- Climate adaptation and greenhouse gas reduction
- Environmental health and biodiversity

The reviews used a horizon to 2030 and beyond, drawing on both previous CGIAR-sponsored foresight research and studies by external organizations that paid significant attention to agrifood systems (AFS). Referenced studies, a subset of the thousands published, used a range of foresight methods. The three most prominent methods involved (1) projecting the likely impacts of megatrends, (2) scenario planning of prospective pathways, and (3) visioning and backcasting to identify feasible pathways to desired outcomes. A summary of foresight findings is listed below.

- The foresight literature largely ignored the impact areas of nutrition and food security; poverty reduction, livelihoods, and jobs; and gender equality, youth, and social inclusion. In addition, agriculture as a broader component of multifunctional landscapes received insufficient attention, limiting insights on the essential interplay with other land uses. Research focused instead on intermediate outcomes, such as prices or crop and livestock output, or on other outcomes such as per capita income or money metric net surplus. CGIAR must be alert to these omissions.

- Some studies showed that trends in population growth, urbanization, migration, climate change, and natural resource depletion will have mainly adverse consequences for gender equality, poverty reduction, and nutrition, especially in low- and lower-middle-income countries.

- AFS face the core challenges of reducing greenhouse gas (GHG) emissions and addressing climate change through adaptation and mitigation. High uncertainty exists across spatial and temporal scales about whether adaptation can offset the adverse net effects of climate change on AFS and greater emphasis will be required on mitigation. AFS will need to adapt to greater water stress, more frequent extreme weather events, existential threats to coastal agro-ecosystems, and transformative change to agro-ecosystems due to biotic and abiotic stresses and endogenous ecological shifts. At the same time, greater emphasis will be required on mitigation. Policymakers will face tough trade-off choices among emission reduction targets, nutrition and food security goals, poverty and gender equity objectives, and resource use decisions (mainly regarding land and water).

- Pressures on agricultural land management will further increase, although scenarios showed varying degrees of expansion of cultivated area and impacts on biodiversity, nutrient cycling, and water resources. Sustainability concerns associated with land and water management practices demand a search for innovative production methods to meet growing nutrient requirements. Research should seek better management of fish stocks and more sustainable forms of aquaculture and mariculture. The effective management of trees for coproduction of food and ecosystem services in actively managed agricultural landscapes likewise demands further exploration.

- Technology and innovation played significant roles in future scenarios across all impact areas in the literature, yet the unique needs of women and youth were missing. Increasing total factor productivity of farm-level food production and decreasing food waste and loss will be crucial. Research must explicitly consider complementary technology and innovation adoption and adaptation pathways. The foresight literature gave insufficient attention to these issues. Although governance and policy were recognized as major barriers to adoption, innovations in these areas were less explored. Indeed, foresight research exhibited considerable naiveté around the potential for national and global governance to modify policies and institutional arrangements to resolve barriers to the adoption and equitable distribution of gains from AFS innovations. Foresight studies generally did not focus sufficiently on crucial issues such as intellectual property regimes, antitrust regulations, land and water rights, value chain organization, and conflict management, which risk impeding the adoption, adaptation, and diffusion of innovations and practice changes that are major performance indicators for One CGIAR.

These foresight findings were a focus of the ISDC semiannual, virtual meeting held April 20–23, 2020. ISDC members, CGIAR leadership and advisory services staff, the co-leads of the CGIAR Foresight Community of Practice, and commissioned ISDC foresight and trade-off researchers engaged in presentations and discussions on the One CGIAR reform and potential foresight implications. To further distill the foresight outcomes into actionable knowledge, ISDC members and invited guests convened in small groups, focusing on each of the various One CGIAR impact areas. The guided group work was presented and discussed, laying the basis for the final ISDC consensus-building activity during a closed session. The consensus building and further discussions used the aggregate expertise of the ISDC members and led to eight foresight-driven ISDC reflections and corresponding questions and implications that arose from the trade-off analysis report. Detailed reflections and trade-off questions and implications can be found on p. 7.

1. One CGIAR's success will depend on a highly functional, continuous decision-making process that uses foresight, trade-off analysis, and the Quality of Research for Development (QoR4D) Framework to formulate strategy, make investment decisions, and monitor and evaluate. The One CGIAR impact areas should be integral to an adaptive and participatory research management cycle that draws on a broad range of perspectives.

2. Ongoing foresight and trade-off analyses should prioritize attention to key barriers to adoption, adaptation, and diffusion of innovations for impact within AFS. Such barriers include poor access, lack of affordability, poor governance and policy implementation, prevailing inequities, and lack of suitability to context, including adequate risk assessments.

3. The One CGIAR impact areas of nutrition and food security; poverty reduction, livelihoods, and jobs; and gender equality, youth, and social inclusion appeared less in the foresight research than did climate change adaptation, greenhouse gas reduction, environmental health, and biodiversity. Further, when the One CGIAR impact areas were included, they were siloed. The intersections of these impact areas need elevated attention in future foresight and trade-off analyses.

4. CGIAR is globally renowned for its ability to effectively convene and coordinate diverse dialogues across AFS research and policy organizations. To further increase the effectiveness of these dialogues, One CGIAR should make foresight and trade-off analysis routine elements of this facilitation process.

5. Sustainable agriculture and food systems are characterized by a high degree of diversity. Such diversity should be better leveraged to meet the growing demand for nutrients. Hence, One CGIAR should consider expanded

attention to—and investment in—research on fruits, legumes (including pulses), nuts, and vegetables to broaden the System's commodity composition.

6. One CGIAR research needs to align with and influence emerging trends in AFS. CGIAR core strengths are largely in the domains of farm-level primary production, sustainable management of resources, and preservation of genetic and environmental diversity. Future research should encompass all AFS aspects (i.e., the entire pathway through which farm products are transformed and reach consumers) without compromising core expertise. Ongoing strategic discussions will be needed to determine exactly how to achieve this without losing focus on core competencies and crowding out partners.

7. Both, sustainable intensification and stronger agroecological systems approaches, have their place in CGIAR. The 2030 Research Strategy should consider providing equitable space for both pathways to coexist and flourish. Further, the synergies and trade-offs associated with these two paradigms should be incorporated in relevant foresight analyses, taking into account the local context.

8. Although these reflections are intended for the 2030 Research Strategy, they may also be useful for other topics of the One CGIAR reform Transition Advisory Groups.

Background

CGIAR is undergoing a reform toward One CGIAR. Under this transformation, CGIAR will develop a 2030 Research Strategy anchored in the unifying mission of "Ending hunger by 2030—through science to transform food, land, and water systems in a climate crisis." The One CGIAR reform commenced in 2018 with the establishment of the System Reference Group (SRG) by the CGIAR System Council, which included Funders, Centers, and partner countries. SRG developed innovative recommendations on CGIAR's research emphasis, delivery model, and institutional organization and universally agreed that a drastic restructuring was necessary (CGIAR 2020). To achieve this proposed unified and integrated model, the System Council agreed to the following five SRG recommendations:

- A compelling and aligned mission
- Unified governance
- Institutional integration
- A new research modality
- More, and pooled, funding

The 2030 Research Strategy will focus on five impact areas that intersect and consequently have potential trade-offs among and within them. Through the next decade, the world faces substantial changes, such as major demographic transitions, technological advances, disease and health challenges, climate change, and economic and governance instability, all of which will affect what is grown by whom, how food reaches consumers, and who consumes what. Therefore, the approved ISDC work plan for 2020 focuses on the System Council's request, through its Strategic Impact, Monitoring, and Evaluation Committee (SIMEC), for thought leadership on AFS trade-offs. To make informed and evidence-based decisions ensuring that the One CGIAR research portfolio delivers on the System's mission, it is critical to consider potential trade-offs.

In early 2020, ISDC commissioned two foresight reviews on the five One CGIAR impact areas. One review focused on the societal impact areas, and the other centered on the climate and environment impact areas. The reviews were the first phase in a stepwise approach to extracting actionable knowledge from existing foresight studies.

These studies were followed by a subsequent review of trade-off analyses that also drew on the foresight summaries. For this last step, the trade-off analysis report built on the earlier foresight synthesis and ISDC consensus building. The aim was to investigate the possible impacts of different CGIAR future investments across the five impact areas, along with plausible alternative development pathways. The report reviewed the conceptual foundations of trade-off analysis, described current data and modeling tools from farm to global scales, and identified their strengths and limitations. The aggregate findings from this research were finalized in June 2020 and presented to CGIAR leadership.

Impact Areas and ISDC Commissioned Research

Societal Foresight Review

- Nutrition and food security
- Poverty reduction, livelihoods, and jobs
- Gender equality, youth, and social inclusion

Author: Erin Lentz, PhD, Associate Professor of Public Affairs at LBJ School of Public Affairs at The University of Texas at Austin

Climate and Environment Foresight Review

- Climate adaptation and greenhouse gas reduction
- Environmental health and biodiversity

Authors: Monika Zurek, PhD, Senior Researcher, Food Systems Transformation Group, Environmental Change Institute, University of Oxford; Aniek Hebinck, PhD, Researcher and Advisor, DRIFT for Transitions, Erasmus University Rotterdam; and Odirilwe Selomane, PhD, Researcher, Centre for Complex Systems in Transition, Stellenbosch University

Trade-off Analysis Report

Authors: John Antle, PhD, Professor, and Roberto Valdivia, PhD, Assistant Professor, Oregon State University Department of Applied Economics

Foresight and Trade-off Approach

The foresight and trade-off research was led by ISDC focal points Chris Barrett (lead), Suneetha Kadiyala, and Lesley Torrance. Terms of reference (TOR), developed in January 2020, guided the foresight reviews to ensure they met the goals of ISDC (Appendix A). In late February, a TOR was disseminated for the trade-off analysis report, which commenced when the foresight review drafts were internally shared (Appendix B). The foresight reviews used a horizon to 2030 and beyond, drawing on both previous CGIAR-sponsored foresight and studies by external organizations that paid significant attention to AFS. The literature varied substantially in their specific focus within AFS, from value chains to consumer diets.

The future of AFS is highly uncertain; they will evolve in ways that cannot be entirely anticipated—and certainly not controlled—mainly because of the complex relationships between human and natural systems and the vastly decentralized and uncoordinated nature of decision making throughout these interconnected systems. Foresight approaches are ideally suited to explore these complex relationships and possible pathways, both qualitatively and quantitatively. Insights thus generated provided essential background information for evidence-based decision making. Referenced studies, a subset of the thousands published (Wiebe et al. 2018), used a range of foresight methods, including trend and megatrend analysis, scenario planning, and visioning and backcasting (Table 1).

Table 1: Common Foresight Methods of Literature Reviewed

Foresight Method	Description	Question Method Asks
Trend and megatrend analysis	Trend analysis examines how potential drivers of change have developed over time and how the trend may develop in the future. A megatrend is similar but larger in scale and described as an observable phenomenon. Emerging megatrends can often be categorized as social, technological, economic, environmental, political, or demographic shifts (STEEP-D). This method focuses on understanding drivers and their likely direct consequences.	What is driving us toward a specific future?
Scenario planning	Scenario planning describes plausible future states given realistic scenarios for key underlying trends. Scenarios show how changes to select trends create different futures. Scenarios are neither predictions nor attempts to show the most likely future trends nor prescriptive guidance on how best to reach a desired outcome. Scenarios explore differing patterns of interactions between the key drivers of change. In contrast to megatrends analysis, scenario planning typically emphasizes the indirect effects of trends arising from feedback within systems.	What are likely future worlds under alternative realistic scenarios?
Visioning and backcasting	Visioning starts with the present and uses current trends to develop pathways to attain the preferred future. Visioning and backcasting studies define a desired future state and then work backward to define feasible paths from the present to that desired state. Unlike scenario planning, which expressly maps out multiple future states, some of which may be undesirable, the backcasting approach starts with a single desired future state.	How can we reach a desired future outcome?

The foresight findings were the focus of the ISDC virtual, semiannual meeting held April 20–23, 2020 (Appendix C). ISDC members, CGIAR leadership and advisory services staff, the co-leads of the CGIAR Foresight Community of Practice, and commissioned ISDC foresight and trade-off researchers engaged in presentations and discussions covering the One CGIAR reform and potential foresight implications. To further distill the foresight outcomes, ISDC members and invited guests convened into small groups for each of the One CGIAR impact areas based on expertise. The guided group work was presented and discussed, laying the foundation for the final ISDC consensus-building activity during a closed session. The consensus building used the aggregate expertise of the ISDC members and led to eight foresight reflections and the foundation for the trade-off analysis report.

Findings and Implications for One CGIAR

The megatrends across foresight studies included climate change, increasing competition for and degradation of natural resources, increased demand for food, and shifting dietary preferences. These megatrends point to the need for AFS to identify routes to sustainably increase healthy food production. The need to address climate change and reduce greenhouse gases has raised the simultaneous challenges of adaptation to and mitigation of climate change within AFS. High uncertainty exists across spatial and temporal scales about whether adaptation can offset the effects of climate change. AFS will need to adapt to greater water stress, more frequent extreme events, existential threats to coastal agro-ecosystems, transformative change to agro-ecosystems due to abiotic and endogenous ecological shifts, and the impact of climate change on crop and livestock pests and diseases.

Pressures related to agricultural land management and expansion will increase, although scenarios presented varying degrees of expansion and impacts on biodiversity, nutrient cycling, and water resources. Sustainability concerns associated with land management practices demand a search for new protein sources that fulfill nutrient requirements. Researchers should explore better management of fish stocks and more sustainable forms of aquaculture and mariculture, as well as the role of forestry and trees on farms. Policymakers will face tough trade-off choices among emission reduction targets, nutrition and food security goals, poverty and gender equity objectives, and land and water use decisions.

Key Foresight Research Gaps

- Future long-term impacts on nutrition and food security; poverty reduction, livelihoods, and jobs; and gender equality, youth, and social inclusion
- Fish stocks and more sustainable forms of aquaculture and mariculture
- Effective management of trees for coproduction of food and ecosystem services
- Adoption and adaptation pathways of technological and institutional innovations
- Governance and policy barriers
- Migration gender dynamics
- Specific challenges within sub-Saharan Africa
- Linkages between access to water, sanitation, and water infrastructure and gender, poverty, and nutrition
- Biotic pressures on the AFS resulting from climate change
- Megatrend analyses that include shocks
- Effects of food prices across impact areas

Despite the projected negative societal consequences of climate change and environmental degradation, the foresight literature largely ignored the CGIAR impact areas of nutrition and food security; poverty reduction, livelihoods, and jobs; and gender equality, youth, and social inclusion, as well as how these areas intersect with climate change adaptation, greenhouse gas reduction, environmental health, and biodiversity. Research focused instead on intermediate outcomes, such as prices or crop and livestock output, or on other outcomes such as per capita income. Studies generally showed that trends in population growth, urbanization, migration, climate change, and natural resource degradation and depletion will have adverse consequences for gender equality, poverty reduction, and nutrition, especially in low- and lower-middle-income countries. CGIAR must be alert to these omissions.

Technology and innovation played significant roles in future scenarios across all CGIAR impact areas in the literature. Increasing total factor productivity of farm-level food production and decreasing food waste and loss will be crucial. Research must explicitly consider complementary adoption and adaptation pathways, especially among women and youth. The foresight literature gave insufficient attention to these issues. Although viewed as important, much-needed innovations in the governance and policy spaces also were less explored. Indeed, foresight research exhibited considerable naiveté around the potential for national and global governance to modify policies and institutional arrangements to resolve barriers to the adoption and equitable distribution of gains from AFS innovations. This lack of attention is likely to impede the adoption of innovations and practice changes that are major performance indicators for One CGIAR.

Societal Foresight Review

Social drivers are integral to AFS, and their importance is reflected across the literature reviewed. Many foresight studies highlighted that the ability to transform AFS depends strongly on people's dietary choices in the face of growing food demand, combined with equity and gender dynamics. These elements are key to the impacts that will follow unavoidable megatrends.

Societal Change Trends in Drivers

- Shifting diets
- Growing inequalities
- Growing food demand
- Changing food culture and knowledge
- Improving demographic imbalances (e.g., education, reproductive health care)
- Rising urbanization
- Increasing migration pressures

Nutrition and Food Security

The future nutritional status of global populations is uncertain. The few nutrition-focused foresight studies argued for slower—in some cases, negative—growth in the production of starchy staple cereals, roots and tubers, and livestock, and faster expansion in the supply of other commodities that may stimulate consumption of more diverse and healthy diets. Several studies charted pathways that expand the supply of affordable, healthy foods, ensure those foods reach consumers, and encourage consumers to eat them. Those diets were composed of modest consumption of animal-source products and increased consumption of fruits, nuts, legumes (including pulses), and vegetables. Many foresight studies focused more on production of cereals and livestock (i.e., the caloric aspects of food systems) with less attention to dietary quality and the role of nonstaple crops (Palazzo et al. 2014; NAS 2019). How to shift consumer demand toward more diverse diets remains an area of debate. Suggestions included mixtures of policy nudges, price changes, cuts in waste, expansion of nutrition-sensitive agriculture, and improved accessibility and adoption of new breeding technologies such as speed-breeding.

Most of the foresight studies that were reviewed focused on yields of staple crops, growth in gross domestic product (GDP), and staple food prices. Decreases in food prices might benefit low-income consumers but could also lead to overconsumption of increasingly inexpensive calories, with adverse overnutrition consequences, depending on how consumer behaviors change. This shift could also affect the profitability of production. Similarly, growth in GDP could disproportionately increase demand for livestock products (the South Asian, Andean, and Central American scenarios make this assumption). If increases in GDP are paired with increases in inequality, the number of overweight and obese people may rise as more people adopt cheaper and more convenient diets heavy in less healthy, highly processed foods. The intersection of gender and nutrition is not explicitly discussed in many scenarios, although increases in food insecurity are likely to negatively influence nutritional outcomes of women and girls.

Given that current diet trends have a large ecological footprint, a shift to sustainable diets is an emerging area of research. The triple burden of malnutrition—undernutrition, micronutrient deficiency, and overnutrition—continues to grow, with the latter two conditions rising especially quickly globally even as progress on undernutrition stalls. The average dietary pattern is a strong driver of GHG emissions and natural resource degradation. Studies suggested a range of different approaches to address dietary change, hinging on policy actions and technological, institutional, and sociocultural innovations (including personalized nutrition and nutrigenetics). A common theme was the promise of alternative protein sources (e.g., plant-based protein or cultured meat) for sustainable and healthy diets. These products could have major implications for AFS that are historically the focus of CGIAR research.

Poverty Reduction, Livelihoods, and Jobs

Several themes emerged around poverty. Poverty-related outcomes are presented in terms of food security (Palazzo et al. 2014), food prices (Hasegawa et al. 2018), or GDP, sometimes (but not often) adjusted for inequality. Poverty outcomes are evaluated for either consumers or producers but rarely both. The impacts of food price increases differed based on whether an individual is a consumer, producer, or other AFS actor. Similarly, different sectors of the economy may experience different rates of growth. If GDP increases primarily in urban areas, urban consumers may benefit while rural producers are left behind. Across the literature, little discussion occurred on the different roles and experiences of AFS actors throughout value chains (e.g., processors, traders, and transporters). Further, few foresight studies advocating the adoption of sustainable agricultural techniques accounted for labor requirements (HLPE 2019). More emphasis on labor as an AFS input may help researchers understand the potential challenges to adoption and the potential for poverty alleviation.

Two common trends emerged: population growth and migration. These trends will affect poverty reduction, livelihoods, and jobs. They also will increase urbanization and likely increase the global middle class, while also boosting demand for highly processed foods. This jump in demand could increase prices, harming poor consumers and increasing the cost of healthy diets, with nutritional consequences (Maggio et al. 2019; Willett et al. 2019).

Gender Equality, Youth, and Social Inclusion

Among the CGIAR's five impact areas, gender is least discussed across the foresight literature reviewed. In studies that considered gender, authors argued that prioritizing gender equality is essential for the successful transformation of AFS (HLPE 2017, 2019; FOLU 2019; Quisumbing et al. 2019; Rawe et al. 2019). But few analyses go into detail. One study reasoned that a gender-transformative food system requires a combination of four elements of gender equality: "increasing access to control over productive resources, investing in women's leadership, addressing gender and social norms, and removing structural and institutional barriers" (Quisumbing et al. 2019, 211). The same study noted that the latter two are least considered in AFS but most important. Few studies assessed social norms or considered the structural and institutional barriers women face when adopting new technologies. If gender issues are left unaddressed as new technologies and new agricultural management techniques are introduced, the result will be increased gender inequality because of more work for women (Tittonell 2019; Skeer and Leme 2019; WEF 2018; NAS 2019).

Understanding unintended consequences is important for supporting marginalized populations and addressing social exclusion within AFS. Similarly, aging populations may increase the time burden for (often female) caregivers and increase demand for convenience foods, potentially at the expense of health (Meenakshi and Webb 2019). Gender norms and gendered inequalities often shape what roles are available to men and women within agricultural value chains. Categorizing women as either only farmers or only consumers risks overlooking opportunities to support transformations within AFS and to reduce poverty. An intersectional approach to understanding how gender interacts with other demographic characteristics such as age, status, poverty, and ethnicity will better support the most marginalized (Huyer et al. 2019). Gender-transformative work also will require engaging men. Yet few foresight studies considered how gender shapes the behaviors and barriers men face or how to engage men and boys as partners in gender-transformative AFS practices.

The impacts of growth and migration on poor farmers and other AFS income earners and the trends' effect on gender are less clear. More men migrate than women (HLPE 2017; Huyer et al. 2019), and migrants are generally younger, leaving women and older people in rural areas (Arslan et al. 2019). The overall implication of this demographic shift is uncertain for rural poverty and women. If people migrate to better urban jobs, rural areas may benefit from remittances, increased urban demand for food, or both. A greater share of men migrating may open income-earning opportunities for women in AFS, particularly as demand for food increases. However, gendered barriers to accessing credit, extension, and information may undermine these opportunities (Quisumbing et al. 2019).

Climate and Environment Foresight Review

The linkages between AFS, the environment, and climate change are complex and in constant flux. AFS rely on environmental inputs such as land, water, and genetic materials. At the same time, poor management of agricultural land, freshwater, and marine resources and the continuing expansion of agricultural land are powerful threats to environmental health. Furthermore, AFS are responsible for a considerable proportion of global GHG emissions, creating a reciprocal relationship.

Climate Adaptation and Greenhouse Gas Reduction

Interactions between climate change and AFS are a heavily researched area, and the literature identified climate change as a key driver of AFS change. However, the likely impacts of climate change vary among the literature. The foresight literature underscored the need for adaptation measures, which are considered crucial to maintaining the ability to feed a growing global population. Nonetheless, the literature included questions about whether current efforts can keep up with expected impacts across countries and agroecological zones.

While adapting to climate change is essential, AFS must also do more to mitigate climate change. The foresight literature anticipated rising GHG emissions from agriculture if current trends continue. In many developing countries, addressing adaptation and mitigation needs will demand a careful balancing act; decision makers will need to find solutions and channel scarce resources into a mix of options that can also maintain and enhance food security levels. This will require prudent navigation of priorities, new technologies, and incentive structures.

Climate and Environmental Change Trends in Drivers

- Increase in GHG emissions
- Changes in rainfall/temperature patterns
- Increase in extreme weather events
- Water quality and quantity
- Nutrient scarcity
- Land use competition
- Biodiversity loss
- Invasive species
- Soil degradation
- Overfishing and aquaculture growth

Although various studies discussed the impacts of changing physical climate variables, they said little about the impacts of climate change on crop and livestock pests and diseases. These pests and diseases, sometimes mentioned under the umbrella of needed adaptations for the food sector, warrant further attention, especially as CGIAR has core competencies in this area.

Evidence from crop models suggested significant capacity to adapt to climate change (WRI 2019). But high uncertainty existed about the extent to which adaptation can offset the adverse effects of climate change. In contrast, some studies raised the question of where agriculture adaptation can take place, if at all. In addition, questions were raised about the extent to which improved climate predictions and climate risk assessments might assist in ensuring more stable food supplies.

The literature emphasized AFS's contribution to GHG emissions. Studies described detailed approaches to lowering GHG emissions, with varying outcomes. While all literature reviewed referred to the Paris Agreement as setting the target for emissions reduction to a maximum of 4 Gt CO_2 in 2030, all stressed the need for net-zero-emissions food systems by 2050. Yet various studies used different assumptions and consequently provided different trajectories of future trends.

Environmental Health and Biodiversity

The environment and AFS have a two-way relationship that produces various outcomes. A healthy environment supports AFS by providing a wide range of inputs, and a degraded environment limits AFS. Similarly, sustainable AFS can improve environmental outcomes. Among the many elements of environmental health, this synthesis highlights water scarcity, biodiversity loss, depletion of soil, nutrient cycling, and land resources, as well as emerging drivers such as pollution from aquaculture.

Water scarcity will become an even greater problem. According to some estimates, half of the world's population will live in water-stressed areas by 2050 (FOLU 2019). As the demand for food and crop cultivation continues to rise, water scarcity will become a bigger threat to AFS. The literature suggested addressing this challenge by improving water use efficiency and reducing water demand, a research emphasis critical for One CGIAR.

Loss of both wild and agricultural biodiversity is expected to continue. Even in the best-case scenario reviewed, biodiversity may marginally decrease (FOLU 2019). The loss is driven primarily by expansion in agricultural land to increase food production, but also by changes in use of existing lands, such as the rise of monocultures. The loss of biodiversity has several implications for AFS. Losses will negatively affect crop and farm animal diversity, as well as functional diversity on farms. Even with the advent of new biotechnologies and precision gene editing, genetic material from wild relatives retains its potential to unlock future foods and nutrition, but the continued loss of biodiversity severely reduces this potential (IPBES 2019). The literature did not highlight issues of food safety and the use of functional foods. As the COVID-19 pandemic shows, the overall integrity and functioning of AFS requires more attention to food safety issues.

As rising seawater reduces the Earth's terrestrial surface, availability of land for agriculture will be a main concern. The studies reviewed unanimously underlined the intimate connections among agricultural land use, biodiversity, and GHG mitigation. Soil degradation is anticipated to worsen in the coming decades. Like most environmental drivers, soil degradation has a complicated relationship with AFS. Agricultural trade is a driver of soil degradation: the demand from countries in one part of the world results in soil health decline, biodiversity loss, and other environmental degradation in other parts of the world (Wilting et al. 2017; Lenzen et al. 2012). Innovations that could help monitor and improve soil health include regenerative agricultural practices and the reform of natural resource governance systems (WRI 2019; FOLU 2019). The role of forests and trees was noticeably absent from the literature.

Many of the world's fisheries are overfished, and fish stocks will continue to decline. At the same time, wild catch fisheries have stagnated. Fish remains an important nutrient-dense food worldwide. Aquaculture, which has grown rapidly in recent years as a complementary source of fish protein, will become an important source of fish to meet growing demand (WRI 2019) and supply essential nutrients. This growth will also raise demand for suitable fish feed and increase the amount of land required for feed production. Although not included in the literature, increased awareness of nutrient flows between terrestrial and aquatic systems may stimulate a debate about a more circular economy that incorporates waste streams. Estimates showed aquaculture using fewer resources than livestock in 2050, although the effects are uncertain and potentially large (Froehlich et al. 2018).

ISDC Foresight Reflections and Trade-off Implications for One CGIAR

ISDC developed the following reflections and implications based on the foresight reviews and trade-off analysis report, ISDC semiannual meeting consensus-building activities, aggregate expertise, and subsequent discussions.

Foresight Reflections

1. One CGIAR's success will depend on a highly functional, continuous decision-making process that uses foresight, trade-off analysis, and the Quality of Research for Development ([QoR4D] ISPC 2017; ISDC 2020) to formulate strategy, make investment decisions, and monitor and evaluate. The One CGIAR impact areas must be integral to an adaptive and participatory research management cycle that draws on diverse perspectives to identify shared goals and viable indicators for monitoring and evaluating progress toward those goals. Foresight and trade-off analyses should be iterative processes that engage key CGIAR stakeholders at local, national, and regional levels and represent all stages throughout AFS—from input suppliers and natural resource managers to food processors and retailers to food consumer groups.

   In addition to using the extensive previous foresight research, One CGIAR may adopt a formal foresight and trade-off research modality that coordinates with ISDC and the CGIAR Foresight Community of Practice to provide the ongoing science-based evidence required to inform participatory decision making at all levels of CGIAR management, not just during the current reform. The context for decision making can change dramatically and quickly, as the present COVID-19 pandemic vividly illustrates. The continued and integrated use of foresight and trade-off analyses is aligned with the principle of adaptive governance, one of the cornerstones of the current reform process.

2. Ongoing foresight and trade-off analyses should prioritize attention to key barriers to adoption, adaptation, and diffusion of innovations for impact within AFS. These barriers include poor access, lack of affordability, poor governance and policy implementation, prevailing inequities, and lack of suitability to context, including adequate risk assessments. To achieve research for development goals, future foresight and trade-off analyses must explicitly identify intended adoption and impact pathways and their prospective barriers and facilitators. A necessary step in strategy development is to understand capacity barriers and people's ability and willingness to embrace change at the local level. Participatory and demand-driven implementation may aid in building partner capacity and expanding adoption. However, there is also a need to inform policymakers and local actors about what is possible to minimize the gap between current demand and potential innovative solutions.

   The multidisciplinary, field-based, and partnership-intensive nature of One CGIAR positions the System well to identify adoption barriers. One CGIAR is foremost an applied research organization. Hence, proactive, effective partnerships and engagement with local agencies that have the mandate and expertise to facilitate adoption and adaptation of research outcomes will be essential for the organization's future impact and success. The articulated and desired impacts of One CGIAR can be accomplished only if, and when, such strong partnerships and engagements are established and functioning. One CGIAR should assess adoption and adaptation failures and successes to learn which partnership and capacity development modalities are most effective. By identifying impactful methods, One CGIAR will discover innovative pathways for strengthening partnerships in adaptive and basic research alongside partners through possible co-design and co-learning language.

3. The One CGIAR impact areas of nutrition and food security; poverty reduction, livelihoods, and jobs; and gender equality, youth, and social inclusion appeared less in the foresight research than did climate adaptation, GHG reduction, environmental health, and biodiversity. Further, when those impact areas were included, they were siloed. The intersections of these impact areas need elevated attention in future foresight and trade-off analyses.

4. CGIAR is globally renowned for its ability to effectively convene and coordinate diverse dialogues across AFS research and policy organizations. To further increase the effectiveness of these dialogues, One CGIAR should make foresight and trade-off analysis routine elements of this facilitation process. CGIAR's geographical reach and collection of scientific expertise across disciplines—as well as its multinational, independent, and nonprofit status—makes the System especially well positioned to broker collaboration and coordination among a range of institutions: developing-country national agricultural research and education systems (NARES), subregional research organizations (SROs), advanced research institutes (ARIs) spanning sectors and disciplines, multilateral agencies, and private and nonprofit organizations throughout global AFS. However, elevating this role will require targeted resourcing. Sufficient investment in supporting existing and building new research partnerships will be vital to deliver on the new research strategy.

5. Sustainable agriculture and food systems are characterized by a high degree of diversity. Such diversity should be better leveraged to meet the growing demand for nutrients. Hence, One CGIAR should consider expanded attention to—and investment in—research concerning fruits, legumes (including pulses), nuts, and vegetables to broaden the System's commodity composition. Interspecies portability in breeding technology increasingly makes this new emphasis more attainable. The question remains whether CGIAR should build or buy increased expertise and capacity in these spaces.

   Aquaculture, poultry, and small ruminants play an essential role in women's livelihoods, and animal-source foods are important for improving nutrition in low- and lower-middle-income countries. These realities mean that One CGIAR should maintain or build excellence in this area while giving attention to the possible trade-offs these nutrient sources pose. By taking stock of its staple crop-breeding activities, CGIAR can identify and champion those areas where it retains comparative advantage while optimizing the roles of public and private partners, allowing it to rebalance the System's commodity portfolio. CGIAR might consider opportunities to graduate certain commodity-breeding activities to NARES partners. One CGIAR should stress the pre-breeding prowess the System can offer (e.g., adoption of new breeding technologies, big data, genomics) to accelerate downstream breeding activities, commodity diversification, and the bringing of new climate-resistant and nutritious cultivars to market. This approach suggests natural partnerships with public and private sector actors with relatively greater downstream and operational expertise.

6. One CGIAR research needs to align and influence emerging trends in AFS. CGIAR core strengths are largely in the domains of farm-level primary production, the sustainable management of resources, and the preservation of genetic and environmental diversity. Future focus should encompass all AFS aspects (i.e., the entire pathway through which farm products are transformed and reach consumers without compromising the core expertise). Exactly how this can be achieved without losing focus on core competencies and crowding partners needs to be subject to ongoing strategic discussions.

   Although CGIAR's major research strengths are in the areas of sustainable intensification of primary food, feed, and fuel production and natural resource management in associated land and water systems, the organization must maintain and grow its understanding of broader AFS, encompassing the entire pathway through which farm and forest products are transformed and reach consumers, and it must do so without losing focus on its core competencies. This will ensure that CGIAR research aligns well with emerging trends in broader AFS. For example, One CGIAR needs to pay careful attention to advances in nontraditional, off-farm technologies (e.g., cellular and plant-based proteins, indoor vertical farming) that have the potential to transform food markets, land use, and the returns on traditional CGIAR investments. The System must tap expertise on post-farmgate AFS technology, policy, management, and institutional issues that will increasingly influence the ultimate impacts of CGIAR's more upstream research activities in its five impact areas. Again, the crucial question is whether CGIAR should build or buy increased expertise and capacity in these spaces. But post-farmgate functions will factor ever-more importantly into the impact pathways for CGIAR programs on each of the System's five impact areas. However, access and affordability of technologies is essential for wide adoption.

7. One of the four Global Capabilities proposed for One CGIAR is in the area of Sustainable Intensification and Landscapes (SIL). This area of activity brings together two paradigms. Sustainable intensification is based on the principle of improved resource-use efficiency to address food security, climate change, and nutrition while maintaining or reducing the environmental footprint of production. The second paradigm takes a stronger agroecological systems approach that focuses on the underlying natural resources, ecology, and biodiversity to sustain food production systems and human nutrition and includes important areas of landscape and water use such as agroforestry systems and irrigation. Both, sustainable intensification and stronger agroecological systems approaches, have their place in CGIAR. The 2030 Research Strategy should consider providing equitable space for both pathways to coexist and flourish. Further, the synergies and trade-offs associated with these two paradigms should be incorporated into relevant foresight analyses, taking into account the local context.

8. Although these reflections are intended for the 2030 Research Strategy, they also may be useful for other topics of the One CGIAR reform Transition Advisory Groups.

Trade-off Implications

1. Modalities of stakeholder engagement are critical in strategic and programmatic decision making. What are CGIAR's mechanisms and capacities for identifying and engaging key partners at the farm system, regional, and global scales in weighing trade-offs?

2. Tools for ongoing trade-off analysis may be embedded deeply into CGIAR research management protocols and decision points involving monitoring, reporting, and stage-gating, as well as at evaluative moments when outcomes and impacts are under discussion. What opportunities exist in emerging research modalities and tools to streamline and mainstream ongoing trade-off discussions?

3. The information needed to study trade-offs related to the One CGIAR societal impact areas require high-quality, nationally representative individual- or household-level data. Does the System have data from all appropriate levels (household, regional, and global) to engage in well-informed debates about trade-offs?

4. Much of the data and expertise needed for foresight and trade-off analyses will reside outside CGIAR. Capacity building through convening should aim to facilitate essential activities such as data collection and analysis by CGIAR research projects. How will One CGIAR play a convener role in sourcing the necessary data and expertise needed for foresight and trade-off analyses across geographies and disciplines?

5. Demand-side and cross-scale linkages are at the cutting edge of trade-off analysis modeling. The double-pronged One CGIAR entry points of global and regional priority setting afford the potential to look at impacts at a level more granular than global strategy. Given the high diversity among sustainable AFS, mechanisms for trade-off analysis at regional levels would recognize the context-specific nature of decision making in highly complex systems.

6. As innovation evolves in AFS, how will the trade-off analysis systems of CGIAR continually assess and weigh the inevitable unintended consequences that new technologies spur?

7. A gap in the megatrend literature reviewed was the impact of shocks, such as COVID-19. In future foresight and trade-off analysis research, it will be critical to study and project the possible impacts of shocks across AFS—from production to consumers—to align research with and influence emerging AFS trends.

8. Trade-off analysis also identifies areas of synergy. Which aspects of the One CGIAR portfolio will provide space for examination of synergistic effects?

9. A strong integration of science and stakeholder-based knowledge is required to enable priority setting and to effectively support decision-making processes using trade-off analysis.

Appendix A: Foresight Reviews Terms of Reference

TERMS OF REFERENCE
Food and Agriculture Systems Foresight Study
Synthesis through Desk Review

{NAME}
(Level of Effort 35 days)

Background and Context

CGIAR is a global scientific research-for-development partnership consisting of the System Organization, Centers, CGIAR Funders, and Partners to implement its Strategy and Results Framework (SRF). CGIAR is undergoing a reform towards One CGIAR. Under this reform, CGIAR will develop a 2030 Research Strategy anchored in a unifying mission of "Ending hunger by 2030 – through science to transform food, land and water systems in a climate crisis," focused on five Impact Areas of nutrition, poverty, gender, climate, and environment.

As a prelude to the current reform of the CGIAR, the Independent Science for Development Council was created, being a reformulation of the mandate of the past Independent Science and Partnership Council (ISPC). The ISDC delivers according to a CGIAR System Council-defined Terms of Reference. Its membership has been defined as of October 2019. In order to operate, the ISDC receives the operational support of CGIAR Advisory Services Shared Secretariat (CAS Secretariat), hosted at the Rome, Italy, office of the Alliance of Bioversity International and the International Tropical Agricultural Research Center.

Assignment Details

The ISDC is seeking expert consultants with experience in applied research for development and long-term strategic thinking, in particular in one or more of the domains of food and agriculture systems (nutrition, poverty, gender, climate, and environment) that are identified impact areas of One CGIAR. Under the overall thought leadership and guidance of ISDC Member Professor Chris Barrett and under the operational supervision of CAS Secretariat Director Allison Grove Smith, the expert consultants will conduct a desk review that aligns and translates the agriculture and food systems foresight work of ISPC and other actors within and without CGIAR to clusters of specified Impact Areas of CGIAR.

ISDC is especially interested in translating the considerable mass of recent high-quality foresight studies to the new One CGIAR context, deploying science to transform food, land and water systems in a climate crisis with a tight focus on specific impact areas. The objective is not new foresight work but rather synthesis and translation of existing work to help inform CGIAR research strategy to 2030.

The deliverable expected is a report of 15-25 pages (not including citations) with a 2-page executive summary. Leading a presentation and discussion of the content with ISDC and guests at the ISDC April meeting is required.

Two desk studies will be commissioned. The first will focus on the implications of recent foresight studies for CGIAR research for development as it relates to impact areas of nutrition, poverty and gender. The second will focus on the implications of recent foresight studies for CGIAR research for development as it relates to impact areas of climate and environment. ISDC recognizes that there is overlap in these areas.

In particular, the consultant for the Environment and Climate Change Foresight Synthesis will:

- Undertake a critical desk review to synthesize existing analyses through the lens of climate and environment impacts on which the One CGIAR will focus, with a horizon to at least 2030 or beyond, drawing in particular on:
  - ISPC-sponsored foresight work from 2016-2018, culminating in R. Serraj and P. Pingali, eds. (2018), *Agriculture and Food Systems to 2050: Global Trends, Challenges and Opportunities*.
  - CGIAR-sponsored foresight and ex ante impact assessment work, in particular under Global Futures and Strategic Foresight https://globalfutures.cgiar.org/project-overview/.

- Agri-food systems foresight and ex ante impact assessment work by selected other leading organizations, including, but not limited to:
    - Committee on World Food Security High Level Panel of Experts on Food Security and Nutrition (CFS HLPE), various reports available at http://www.fao.org/cfs/cfs-hlpe/reports/en/
    - Food and Land Use Coalition (FOLU, 2019), Growing Better: Ten Critical Transitions to Transform Food and Land Use (2019).
    - Global Knowledge Initiative and Rockefeller Foundation (2017), Innovating the Future of Food Systems.
    - Graff, G.D. and I. Hamdan-Livramento (2019), Global Roots of Innovation in Plant Biotechnology (World Intellectual Property Organization).
    - Hansen, A.R., Keenan, C., and Sidhu, G. (2019). Nutritious Food Foresight: Twelve ways to invest in good food in emerging markets. Global Knowledge Initiative and Global Alliance for Improved Nutrition.
    - National Academies of Sciences (2019), Science Breakthroughs to Advance Food and Agricultural Research by 2030.
    - RethinkX (2019), Rethinking Food and Agriculture 2020-2030.
    - World Economic Forum (2018), Innovation with a Purpose: The role of technology innovation in accelerating food systems transformation.
    - World Resources Institute (2019), World Resources Report: Creating A Sustainable Food Future.

- Author study of 15-25 pages that (i) defines different scenarios for agri-food systems evolution over the coming 10-25 years, recognizing likely variation across agroecological and socioeconomic contexts, (ii) synthesizes the findings of prior foresight and ex ante impact assessment work through the lens of climate and environment impacts, (iii) identifies key prospective roles – and specific innovation spaces – for the CGIAR in those scenarios, and (iv) highlights gaps in foresight work that ISDC might explore in the coming 2-4 years. The study should include complete citations and references for key innovations and findings.

- Prepare a two-page executive summary that points to the strategic planning implications of foresight work.

- Present the findings in a meeting with ISDC members in April.

- Arrange three virtual meetings during February and March with Prof Barrett and Professor Lesley Torrance to update on progress and discuss emergent findings and themes.

Appendix B: Trade-off Report Terms of Reference

CALL FOR EXPRESSIONS OF INTEREST: TERMS OF REFERENCE
Food and Agriculture Systems Trade-off Report for One CGIAR
(Level of Effort: Not to exceed 30 days)
Timeline: 15 April to 29 May 2020

Background and Context

CGIAR is a global scientific research-for-development partnership consisting of the System Organization, Centers, CGIAR Funders, and Partners to implement its Strategy and Results Framework (SRF). CGIAR is undergoing a reform towards One CGIAR. Under this reform, CGIAR will develop a 2030 Research Strategy anchored in a unifying mission of "ending hunger by 2030—through science to transform food, land and water systems in a climate crisis," focused on five impact areas of nutrition, poverty, gender, climate, and environment.

As a prelude to the current reform of the CGIAR, the Independent Science for Development Council (ISDC) was created, being a reformulation of the mandate of the past Independent Science and Partnership Council (ISPC). The ISDC delivers according to a CGIAR System Council-defined Terms of Reference. Its membership has been defined as of October 2019. In order to operate, the ISDC receives the operational support of CGIAR Advisory Services Shared Secretariat (CAS Secretariat), hosted at the Rome, Italy, office of the Alliance of Bioversity International and the International Tropical Agricultural Research Center (CIAT).

Assignment Details

The ISDC is seeking an expert consultant(s) with deep trade-off analysis experience relevant for the CGIAR impact areas of nutrition, poverty, gender, climate, and environment. The consultant(s) will work under the overall thought leadership and guidance of ISDC Member Professor Chris Barrett and under the operational supervision of ISDC Senior Manager Dr. Amy Beaudreault.

The trade-off report will be a follow-on project that uses two desk reviews, currently in process, synthesizing and translating existing foresight studies to inform the CGIAR 2030 Research Strategy. One review focuses on nutrition, poverty, and gender and the other on climate and the environment. These reviews will be presented at the first ISDC meeting scheduled for 21-22 April 2020 in Addis Ababa with the Ethiopian Institute of Agricultural Research. An expectation is that the consultant will attend this meeting (preferably in person) and actively participate with a neutral and unbiased perspective to this trade-off analysis' deliverables.

Deliverables

Please refer to timeline on pages 2 and 3 for detailed schedule. All deliverables should be single-spaced. The following deliverables are required for this consultancy.

1. Attendance in virtual meetings and ISDC meeting (approximately 20 April to 24 April)
2. A detailed 3- to 5-page outline
3. 1st draft report for the purpose of being distributed internally among a subset of ISDC members for review; feedback provided will be consolidated
4. 2nd draft report that incorporated feedback from 1st draft, including a 2-page executive summary and full citations. This draft will be distributed to all ISDC members
5. An approximately 20-minute presentation and follow-up discussion led by consultant(s) of the findings at a virtual ISDC meeting (date: approximately 27 May)
6. A final 15- to 25-page final report
7. Participation in conference calls when necessary

Scope of Work

Building on the two foresight reviews and Addis presentations and discussions, the consultant(s) will include the following key aspects in the trade-off analysis (please note that the consultant(s) *is not* expected to develop a new model; the consultant(s) should use an unbiased lens when conducting this research):

- Advance knowledge on how trade-off analyses may provide diverse pathways in obtaining the One CGIAR research-for-development goals in the five impact areas of nutrition, poverty, gender, climate, and environment
- Include a review and analysis of several (minimum of 3 but open for discussion during outline phase) with each model presented with an accompanying case study (i.e., scenario) that summarizes where CGIAR is well-positioned to influence within and across its impact areas
    - Models and accompanying case studies should showcase a variety that focus on internal (within impact areas) and external (across impact areas)
    - Models should range in timescales and techniques
    - While quantitative models are preferred, some CGIAR impact areas may not have the evidence and qualitative (preferably ordinal) models will be acceptable
    - Case studies should contain different trajectories for complementary private and public investments to spark explicit consideration and discussion of where CGIAR research for development fits across its research portfolio. The trajectory data sources should be included in the outline
- Describe the advantages and disadvantages of each model and case study from the perspective of CGIAR stakeholders
    - Define what models are used most and why, and their relevance for CGIAR priority setting
- Translate complex trade-off examples into understandable implications for all CGIAR stakeholders (including but not limited to donors, policymakers, implementers, and evaluators)
- Report should be framed to provide strategic planning implications for practical decision-making for One CGIAR. This element should be incorporated in the executive summary.

Timeline

Start Date: 15 April
The consultancy is expected to commence on April 15 when drafts of the two foresight studies will be internally disseminated.

Deliverable 1: Attendance at Addis Meeting 21-22 April
An expectation is the consultant(s) should not do heavy work prior to the Addis ISDC meeting, except reading of foresight drafts and commencing conceptualization of analysis. Ideally, the consultant should attend the meeting in person.

Deliverable 2: Detailed Outline, April 28 (3:00 p.m. CET)
Draft a 3- to 5-page detailed outline for ISDC feedback that provides what models, case studies, and trajectory data sources will be included. ISDC will give feedback on outline no later than 1 May. If required, a call will be scheduled.

Deliverable 3: 1st Draft, 8 May (3:00 p.m. CET)
A full draft of the report is due. Placeholders for citations are acceptable. ISDC will respond with all feedback on 18 May.

*Deliverable 4: 2nd Draft: 22 May (3:00 p.m. CET)*A near final draft (including 2-page executive summary and full citations) is due. This will be shared with full the full ISDC as a pre-read for the presentation and discussion.
Deliverable 5: ISDC Presentation, 27 May
Consultant will present and lead discussion during virtual ISDC meeting (time TBD).

Deliverable 6: Final Report, May 29 (3:00 p.m. CET)
Final report that is fully proofed, formatted, and incorporates any remaining items conversed during presentation and discussion.

Expressions of Interest and Other Requirements

- Deadline: 6 March 2020, 3 p.m. CET via email to isdc@cgiar.org
- Proposal packages must contain a maximum 2-page approach to analysis, including applicant(s) expertise in trade-off analysis. In addition, please submit two relevant writing samples and CV(s).
- This consultancy is not to exceed 25 days. The contract can be designed as a daily rate or lump sum.
- With proposal, please provide daily rate and estimated days or preference for lump sum. If team applies, separate contracts can be developed.
    - If awarded, evidence of day rate *must be provided* for similar consultancies.
- Contracting is subject to the policies and procedures of the Alliance of Bioversity International and CIAT, which is the host institute of the CAS Secretariat.
- Consultant(s) will need to sign conflict of interest during contracting stage.

Appendix C: ISDC Semiannual Meeting Agenda

ISDC Virtual Meeting Agenda, 20–23 April 2020

** Platform is Microsoft Teams. Please refer to accompanying Microsoft Teams Quick User Guide for details regarding use for discussions and Q&A. Meeting will be recorded for notetaking purposes.*

Monday, 20 April

14:00 to 16:10 CET
Attendees: ISDC, SPIA Chair, CAS Secretariat, foresight/trade-off researchers, and invited guests

Theme of Day
Making ISDC research actionable for decisionmakers
(includes update for ISDC members, presentations, discussion, and feedback from guests)
Expected Outcomes
Clarity and agreement regarding ISDC's role and expected deliverables for One CGIAR

Welcome and One CGIAR Reform

- Welcoming Remarks
  14:00 to 14:10
  ISDC Chair Holger Meinke
- Perspectives of ISDC in One CGIAR
  14:10 to 14:25
  CGIAR System Executive Director Elwyn Grainger-Jones
- Transition Consultation Forum Review (TCF)
  14:25 to 14:40
  CGIAR System Management Board Chair Marco Ferroni
- Ideas for ISDC's Contribution to the CGIAR System's Current Landscape Emerging from a Process Lead by the System Council's Standing Committee on Strategic Impact, Monitoring and Evaluation (SIMEC)
  14:40 to 14:55
  SIMEC Chair Michel Bernhardt
- Research Transition Advisory Group Update (TAG 2)
  14:55 to 15:10
  TAG 2 Co-conveners Martin Kropff and Melissa Wood

Foresight for Decisionmaking: Outcomes of Synthesis
Video of foresight presentation(s) to be provided in advance

- Introduction
  15:10 to 15:15
  ISDC Member and Foresight/Trade-offs Focal Lead Christopher Barrett
- Rapid Summary of Findings
  15:15 to 15:35
  Foresight Synthesis Researchers Erin Lentz and Monika Zurek
- Update on Foresight CGIAR Community of Practice
  15:35 to 15:50
  CG Foresight Team Co-leads: Principal Scientist, Climate-Resilient Food Systems Steven Prager and IFPRI Senior Research Fellow Keith Wiebe

- Follow-up Questions to Presentations
  15:50 to 16:05
  Facilitator: ISDC Member and Foresight/Trade-off Focal Lead Christopher Barrett

Day in Review and Next Steps

- Overview of Day and Review of Meeting
  16:05 to 16:15
  ISDC Chair Holger Meinke

- Review Goals and Logistics of Following Day Group Work
  16:15 to 16:20
  CAS Secretariat Senior Manager Amy Beaudreault

Tuesday, 21 April

Times Differ Among Groups
Attendees: ISDC, SPIA Chair, CAS Secretariat, and foresight/trade-off researchers

Independent Group Work
*all times in CET, anticipated length 1 to 2 hours

- Climate: Andrew Ash, Holger Meinke, Monika Zurek (9:00) [additional participants: Lesley Torrance, CAS Secretariat]
- Environment: Mandefro Nigussie, Allison Grove Smith, Lesley Torrance (10:00) [additional participants: Monika Zurek, Christopher Barrett, CAS Secretariat]
- Nutrition & Gender: Amy Beaudreault, Suneetha Kadiyala, Erin Lentz, Roberto Valdivia (17:00) [additional participants: Christopher Barrett, CAS Secretariat]
- Poverty: John Antle, Christopher Barrett, Nighisty Ghezae, Karen Macours (18:00) [additional participants: Erin Lentz, CAS Secretariat]

Wednesday, 22 April

13:00 to 16:15 CET
Attendees: ISDC, SPIA Chair, CAS Secretariat, foresight/trade-off researchers, and invited guests

Theme of Day 3
Linking foresight to trade-offs and policy
(includes group presentations, open discussion, and consensus building)
Expected Outcomes
Implications for trade-off analysis and translation to policymakers

Group Presentations
13:00 to 13:30
Two groups present on its outcomes for 10 minutes with 5 minutes following of Q&A moderated via chat by CAS Secretariat Senior Manager Amy Beaudreault

The Contribution of Trade-off Analysis to CGIAR
13:30 to 13:45
SIMEC Chair Michel Bernhardt

Group Presentations Continued
13:45 to 14:15
Two groups present on its outcomes for 10 minutes with 5 minutes following of Q&A moderated via chat by CAS Secretariat Senior Manager Amy Beaudreault

Foresight Guided Discussion
14:15 to 15:00
Facilitators: ISDC Foresight Focal Point Suneetha Kadiyala

Short Break (10 minutes): External Guests Join

Introduction to Trade-offs Report
15:10 to 15:15
ISDC Member and Foresight/Trade-off Focal Lead Christopher Barrett

Overview of Trade-offs
15:15 to 15:30
Trade-off Researchers John Antle and Roberto Valdivia

Implications for Trade-offs and Policy Discussion
15:30 to 16:00
Facilitators: ISDC Trade-off Focal Point Lesley Torrance

Close of Day and Thank You
16:00 to 16:05
ISDC Chair Holger Meinke

Thursday, 23 April

12:00 to 14:10 CET
Attendees: ISDC, SPIA Chair, and CAS Secretariat

Theme of Day 4
Developing recommendations and next steps for ISDC in 2020
(includes facilitated and open discussions and decisionmaking)
Expected Outcomes
Main themes for 10th Meeting of the System Council and review of 2020 ISDC work plan

Recommendations for Systems Council Discussion
12:00 to 12:45
Facilitators: ISDC Chair Holger Meinke and CAS Secretariat Senior Manager Amy Beaudreault

ISDC Member Open Input
12:45 to 13:15
Moderators: ISDC Chair Holger Meinke and CAS Secretariat Senior Manager Amy Beaudreault

2020 Work Plan Review
13:15 to 14:00
- 2020 mid-point work plan review and reflection
- ISDC member recruitment
- Potential partnerships
- ISDC mid-point survey background (to be completed independently)

Facilitators: ISDC Chair Holger Meinke and CAS Secretariat

Close of Meeting
14:00 to 14:10
ISDC Chair Holger Meinke

References

Arslan, A., Egger, E.-M., and Winters, P. 2019. "Migration, Demography, and Agri-Food Systems." In R. Serraj and P. Pingali, eds., *Agriculture and food systems to 2050: Global trends, challenges and opportunities*, 87–135. Singapore: World Scientific. https://www.worldscientific.com/doi/pdf/10.1142/11212.

CGIAR. 2020. CGIAR System Reference Group. https://www.cgiar.org/how-we-work/strategy/cgiar-system-reference-group/.

FOLU (Food and Land Use Coalition). 2019. *Growing better: Ten critical transitions to transform food and land use*. www.foodandlandusecoalition.org/global-report/.

Froehlich, H. E., Runge, C. A., Gentry, R. R., Gaines, S. D., and Halpern, B. S. 2018. Comparative terrestrial feed and land use of an aquaculture-dominant world. *Proceedings of the National Academy of Sciences*, 115(20), 5295–5300. https://doi.org/10.1073/pnas.1801692115.

Hasegawa, T., Fujimori, S., Havlik, P., Valin, H., Bodirsky, B. L., Doelman, J. C., et al. 2018. "Risk of increased food insecurity under stringent global climate change mitigation policy." *Nature Climate Change* 8: 699–703.

HLPE (High Level Panel of Experts on Food Security and Nutrition). 2017. *Nutrition and food systems*. Rome. http://www.fao.org/3/a-i7846e.pdf.

HLPE (High Level *of Experts* on Food Security and Nutrition). 2019. *Agroecological and other innovative approaches for sustainable agriculture and food systems that enhance food security and nutrition*. Rome. http://www.fao.org/3/a-i7846e.pdf.

Huyer, S., Gumucio, T., Chanana, N., Cramer, L., Mungai, C., Ouedraogo, M., et al. 2019. *Learning and action for gender-transformative climate-smart agriculture*. CCAFS Working Paper No. 279. Wageningen, Netherlands: CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS).

IPBES (Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services). 2019. *Global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services*. E. S. Brondizio, J. Settele, S. Díaz, and H. T. Ngo (editors). IPBES secretariat, Bonn, Germany. https://ipbes.net/global-assessment.

ISDC (Independent Science for Development Council). 2020. *Quality of research for development in the CGIAR context*. Rome: CGIAR ISDC. https://cas.cgiar.org/sites/default/files/pdf/ISDC_QoR4D%20Framework.pdf.

ISPC (Independent Science for Development Council). 2017. *Quality of research for development in the CGIAR context*. Rome: CGIAR ISPC. https://cas.cgiar.org/sites/default/files/pdf/ispc_brief_62_qord.pdf.

Lenzen, M., Moran, D., Kanemoto, K., Foran, B., Lobefaro, L., and Geschke, A. (2012). International trade drives biodiversity threats in developing nations. *Nature*, 486(7401), 109–112. https://doi.org/10.1038/nature11145.

Maggio, A., Scapolo, F., van Criekinge, T., and Serraj, R. 2019. "Global drivers and megatrends in agri-food systems." In R. Serraj and P. Pingali, eds., *Agriculture and food systems to 2050: Global trends, challenges and opportunities*, 47–83. Singapore: World Scientific. https://www.worldscientific.com/doi/pdf/10.1142/11212.

Meenakshi, J. V., and Webb, P. 2019. "Food Systems, Diets, and Nutrition." In R. Serraj and P. Pingali, eds., *Agriculture and food systems to 2050: Global trends, challenges and opportunities*, 215–242. Singapore: World Scientific. https://www.worldscientific.com/doi/pdf/10.1142/11212.

NAS (National Academies of Sciences). 2019. *Science breakthroughs to advance food and agricultural research by 2030*. Washington, DC: National Academies Press. https://www.nap.edu/download/25059.

Palazzo, A., Vervoort, J., Havlik, P., Mason-D'Croz, D., and Islam, S. 2014. *Simulating stakeholder-driven food and climate scenarios for policy development in Africa, Asia and Latin America: A multi-regional synthesis*. CCAFS Working Paper No. 109. Copenhagen: CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS).

Quisumbing, A., Meinzen-Dick, R., and Njuki, J., eds. 2019. *Annual trends and outlook report: Gender equality in rural Africa: From commitments to outcomes*. Washington, DC: International Food Policy Research Institute. https://www.ifpri.org/publication/2019-annual-trends-and-outlook-report-gender-equality-rural-africa-commitments-0.

Rawe, T., Antonelli, M., Chatrchyan, A., Clayton, T., Fanzo, J., Gonsalves, J., et al. 2019. *Transforming food systems under climate change: Local to global policy as a catalyst for change*. CCAFS Working Paper No. 271. Wageningen, Netherlands: CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS). https://cgspace.cgiar.org/bitstream/handle/10568/101601/CCAFS%20WP%20No.271%20-%20Local%20to%20global%20policy%20as%20a%20catalyst%20for%20change.pdf.

Skeer, J., and Leme, R. 2019. "Renewable energy in the energy future." In R. Serraj and P. Pingali, eds., *Agriculture and food systems to 2050: Global trends, challenges and opportunities*, 473–502. Singapore: World Scientific. https://www.worldscientific.com/doi/pdf/10.1142/11212.

Tittonell, J. 2019. "Ecological intensification of agriculture." In R. Serraj and P. Pingali, eds., *Agriculture and food systems to 2050: Global trends, challenges and opportunities*, 437–472. Singapore: World Scientific. https://www.worldscientific.com/doi/pdf/10.1142/11212.

WEF (World Economic Forum). 2018. *Innovation with a purpose: The role of technology innovation in accelerating food systems transformation*. Geneva. http://www3.weforum.org/docs/WEF_Innovation_with_a_Purpose_VF-reduced.pdf.

Wiebe, K., Zurek, M., Lord, S., Brzezina, N., Gabrielyan, G., Libertini, J., Loch, A., Thapa-Parajuli, R., Vervoort, J., and Westhoek, H. 2018. "Scenario development and foresight analysis: Exploring options to inform choices." *Annual Review of Environment and Resources*, 43(1), 545–570. https://doi.org/10.1146/annurev-environ-102017-030109.

Willett, W., Rockström, J., Loken, B., Springmann, M., Lang, T., Vermeulen, S., et al. 2019. "Food in the anthropocene: The EAT–Lancet Commission on healthy diets from sustainable food systems." *Lancet* 393 (10170): 447–492. http://dx.doi.org/10.1016/S0140-6736(18)31788-4.

Wilting, H. C., Schipper, A. M., Bakkenes, M., Meijer, J. R., and Huijbregts, M. A. J. 2017. "Quantifying biodiversity losses due to human consumption: A global-scale footprint analysis." *Environmental Science and Technology*, 51(6), 3298–3306. https://doi.org/10.1021/acs.est.6b05296.

WRI (World Resources Institute). 2019. *World resources report: Creating a sustainable food future*. Washington, DC. https://wrr-food.wri.org/sites/default/files/2019-07/WRR_Food_Full_Report_0.pdf.

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