Submission from the Consortium of International Agricultural Research Centers and International Centre for Tropical Agriculture, to the UNFCCC Adaptation Committee, in response to Decision 1/CP.21, paragraph 42 (b).

This submission was prepared in response to the Adaptation Committees' (AC) tenth session call for technical information on adaptation needs assessment, stemming from the United Nations Framework Convention on Climate Change (UNFCCC) Conference of Parties (COP) 21st session (decision 1/CP.21, paragraph 42 (b)). Specifically, the AC is requesting information regarding "methodologies for assessing adaptation needs with a view to assisting developing country Parties, without placing an undue burden on them".

JANUARY 2017

Key messages

- In the **agricultural sector there is an especially urgent need to develop and disseminate adaptation prioritization tools** given the prominence of the sector in INDCs to the Paris Climate Agreement.
- Adaptation practitioners in the sector are increasingly **considering a more holistic view of adaptation** that, from early in the prioritization process, takes in to account food security considerations and mitigation co-benefits.
- There are several **growing sources of data on agricultural adaptation**, including: Climate-Smart Agriculture (CSA) Country Profiles, CSA Compendium (forthcoming), and evidence from Climate Smart Villages.
- The CCAFS-CIAT CSA Prioritization Framework (CSA-PF) was **designed to help countries prioritize adaptation interventions in the agricultural and water sectors**, drawing on known practices to develop adaptation portfolios that can be scaled out.
- **Cost benefit analysis alone should not serve as a proxy for prioritization**. It is critical that CBA analyses are complemented by qualitative assessments of barriers to adoption and an assessment of environmental and social impacts of adaptation strategies.
- **Prioritization frameworks are only as good as the data entered in to them**. National research institutions must plan long-term experiments or data collection schemes to measure the impacts of adaptation interventions on farming systems and to provide future inputs in to adaptation prioritization.

1. "How could adaptation needs be defined? What should be the goals(s) when assessing adaptation needs?"

As noted in the IPCC 5th Assessment report, climate change adaptation needs are "the gap between what might happen as the climate changes and what we would desire to happen." Adaptation needs can be derived from a variety of factors including the nature of the climate impacts experienced and projected; an assessment of the geographical areas and users that adaptation interventions should be prioritized for; the criteria/indicators used to evaluate and prioritize options; and the timeframe for adaptation, among other considerations.

While adaptation needs can refer to the underlying socio-economic conditions or hazards affecting a system, for the purpose of this brief, **"needs" refer to practices, services, policies or a range of best-bet adaptation interventions** that can be scaled out and used to attract investment and funding and that are derived at through prioritization methodologies.

Decisions regarding the most appropriate adaptation strategies in a given country will necessarily require tradeoffs across levels of operation, beneficiaries, and even sectors. In addition to securing sufficient funding, developing country Parties, in particular, face considerable challenges in assembling the necessary information regarding the likely economic, social and environmental impacts of competing adaptation strategies and the synergies or tradeoffs that can occur in a portfolio of adaptation options comprising a comprehensive policy.

1.1 Adaptation needs in the agricultural sector

In the agricultural sector there is an especially urgent need for support to assess adaptation needs and devise suitable adaptation strategies. Over 90% of Intended Nationally Determined Contributions (INDCs) to the UNFCCC's Paris Agreement that include adaptation selected agriculture as a priority sector for action, and suitable methodologies and tools can help translate these priorities into actions.

Fortunately, years of agriculture research for development has produced useful resources for adaptation needs assessment and planning in the sector (Box 1). Increasingly, adaptation practitioners are considering a more holistic view of adaptation that—from early in the prioritization process— takes in to account food security considerations and mitigation co-benefits that can be realized as a result of adaptation actions. This is true of Climate Smart Agriculture (CSA), or agricultural actions that aim to sustainably increase productivity, incomes and food security, adapt and build resilience to climate change, and reduce greenhouse gas emissions when possible, in a context specific manner.

Box 1. Select resources for adaptation needs assessment and planning

CSA Country Profiles: Country briefs that include relevant institutional and policy background and a list of potential climate smart practices that help decision makers identify adaptation opportunities, prioritize actions, and make decisions. Briefs are currently available for: Argentina, Colombia, Costa Rica, El Salvador, Grenada, Mexico, Peru, Nicaragua, Uruguay, Kenya, Rwanda, Senegal, Sri Lanka and Moldova.
Link: https://ccafs.cgiar.org/publications/csa-country-profiles

CSA Compendium (Forthcoming): A searchable web-based database of published scientific literature to date on global CSA practices. Here, thousands of promising practices identified as potentially climate smart are organized into five general themes: agronomy, agroforestry, livestock and aquaculture, postharvest management, and energy systems.
Link:
https://cgspace.cgiar.org/rest/bitstreams/67313/retrieve

Climate Smart Villages (CSV): Real-life laboratories, founded on the principles of participatory action research, that aim to generate greater context-specific evidence on the effectiveness of CSA practices, technologies, services and institutional arrangements. CSVs facilitate the co-development of scaling mechanisms towards landscapes, subnational, and national levels for CSA practices. CSVs have been established to identify practical steps that smallholder farmers and other stakeholders from local to sub-national level can take to adapt their agricultural practices to secure dependable food supplies and livelihoods, generating CSA-related outcomes. Since their inception, 36 pilot CSV sites have been established in 20 countries, and efforts are underway to scale up to 2,000 sites.
Link:
https://cgspace.cgiar.org/bitstream/handle/10568/33322/CCAFSClimate-SmartVillages2013.pdf?sequence=9

2. What are examples of methodologies for assessing adaptation needs?

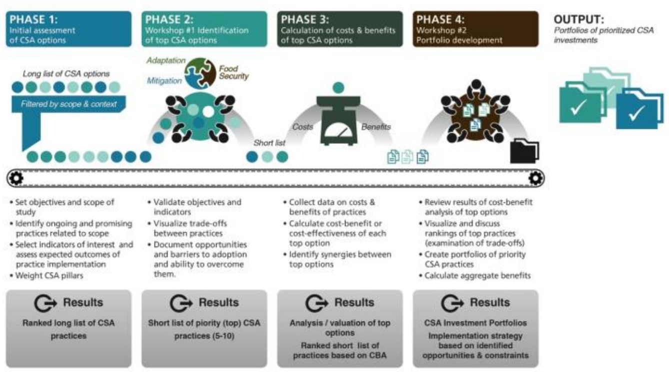
Just as there is complexity in defining adaptation needs, there are several types of tools and methodologies to support Parties to assess and prioritize adaptation needs. These range from comprehensive, step-by-step frameworks to more specific tools designed to support isolated stages of the adaptation decision making process. Prioritization frameworks also differ in their level of application and degree of multi-stakeholder/community participation, some designed for national governments developing comprehensive plans and others for community level rapid-appraisal of adaptation interventions.

Here, we provide a detailed overview of the Climate Smart Agriculture Prioritization Framework (CSA-PF), a holistic analytical framework for adaptation/CSA prioritization applicable across levels, as well as other CCAFS prioritization tools that are narrower in scope or level of application. We then provide examples of the application of these tools in across CCAFS regions in Latin America, East and West Africa, and South and Southeast Asia.

2.1 CSA Prioritization Framework

The CSA Prioritization Framework (CSA-PF), developed by CCAFS and the International Center for Tropical Agriculture (CIAT), was designed to assist decision makers in identifying best-bet CSA investment portfolios that achieve gains in food security, farmers' resilience to climate change, and low-emissions development of the agriculture sector. The framework is divided into four phases: (i) Scoping and initial assessment of CSA options; (ii) Identification of top CSA options (workshop); (iii) Calculation of cost and benefits of top CSA options; and (iv) portfolio development and evaluation of barriers (workshop). While the framework was developed for the agricultural sector, it has potential utility to related sectors, especially water and land use.

Figure 1. CCAFS-CIAT Climate Smart Agriculture Prioritization Framework



Phase 1. Initial assessment of CSA options

Defining the scope, vulnerable areas and production systems and creating a long list of potential CSA practices (adaptation strategies) and likely end users is the objective of the first phase of the CSA-PF. This process begins with setting the scope of the study (e.g. determining the production systems, agro-ecological zones, nature of climate change to be addressed, types of farmers targeted, transformative actions needed); drawing on resources like the CSA Country Briefs, CSA Compendium, Climate Smart Villages work, local expertise and knowledge and other data sources to identify a preliminary list of relevant practices; and identifying indicators for the monitoring and evaluation of these potential strategies (For a list of indicator tools see: https://csa.guide/csa/monitoring-evaluation-and-learning OR https://cgspace.cgiar.org/rest/bitstreams/83141/retrieve)

Phase 2. Identification of top CSA options

The second phase of the CSA-PF seeks to reduce the initial long list of CSA options by engaging a broad group of stakeholders engaged in agricultural development in a workshop designed to define the relative weight that should be given to each of the three pillars of CSA (adaptation, mitigation and productivity). This group will analyze and discuss the expected impacts that different land use practices/development trajectories will have on the CSA goals, as well as the scalability, feasibility and potential beneficiaries of each practice.

Phase 3. Calculation of cost and benefits of top CSA options

The third phase of the CSA-PF aims to assess the costs and benefits and potential externalities of each CSA option or of different portfolios of CSA options over time, utilizing CSA options, weighted criteria, and indicators from phases one and two as inputs into economic modeling prioritization tools.

Box 2. Approaches to Cost-Benefit Analysis of adaptation strategies

While there are excel and web-based tools designed by CCAFS for cost-benefit analysis (CBA) associated with the CSA-PF, there are many ways to undertake CBA. In fact, over the last decade cost analyses of adaptation have been widespread in climate change literature. Adaptation costing efforts vary widely in their scope and level of application. Generally speaking, we can differentiate between the following CBA support tools: (1) **global analyses** of investment and financial flows and integrated assessments models that seek to determine the global cost of adaptation and the impacts on the global economy of action/inaction; and (2) **national level analyses** that include the costing exercises associated with National Adaptation Programmes of Action (NAPA) and National Adaptation Plans (NAP) and the use of more sophisticated tools like computable general equilibrium analyses (also applicable at global levels), among others. For a summary of global and national CBA/costing approaches see: https://ciat.cgiar.org/wp-content/uploads/2013/01/policy_brief5_climate_change.pdf

More recently, site-specific methodologies for cost-benefit analysis have been developed. In the agricultural sector, this means undertaking CBA at the farm and community level. This bottom-up approach allows for more detailed, high-resolution assessments of cost-effectiveness and of scaling these interventions up and out. Here are three such examples:

a) In Guatemala, CCAFS researchers applied 'probabilistic cost-benefit analysis', or CBA that does not rely solely on a single average of return but rather a range of potential values. This approach more appropriately takes in to consideration the diverse interests present in a community and can help to assuage the value-laden assumptions common to most CBA analyses. Probabilistic CBA adopts an internal rate of return (IRR) approach that does not require specific definition of capital costs, only of returns on investment in the form net present value (i.e. a representation of the benefits over the lifetime of the intervention). An intervention is considered profitable when the IRR is higher than the discount rate used to determine net present value. Link: http://www.sciencedirect.com/science/article/pii/S0308521X16301160

b) In India, CCAFS applied a "willingness-to-pay approach" with farmers in state of Rajasthan across diverse rainfall zones. "Farmers' were organized into a group of 5-6 for discussion on [21] CSA technologies and then asked to score each technology from 0 to 3 scale (0 = no preferences, 1 = low preference, 2 = medium preference, and 3 = high preference)". In a second phase, "for only those technologies that were highly preferred by the farmers in the scoring exercise, the study team conducted a bidding exercise using pseudo money". Bidding exercises/scenarios in this way can effectively measure financial burden and identify reluctance to invest in the technologies. Link: http://www.sciencedirect.com/science/article/pii/S0308521X1630645X

c) Further highlighting the value of farm-level CBA analyses, in Kenya, CCAFS researchers applied an approach known as Participatory Social Return on Investment (PSROI). Social Return on Investment (SROI) is a CBA strategy designed to go beyond economic returns alone to measure the social and environmental impacts of an intervention. Application of 'participatory' SROI (i.e. SROI built in to a wider participatory process of adaptation prioritization) with farmers in Western Kenya determined that there was an approximate 70% reduction in the community valuation of intercropping when compared with expert – led desk-based valuations. This difference was attributed to a lack of knowledge about the intervention, misconception about the potential costs and benefits, and the risk-averse nature of the farmers.
Link: http://link.springer.com/article/10.1007/s11027-014-9600-5; or https://ccafs.cgiar.org/publications/participatory-social-return-investment-psroi#.WEQ_3GWrw80

Phase 4. Portfolio development and evaluation of barriers

The final phase of the CSA- PF brings together stakeholders again in a workshop format to review the analyses resulting from previous steps, and to conduct a robust analysis of perceived constraints and barriers to adoption from the perspective of different stakeholder groups. This stage of the CSA-PF recognizes that prioritization of CSA interventions extends beyond cost-benefit analysis alone. The portfolios of options and suggested best practices with the greatest prospects of success are then selected by stakeholders for national, regional and/or local implementation.

2.2 CSA-PF Case Studies

Guatemala: In Guatemala, the CSA-PF was implemented in collaboration with the Ministry of Agriculture, Livestock, and Food (MAGA). In phase one, 24 potential CSA strategies were identified focusing on five departments and interventions related to maize and beans —the dominant cropping system in the region. Following a phase two workshop with 42 stakeholders from the region, cost benefit analysis was conducted on eight practices chosen across three categories: agroforestry, agronomy and water resource management. Probabilistic cost-benefit analysis was used, with data collected through a survey of 200 farms and secondary literature. Social and environmental externalities were also considered and analyzed, including impacts of biodiversity, carbon sequestration and labor/employment. All CSA strategies, with the exception of one, were profitable over the lifetime of the interventions and contributed to improved biodiversity. The results of this analysis were shared stakeholders in the phase 4 workshop using a visualization tool that demonstrated the various tradeoffs between the CSA goals (productivity, adaptation, mitigation). This example demonstrates how CSA-PF can be adopted by governments and integrated in to existing planning processes.
Link:
http://www.sciencedirect.com/science/article/pii/S0308521X16301160

Mali: In Mali, the CSA-PF was implemented by a non-governmental organization Malian Association of Awareness to Sustainable Development (AMEDD) with the support of the Agency of Environment and Sustainable Development (AEDD). In the phase one assessment, analysts identified 23 CSA strategies widely applicable across the country. In the second phase workshop, 10 specific practices for different regions such as the fixation of dunes in the Sahelian region, sorghum-cowpea association for the Sudano-sahelian region, and contour fields for the southern region were identified. These interventions were selected for CBA analysis over a five-year life cycle, focusing on impacts on the main crops found in the diversified farming systems (maize, millet, sorghum). Like in Guatemala, social and environmental externalities like carbon sequestration, gender, and social conflicts related to land access were considered. In phase 4, two prioritized portfolios of CSA activities were adopted, the first focusing on farm-level activities (e.g. sorghum and cowpea integration) and the second on a landscape level (e.g. development of rice cultivation valleys). This example demonstrates the cross-level utility of the CSA-PF and its integration with existing development initiatives.
Link:
https://cgspace.cgiar.org/rest/bitstreams/71151/retrieve

Vietnam: In Vietnam, the CSA-PF served as the model for an alternative framework for the rapid appraisal of climate smart practices. In its application, a baseline assessment of adaptation needs and potential options was conducted in 2014 in My Loi village. The 13 original practices were reduced to 10 based on their "climate-smartness" through phase 1 assessment through consultations with male and female villagers, local leaders and experts, field visits, and cost-benefit analysis using a net-present value approach. The top ten interventions were presented to the broader community in "CSA Fair" where 200 community members participated. Intervention posters were posted on the walls of an event hall and community members, following technical presentations on each practice, voted for the interventions they thought were most applicable to them. This included home gardening, intercropping, agroforestry, and livestock (pig) raising. Both, "CBA and the prioritization", the authors note, "clearly show that women and men both want trees, but women preferred fruit trees and home garden development while men were more interested in forestry development". This example demonstrates how the CSA-PF framework can be modified to suit local conditions, providing not prescriptive steps, but a broad guiding framework.
Link:
https://cgspace.cgiar.org/rest/bitstreams/78307/retrieve

2.3 Other Prioritization frameworks/tools for adaptation needs assessment

The CSA-PF is the result of learning from best practices in the area of adaptation prioritization, yet it is not the only CCAFS framework available to developing country Parties. Other toolkits rely more heavily on agricultural modeling, or highlight specific aspects of adaption planning, like gender, and tend to be focused centrally on communities. Here, a range of alternative tools are provided:

CSA Prioritization (CSAP) toolkit: This approach to adaptation prioritization requires a detailed location-specific database on soil, crop varieties, cropping area, agronomic practices, irrigation and historical weather information along with socio-economic data. Future crop yields, water-use and emissions are then forecasted under different climate-scenarios using crop-modeling techniques. The approach identify priorities for investment in: (i) crops best suited to delivering target growth under impacts of climate change on yields; (ii) technologies to deliver targeted increases in productivity, based on potential yield increases and the efficient use of resources; and (iii) locations for priority investment given an existing surplus of productive capacity.
Link:
https://cgspace.cgiar.org/rest/bitstreams/38402/retrieve

CSA Rapid Appraisal (CSA-RA) tool: "The Climate-Smart Agriculture Rapid Appraisal (CSARA) provides an assessment of key barriers to and opportunities for CSA adoption across landscapes by collecting gender-disaggregated data, perceptions of climate variability, and resource and labor allocation, as well as economic assessments at the household level. This approach combines participatory workshops, expert interviews, household/farmer interviews, and farm transect walks to gather and capture the realities and challenges facing diverse farming communities". CSA-RA was piloted in Tanzania and Northern Uganda.
Link:
https://dataverse.harvard.edu/dataset.xhtml?persistentId=doi:10.7910/DVN/28703

"TargetCSA" Framework: TargetCSA is a national-level CSA prioritization tool that integrates stakeholder/expert opinion and quantitative data on vulnerability and CSA options to produce a portfolio of spatially-explicit CSA options. The method uses a workshop to identify vulnerability indicators and CSA practices and a survey to conduct a pair-wise comparison of those options (i.e. assigning numerical weights) that are then analyzed in a computerized optimization model to produce a 'majority consensus' that most closely reflects stakeholder preferences, or other scenarios. These preferences are then coupled with spatial data (.e.g. annual precipitation, literacy, soil organic matter etc.) to produce mapped indices demonstrating the highest areas of CSA potential. This approach is documented in Kenya's agricultural sector. Link: http://www.sciencedirect.com/science/article/pii/S0308521X1530069X

"Generic" Framework: Notenbaert et al. (2017) offer a generic framework for CSA prioritization applicable for diverse operational levels and users. It follows four steps (1) Diagnosis and identification of potential options, (2) characterization of options, (3) identification of the recommendation domains (i.e. spatial mapping) and out-scaling potential of the options, and (4) ex-ante impact assessment of the alternative options. The framework is intended to be iterative and non-linear, and employ varying degrees of qualitative and quantitative data including expert opinion and spatially explicit data. The approach was documented in Tanzania's livestock sector. Link: http://www.sciencedirect.com/science/article/pii/S0308521X16301962

Minimum Data Approach: Shikuku et al. (2017) combine a livestock model with a Trade-Off Analysis Model for Multi-Dimensional Impact Assessment (TOA-MD) to identify the potential rates of adoption for CSA strategy variations. In the case of rural Tanzania, farmers were divided in to strata, or groups, pertaining to local or improved cow ownership. Adoption of improved breeds and improved feeding strategies were determined by the TOA-MD model, producing economic, environmental and social impact indicators for adopters and non-adopters. Based on adoption rates, income, food security poverty and GHG emissions were then calculated. This 'minimum data approach' utilizes survey data, expert consultations, and and secondary data as inputs in to the livestock and economic models.
Link: http://www.sciencedirect.com/science/article/pii/S0308521X16302189

3. What barriers and gaps exist with respect to the development and application of methodologies for assessing adaptation needs?

When derived at through participatory processes and considered holistically alongside food security, productivity and mitigation co-benefits, Parties can build robust portfolios of agriculture adaptation actions that are simultaneously relevant to those most vulnerable and attractive to donors.

The frameworks presented in this brief offer prioritization approaches that have been tested across continents and in a variety of unique field-level settings. They are not intended to be prescriptive, but rather to provide general guidelines for important considerations in the adaptation prioritization process. Implementation of these prioritization frameworks to-date has surfaced several important challenges and considerations:

First, a common challenge across all prioritization framework pilots is **presenting CSA options with sufficient resolution to be instructional but with ample flexibility to accommodate local realties**— CSA options are not, after all, 'climate-smart' in every setting. Therefore, for phase 3 'cost benefit analysis' to be contextually appropriate, phase 2 'Identification of top CSA options' must also allow for modification of promising strategies with respect to local opportunities and barriers to implementation. The continued use of these prioritization tools will ensure that the Convention's technology mechanism prioritizes the most appropriate technologies for specific contexts.

Second, regarding the identification of indicators for measuring adaptation outcomes, **in some cases, indicators are too costly and time-consuming for rapid field assessments.** Key findings from CCAFS Programming and Indicator Tool indicate that mitigation co-benefits are seldom measured at field level. The most common indicators tend to be related to productivity—especially yields and farm income. Furthermore, there are very few indicators to address specific adaptation measures such as seed varieties or crop insurance. Also lacking are financial indicators on adoption of CSA technologies and practices, and indicators lacked the ability to show a change over time, or to measure specific changes in low/lean season.

Third, cost benefit analysis alone should not serve as a proxy for prioritization. It is critical that CBA analyses are complemented by qualitative assessments of barriers to adaptation adoption and an assessment of environmental and social impacts. For example, as demonstrated by CCAFS evidence in India, CBA can overestimate farmers' willingness to pay for costly up-front adaptation investments. Meanwhile, in Kenya, it was demonstrated that CBA desk studies may overestimate adaptation benefits compared to community level assessments. In all cases, practitioners should aim for the utmost transparency regarding the assumptions made in CBA calculations.

Ultimately, as demonstrated in Vietnam, CBA analyses are challenged by the fact that practices may be new to farmers or the particular geography and the costs and benefits are not known; and, second, that many CSA options involve integrated farming systems at the landscape scale where indirect competition and complementary effects may be misjudged. Analysis of trade-offs at the national level can aid decisions on best bets for agricultural investment under climate change. For example, de Pinto et al (2016) provided an analysis of trade-offs between profitability and emissions reductions for oil palm expansion, forest conservation and pasture management that informed the Intended Nationally

Determined Contribution (INDC) submitted by Colombia. Link:
http://www.sciencedirect.com/science/article/pii/S0305750X16304041

Finally, prioritization frameworks are only as good as the data available to them. National research institutions must plan long-term experiments or data collection schemes to measure the impacts, economic, social and environmental impacts of CSA/adaptation practices on farming systems and to provide future inputs in to adaptation prioritization, as these tools evolve and improve in sophistication. Robust monitoring and evaluation must also be put in place following the application of prioritization frameworks to capture data on implementation that can also inform future work.

For each of these prioritization challenges to be remedied, funding, capacity and technological gaps need to be addressed. **It is important that any local prioritization process gives consideration to the broader policy and economic landscape framing the local context**. Demand-driven policies that are mainstreamed in to existing development planning processes are important. The Framework Convention's finance mechanism must include support for robust adaptation needs assessments to properly mainstream these efforts.