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E-consultation Summary

Synthesis of E-consultation Discussion Conducted May 9-27, 2011

a U.S. Government initiative

ASSOCIATION OF PUBLIC AND LAND-GRANT UNIVERSITIES

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From the Forum Organizers

Dear Forum participants,

This E-consultation Summary is an interim statement. It looks solely at the major outcomes from the e-consultation that took place May 9-27, 2011 at www.globalfoodsecurityresearch.net, and strives to represent as faithfully as possible the major views expressed there.

This document is meant to provoke further conversation and to set the stage for the *Feed the Future Research Forum: Engaging the Research Community*. A more focused report, covering the entire multi-stage consultation process including the outcomes of this Forum, will be made available in July 2011.

We look forward to your contributions during the Forum that will help us shape the final set of recommendations to be made to Feed the Future.

If you have any questions about the process or would like to contribute additional thoughts after the forum, please contact us via email at mwdemment@ucdavis.edu and simon.nicholson@american.edu.

Sincerely,

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Executive Summary

This report highlights the major outcomes of an online "e-consultation" convened by the Association of Public and Land-grant Universities (APLU), May 9-27, 2011. The e-consultation provided a forum for stakeholders to offer feedback on the Feed the Future (FTF) initiative's research strategy, and invited researchers to consider how best to support FTF's goals of alleviating global poverty and hunger. The e-consultation was one step in a longer process of researcher engagement with FTF that APLU has developed with the Board on International Food and Agricultural Development (BIFAD), in close collaboration with U.S. Agency for International Development (USAID) and U.S. Department of Agriculture (USDA).

The e-consultation had two main components. The first week was devoted to soliciting reactions to the published FTF Global Food Security Research Strategy. The second and third weeks continued this process, and in addition invited e-consultation participants to develop a series of "research challenges." These research challenges characterize the e-consultation's sense of the major research areas that need attention if FTF's goals are to be met. The challenges as spelled out in this report will receive greater elaboration and refinement during breakout group sessions at a major three-day forum organized by APLU and planned for June 21-23, 2011 in Washington, DC.

Outcomes from the e-consultation are summarized below. The report highlights ten themes, which collectively capture the general feedback offered regarding the FTF research strategy, and ten specific research challenges.

Feedback on Research Strategy

The e-consultation showed generally high levels of enthusiasm for the FTF research strategy. At the same time, the e-consultation also elicited a large number of comments about how FTF's research focus might be strengthened and further developed. Here are the three most important pieces of feedback:

I. The FTF research strategy turns on three core concepts that are best viewed collectively.

The FTF research strategy promises i) investment in international public goods while leveraging and otherwise encouraging private investment by farmers and businesses, to ii) sustainably intensify food production, with the goal of iii) reducing the incidence and effects of global poverty and hunger. Participants were overwhelmingly supportive of this framework.

Many stressed the importance of sustainable intensification, and welcomed its prominent inclusion in the research strategy. One research priority that many comments on the e-consultation forum supported is the leveraging of the unique resources of the U.S. Government and U.S.-based research community to develop production-side game-changers. The world must grow more food in coming years without further degrading the environmental condition. This is a prerequisite, suggested participants, for other forms of action on global hunger and poverty.

However, some participants also argued that the production of more food, while essential, can never in itself be a sufficient response. Participants expressed support, on this basis, for the fact that FTF moves far beyond a production-focused research agenda. Indeed, many saw the real strength of the FTF research agenda lying in the *links* that it draws between an environmentally sustainable boost in food production and human nutrition. There is a hope, then, that FTF will give significant support to research focused on ensuring that production increases lead to real reductions in hunger and poverty.

2. ***FTF would be better off identifying, framing, and supporting research on key problems, rather than crafting an agenda that pre-supposes solutions*.**

One clear hope voiced by the research community is that the U.S. Government will use FTF to support and incentivize research that brings the best available thinking from a range of disciplines and perspectives to bear. Participants in the e-consultation urged strongly that the research agenda FTF is developing be expressed as problems that must be addressed, rather than pre-determined solutions that must be pursued, to avoid limiting creativity in the actual research needed to address the challenges.

A point that came through clearly from the e-consultation is that there are no silver bullets—no single, straightforward answers—to the challenges of global poverty and hunger. There is clearly a need for research on potential game changers. At the same time there is a danger, worried some, that the pursuit of revolutionary technologies alone might result in a playing-down of the complex causes of poverty and under-nutrition, and create a research strategy that in its enactment ends up privileging grand gestures. It is important not to forget the nuts-and-bolts work that connects technological improvements to real improvements in the lives of the poor.

3. ***Capacity building is critical to any attempt to address the goals of FTF.***

Both human and institutional capacity, particularly in the fields related to the FTF research strategy, need to be built in if the development efforts are to be sustainable and country-led. Many were insistent that there is no legitimate, meaningful way to separate a conversation about research from a conversation about capacity. Lack of

human capacity at any level within the sectors relevant to FTF is a major constraint on development efforts; therefore the weak state of institutions capable of producing that human capacity is of equal or greater importance. This calls for a focus on the supporting and linking of a range of institutional partners, from private sector, to financial institutions, to universities, to sub- and transnational research institutions. One challenge received particular attention: If we want to eliminate and avoid poverty and malnutrition over the next 40 years, create greater equality globally, and stabilize human populations, then we need to find a way to educate a whole new cohort of people from developing countries now who will carry much of the intellectual and political responsibility for achieving those goals into the future.

Major Research Challenges

Weeks two and three of the e-consultation tasked e-consultation participants with the construction of a research agenda to support researcher engagement with FTF's mission. All told, participants proposed dozens of different research ideas. These were winnowed down throughout the e-consultation process to ten major research challenges. Each challenge was then further developed through elaboration of research themes.

1. Advancing the productivity frontier

I. *Increase the productivity potential of high priority crops and livestock:* Research must be undertaken directed towards increasing the productivity of high priority crop and livestock systems, in ways that enhance environmental services and that build social resilience.

2. Transforming production systems

II. *Improve soil fertility, quality, and conservation:* Research is needed to generate new, game-changing fertilizer technologies that more efficiently make available critical nutrients and that are more environmentally sound. Research is also needed to improve knowledge about the specific soil protection, remediation, and fertilization needs of FTF-focus regions.

III. *Better understand and manage the risk environment:* Work is needed to better understand the nature of the risk people face, the coping mechanisms that individuals and communities have used in the past, and potential new ways they can respond in the changing environment of the future.

IV. *Improve the distribution of relevant research outputs, and the ability of researchers to learn from intended beneficiaries:*

There is significant work—both on the programmatic and research fronts—needed to ensure that research outputs find their way to those who need them, and that researchers of all types are able to better collaborate with and learn from the intended beneficiaries of their efforts.

3. Enhanced nutrition and food safety

V. *Improve availability of, and access to, a high quality diet:*
Research is needed to better understand the appropriate points for targeted, high impact interventions that link increases in food production with better nutrition and increased human capital. In addition, work is needed to understand how nutritional education, resource accumulation, and other interventions can build demand and capacity so that populations can create a demand for high quality diverse diets because they understand the impacts on human health, child development and human productivity.

VI. *Ensure safer diets:*
Work is needed at the most fundamental level to identify the chief constraints preventing the development of safe food systems. Research is then required to develop new technologies and techniques that will dramatically improve the availability of safe and nutritious food, particularly in resource constrained regions.

VII. *Reduce postharvest losses and waste:*
There is a need for the development of new technologies and practices that tackle sites of loss and contamination throughout the postharvest value chain, and identification of avenues for spreading the best existing technologies and practices. A core component is connecting farmers to appropriate markets, so that sustainable intensification and reductions in crop loss can yield real returns.

4. Cross-cutting challenges

VIII. *Develop methodologies and research practices to better determine what works:* There is a clear need for better analysis of development efforts. What works? What are the kinds of strategies and interventions that in demonstrable and replicable ways alleviate hunger and poverty?

IX. *Develop food systems that mitigate, and that increase resilience to the effects of climate change:* There is a need to work on climate change adaptation strategies, particularly for small-scale farmers and those particularly vulnerable to food price volatility. At the same time there is a need to work to shrink atmospheric greenhouse gas concentrations through the identification, development, and adoption of climate-conscious agricultural systems.

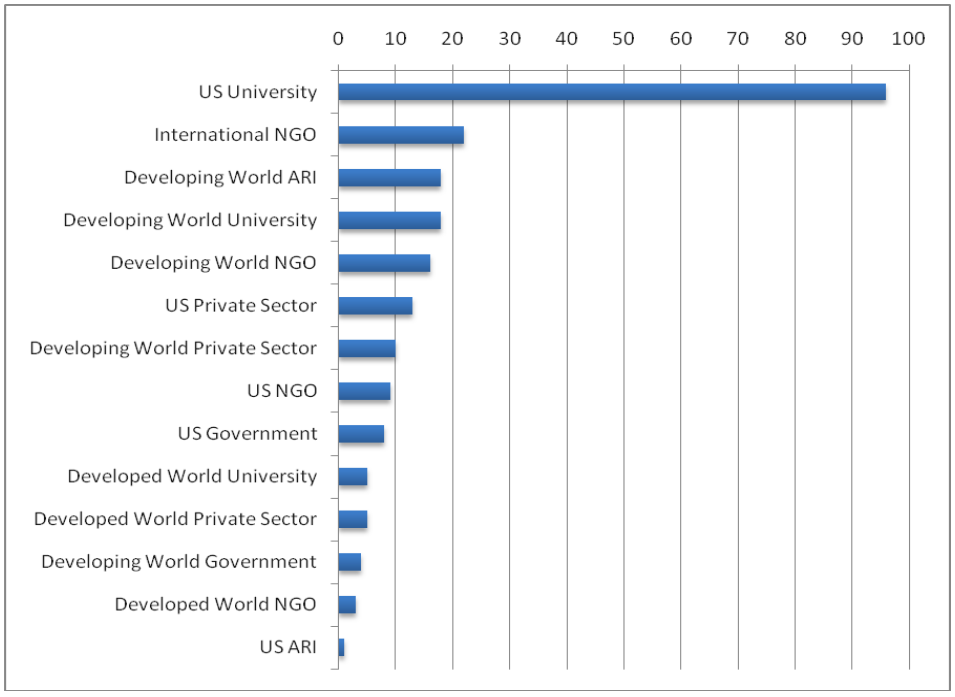
X. *Identify avenues for the building of human and institutional capacity:* Research must be undertaken to better determine and characterize the types of capacity building in which FTF might meaningfully invest. Research is also needed to understand how to give real voice in the FTF and other development processes to all major stakeholder groups, particularly smallholder farmers, women, and youth.

I. E-consultation Background

During the three-week period May 9-27, 2011, the Association of Public and Land-grant Universities (APLU) convened an on-line "e-consultation," to solicit feedback on the research strategy associated with the U.S. Government's Feed the Future (FTF) initiative.[1] The e-consultation was designed to allow researchers and other stakeholders to consider and provide input to the U.S. government on FTF's research priorities, and to discuss how best to support and engage with this important new program.

The e-consultation garnered wide interest. More than 1,100 people registered to participate (see *Appendix I* for a breakdown by country), representing more than 85 distinct academic disciplines and hundreds of distinct institutions. Between them, these participants contributed more than 600 separate written comments to a vigorous and wide-ranging conversation. The bulk of these contributions, 387, were made by people from the U.S., with the university-based research community particularly active. Sixty-nine individual contributions were made by people living in developing countries. The website established for the e-consultation ultimately attracted more than 2,000 unique visitors from 102 countries.

FIGURE I: Participants by Type of Institutional Affiliation[2]



[1] The website on which the forum was hosted is available here: http://globalfoodsecurityresearch.net/

[2] This data is based on self-identification at registration. NGO = non-governmental organization; ARI = agricultural research institution.

This summary document highlights the major themes and insights that emerged from the e-consultation process. It is in two parts, mirroring the e-consultation's structure. These two parts are:

a) Feedback on the Published FTF Global Food Security Research Strategy
b) Research Challenges Identified by E-consultation Participants

The e-consultation was one step in a process that APLU has designed with BIFAD, and in close consultation with USAID and USDA, to enable researchers to engage with the FTF research strategy. An initial workshop was held at Purdue University in January 2011 to set the context for the discussion and to frame a process for researcher engagement.[3] The e-consultation process was then developed. The e-consultation was itself designed to set the stage for a major three-day forum June 21-23, 2011in Washington DC, which will bring together a wide cross-section of stakeholders from the U.S. and international research communities, government, civil society and industry, to refine the key challenges and major research questions facing the FTF initiative.

It is important to note that the present document is an interim statement. It looks solely at the major outcomes from the e-consultation, and strives to represent as faithfully as possible the major views expressed on that forum. This document is meant to provoke further conversation and to set the stage for the June forum. A more focused report, covering the entire multi-stage consultation process, will be made available in July 2011.

[3] A white paper was produced following this meeting: Ann Carlson, Kathie Olsen, and Montague Demment, "A Research Agenda for Feed the Future (FTF): Planning Workshop at Purdue University, January 11-13, 2011" (January 2011), available at https://www.aplu.org/ftfresearchforum.

II. Feedback on the Published FTF Global Food Security Research Strategy

The first week of the e-consultation gave participants a chance to comment on the official *FTF Global Food Security Research Strategy*.[4] This document, prepared by authors from USAID and USDA, had been released to the public the week prior. The document establishes a "global research portfolio" to support FTF's programmatic intent.

The feedback received on the research strategy was generally positive. The strategy's major suppositions, its proposals for directing and funding research, and its major research objectives were, by and large, seen by e-consultation participants as entirely appropriate and well developed. A number of participants acknowledged the depth of thought apparent in the document, and welcomed the opportunities FTF provides for deeper levels of engagement between U.S. Government agencies and the research community.

These positive views of the research strategy actually became stronger as the e-consultation progressed. As one participant, Kent Curtis, Assistant Professor of Environmental Studies of Eckerd College, United States, put it: "**I will … say that each time you [the e-consultation moderator] push us back to the document itself, I see nuance and elements of careful intention that were not initially obvious**." [5]

Still, despite general enthusiasm for the FTF research strategy, the e-consultation also elicited a good number of comments about how FTF's research focus might be refined, strengthened, and further developed. Many of these ideas also amount to suggestions about how researchers might best engage with the programmatic elements of the FTF initiative, and about how researchers might best orient themselves in support of FTF's goals of alleviating hunger and poverty.

Ten major themes derived from the e-consultation are summarized below. Each of these themes is accompanied by a brief description, along with quotes pulled directly from the e-consultation text.[6] The quotes are designed to illuminate particular points, and also to give a sense of the range of views apparent throughout the online conversation.

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4 U.S. Government, "Feed the Future: Global Food Security Research Strategy" (May 2011), available at www.feedthefuture.gov/documents/FTF_research_strategy.pdf

5 Bolded text in quotes indicates emphasis added.

6 Note that some of these quotations have received light editing to remove spelling and grammatical errors.

Theme 1: Sustainable intensification is a useful unifying concept, but participants asked that care be taken to ensure that sustainable intensification does not just come to mean a single-minded focus on boosting levels of production.

Sustainable intensification is a recurring conceptual touchstone in the FTF research strategy document. The e-consultation devoted significant attention to unpacking and making sense of this idea. There was wide agreement that while hunger and poverty have many complex causes, sustainable intensification deserves special attention. This is because, suggested participants, boosting food production in ways that protect and restore the environmental condition is a prerequisite for other kinds of action to reduce poverty and malnutrition.

> Donald Crane, Senior Development Officer, International Fertilizer Development Center, United States:
> "FTF is correct to target Sustainable Intensification. The world cannot afford to continue wasting natural resources and polluting our environment as we have been doing. **It is imperative to find a way to produce more and nutritionally better food more efficiently and with a decent respect for our environment and future generations."**

Yet while there was widespread comfort with the concept of sustainable intensification, a number of participants expressed the hope that research oriented by this concept will deliver more than a single-minded focus on improving yields of a small number of commodity crops. The implication is that while boosting food production in environmentally sensitive ways is absolutely *essential* for the reduction of poverty and hunger, sustainable intensification is not in itself a *sufficient* response to those challenges. Real progress on hunger and poverty will only be made, many asserted, when sustainable intensification is tied in thought and deed to the other goals of the FTF research strategy (see Theme 2 below).

More and ongoing work, the e-consultation suggested, is also needed to define precisely what is meant by sustainable intensification. Agriculture can be "sustainably intensified" in many different ways, with many different possible social and economic results. A focus on sustainable intensification, in other words, is sensible and appropriate, but the hope is that the concept will not obscure the asking and answering of other important questions, including the ultimate meaning of agriculture's "sustainability."

> Garrett Graddy, Assistant Professor, School of International Service, American University, United States:
> "**The foregrounding of productivity begs the questions: productive of what and for whom**? Many of the posts in these

threads have offered substantive contributions to these questions—calling for more research into effective and increased cultivation of fruits, vegetable, underutilized tubers and obscure grains, indigenous livestock breeds. Within the FTF Research Agenda itself, however, discourses of yields invariably focus on high-input commodity crops: in short, a second, allegedly greener, Green Revolution. **Yet, a myopic focus on export-oriented, highly irrigated, intensively petroleum-dependent, genetically uniform fields of commodity crops could be construed as undermining the stated goals of immediate and long-term hunger-alleviation**. The logic of the FTF vision blurs here…"

Moses Osiru, Regional Universities Forum for Capacity Building in Agriculture, Uganda:
"I appreciate the opportunity to join the group here to comment on sustainable intensification. From my perspective, over the last few years I have come across very disturbing scenarios in many parts of Eastern and Southern Africa where food … became so cheap that farmers have literally had to throw it away. Not surprisingly, a few months later the same community may be in dire need of food. Being from a research background, **I fully recognize the need for 'sustainable intensification' and the requisite underpinning technologies to spur the accelerated, environmentally friendly productivity that we all know is required to 'feed our future.' However, there are a few assumptions here that we need to validate or rethink**: 1) that increased amounts of food availability will lead to increased farm gate sales, and incomes; 2) that driving down food prices is positive for small scale farmers; 3) that farmers are not making use of research outputs such as improved crop/livestock breeds because they are unable to access them and that; 4) there is a simple direct relationship between food production, productivity and incomes."

John Gregg, Retired Vice President for Research and Development, Kraft Foods, United States:
"**Sustainability is born out of a positive financial situation.** (Some people call this profitability. Others call it creating value that is worth something to somebody else other than the producer). … Farmers who are not profitable will not stay farmers. That is true everywhere on earth including the USA, Germany, etc. … not just Africa or other under-developed areas."

> Durga D. Poudel, Professor of Environmental Sciences, University of Louisiana at Lafayette, United States:
> "**Sustainability of a food and agricultural production system depends on the strength and the vitality of its self-reinforcing linkages and feedback systems.** For instance sustainable food and agriculture in the mixed farming system of Nepal is not possible without establishing or enhancing linkages between forest resources, livestock production, soil fertility and land resources, and farm families and nutrition. Therefore, farming system research from a holistic perspective and capacity-building for farming system research, teaching, and extension services are critical."

Theme 2: A particular strength of the FTF research framework is that it draws a clear connection between productivity gains and improved nutrition outcomes.

The FTF research strategy paper establishes three overarching research priorities:

1. Advancing the productivity frontier
2. Transforming production systems
3. Enhanced nutrition and food safety

The e-consultation demonstrated general support for these priorities as stated. Each was recognized as critically important in itself. Many participants suggested, though, that these research priorities make the most sense, and offer the greatest potential, when they are viewed as a coherent package.

When these priority areas are viewed collectively, it becomes clear that FTF's research agenda is firmly focused on improving human health and wellbeing through the production of better nutrition outcomes. This drawing of a clear link between agricultural gains and improvements in human wellbeing received broad support.

> William A Masters, Professor of Food Policy, Friedman School of Nutrition, Tufts University, United States:
> "This [comment during the e-consultation on the importance of nutrition] is too important to pass without applause from the audience out here! **A focus on nutrition and diet is one of the distinctive features of FTF, as research on agriculture-nutrition-health linkages is one of the key opportunities to make today's green revolution 2.0 work better than the original one.**"

Many e-consultation participants expressed the hope that this focus will be made

apparent in all, or at least the bulk, of the research efforts that FTF supports. This might be achieved, suggested some, through prioritizing and incentivizing research into productivity gains and food system transformations that demonstrably improve nutrition outcomes, especially for women and infants, in line with FTF's "1,000 days" objective.[7] This also entails working closely with local actors in FTF focus countries to determine the real roadblocks to adequate nutrition in particular locations and populations. These types of considerations have, suggested participants, important implications for the types of research that receive support, and for the appropriate measures of FTF-focused research success (health outcomes, for instance, rather than crop yields).

> William Sischo, Paul G. Allen School for Global Animal Health Food, Washington State University, United States:
> "The linkage of productivity to nutrition outcomes … is an important concept and **I suggest that we still need to take the additional step to explicitly measure health as the real outcome**. The productivity of the food system (production, harvest, storage, etc) then accounts for multiple dimensions of availability, access, cost, safety, and nutrition."

Theme 3: The FTF Research Strategy's commitment to a country-led process is welcome, though questions were raised about whether this can effectively translate into research focused fully on the needs of the poor.

A major recurring theme of the e-consultation was the hope that FTF-focused research will adequately and truly address the real and demonstrated needs of the hungry and poor. With this in mind, the "country-led" approach of FTF was viewed positively.

However, some questions were asked about just what this country-led approach will mean in practical terms for research, and in particular whether the insights, needs, and hopes of those towards whom FTF research is directed will be engaged meaningfully. There was some concern expressed that "country led" might not necessarily mean "in consultation with smallholders," or with the other intended beneficiaries of FTF's research and programming.

There were recurring calls, on these grounds, for real participatory interactions with developing country farmers and farmer groups, and with the rural and urban poor who are not themselves involved in food production, but are connected in

[7] See, for instance, USAID, "USAID Administrator Talks about 'The True Yields of Food Security," (press release, May 24, 2011) available at www.usaid.gov/press/releases/2011/pr110524.html.

other fundamental ways to FTF's efforts to reduce hunger and poverty. This, according to some e-consultation participants, entails more than simply seeing smallholder farmers and other populations as the objects of research, but instead means working with them to craft research that truly meets their needs.

> Ravishankar Mantha, Banker and Entrepreneur, India:
> "Given the fact that the entire initiative is being led by the U.S. govt. wherein agriculture is dominated by a handful of players across the value chain—inputs, marketing, production (processed food) etc—the big question remains as to the efficacy of the entire initiative. **Will this truly meet the ground level expectations of the poor farmers especially in the Afro-Asian continents, wherein, the main challenges are survival and food availability?**"

> Shamsher H. Khan, Consultant, Associated Development Managers, Pakistan: "In my experience, the research opportunities are mostly undertaken in collaboration with the public sector institutions and the results of research findings are rarely shared with the farming communities. The researchers normally do not take into account the local knowledge and expertise, therefore when the policies are formulated for implementation, these are not well acknowledged by the farmers. **I have experienced that the most successful programs are those which were designed in consultation with the farming communities. This participatory approach will work better and farmers will take the ownership of development initiatives.**"

> Ehud Gelb, Consultant, Center for Agricultural Economic Research, Israel:
> "**A major constraint to adoption/implementation of the tangible aspects of research is a gap between 'research' and the 'farmer' end user. Closing this gap should be a major strategic goal of the FTF.** Success will go a long way to reaping the results of past and current research results. Even more it will guide and streamline future research to effectively meet the FTF objectives as outlined in the consultation."

Theme 4: International Public Goods were seen as an important and proper focus of FTF research efforts, though some suggested that too tight a focus on international public goods might be in tension with other of FTF's explicit and implicit research aims.

There appeared widespread agreement that the development of "international

public goods" is a worthy and proper central goal for FTF's research strategy. The e-consultation shows support for the idea that a major focus of FTF should be on big, bold, and sustained investment in game-changing policy ideas, social and economic innovations, technologies, extension practices, and the like.

> Dr. Sarah Gavian, Chief Economist, International Fertilizer Development Center, United States:
> "Big & Bold technical solutions**:** In terms of research on agricultural technologies (as opposed to polices, technology adoption, etc), think big. **Take an approach equivalent to MCC, where the U.S. dedicated itself, once it determined an environment to be enabling, to providing massive resources to overcome major constraints.** In terms of research, this implies focusing a large and steady flow of resources on tackling the huge problems of salt- and drought tolerant crops, transport/storage (where an average of 30% of production is lost), fertilizer inefficiency (where again 40-60% of nitrogen is lost), biotechnology (which can offer huge gains in pesticide reduction)."

To truly be "public goods," participants expressed the hope that the results of such efforts will remain in the public domain, or be commercialized in ways that do not limit access for those who most need the benefits of the innovations. The intent here is not to downplay the crucial role to be played by the private sector in agricultural and other forms of development. Instead, it is to say that a "public good" must by definition be made widely available. This requires careful attention to economic and other forms of exclusion that keep technological and other innovations out of the hands of those who most need them.

> David Van Tassel, The Land Institute, United States:
> "The FTF document seems to be organized around the idea of developing new 'international public goods.' This explains the emphasis on technology and research. **As a philosophy of action it seems more modest and less neo-colonial than something like 'feeding the world.'** International public goods and Transforming Production Systems: production systems are built around technologies. Technologies like domesticated rice. We can (and should) continue to fine-tune the practices (e.g., exactly when to irrigate) or the technologies (new cultivar of rice) **but to transform the system, someone may first need to replace or reinvent the core technologies. And keep them in the public domain.** Examples of potentially transformative new technologies: deep rooted, drought tolerant rice; nitrogen fixing crops with grain yields equivalent to maize; oilseed crops that can be irrigated with sea water; perennial trees shrubs or herbs capable of rapidly

bearing large crops of high calorie/protein fruit or seeds; insect "micro-livestock" that eat crop byproducts but taste like chicken; wind-powered, village-scale nitrogen fertilizer factories. These are ambitious goals requiring sustained, first-rate R&D. Some may not be possible. But if successful, these technologies would make possible cropping systems with options for production, conservation and reclamation that are unimaginable today. …

"**The real game-changer would be to fund agricultural research, education, and extension around the world closer to the level of biomedical research, education and outreach**. For U.S. based research, at least, there is a huge discrepancy: the 2012 budget proposes $32 billion for the NIH and $2.3 billion for agricultural research (USDA). I have heard it rumored that some land grant universities' administrations have little interest in their Agriculture Departments because the flow of grant money is low and they don't earn enough overhead. Create a huge pot of competitive funding with lots of overhead, and there will be a renaissance in agricultural institutions, research and extension worldwide."

There is also a need, suggested the e-consultation, to focus on more than simply technological development. Neither new technologies, nor the wider dissemination of the best existing technologies, will alone alleviate poverty and hunger. There is a hope that technological innovation and implementation will be guided by recognition of likely system-wide impacts, and by research in a range of other areas, notably research into the development of appropriate solutions to local challenges. This puts a focus on international public goods in some tension with a focus on adaptive, geography- and culturally-specific research. Participants in the e-consultation were very happy to see, then, that the FTF research strategy paper calls for research to be supported at multiple levels, across a range of timeframes.

Ruth Oniango, Editor, *African Journal of Food, Agriculture, Nutrition and Development*, and Member of Parliament, Kenya:
"Having worked in this field for a number of decades, **I am aware of constraints to productivity which have nothing to do with lack of technology or inputs. We need to understand through social science methodologies why adoption of proven technologies by smallholder farmers is so low. If we do not address this, we shall go on generating more and more technologies without any guarantee of their adoptability.** Hybrid seed is still available and viable, yet few smallholder farmers would rather use their low yielding landrace seed. That is major social science research that needs to be carried out."

Juan Carlos Morales Marcucci, Professor of Business, University of Iberoamericana, Mexico:
"For FTF to become successful we all need to think of our proposals in a very holistic manner: **if we only dwell on technology (agriculture, environmental protection, sustainable intensification, etc.) and we do not include the human aspects (REALLY empowering those who lack the food- as opposed to mere capacity building) all of our research proposals will become part of a three-legged table (somewhat useful but yet incomplete) and therefore only adding to the 'developmental divide.'** This complicates the equation tremendously, because it is not just technology what we must consider (nor the lack of funds for that matter) but there are political issues, educational issues, economical issues, and cultural issues that must be included in the research proposals to achieve the objectives of effective poverty alleviation."

Theme 5: FTF is to be praised for its intent to carefully identify and make best use of the comparative strengths of the institutions with which it engages.

The FTF initiative seeks to engage a wide range of different institutional partners. Different institutions have their own unique capacities and capabilities. It is critically important, then, as the FTF research strategy paper takes great care to stress, that FTF identify and draw on the particular strengths of each of these potential partner institutions. It seems an obvious point, but based on the level of interest in this area during the e-consultation, it appears a point that deserves restatement: research programs should be structured in ways that make best use of different institutional strengths, and that facilitate long-term, ongoing collaborative partnerships between institutions where appropriate.

Katharine Pelican, Assistant Professor of Ecosystem Health, College of Veterinary Medicine, University of Minnesota, United States:
"I applaud FTF for its emphasis on working across sectors and on sustainability, gender and the environment in addition to agriculture. … **I also strongly support the emphasis on capacity building**. Our University experienced a … long-term commitment to capacity building in Morocco … through a University partnership that resulted in a newly formed agricultural university. **These relationships continue today, almost 20 years after the project closed**. Even better, supporting regional networks of universities that can foster research, capacity building, and community development throughout regions amplifies these kinds of university partnerships and

> mentorship relationships beyond traditional developing-developed country relationships."

The FTF research strategy document was highly praised for recognizing the need to work with a range of institutional partners, and to foster partnerships between institutions. At the same time, there was some concern raised that the research strategy may be further entrenching existing funding and support arrangements, without looking widely at the full range of actors that could, and perhaps should, be engaged in pursuit of FTF's research goals. This could result, worried some, in the rote continuation of existing research programs and agendas, rather than the production of anything markedly new.

> Sarah Gavian, Chief Economist, International Fertilizer Development Center, United States:
> **"[T]he FTF modalities might include a more aggressive approach to collaboration beyond the U.S. and its usual research partners than emerges in the current research strategy**. While there is reference to different kinds of collaboration, the weight is primarily on collaborating 1) within the U.S. government, 2) with the U.S. based university and NGO community, 3) with international centers and 4) with NARS. India, China and Brazil are huge agricultural powers with substantial investments in their research centers and human capital, both in the public and private sector. They may prove strong partners for research in other zones than their own. **The sense of tapping into the greatest minds worldwide for any given research topic does not emerge strongly from the document."**

It was suggested by participants that working to the strengths of institutional partners, including those beyond the U.S. government's usual circle of collaborators, would not just make for more effective research. It may also help FTF with capacity building, and with the spread of new and the best available technologies and practices. The research capacity and capabilities of institutions of higher education in FTF focus countries, for instance, could be enhanced if those institutions are provided avenues for deep engagement on research projects to which they are already well suited and that matter for their countries and communities. There is a dual point here. The e-consultation argued for the more effective engagement of developing country research capacity, and at the same time expressed that through such engagement the FTF research agenda will have a more direct and sustained impact on the poor.

> Duncan Boughton, Mozambique Country Coordinator, Department of Agricultural Economics, Michigan State University, United States:
> "The U.S. Land Grant System was developed to provide public goods at

national or sub-national levels. It accepted responsibility for identifying problems, diagnosing the causes, developing technological solutions, and ensuring that stakeholders had the knowledge and other resources to apply them**. The job wasn't done until the farmer was able to implement the technology. Does that philosophy change when we shift to international public goods? I don't think it should.** U.S. universities cannot do everything themselves, but they have a responsibility to form the partnerships and engage in the capacity building activities necessary to ensure that Rebecca eats a more nutritious staple in, say, Tanzania developed by Joanna, a grad student in California (or vice versa one day). **We should not disengage from messy downstream issues by appealing to convenient arguments about comparative advantage. Capacity building, human and organizational, must be integral to everything we do.**"

Michael Thomson, International Rice Research Institute, Philippines: "**Competitive grants bring out the best science**: There is a tremendous amount of excellent research going on around the world in universities, the CG system, and national programs around the world. However, many of the U.S. competitive grants programs do not allow funds to go to international partners. **A new competitive grants program that encourages international teams can help bring those groups together to address the challenges of the future**. If FTF could lead something like the NSF-BREAD program, but on a larger scale and including translational research (not just basic research), this would attract the partnerships needed to address the research strategy."

Theme 6: The FTF Research Strategy identifies important cross-cutting themes, but there are others that deserve attention.

The FTF Research Strategy gives attention to three cross-cutting issues: gender, climate change, and environment. Participants in the e-consultation displayed wide support for these themes. As well, though, participants proposed a number of additional cross-cutting themes that they suggested are worthy of attention as the FTF team works to implement its research agenda. Among the more prominent additional cross-cutting themes proposed were:

- Youth
- Indigenous populations
- Land and landlessness

- Other categories of social and economic exclusion
- Energy and energy poverty
- Nutrition and health (as categories that should drive and guide all other research investments)

> Kirk A. Astroth, University of Arizona and Director, Arizona 4-H Youth Development, United States:
> "There does not seem to be any information on the youth contribution to agricultural productivity--either in developed countries or in the developing world. … 4-H began here in the U.S. as a subversive adult education strategy to get parents to change behaviors--and it worked. **By focusing some of our efforts on youth and the role they play in agricultural production, we may be able to replicate the U.S. experience in changing adult agricultural practices by teaching young people new, innovative methods.**"
>
> Bernardo Ospina, Senior Research Fellow, Centro Internacional de Agricultura Tropical, Colombia:
> "The International Agricultural Research System which has benefitted from decades of financial support has been able to develop many technologies that could help to solve the hunger and poverty problems of millions of farmers. Some of these technologies have found their ways to go down to the end users. However, many of the existing technologies will not be easily reached and used by millions of small farmers. **One of the main reasons for this is the energy poverty status of the small farmers.** It has been estimated by UNDP that near 2 billion persons around the world do not have any access, whatsoever, to any source of energy to meet their daily needs for cooking, heating, etc. **How can we expect that the technologies upon which the FTF strategy will be supported are going to be adopted and used by poor farmers if they are totally dependent on fossil fuels for their energy needs?** In most of the cases, these fossil fuels have to be transported to the villages, usually in remote areas, and farmers have to purchase them at very high prices."

There was hope expressed that the implementers of the FTF research initiative will be able to pay attention to some of these additional cross-cutting themes in designing and funding programs. In addition, there were many comments about particular areas of research that some believed did not receive adequate attention in the FTF research strategy document. Among these areas were livestock, aquaculture, forestry, post-harvest loss, and others. Many of these and other areas of research are captured below in the "research challenges" section of this summary. Still, while there was significant interest in the defining of cross-cutting themes,

others pointed to a danger in heaping too much additional complexity on to an already complex-laden enterprise—a danger of which the FTF research strategy paper shows a deep appreciation. Sjoerd Willem Duiker, Professor of Agronomy at Penn State University, put it succinctly: "**I think it much better to provide simple answers that make a big impact instead of spreading ourselves too thin**."

Theme 7: In its dealings with researchers, the hope was expressed that FTF will identify, frame, and support research on key problems, rather than crafting too specific an agenda.

Global poverty and hunger are complex, multi-dimensional challenges. There was broad and general agreement on the idea that there are likely no silver bullets—no single, straightforward answers. The implication, and the hope expressed by participants, is that FTF will find ways to support and incentivize research that brings the best available thinking from a range of disciplines and perspectives to bear. The call from the e-consultation was for a sustained focus on integrative thinking—a problem-solving approach, that is, that effectively brings together disciplines required to solve particular problem. This is most likely to happen, suggested the e-consultation, if FTF poses problems and challenges to researchers, rather than prescribing answers.

> Maria Haws, Aquaculture Extension Specialist, Pacific Aquaculture and Coastal Resources Center, University of Hawaii, Hilo, United States:
> "**Why should USAID & USDA dictate specific research topic areas, when they would engender better research by stating a problem and general topic area, and letting researchers propose solutions (like NSF does)?**"

> Sudhir Wanmali, Consultant, Sheladia Associates, Inc., United States:
> "In [an exercise organized by IFPRI], it was recognized that when conducted … policy research should be multi-disciplinary, multi-sectoral and multi-level in its nature. … It was also recognized that the locations of these services and facilities are not solely a matter of demand and supply (economics), but also of location and distance (geography), of social stratification and class formation (sociology), of power structure and forms of governance (political science) and of tribal customs, rituals, and rites (anthropology) at the same time. Thus, it was further recognized that **trying to answer the issues… based on the analysis from one discipline only is likely to give very simplified answers to a complex issue, and is also likely to offer not only rudimentary but also unworkable, and impractical, solutions to the original problem.**"

As one example, consider research on the threat posed to agricultural productivity by climate change. One approach would be for FTF to call for research into particular "solutions" to this threat—drought-resistant seeds, say, or agroecological cropping systems.

Framing research challenges in this way, though, would radically foreshorten the opportunities for truly innovative thinking. It would be far better, suggested the e-consultation, to pose a set of clear, broad, researchable questions and targets relating to climate change, and then leave it to competing and collaborating research communities to work out how those questions might best be answered and those targets best attained. In this case, one such challenge might be, "How is the world to boost agricultural productivity in tropical areas facing increasingly variable weather conditions?" Such a question does not presuppose a particular answer, and steers away from picking winners.

William A. Masters, Professor of Food Policy in the Friedman School of Nutrition at Tufts University, United States:

> "USAID needs to have a single integrated FTF research strategy, but the fruits of that strategy will necessarily be very diverse and location-specific. **The absence of any silver bullet or one-size-fits-all program does not eliminate the need for strategic direction -- it just explains why attempts at centralized targeting of research outcomes are doomed to fail, while central support for locally-controlled, autonomous institutions is more likely to succeed.** Historically, within the U.S. and elsewhere, agriculture's need for central public funding to meet diverse, location-specific needs has been accomplished by having the Federal government provide much but not all of the money to run decentralized institutions that are accountable to local interests. Ground-level R&D, extension and education is sustained and networked together by central funding, but priorities and the content of research takes very different forms in different places."

It should be noted that this point, which came up in a range of different ways during the e-consultation, is not an argument for directionless research. Nor should it be taken to mean that researchers deplore being focused by specific topics and targets. It is merely an acknowledgment that there are almost always multiple ways to approach particular problems, and that a response to one challenge has implications for how other challenges are addressed. The e-consultation expressed the hope that those implementing the FTF research strategy will be able to take these realities of the conduct of research into account.

Theme 8: Capacity-building needs focused research and programmatic attention.

The e-consultation brought a great deal of attention to bear on the need for sustained, coordinated capacity development. The e-consultation forum was concerned strictly with the FTF research agenda. With this in mind, some suggested that capacity building is a solely programmatic concern, and that the e-consultation should therefore devote little time to discussing it. Many others, though, were insistent that there is no legitimate, meaningful way to separate a conversation about research from a conversation about capacity, arguing that the two concerns must go hand in hand.

One major thread was the need for sustained U.S. investment in training the next generation of agricultural and development leaders. A second thread was the need for long-term focus on ensuring that there are strong and effective institutions in which these leaders can work. A third thread concerned extension services: Research aimed at hunger and poverty alleviation matters little unless it can readily find its way to those who can make best use of it. FTF's objectives are most likely to be realized, the e-consultation highlighted, if clear pathways are established for the beneficial adoption of technological and other innovations.

> William W. Hare, District of Columbia Water Resource Research Institute, University of the District of Columbia, United States: "**Research, the buzz word for solving the world's problems! Unfortunately, research without EXTENSION and EDUCATION in my opinion is insignificant and only benefits the researcher**, from a scholarly perspective and the grantor, in terms of documented new knowledge. How research is adopted or utilized to benefit mankind is extremely important and, without a doubt, the limiting factor to agriculture development in developing countries. The success of the U.S. and other developed countries' agriculture sector has always been the effective integration of research, extension and education to identify specific problems, solve them through experimental and statistically validated data generating mechanisms, dissemination of findings through extension fact sheets, workshops, and program activities to eventually increase stakeholders' knowledge; to change behavior; and ultimately to change economic and/or environmental conditions."

Capacity building is a consideration with both programmatic and researchable elements. Researchers, some suggested, must work to more effectively determine and demonstrate what is needed and what works in the area of capacity building. In addition, there are many international public goods and locally-derived strategies and technologies already in existence that are not appropriately utilized. More

research is required to determine avenues for getting the best existing technologies and practices into the hands of those who can best make use of them.

Effective research in support of FTF, in other words, requires three elements: the creation of truly useful and appropriate knowledge and technology; a clear means to move knowledge and technology into the field; and the production of a sustainable demand for that knowledge and technology. It is worth noting again that the e-consultation was not tasked with producing an extension or an empowerment agenda. However, the attention paid to this issue by participants indicated strongly a belief that extension and wider capacity building should be considered a basic component of effective research.

> Linda Jo Turner, Director, Human Development & Family Studies, MU Missouri 4-H Youth Development Program, United States:
> "**[W]hile I love the idea of 'smart fertilizer,' it won't distribute itself to farmers, apply itself to fields, and evaluate its effectiveness.** It all comes back to education and extension, in my opinion."

> Stephanie Hanson, Director, Policy and Outreach, One Acre Fund, United States:
> "I believe the research strategy needs to include more emphasis on deployment, as well as more emphasis on analyzing the research that has already been done in the discovery and development stages. **For instance, in Kenya, the Kenya Agriculture Research Institute has developed a number of high-yield bean varieties that are not available to smallholders. FTF should invest money in the deployment of those bean varieties, not the discovery and development of more bean varieties**."

> Duncan Boughton, Mozambique Country Coordinator, Department of Agricultural Economics, Michigan State University, Michigan State University, United States:
> "The focus of the FTF research strategy is international public goods that will link up with country level investments to ensure adaptation, diffusion and adoption. Several commentators in the first week, e.g., Joe Ryan from USAID Pakistan, noted the critical role of long-term institutional capacity building to provide the human capacity necessary for effective agricultural research and dissemination at country level. The FTF strategy is therefore right to include institutional sustainability and impact on capacity as an evaluation criterion. But in the absence of any strategy for capacity building at country or regional-level how is this criterion going to be evaluated in

practice? **Any international organization seeking research funding knows how to include downstream capacity building in their proposal boilerplate, but the fact is that organizational and human capacity at country level in most focus countries is very severely depleted and the binding constraint to the impact of international public goods**. It would be helpful if this forum could explicitly address this critical gap in the FTF research strategy."

Theme 9: The fact that FTF will prioritize research that focuses on the smallholder received wide praise, but some suggested that this is a focus that must have a degree of flexibility.

Smallholder farmers make up the largest proportion of the world's poor. Focused agricultural, value-chain oriented development programs can make a real difference to the lives of many of these smallholder farmers. On these grounds the e-consultation largely supported FTF's programmatic orientation towards smallholders. Researchers will help with this effort in myriad ways.

> Sonali Bisht, Institute of Himalayan Environmental Research and Education, India:
> "The endeavor to Feed the Future cannot succeed without multi-stakeholder collaboration. **The primary driving force will have to be the requirement and aspirations of farmers, especially the smallholder farmers who constitute the majority globally**. They must be especially consulted and involved. Locally adapted diversified solutions are needed. These have to be tailor-made to suit local conditions (social, economic, environmental) and opportunities. Successful local farmers and development NGOs require to be engaged as consultants to the process to support researchers and be a bridge between them and farmers."

Still, a number of comments on the e-consultation forum suggest that it is important not to fall into the trap of romanticizing the smallholder, nor of prescribing particular forms of societal organization. On some occasions, in some places, research findings will no doubt suggest that larger land-holdings and more consolidated ownership of agricultural resources make more economic, social, and environmental sense. The implication is that sometimes the best way to support smallholder farmers may be to help them leave farming. Again, this is an assertion with both researchable and programmatic elements.

> Seth, Amboy, United States:
> "**How many development professionals are willing to really look**

ahead to a world in which countries are nutritionally self-sufficient and where projects for poor people are no longer necessary? This means abandoning the assumption that the same number of small farmers will keep farming. If we look at countries that have made this transition, like Taiwan or Brazil, what happened to their agricultural sectors? Farms got larger and more efficient and less numerous, most small farmers left the land, and this allowed supporting industries like processing, marketing, and input supply to flourish. A minority of small farmers adapted and grew to a point where they could make a good living and be competitive, while the majority of the rural poor stopped trying to scratch out a meager existence through small farming, and engaged in paid labor as in any developed economy. Some of this employment comes from the larger farms and ag-related industries. Some comes from self-employment and entrepreneurship. If you sincerely want to look forward to a day when a Mozambique or a Sri Lanka are not poor, when they compete on an equal basis in the world economy, and when living standards for the general population rise to comfortable and food-secure levels, you have to put aside the attachment to small, inefficient subsistence-level farms, and tailor your research programs toward a modern agricultural economy."

This comment also runs the other way. Others suggested during the e-consultation that development interventions that begin with the intent of integrating smallholders into global markets can be equally as problematic. Researchers expressed a hope that FTF will guide research that is true to the needs of those being impacted, as opposed to research that consistently supports a particular ideology or presupposes an outcome.

John Gregg, Retired Vice President for Research & Development, Kraft Foods, United States:
"**Research should all be linked to an end goal. Each piece of research should clearly link to achieving this goal. One such goal should be self-sustainability. Looking at highly developed countries, which are self-sustaining...they do not have 75% of the population farming....in all cases, they are well under 10%.** It frees up large portions of the population to do other value added things. These thoughts suggest that a key question that should be addressed in all future submissions is the question.... 'How does your research add value to what the agri-community is producing?'"

Jonathan 'Tim' Williams, Director, Peanut Collaborative Research Support Program, College of Agriculture and Environmental Sciences, University of Georgia, United States:

"**What is really important is that agriculture responds to the best available market**. That may not be the international market; indeed for many of the major commodities those markets dictate prices that are lower than the logical local price. We need to work through policy research to realignment markets taking into account the nutritional needs of the local populations. Among a list of possible misdirected food use/markets is the processing of highly nutritious peanut into oil for export. Here the nutrition value is bypassed for oil, making peanut which is an almost complete food with great flavor properties just one of many edible oil sources in competition on the international market. Clearly this is neither in the interest of the farmer or the consumer. Small farmers receiving prices dictated by the international market are likely to remain poor particularly since the prices in industrial farming systems are generally dictated by surpluses (we have food price crises as soon as that situation changes), and FTF's implicit goal is to preserve those conditions of surpluses."

Theme 10: There was praise that the FTF research strategy is not simply a blueprint for agricultural research, but rather recognizes the multiple components of human development.

A broader implication of Theme 9 is that agriculture cannot be meaningfully viewed as a standalone sphere of economic activity. Many contributors to the e-consultation stressed the importance of system-level thinking. Particular focus was given to the importance of value-chain analysis, and to the need for a full appreciation in research and in programming of the fact that agriculture is linked inextricably to wider economic, social, and political activities and relations. Improving agricultural value chains should rightly be the primary focus of FTF efforts, but for many, long-term alleviation of hunger and poverty will require the development of opportunities apart from agriculture.

At the same time, a number of participants urged a focus *beyond* those who derive their livelihoods from the agricultural sector. The rural and urban non-farming poor face unique food security challenges that some participants hope the implementers of the FTF research strategy will be able to give some attention to.

Patrick Webb, The Fletcher School, Tufts University, United States:
"I suggest that we should be highlighting the need to a) build capacity for research and response within high burden countries (those with highest undernutrition), not just in the US; b) that definition of the priority research topics has to be country-owned and country-driven (to use FTF terminology), not driven by a U.S. university agenda; and c) while the single-minded focus on smallholders is appropriate, **there has to be more**

balanced attention to rural non-farmers and urban consumers. Their changing patterns of demand are already rapidly changing dietary patterns in the poorest of regions of poor countries. The link between demanded diet and what farmers are willing to grow (mediated via prices, advertising, the retail revolution, etc.) is going to be key to whether or not we can achieve enhanced 'nutrition' (not just food consumption) in coming decades; thus, this side of the food security problematic should have a prominent place in any research agenda of the kind we are considering."

III. Research Challenges Identified by E-consultation Participants

Following a week of sustained engagement with the *FTF Global Food Security Research Strategy*, weeks two and three of the e-consultation were then spent in wide-ranging conversation about research priorities, and discussions about how researchers might best support and engage with FTF. Out of this conversation the e-consultation developed ten different "research challenges" that participants suggested require focused attention and long-term support, along with a number of "research themes" that fit beneath each of those challenges.

The research challenges and themes described below are intended to set the stage for breakout sessions at the June forum in Washington DC. There, they will receive further elaboration and refinement.

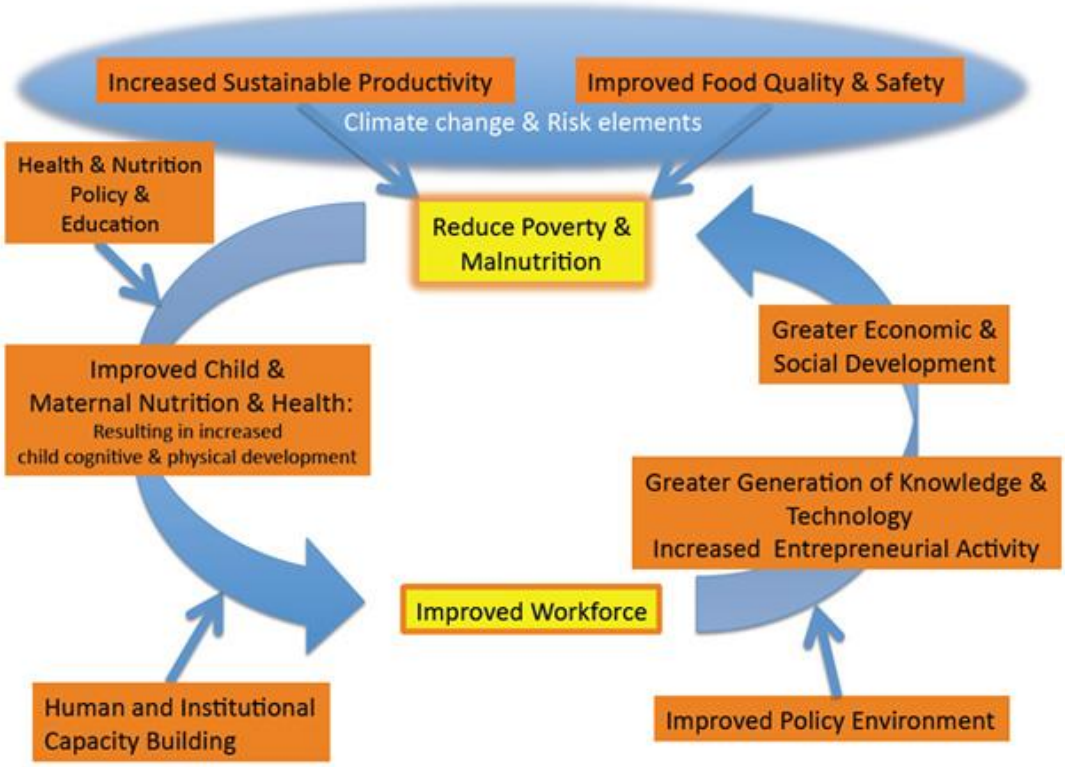
A final report in July will pull together a fully articulated set of research challenge ideas based on the e-consultation, the June forum, and the input of the Purdue working group.

The challenges described below are arranged into four categories, corresponding to the FTF research strategy paper's stated research priorities:

1. Advancing the productivity frontier
2. Transforming production systems
3. Enhanced nutrition and food safety
4. Cross-cutting challenges

One thing is important to note at the outset of this section: Participants in the e-consultation suggested in a number of different ways that while it is important to identify particular researchable challenges and problems, it is also crucial to keep in mind an overarching vision of what FTF-focused research is trying to achieve, and how different research efforts fit with one another.

To this end, Montague Demment, Associate Vice President for International Development at APLU, and Professor of Ecology at the University of California Davis, United States, offered the following "virtuous cycle" to e-consultation participants:



Demment's virtuous cycle is reproduced here for its neat fit with the logic of the FTF research strategy. The cycle demonstrates in a useful way that research of many types, directed at different challenges and problems, is needed to support the goals of hunger and poverty alleviation.

Here are the research challenges in turn:

1. Advancing the productivity frontier:

Research Challenge I: Increase the productivity potential of high priority crops and livestock

The world will need to produce significantly more food in coming years. At the same time we are faced with a stressed and shrinking resource base. Part of an effective response to these challenges will be the sustainable intensification of production. This is a prerequisite for other forms of action. Research must be undertaken directed towards increasing the productivity of high priority crop and livestock systems, in ways that enhance environmental services and that build social resilience.

> Ken Cassman, Professor of Agronomy, Director, Nebraska Center for Energy Sciences Research, University of Nebraska, United States:

> "[T]he beauty of the sustainable intensification focus is that it forces the dialogue to address the dual issues of need for increased production (food security) with the need to enhance environmental services and conserve natural resources. … [S]uccess in meeting future food demand while protecting the environment and dealing with climate change (and helping to mitigate it, or at least avoid contributing to it) will depend on the ability of farmers in developing countries to achieve large increases in crop and livestock yields while improving soil quality, protecting water quality, increasing nutritional quality, and developing production systems that are resilient to changing and variable climate. **While all scientific options are on the table for discussion, the need for sustainable intensification limits the options by requiring a focus on the key challenge, namely, developing agricultural systems that can deliver higher production to meet human food needs and a better environment over the long term.**"

Research Themes

- The world needs to as much as double the amount of food it produces by 2050. This necessitates a new concerted push to develop, disseminate, and better utilize higher yielding varieties of high priority crops and livestock. "High priority" crops will vary depending on context. There must be work on commodity cereals, certainly, but also on the crops and animals that matter for local markets in Africa, Asia, and South America, and on improvements that will add not just calories, but also diversity to diets and to livelihoods.

- Focused work is needed to enhance the productivity and efficiency of locally adapted crop systems, particularly smallholder and rain-fed systems, recognizing that rain-fed agriculture continues to support the lives and livelihoods of hundreds of millions of the world's poorest people.

- In keeping with the FTF research strategy's goal of linking increases in productivity to human development outcomes, there is a need to develop tools of system-wide, value-chain analysis to pinpoint sites for effective programming. The goal is yield gap analysis and diagnosis, to determine physical and social factors presently limiting yields, and to indicate areas for yield-enhancing interventions.

- Undertake base-lining work to better classify the climatic, soil, freshwater, and other physical characteristics of specific geographies.

- Given that there are many ways to intensify agricultural production, analysis is required to help determine which of the menu of options makes most sense in

particular locations. Where are the areas where current yields can be meaningfully and cost-effectively lifted in ways that are environmentally sound?

- Examine the potentials and specific challenges of urban agriculture:

  Taylor Pursell, NFT Industries, LLC, United States:
  "Now that there are more people living in urban areas than rural areas, it will be important to focus on improving urban agriculture...especially for fruits and vegetables. Too many empty calories lead to poor nutrition and obesity. Research is needed to help understand the importance of quality, locally grown food that provides more than calories and is easily accessible by people living in urban areas."

- Work on the more efficient and effective use of low-cost inputs:

  Rodney Allan Hill, Professor, Department of Animal and Veterinary Science, University of Idaho, United States:
  "I wish to suggest that an important sub-category is to include the context of inputs. Thus I pose the question: In the context of low cost inputs (including resource inputs) what can research and technology bring to increasing the productivity potential of high priority crops and livestock? There is great potential to better utilize low cost resources (for example - extensive grasslands for livestock production by bringing research that improves animal performance in the context of low cost inputs.)"

2. Transforming Production Systems:

Research challenge II: Improve soil fertility, quality, and conservation

In order to ensure the long-term productivity of soil we must research new game changing fertilizer technologies that increase production while preserving soil integrity. Research is also needed to improve knowledge about the specific soil protection, remediation, and fertilization needs of FTF-focus regions. The intended primary beneficiary of this research should be the smallholder, with particular attention to producing technologies and practices that function where the timely and consistent availability of modern fertilizers are major constraints.

Murray Hasinoff, AMT Technologies LLC, United States:
"Sustainable intensification must include fertilizer research currently not available through the private sector. FTF can 'catalyze' fertilizer research and the private sector will follow. The first and major component is a research effort to develop the next generation of fertilizer products that are more efficient and sustainable, soil amendments that support fertilizer uptake, improve human

nutrition via fertilizer inputs along with process technologies that reduce fertilizer costs."

J.J. Rob Groot, Director, East and Southern Africa, International Fertilizer Development Center, Kenya:
"In Sub Saharan Africa, average fertilizer use is 7-8 kg of nutrients per hectare, less than 10% of the global average fertilizer use, and the efficiency of uptake of nutrients from fertilizers is low, on average 30-40%. For most smallholder farmers, fertilizer is a major investment and most farmers don't have the cash at hand to buy fertilizer at the start of the season, while assessing credit is difficult if not impossible. There is little doubt that a coordinated research effort can lead to new fertilizers with a higher use efficiency—smart fertilizers that release fertilizer when the plants need it. Assuming that the price of these fertilizers will not be considerably higher, this would lead to a higher return on investments in what smallholders consider expensive fertilizers—considerable productivity increases."

Research Themes

- Strive for widely deployable advances in environmentally sound and efficient fertilization technologies and practices, and identify soil amendments and practices that facilitate fertilizer uptake and minimize leakage. In pursuit of sustainable intensification, it will be critical to conduct research where the productivity gains of new technologies and their environmental impacts are measured simultaneously in the same field experiments.

- Using GIS-based mapping and other technological and methodological forms, undertake base-lining work to better classify the soil, freshwater, climatic, and other physical characteristics of specific geographies. The goals of this work would be to better understand local and regional fertilizer and soil amendments needs, and to ensure that fertilizer resources are directed to their most productive ends.

- Develop rapid appraisal methodologies to identify the physical, social, political, economic, and other constraints to improved soil fertility in particular regions. The goals would be to increase access to, and the potential for meaningful adoption of, new technologies, and to ensure that any new technologies developed take into account the constraints faced by users.

- Catalogue and develop paths to utilization of effective and appropriate soil conservation techniques, to increase soil health and provide resilience from weather shocks.

- Investigate efficient, effective, and environmentally sound forms of weed control, to add to the net effectiveness of fertility enhancement strategies;

Research Challenge III: Better understand and manage the risk environment

Coming years will likely present further impacts from climate change, economic integration, population pressures, competition over increasingly scarce natural resources, the appearance of new diseases affecting people, crops, and livestock, etc. While farmers at all scales are susceptible to an increasing number of potential disruptions, smallholder farmers are in a particularly precarious position, being less able to adopt new technologies and techniques unless they can manage their risk environments. At the same time, the rural and urban poor face increasing turbulence from food-price fluctuations and global economic recession. Work is needed to better understand the nature of the risk people face, the coping mechanisms that individuals and communities have used in the past, and potential new ways they can respond in the changing environment of the future.

> Shana Gillette, Assistant Professor of Risk Communication, College of Veterinary Medicine and Biomedical Sciences, Colorado State University, United States: "[There is a need to] 1) Determine risk management approaches that provide co-benefits across sectors; 2) Identify equitable livelihood diversification strategies that lead to an equitable improvement in family income and nutrition; and 3) Identify strategies that provide a flexible and sustainable approach for transitioning between different types of ag systems (e.g. mixed-crop and livestock, sedentary, pastoralist, etc) in response to different resource constraints."

Research Themes

- Investigate best practices in providing access to credit, markets, cooperatives, and insurance. Examine integration between these economic and policy tools with appropriate technologies to build resources for managing risk.

- Identify and investigate crop, educational, and livelihood diversification strategies, to add resilience to household, local, and regional economies.

- Develop and deploy appraisal methodologies to better characterize the risk landscape faced by particular communities. This would include developing deeper knowledge about how particular rural producers and agricultural technicians presently understand and cope with risk, in order to develop effective risk mitigation and coping strategies in conjunction with the intended beneficiaries

- Devote renewed and sustained attention to the examination of risk in the context of land tenure and use issues, gender, and other social categories that drive

disempowerment and deprivation, in order to better tailor policy and other forms of intervention.

Research Challenge IV: Improve the distribution of relevant research outputs, and the ability of researchers to learn from intended beneficiaries

New technological developments, production and management practices, and other research findings, and the best existing ideas in each of these categories, matter little unless they find their way into the right hands. Existing extension systems in the global North are designed around infrastructures and resource bases that do not currently exist in much of the global South. There is significant work—both on the programmatic and research fronts—needed to ensure that research outputs find their way to those who need them, and that researchers of all types are able to better collaborate with and learn from the intended beneficiaries of their efforts.

Stephen Machado, Associate Professor of Agronomy, Oregon State University, United States:
"My sense is that Africa has technology that can transform small holder farmers but this technology remains elusive and has not been put to use. I bet FTF will get a big bang for their money if projects are designed to access this technology, disseminate it, assist small holder farmers in implementing it, and find markets for the end products. For instance, there is research work done dating back to the early 1900s that show the benefits of fertilizers yet very few farmers use fertilizer because they can't afford it. This applies to most of the technologies that have been developed such as hybrid seed or irrigation. To this end I suggest that FTF should put high priority on implementation of already existing technology. This is the weakest link in the development of African agriculture and African economies as whole. The same scenario is observed in many other fields including Health and Engineering."

Frances Alloway, Cooperative Extension, Penn State, United States:
"It is important to consider the link between the research and the community. Extension educators in the U.S. are able to take research from the universities to the people but Extension systems in many developing countries are understaffed or nonexistent. There are many NGOS that could be tapped to assist in this effort. Many are working to improve nutrition and ag production but their outreach is not coordinated with the research organizations. Plans to work with government health departments and agricultural centers would also support greater implementation of research goals. The most successful efforts also include community 'buy in'. Local persons of influence need to be consulted to create change, whether it is a more nutritious version of familiar foods, a new agricultural production method or improved handling of food supplies. Research design needs to include strategies that will allow this vertical integration from university or research facility to the families. If funding is not sufficient to include

staff in the field, wonderful research papers will be written but the results will be meager."

Mark Varner, Professor and Acting Associate Director, International Programs in Agriculture and Natural Resources, University of Maryland, United States: "Farmers, teachers and researchers all need to communicate. Problems need to be solved. Class projects need to be grounded in the 'real world.' Possible research solutions to applied problems need to be vetted by practitioners. Many times, these people with common needs are located so far apart that face-to-face communication is neither possible nor practical. Electronic communication technologies have been shown to effectively break down these barriers. Asynchronous electronic communication often makes this even more effective than playing 'telephone tag.' Virtual communities have use Internet-enabled communication in the past, but the widespread availability of SMS text message capabilities, even in remote areas of the world, allow for establishment of new virtual communities through appropriately constructed microblogging outlets, effective marketing and enthusiastic support during the start-up phase. These mobile phone-enabled virtual communities can and will be true 'game changers.'"

Research themes

- Work to identify and develop dissemination strategies, including traditional extension services and emerging strategies engaging new communications technologies. The goal is to aid the spread of new, and the best existing, technologies and practices, so that they can get readily into the hands of those who can best make use of them.

- Develop research and programming consultation models that better coordinate the views of multiple stakeholders. The goal is to use the best available communications research to facilitate better collaboration between researchers in the global North and global South, while also working to ensure that the intended beneficiaries of FTF-focused research have a clear hand in development of research agendas and programs.

3. Enhanced Nutrition and Food Safety:

Research Challenge V: Improve availability of, and access to, a high quality diet

Advancing the productivity frontier requires robust examination of entire food systems and value chains. Research is needed to better understand the appropriate points for targeted, high impact interventions that link increases in food production with better nutrition and increased human capital. In addition, work is needed to understand how nutritional education, resource accumulation, and other interventions can build capacity and motivate populations to create a demand for

high quality diverse diets because they understand the impacts on human health, child development and human productivity.

> Montague Demment, Associate Vice President for International Development, APLU and Professor of Ecology, University of California Davis, United States: "If the challenge is [for example] to increase the efficiency of fertilizers for small farmers and ensure that it increases the nutritional status of pregnant mothers and young children, then how do we attack that problem? Can we make the soil scientist or the agronomist working on nutrient uptake consider how the increased productivity is marketed and consumed? We do want that scientist to increase nutrient use efficiency and that is a project in itself. The question is how will the products of that nutrient use efficiency be directed? What connects the soil scientist to the human nutritionist and how do we understand what to do at one end of the value chain to get the impact we want at the other end?"

Work in this area, as in all others under investigation here, is not taking place in a vacuum:

> Patrick Webb, The Fletcher School, Tufts University, United States: "The international nutrition community has been actively engaged over the past five years in defining and agreeing priority research gaps (laid out in, for example, the *Lancet Series* on maternal and child under nutrition of 2008), and priority action gaps (as in, for example, the *Scaling Up Nutrition: What Will it Cost?* Report of the World Bank from 2010, and the *Scaling Up Nutrition Alliance Roadmap* of 2010). The World Health Organization and Gates Foundation have also recently conducted extensive reviews of developing country capacity for rapidly implementing interventions known to be efficacious at scale. And this year, the Irish and U.S. governments recently launched the high visibility "1,000 days" initiative … which is being picked up by many developing country governments as the framework for action for the coming decade in dealing with nutrition.
>
> "My point is that we need to seize the opportunity presented here (by FTF) to engage in cross-disciplinary dialogue on priorities. While the Research Challenges … that deal with 'enhanced nutrition and food safety' are useful, we must ask if they are consistent with what the nutrition community (and the food insecurity and humanitarian action communities more broadly) see as priorities? If yes, we should move quickly to find ways to leverage the required resources to support research that will deal with these agenda items, drill deeper into the research questions to determine how to best answer the key questions (what role for the agriculture-focused researchers in addressing core nutrition questions, and visa versa?), and consider existing empirical evidence that rigorously demonstrates ways forward."

Research Themes

- Focus attention on developing effective strategies for nutrition interventions during pregnancy, lactation, and early infancy, in both rural and urban areas, in line with the U.S. Government's stated "1,000 days" focus.

- Investigate how best to tackle micronutrient deficiencies, through evidence-based appraisal of intervention strategies, and the long-term addition of diversity to local and regional diets.

- Connect local improvements in agricultural productivity with measurable improvements in nutrition and health outcomes. This calls for value-chain analysis and other forms of system-wide investigation to ensure that sustainable intensification of crop, livestock, and aquaculture systems make meaningful differences in the lives of the poor.

- Develop a rapid appraisal methodology to determine the structure and function of food systems at the local, national and perhaps regional levels, to understand the constraints on enhanced nutrition outcomes.

Research Challenge VI: Ensure safer diets

The safety of available food remains a crucial concern in FTF focus countries. Work is needed at the most fundamental level to identify the chief constraints preventing the development of safe food systems. Research is then required to develop new technologies and techniques that will dramatically improve the availability of safe and nutritious food, particularly in resource constrained regions.

> Fisseha Abenet Tadesse, Ethiopian Veterinary Association, Ethiopia:
> "I think food safety challenges are crucial problems in today's agricultural systems. But, it is not only an issue of reducing contamination of food that should be addressed. We must bear in our minds that food of animal origin would be produced with the disease agents in the live animals themselves while post harvest contamination would add to the problem. Examples could be milk produced from TB positive animals and meat produced from taenia and toxoplasma positive animals, etc. There are also numerous other widely prevalent diseases threatening animal and human health and also food safety and quality. Therefore, we should consider sanitary and phytosanitary measures across the whole value chain of livestock commodities (dairy, meat. egg, etc)."
>
> Jonathan 'Tim' Williams, Director, Peanut Collaborative Research Support Program, College of Agriculture and Environmental Sciences, University of Georgia, United States:

"Agriculture needs to realize its potential to be a driver of better public health. FTF should make provision for this, and add to our vision more than the supply of food as an end point - an equally important end point is health. FTF needs to be specific about addressing the major mycotoxins of foods in developing countries. The presence of both protein and micro-nutrients can be negated by neglecting this issue. For developing countries the regulatory approach to management does not work because of the food system, deficiencies in infrastructure and the challenges of subsistence agriculture and food insecurity."

Research Themes:

- Develop or better bring to bear existing appraisal strategies that enable rapid identification of sites of food contamination, in order to better target food safety interventions and responses.

- Focused research is needed to better understand the major mycotoxins affecting food in FTF focus countries, and to identify avenues for the spread of technologies and other measures that will enable resource constrained communities to tackle them.

- Research is needed to translate best-practice sanitary and phytosanitary practices into forms that can be readily applied in resource constrained environments.

Research Challenge VII: Reduce postharvest losses and waste

Postharvest losses remain a significant area of concern in FTF focus countries, with estimates for some countries putting postharvest losses at 30% or more of food harvests. Poor postharvest practices, in turn, can affect incomes, food quality, and the long-term abilities of families and communities to escape from poverty. There is a need for the development of new technologies and practices that tackle sites of loss and contamination throughout the postharvest value chain, and identification of avenues for spreading the best existing technologies and practices. A core component is connecting farmers to appropriate markets, so that sustainable intensification and reductions in crop loss can yield real returns.

Evelyn Adu-Kwarteng, CSIR-Crops Research Institute, Ghana:
"I am a Food Scientist in Ghana with a keen interest in post harvest issues. I hold the view that anyone interested in the world's food and nutritional security cannot emphasize enough the importance of tackling post harvest losses. In this vein I propose more practical research attention on the development and sustained transfer/ dissemination of appropriate, efficient, ecologically sound, low-cost, value addition or preservation technologies at the on-farm level, with sufficient training and backstopping. For instance village-level solar technologies in many tropical food-producing areas hold huge potentials for safe food

dehydration to reduce bulk (for ease of transportation) and preserve nutritional quality."

Adel A. Kader, Department of Plant Sciences, University of California, Davis, United States: "Strategies for reducing postharvest losses and waste of perishable foods in developing countries include: (1) application of current knowledge to improve the food handling systems and assure food quality and safety; (2) removing the socioeconomic constraints, such as inadequacies of infrastructure, poor storage facilities and marketing systems, and weak research and development capacity; and (3) overcoming the limitations of small-scale operations by encouraging consolidation and vertical integration among producers and marketers of each commodity or group of commodities."

Deborah Delmer, College of Biological Sciences, University of California, Davis: "FTF can address quality seed, innovative storage, but it cannot alone address what are perhaps the greatest limitations of small farmers—their isolation. I once heard of a farmer in a remote area who responded when asked what two things would be most important to her, "I want a cell phone and road near my house"—in short , it was all about being connected to the world. Just as the cell phone has made the laying of phone lines irrelevant, so might intensive development of local power mitigate the need for vast new electric grids and open up access to many new technological advances. And without a strong system of feeder roads, market access will always be problematic. How can FTF integrate its efforts with those of the World Bank who should be making massive efforts to solve the connectivity problems of the rural poor?"

Research Themes

- Strive for widely deployable technological developments to aid with postharvest storage and processing in resource and infrastructure challenged countries. Such developments must collectively address a number of pressing issues, among them contamination of food by foreign materials; crop loss due to pests or rot; challenges with shelf-life and transportation; and other, region-specific problems.

- Pair technological development with integrative research on how to better allow market access. This will include regional-level research on transportation, communications, and other infrastructure requirements, along with local-level research on the kinds of markets that make the most sense of particular communities.

- Better identify and map socioeconomic and geographic constraints to effective postharvest handling, to better target interventions.

4. Cross-cutting challenges:

Research Challenge VIII: Develop methodologies and research practices to better determine what works

There is a clear need for better analysis of development efforts. What works? What are the kinds of strategies and interventions that in demonstrable and replicable ways alleviate hunger and poverty?

> Patrick Webb, The Fletcher School, Tufts University, United States: "[T]here is a lot of attention these days to finding metrics of diet quality, consumption adequacy, gendered perspectives on the experience of food insecurity, etc. The problem is that too much of this kind of work is mainly used for operational purposes (emergency needs assessments, targeting program interventions, and advocacy)--not enough effort has gone into determining what can be measured universally (globally) to determine prevalence of problems and trends as an alternative/complement to the standard FAO metric of chronic undernourishment/hunger...which is widely seen as insufficient for most of our purposes. A big push at seeking such a measure through consensus and then supporting its systematic collection and dissemination will be really important for any MDG1 effort post 2015. …
>
> "FTF is pretty explicit about not wanting more "demonstration projects". The international nutrition community is pretty much in agreement these days that evidence-based programming at scale is now possible thanks to wide (not universal, of course) agreement on 'things that work' to improve nutrition. So its not more pilots that we need (not efficacy trials) but an understanding of delivery science (what works at large scale in practice—with a big focus on costs and effectiveness). Where the largest gaps in our empirical evidence base exist is in knowledge of how best to design and implement multi-sectoral, integrated programs at scale that combine the positive impacts of agriculture, health and nutrition activities (through the whole value chain). That's where the CGIAR (CRP4) is focused, where USAID's global nutrition CRSP is focused, and where the FTF's research agenda can play an important role in advocating for, and sustaining, that kind of research."
>
> David A. Raitzer, Chair, Strategic Assessment Taskforce, International Rice Research Institute, Philippines: "To determine "what works," evidence on the expected and achieved efficacy of alternative feed the future investments in generating key poverty, economic, nutrition/food security, and environmental benefits is needed. …
>
> "To address this head on, improved priority assessment and impact assessment is essential. Our current ability to generate credible evidence on the effects of agricultural development performance lags far behind our ability to generate lists of metrics/indicators and reporting requirements. Generating wide scale impact

on poverty takes time, and involves many partners. Take varietal improvement as a simple example. Improved varieties are well documented to often diffuse much faster than improved management. Yet, the lag time from research initiation to the peak adoption of a variety, such as IR64, was more than 30 years! In that context, what is the utility of an annual indicator on factors, such as "prevalence of stunted children?" Over a one year horizon, it would be zero, but over many years, it would have been very high. …

"So, I would propose that there should be concerted effort to discern the lag times associated with particular investments, and tailor reporting requirements accordingly. Then, specific rigorous detailed studies involving the implementing partners should be commissioned to meaningfully appraise contributions to key indicators. Subsequently, meta-evaluation should be applied across the specific studies to draw larger conclusions about comparative performance."

Research Themes

- Building from FTF's intent to connect sustainable intensification to improvements in health and nutrition, work to develop appropriate metrics and methodologies that measure real hunger and poverty reduction outcomes. The goal is to develop tools that better enable FTF to scale-up programs that clearly work, and to effectively track the impacts of such programs. This would include streamlining and tailoring realistic reporting requirements and intervals for specific categories of investments.

- Assess before implementation, by using established methodologies to determine the expected future poverty, food security, nutrition, and environmental benefits of actual and potential FTF investments.

Research Challenge IX: Develop food systems that mitigate, and that increase resilience to the effects of climate change

The world's climate system is changing. The worst effects of these changes will likely be felt by those with the lowest capacities to respond. There is a need, then, to work on adaptation strategies, particularly for small-scale farmers and those particularly vulnerable to food price volatility. At the same time there is a need to work to shrink atmospheric greenhouse gas concentrations through the identification, development, and adoption of climate-conscious agricultural systems.

Kathleen McAfee, Assistant Professor of International Relations, San Francisco State University, United States:
"Global climate policies (e.g, REDD) direct attention to forests as carbon sinks, and many assume a conflict between increased food production and ecosystem conservation. But soils sequester far more carbon than vegetation. Although

farming currently adds as much as 30% of greenhouse gasses to the atmosphere, a growing body of research shows the potential to reduce this damage while increasing food production by means of regenerative agriculture, locally adapted and based on various combinations of 'traditional' farming practices and cutting-edge agro-ecological science."

Research Themes

- Benchmark agricultural, food manufacture, distribution, and food waste disposal systems in terms of greenhouse gas emissions. Develop technologies and methodologies that allow cost-effective landscape level management of carbon stocks.

- Develop low-cost metrics and assessment strategies to quantify environmental performance of farms and food production systems, taking into account not just climate change but biodiversity protection and other environmental imperatives.

- Identify and develop institutional, market, and technological innovations to reduce and respond to water scarcity, and to encourage water conservation, in food production, processing, transportation, and end use.

- Focus on innovations that will enable agricultural productivity to improve, or at least not stagnate, in areas facing the current and likely future effects of climate change. This will mean, depending on the region of the world under investigation, attention to the effects of increased weather variability including changing rainfall patterns, increased soil salinity, changing growing seasons and crop growing zones, and a range of other challenges.

- Identify and develop agricultural production systems that facilitate a net draw-down and long-term storage of atmospheric carbon.

- Investigate the appropriate role for biofuels production, with particular attention to the identification of policy environments that unduly pit food production against fuel production.

Research Challenge X: Identify avenues for the building of human and institutional capacity

Research targeted at reducing poverty and hunger requires real, sustained attention to the development of human and institutional capacity. This is an area where research and programmatic concerns clearly overlap. Research must be undertaken to better determine and characterize the types of capacity building in which FTF might meaningfully invest. Research is also needed to understand how to give real

voice in the FTF and other development processes to all major stakeholder groups, particularly smallholder farmers, women, and youth.

> Joseph Ryan, Associate Mission Director on Education and Economic Growth USAID, Pakistan:
> "I doubt the benefiting countries can fully exercise leadership unless FTF integrates research support with capacity building for the benefiting countries' institutions."
>
> Steev Lynn, Technical Advisor, Agricultural Development, Mercy Corps, United States:
> "Design FTF interventions in consultation with private sector stakeholders in the focus countries (farmers, input and service providers, produce buyers), with the intention that the private sector will take up the resulting developments and be the conduit for their widespread availability and adoption."
>
> Leif Jensen, Professor of Rural Sociology and Demography, Penn State University, United States:
> "[W]e need to think beyond just economic relations and broaden our perspective to include social, cultural, political and demographic dimensions as well. Of particular concern should be social structures (replete with structured inequalities by gender, class, race, ethnicity, immigrant status, caste, what have you) that perpetuate poverty and food insecurity. … An FTF agenda that has the guts to be open to research that is critical and challenges the status quo stands a better chance of making a meaningful difference."

Research Themes

- Investigate and identify categories of educational models and best practices in institutional capacity building. The goals will be, in a systematic and evidence-based fashion, to determine how best to train the next generation of specialists and leaders to work on hunger alleviation and poverty reduction, and to better allow communities and institutions in the global South to tackle their own development challenges.

- Identify, characterize, and develop research agendas that take account of the comparative advantages of research institutions, NGOs, and private sector actors in the global South, to ensure that international research has utility in the field.

- Identify pathways to agricultural success for women and youth.

Appendix: Registered Participants by Country

Country	Participants	Country	Participants
USA	786	Ireland	2
Kenya	29	Israel	2
India	22	Lesotho	2
South Africa	19	Mali	2
Uganda	19	Martinique	2
Ghana	17	New Zealand	2
Nigeria	17	Papua New Guinea	2
Tanzania	17	South Korea	2
Ethiopia	13	Spain	2
United Kingdom	12	Sudan	2
Iran	11	Switzerland	2
Botswana	10	Tunisia	2
Zambia	10	Uzbekistan	2
Philippines	9	Afghanistan	1
Australia	8	Albania	1
Canada	7	Algeria	1
Germany	7	Argentina	1
Malawi	7	Armenia	1
Nepal	7	Burundi	1
Netherlands	7	Cambodia	1
Senegal	7	Cape Verde	1
Mexico	6	Denmark	1
Zimbabwe	6	Finland	1
Colombia	5	France	1
Indonesia	5	Georgia	1
Syria	5	Jordan	1
Bangladesh	4	Lebanon	1
Burkina Faso	4	Liberia	1
Cameroon	4	Malaysia	1
Costa Rica	4	Mauritania	1
Egypt	4	Mauritius	1
Morocco	4	Panama	1
Rwanda	4	Peru	1
Benin	3	Russia	1
D.R. Congo	3	Seychelles	1
Honduras	3	Singapore	1
Italy	3	Sri Lanka	1
Japan	3	Swaziland	1
Pakistan	3	Sweden	1
Brazil	2	Taiwan	1
China	2	U.A.E.	1
Cote d'Ivoire	2	Ukraine	1
Guatemala	2	Vietnam	1