CGIAR Climate Change, Agriculture and Food Security Program
Theme 3: Pro-Poor Climate Change Mitigation
Currently Named: Theme 3: Low Emissions Agriculture

Evaluation of 2011-2013

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Gordon R. Smith, Ecofor LLC

Contents

I. Executive Summary

This document is an evaluation of a component of the CGIAR research program "Climate Change, Agriculture and Food Security" (CCAFS), specifically the program "Pro-poor climate change mitigation" which CCAFS has labeled "Theme 3" and since renamed "Low emissions agriculture." This evaluation addresses CCAFS Theme 3, from years 2011-13.

CCAFS specified that the evaluation will use six criteria:

1. **Relevance**: Is the Theme 3 program being managed in line with vision in the Program Plan and Theory of Change, and CGIAR reform process, including cross center research, working with partners and consulting with stakeholders in designing research?
2. **Effectiveness**: How successful is program management at guiding program work to serve program goals, include synergies across activities , involving regional programs, working across scales, and addressing situations that are not going according to plan?
3. **Efficiency**: Are administrative and transaction costs reasonable?
4. **Impact**: Are outcomes and incipient outcomes sufficient for a US $10 million per year program? Is low emission development occurring in land use in regions where CCAFS is working? Are women and marginalized groups benefiting?
5. **Sustainability of Benefits:** Are impacts likely to have continuing benefit for a long time?
6. **Quality of Science**: For the amount of funding of the program, are there enough high quality publications, and publications in high impact journals?

The complete guidance is in the "Framework for CCAFS Review" which is reproduced in Appendix 1.

A nomenclature distinction is in order here. The word "output" is used here to refer to the work products of CCAFS activities. Work products include journal articles, working papers, policy briefs, workshops, presentations, methodologies, software tools, data sets, and trainings. The word "outcome" is mainly used to refer to changes in environmental conditions or functions or human welfare. Examples of desired changes in environmental conditions or functions include increases in crop yields, maintaining crop yields over time, reducing greenhouse gas emissions, sequestering carbon in terrestrial ecosystems. Examples of desired changes in human welfare are increased food security and reduction of poverty. CCAFS also uses the term "outcome" to refer to uses of CCAFS outputs by non-CCAFS people, and reference to CCAFS outputs in non-CCAFS analyses, guidance documents, and policies.

The evaluation included desk review of written documents produced by Theme 3 or produced with Theme 3 funding by outside entities, CGIAR and CCAFS documents, interviews with people doing Theme 3 work, people who formerly did Theme 3 work, and people with partner organizations who have been involved in Theme 3 work. Part of the evaluation was identifying and talking to individuals who would be expected to use the results of Theme 3 work or be beneficiaries of Theme 3 outputs, particularly government policy makers and smallholder farmers. Site visits were made in Kenya to three center offices and several farms. Interviews were done in person, by phone, and by Skype. Also, effort was made to identify outcomes and impacts resulting from Theme 3 work.

Findings

The Theme 3 program is generally **relevant** to the program goals and objectives. However, some gaps exist.

The program in generally **effective**ly managed.

The program operation is **efficient**, and management and transactions costs of the program are low.

It is too soon to make a definitive statement about the **impact** of the program, but it appears that the impact is moderate relative to the scale of the resources applied to the program. Some activities are high impact and some appear to have little impact.

It appears that many of the outcomes of the program will be **sustainable**.

The **quality of the science** of a few outputs is very high. There are a fair number of science outputs that are solid science but that are not high impact.

Conclusions

CGIAR and CCAFS need to articulate a vision of how their work can achieve their goal of alleviating poverty. If the goal is to alleviate poverty, this means moving millions of people out of smallholder farming. If your primary livelihood is producing your family's food on 0.5 to 2 ha, generally you will be poor.

This report does not argue for any particular pathway for reducing rural poverty. Instead, this report argues that achieving food security is a necessary first step, but by itself is not sufficient for broad alleviation of poverty. Probably millions of people need to find livelihoods other than smallholder farming. The shift will likely be generational, where current mature farmers continue to farm, while their children obtain skills and make livelihoods other than farming. Those who remain in farming will farm large areas, or raise high value, labor intensive crops, or farm as a lifestyle choice rather than a primary source of income.

CGIAR, and CCAFS within it, have unique research capacity. CCAFS is able to do highly technical measurements requiring expensive equipment, such as a year of sampling of soil nitrous oxide fluxes. CGIAR is able to investigate hundreds of issues concurrently, and work around the globe.

The CCAFS "Climate Smart Villages" activity is an example of CCAFS including assessment of outcomes into the program. This work merits expansion, to help figure out how development organizations can efficiently scale up their work by orders of magnitude.

CCAFS is examining the landscape interactions between multiple land uses, including greenhouse gas emissions. Many policies are proposed without understanding of how they will affect other lands and other sectors of the economy. Broadening and deepening this work would make it less likely that policies are implemented that have unanticipated negative consequences elsewhere in the landscape.

It is probably too soon to judge the outcomes of the CCAFS Theme 3 program. The number and quality of publications in 2010 through 2013 was moderate, but more publications are coming out. And the more important measure is effects on the livelihoods of millions of smallholder farmers, and greenhouse gas emissions. And there has not been enough time for the outputs of Theme 3 work to have much of the effects on land management that they may have over time.

Recommendations

Recommendation 1: CCAFS Theme 3 should clearly articulate a vision for a pathway or pathways where hundreds of millions of food insecure smallholder farmers can escape from poverty. This escape likely will involve transitions, over a few decades, to non-farming livelihoods, high value agricultural products, and larger scale farming.

Recommendation 2: CCAFS Theme 3 should continue with efforts to develop emission factors and inexpensive methods for assessing nitrous oxide emissions from a variety of smallholder farming vegetation types, management practices, and soil conditions, including emission rates several years after practice changes. Nitrous oxide emission generation is complex and nonlinear, and estimates and models for emissions resulting from climate smart agriculture practices could be wrong by a significant amount. We need to reliably estimate the net greenhouse gas effects of the land management changes we are proposing.

Recommendation 3: CCAFS Theme 3 should increase the measurement of the effectiveness of interventions with smallholder farmers and policy makers, and ensure that measurement of effectiveness is incorporated in all capacity building and policy change activities undertaken by CCAFS, and this work should be done comparatively in multiple countries. Measuring the effectiveness of different interventions is different from impact evaluation. It is to assess what interventions work better. “Climate Smart Villages” are a promising venue for conducting much of this work on effectiveness of interventions.

Recommendation 4: CCAFS Theme 3 should dramatically increase the quality of financial analysis of returns to different smallholder farming practices and systems, including comparisons of alternative systems. Cropping systems that increase yields or make yields more reliable won’t be broadly adopted if the increase in costs is greater than the increase in benefits, relative to conventional systems.

Recommendation 5: CCAFS Theme 3 should continue work to develop methods to make inexpensive and accurate estimates of GHG emissions from landscapes that include smallholder farms.

Recommendation 6: CCAFS Theme 3 should develop efficient sample selection systems and plot designs for measuring biomass carbon stock change in smallholder farming and agroforestry systems. This is a relatively small project.

Recommendation 7: CCAFS Theme 3 should consistently implement its requirement that publications supported by CCAFS be open access. CCAFS should investigate procedures for working with partners to get open access to partner publications that are partially the result of CCAFS-funded work.

Recommendation 8: CCAFS Theme 3 should request that CGIAR provide all its units, including CCAFS Theme 3, a work and budget planning and reporting system where work plan commitments can be directly compared to delivered work, activities may have durations longer than one year, deliverables may be due in year later than initial funding, and expansions of prior activities are clearly linked to those prior activities. The new tracking system was not reviewed and may have these capacities.

II. Overview

A. CGIAR Purpose, Vision, and Strategy

The CGIAR is a global agricultural research partnership. The CGIAR website states: *The CGIAR Consortium is an international organization that, together with the CGIAR Fund, advances international agricultural research for a food secure future.*

The CGIAR' vision statement: *To reduce poverty and hunger, improve human health and nutrition, and enhance ecosystem resilience through high-quality international agricultural research, partnership and leadership.*[1]

CGIAR intends to operationalize this vision by pursuing four "system level outcomes": *Reducing rural poverty, improving food security, improving nutrition and health, and sustainable management of natural resources*.

B. CGIAR Structure

The CGIAR is composed of 15 research centers which are members of the consortium, each with a historical subject area focus.[2] The CGIAR consortium is led by the consortium board which develops strategies for CGIAR Consortium research, accounts for funds received from the CGIAR Fund, reviews the performance of Research Centers which are members of the CGIAR Consortium, mobilizes financial resources, and reviews the performance of the CGIAR Consortium.

The CGIAR research programs are composed of:

- Seven research programs to improve yields and profits of crops, fish, and livestock
- Three research programs to improve sustainability and environmental integrity, adapt to and mitigate climate change
- Three research programs to improve the productivity, profitability, sustainability, and resilience of entire farming systems
- One research program to improve policies and markets
- One research program to improve nutrition and diets, and
- One research program for managing and sustaining crop collections.

Of the programs on sustainability and environmental integrity is CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS). This evaluation addresses CCAFS, from years 2011-13.

C. CCAFS Goal and Structure

The CCAFS goal is "to promote a food-secure world through the provision of science-based efforts that support sustainable agriculture and enhance livelihoods while adapting to climate change and conserving natural resources and environmental services."[3]

[1] CGIAR. A Strategy and results framework for the CGIAR. 20 February, 2011.
[2] http://www.cgiar.org/cgiar-consortium/
[3] CCAFS Program Plan Summary 2011.

CCAFS is directed from the University of Copenhagen, and Theme 3 is administered through an office at the University of Vermont.

CCAFS works through four Themes:

1. Adaptation to progressive climate change
2. Adaptation through managing climate risk
3. Pro-poor climate change mitigation
4. Integration for decision making

The target outcomes identified for Theme 3 in 2011 are to (by the year 2020):

- 3.1. Enhance knowledge about agricultural development pathways that lead to better decisions for climate mitigation, poverty alleviation, food insecurity and environmental health, used by national agencies in at least 20 countries.
- 3.2. Improved knowledge about incentives and institutional arrangements for mitigation practices by resource-poor smallholders used by farmers, (including farmers' organizations), project developers and policy makers in at least 12 countries.
- 3.3. Key agencies dealing with climate mitigation in at least 12 countries promoting technically and economically feasible agricultural mitigation practices that have co-benefits for resource-poor farmers, particularly vulnerable groups and women.[4]

Outcomes were adjusted and articulated in more detail as the program developed. After the initial program design, goals were stated in the "CCAFS Logframe 2012 to 2015.docx." This list of target outcomes and outputs is 44 pages long, with 11 pages for Theme 3. For each target outcome, outputs are specific for each year. For example the first Theme 3 output is:

> Milestone 3.1.1 2012. Analysis and frameworks for planning low carbon agricultural development and understanding trade-offs, including ensembles of global integrated assessment models to examine food-energy trade-offs and social returns of investments in mitigation, ex-ante impacts assessed of options with different trade-offs for men, women and the poor (ILRI- linked to T4, CIAT-Colombia, T3).

Each milestone has a performance indicator. For example, the performance indicator for milestone 3.1.1 for 2012 (above) is:

> Article on bioenergy and food security implications (PIK). Review of methods for ensembles of IA models (ILRI). Synthesis report and paper on mitigation costs, best-bet options and trade-offs along value chain comparing 3-8 mitigation options in Columbia (CIAT). Paper on social returns to investment for mitigation options in Uganda (T3). Framework and indicators developed, and community of practice initiated for assessing the impacts of 'low-climate-impact' agricultural development options on women and marginalized farmers (T3)

The logframe was revised as "REVISED CCAFS Logframe 2013 to 2015."

CCAFS has a matrix structure. Each Theme distributes funds to programs through the 15 CGIAR member centers, and through five geographic regions that encompass the earth. Regions have coordinating staff, and support work by CGIAR staff administratively located in centers, and by external partners. Theme 3 also

[4] CCAFS Program Plan Summary 2011, p. 11.

funds some research directly through the Theme office, and contracts with external partners. CGIAR work funded by CCAFS is performed primarily by CGIAR staff associated with centers, by external partners contracted by the Theme office, and by Theme staff.

CGIAR decided to create the pro-poor climate mitigation program in 2009. The Theme Leader was hired and the Theme officially launched in May 2010, and was then called Theme 6. Research work began in June 2010. In December 2010 the consortium research program was reorganized, Theme 6 was renamed Theme 3, and the budget expanded to approximately its current magnitude.

CCAFS calls its funded units of work "activities." Many activities are scientific research, and syntheses of research, but many are not research. Non-research activities include workshops for program planning, trainings to build capacity of government staff and others, and producing videos. In addition to journal articles, book chapters, and books, Theme 3 produces other types of written publications including policy briefs, reports, working papers, posters, training manuals, brochures, and methods guides.

In each of the years evaluated, Theme 3 had more than 50 ongoing activities supported by Theme 3 funding. Many of these were multi-year efforts but, other than interviewing the people involved, in most cases, there is no way to determine if an activity is a continuation of an activity funded in a prior year (an issue that is addressed in the findings and recommendations of this evaluation).

D. Scope of This Evaluation

This evaluation was directed by CCAFS to address CCAFS Theme 3, Pro-poor climate change mitigation, years 2011-2013. The evaluation also addresses work to date, largely because work products issued in 2014 are based on work done before 2014. Also, CCAFS information systems generally allow only a very general association of work products to funding (discussed below in the findings section IV.B, Effectiveness), so attributing a particular work product to a specific activity number, or contract, and fiscal year of funding generally requires discussion with the program manager or an institutional contact point person.

Evaluating Theme 3 requires understanding the context in which it operates: CCAFS and CGIAR, and the consortium and region structures of CGIAR. It also requires consideration of external partners doing work funded by Theme 3. For this evaluation, limited time was allocated to understanding the rest of CGIAR.

CCAFS said the evaluation will use six criteria. CCAFS provided guidance on operationalizing the six evaluation criteria. The guidance is summarized here. The complete guidance is in the "Framework for CCAFS Review" which is reproduced in Appendix 1.

1. **Relevance**: Is the Theme 3 program being managed in line with vision in the Program Plan and Theory of Change, and CGIAR reform process, including cross center research, working with partners and consulting with stakeholders in designing research?
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5. **Sustainability of Benefits:** Are impacts likely to have continuing benefit for a long time?
6. **Quality of Science**: For the amount of funding of the program, are there enough high quality publications, and publications in high impact journals?

For each criterion, questions to be addressed, expected evaluation products, and expected approaches are specified in the "Framework for CCAFS Review" (Appendix 1).

A nomenclature distinction is in order here. The word "output" is used here to refer to the work products of CCAFS activities. Work products include journal articles, working papers, policy briefs, workshops, presentations, methodologies, software tools, data sets, and trainings. The word "outcome" is mainly used to refer to changes in environmental conditions or functions or human welfare. Examples of desired changes in environmental conditions or functions include increases in crop yields, maintaining crop yields over time, reducing greenhouse gas emissions, sequestering carbon in terrestrial ecosystems. Examples of desired changes in human welfare are increased food security and reduction of poverty. CCAFS also uses the term "outcome" to refer to uses of CCAFS outputs by non-CCAFS people, and reference to CCAFS outputs in non-CCAFS analyses, guidance documents, and policies.

The evaluation included desk review of written documents produced by Theme 3 or produced with Theme 3 funding by outside entities, CGIAR and CCAFS documents, interviews with people doing Theme 3 work, people who formerly did Theme 3 work, and people with partner organizations who have been involved in Theme 3 work. Part of the evaluation was identifying and talking to individuals who would be expected to use the results of Theme 3 work or be beneficiaries of Theme 3 outputs, particularly government policy makers and smallholder farmers. Site visits were made in Kenya to three center offices and several farms. Interviews were done in person, by phone, and by Skype. Also, effort was made to identify outcomes and impacts resulting from Theme 3 work.

A selection of activities had to be identified for review because there was not time available to examine all Theme 3 activities. Several variables were used to sort and select activities for review. Activities were sorted by budget, and several projects with the largest budgets were selected for review. Theme leaders were asked to identify activities that they would like reviewed, and were asked to identify the activities that they think had the largest impacts on users of knowledge. This biases the selection of projects and reduces the ability to extrapolate from the sample to the entire program, but this bias was adopted to increase the likelihood that the major impacts of the work would be assessed. Also, some activities with small budgets were selected for review. There were only resources available for one trip for site visits, so the geographic location was selected that allowed visiting activities of high interest (large budgets and highlighted by Theme leaders), allowed visiting farmers, and made it possible to visit several activities in one trip. A list of activities was developed that encompassed more than half the Theme 3 budget for each year being reviewed, and then activities were reviewed until the time available was exhausted. At least 36 activities were reviewed. It is not clear exactly how many activities were reviewed because several work products were reviewed for which the activity identification numbers were not identified. It is likely that some of these work products were from activities in addition to the 36 activities for which work plans and reported deliverables were reviewed.

Activity review included assessing the plan for the work, planned deliverables (where available), work performed, outputs of work, and how the outputs related to the planned work and budget. An effort was made to interview the principal investigator. Climate policy discussions and decisions were assessed for

indications of use of the CCAFS work outputs. Information about changes in smallholder farmer behavior was sought. For a subset of articles, journal article impact metrics were reviewed.

31 people were interviewed as part of this review. These individuals are listed in Appendix 2. Interviewees included principal investigators, CCAFS managers, farmers, field technicians, farmers involved in CCAFS activities, partners, and policy makers who might use CCAFS outputs.

A variety of documents were reviewed as a part of the evaluation. Strategy and program plans for CCAFS, Theme 3, and CGIAR were reviewed. For activities that were reviewed, all written deliverables were sought, and all such documents that were obtained were reviewed. For larger activities, publications about the activity that were produced outside of CCAFS were reviewed. All publications reported for 2013 in CCAFS Planning and Reporting system were reviewed. Searches were done for documents related to selected Theme 3 activities, and documents were reviewed even when it was not clear whether the work was funded by Theme 3, another part of CGIAR, or another organization. A variety of documents and spreadsheets were prepared by the CCAFS and Theme 3 management staff to explain the program; these explanatory documents were heavily used in this review, but are not listed in the document list in this report. These documents are available in the Dropbox folders that staff prepared and made available for the review. A selected list of documents reviewed is in Appendix 3.

III. Findings

A. Relevance

CCAFS defines "relevance" as the work being in line with the program plan and CCAFS theory of change, and CGIAR processes, and that there is evidence of beneficiaries' demand for the work.

This review finds that Theme 3 work is substantially aligned with the program plan and theory of change, but that significant gaps exist. Gaps are discussed later in this section, after the program goals are outlined.

Program plans set goals for outcomes to be achieved by the program:

- Enhance knowledge about agricultural development pathways that lead to better decisions for climate mitigation, poverty alleviation, food insecurity and environmental health, with this knowledge used by national agencies in at least 20 countries.
- Improve knowledge about incentives and institutional arrangements for mitigation practices by resource-poor smallholders (including farmers' organizations), with this knowledge used by farmers, project developers and policy makers in at least 12 countries.
- Key agencies dealing with climate mitigation in at least 12 countries promote technically and economically feasible agricultural mitigation practices that have co-benefits for resource-poor farmers, particularly vulnerable groups and women.

During the 2011-2013 period, Theme 3 goals were adjusted. Later, the name of the program was changed from "Pro-poor climate change mitigation" to "Low emissions agriculture" to reflect the goal changes. These adjustments are reflected in the updating of program plans/business plans, and the logframe. Possibly the most significant shift was in emphasis from reducing greenhouse gas emissions from agriculture to reducing the emission intensity of agriculture. Another significant shift was the realization that carbon credit

payments are unlikely to pay for significant changes in farming practices or make a significant increase in food security or smallholder farmer welfare. As a consequence of this realization, emphasis shifted toward farmers benefitting from increased crop and livestock production, rather than carbon payments, and less emphasis on absolute emission reductions.

Also, this evaluation is to consider the degree to which the work conforms to the reform goals of CGIAR. The vision adopted by CGIAR is "To reduce poverty and hunger, improve human health and nutrition, and enhance ecosystem resilience through high-quality international agricultural research, partnership and leadership" (CGIAR 2011b). To implement this vision, CGIAR intends to operate a global system that is "producing, assembling and delivering research outputs, in collaboration with research and development partners. These outputs will be International Public Goods (IPG) and will clearly contribute to the solution of significant development problems that have been identified and prioritized with the collaboration of developing countries." To accomplish this, the CGIAR intends to work toward four "system level outcomes" (SLOs):

- Reducing rural poverty
- Improving food security
- Improving nutrition and health
- Sustainable management of natural resources

The first goal in the 2012-2015 logframe for Theme 3 is analysis of agricultural development pathways. Milestones and indicators address food security, production, and disadvantaged groups and women. However, milestones, indicators, and funded activities do not explicitly articulate a definition of escaping poverty or pathways out of poverty. Food security is a step, but only a step on the path out of poverty. CCAFS is doing a considerable amount of work that promises to make smallholder farmers better off and food secure. The participatory action research program with farmer groups is the archetypical example of the Theme 3 portfolio making smallholder farmers better off. However, a family is not going to move out of poverty by farming one or two hectares, unless they are growing extraordinarily high value horticultural crops.

Articulating alternative pathways out of poverty provides a starting point for targeting research on the effectiveness and appropriateness of the alternative pathways.

Probably pathways out of poverty will result in far fewer smallholder farmers. Europe and America made this conversion from many smallholder farmers to having far fewer farmers, with most farmers producing multiple orders of magnitude more food (or other agricultural products) than is produced by smallholders. CCAFS and CGIAR need a vision of pathways by which hundreds of millions of people can move out of poverty and instead have more remunerative livelihoods. This transformation will take more than a generation, and—if the pattern is anything like the pattern of developed countries—will involve many children of current farmers taking up livelihoods other than farming. CGIAR needs a vision of how to support and contribute to this transformation.

Discussions with people working in agriculture development reveal that many countries have efforts to get smallholder farmers to adopt more productive practices. However, it is difficult to attribute causes and credit for such diffuse and complex changes. Conservatively, CCAFS describes its contributions to outcomes, and avoids claiming that it causes particular outcomes. In addition to the fact that many actors are involved in

changes in practices, there are decades of knowledge building underlying current climate smart agriculture practices. For example, there was substantial work on intercropping, residue management, and use of fertilizer in smallholder farming was accomplished in the 1970s and 1980s, and as early as the 1960s. More recent work has further investigated interactions between multiple crop species, examined effects of different fertilizer types and application methods, and quantified greenhouse gas emissions of different cropping systems. The challenge is to discern CCAFS contributions to ongoing changes in agricultural practices. Other than some cases where users directly cite CCAFS work, or CCAFS experts are observed being involved in diffusion of new practices, the methods used in this evaluation do not discern diffusion of practices resulting from earlier work versus changes resulting from CCAFS Theme 3 work. These observations are anecdotal. Survey or case study analyses of CCAFS contributions would be useful, but are beyond the scope of this review.

In addition to biological, physical, and geographic science research, CCAFS Theme 3 activities address a variety of social and economic aspects of enhancing livelihoods of smallholder farmers while greenhouse gas emissions. Unlike traditional university-based research, CGIAR has a goal of involving the stakeholders who are expected to benefit from the organization's work. Perhaps the best example of integrating stakeholders is the "Climate Smart Villages" program where researchers do participatory action research with farmers to identify promising practice changes and measure crop and livestock performance. At the Western Kenya location, this evaluation verified that CCAFS surveys ask farmers why they adopt practices, and that there is a control group of farmers who are not receiving technical assistance and whose innovation rates can be compared to the innovation rates of farmers involved in research activities or being given technical assistance. If this research is continued, it could reveal useful information about why smallholder farmers innovate, and the propagation of innovation (and possibly reversion to prior practices) in communities dominated by smallholder farmers. This work could identify what attributes of policies or interventions that result in higher rates of farmer innovation and welfare increases.

To achieve the CCAFS goal of broad use of improvements by smallholders in at least 10 countries, different research designs are needed to better quantify reasons why farmers innovate and why practices diffuse beyond farmers who directly deal with extension programs. It seems unlikely that extension work will be scaled up by the orders of magnitude that would be required to reach most smallholder farmers. More specific data gathering is needed to discern the reasons why farmers who do not receive technical transfer or financial support adopt "climate smart" practices, and where these farmers get information about practices. Also, a larger number of farmers without direct intervention is probably needed to be able to draw statistically robust conclusions about baseline trends in practice changes, and causes of adoption of different practices.

This review included cursory evaluations of smallholder agriculture development concepts stated as goals by agricultural climate policy staff or climate policy planning documents of five developing tropical countries. In the materials reviewed in this very incomplete survey, four of the countries articulated concepts being pursued in the CCAFS climate smart agriculture program. However, these cursory reviews did not elucidate when countries adopted these goals, or why the goals were adopted.

This review did not reveal much information about whether staff in country agriculture development and climate programs want the work that CCAFS is doing (which CCAFS calls "demand by beneficiaries"). There are frequent assertions in CCAFS documents that more accurate and/or cheaper methods for quantifying

terrestrial greenhouse gas emissions are needed. However, it is not yet clear whether the methods that CCAFS is developing will meet the needs of countries. This issue is discussed further in the section below on the impacts of work. Also, this focus on GHG quantification is partly due to the fact that the decision to undertake the activities analyzed in this evaluation were largely selected in 2010-12, and during that time there was much more widespread belief that carbon credits or other greenhouse gas mitigation payments might provide a large enough incentive to change land management across large areas.

CCAFS has CGIAR center staff, partners, and regional staff working with policy makers to get adoption of policies and programs, beyond just doing science and putting the results out in public view and hoping that policymakers use the science. This review did not investigate these policy adoption activities in sufficient depth to make any conclusions about their effectiveness.

It is too early to make definitive statements about whether CCFAS' practice adoption goals will be met. It typically takes years to plan research, do the research, get results published, and have the results broadly applied by governments and farmers. And CCAFS Theme 3 has been operating for only about four years. Fragmentary data suggests that many countries are probably advocating for or disseminating "climate smart" practices promoted by CCAFS. Some countries have been observed discussing incentives and institutions for climate smart agriculture, and training courses for development agency staff often address these issues. However, again, this analysis has no information about whether or not CCAFS actions contribute to development and policy staff addressing these institutional issues. Closer examination is needed to see if development agencies and government ministries are following recommended practices, and whether pursuit of such practices is because of CCAFS work.

Gender is integrated into Theme 3 work. Discussion with CCAFS researchers and technicians, and examination of research designs in the Climate Smart Village program revealed substantial attention to gender and to reaching poor farmers and addressing their needs. Activities are designed so that they will reach women in ways where the women will be able to communicate with researchers and technical transfer staff. From the field technicians to the Theme 3 program manager, people are paying attention to the number of women involved in activities, both as farmer and as researchers. Activities have to report on how they address gender.

CGIAR reforms of the last few years have promoted cross-center collaboration and collaborative design of research plans with partners. Cross-center collaboration is rewarded in Theme 3 funding decisions, and is a tracked metric that centers and funded activities have to report. Substantial cross-center collaboration was observed in this review, and can be seen by the fact that many CCAFS publications include authors from multiple centers and/or multiple regions. Some activities are separately funded in different regions of the world. This review did not directly investigate cross-region collaboration and does not draw conclusions about levels of collaboration between regions. Substantial collaboration with outside partners was observed, but not enough information was gathered about research design processes to say if partners are frequently involved. Interviews with two of the partners did produce unsolicited statements that CCAFS people did collaborate with these outside partners to design research.

In 2014 CCAFS instituted a process where some funding is allocated by review of competitive proposals submitted by CGIAR scientists. Soliciting proposals and awarding funding to the proposals that best serve program goals helps align the work with the program plan.

B. Effectiveness

CCAFS defines effectiveness as referring to management of the Theme 3 program. The guidance for this evaluation specifies multiple dimensions for evaluation of the effectiveness of program management. These dimensions include management being effective at getting the program to conform to program goals, pursuing synergies between adaptation and mitigation, having synthesis in work products, involving CGIAR regions in CCAFS work, working at landscape and regional scales, and tracking progress of research and proposing adjustments as needed. See Appendix 1 for the complete guidance.

Activities do appear to fit within program goals, particularly in 2012 and 2013. 2011 activities were allocated to the new CCAFS Theme 3 program because they related to the goals of the program, but were substantially continuation of work chosen and initiated before the existence of the Theme 3 program. Despite this, most 2011 activities address greenhouse gas emission quantification, carbon market design issues, and/or smallholder farmers or food security. Even the activities that did not address one of these categories were not inconsistent with CCAFS goals. All 2012 and 2013 activity descriptions address some aspect of greenhouse gas accounting, developing or testing practices with lower emissions or lower emission intensity—particularly on smallholder farms, or address policy aspects of implementing lower emission activities.

All of the activities reviewed for this evaluation that address mitigation of greenhouse gas emissions also addressed adaptation in that the practices, systems or varieties were assessed for productivity or functionality in expected future climate conditions.

This evaluation only investigated one region. That region is actively involved in implementation of Theme 3 activities. Planning was not investigated in sufficient depth to make conclusions about the involvement of regions in program planning. Regions report activities they are involved in, but most activities are led by centers. This review did not find reviews of region performance of the level of detail of reviews of center performance. Information is insufficient to draw any significant conclusions about region involvement in evaluation of CCAFS work.

There are some challenges in cross-scale work. Early in the program there was a great deal of attention to farm scale quantification of greenhouse gas emissions. As it became clearer that carbon markets are not likely to pay to transform smallholder farming, emphasis shifted to landscape, and sectoral accounting of greenhouse gas emissions, and enhancing capacity of countries to do national scale greenhouse gas accounting. Farm scale work continues, quantifying emissions from different farming systems, but this work is focused on serving as a basis for scaling up to regional or national emissions rather than farm-scale crediting. This shift matches shifts in the dominant understanding of opportunities for managing terrestrial greenhouse gas emissions. At the same time, some of the farm scale work did not produce farm scale quantification methods (discussed below) and some of the landscape level accounting methods do not yet appear to yet provide robust quantification of changes in greenhouse gas emissions that may result from changes in land management practices.

On line information systems available to Theme 3 staff capture only a small amount of the work that is actually done. The following comments on activities and work products are mainly about the information systems, and often do not reflect the amount of work that has been completed. Research for this evaluation

frequently did not reveal work products or work plans when the official information systems were queried. Often after multiple systems were reviewed and multiple people interviewed with few work products revealed. Later, the right question would be asked to the right person and a flood of work products would be provided. Even asking the contact person responsible for an activity did not necessarily reveal work products that individual had done. As a result, absences of work products discussed here might be the failure of this evaluation to find work products, rather than reflecting the lack of completion of work.

Detailed research plans or proposals are not in the on-line planning systems made available for this evaluation. Program managers say that most activity funding agreements are in the form of terms of reference agreements (except the first year of SAMPLES work did not have terms of reference). These agreements were not reviewed.

Through the period reviewed, Theme 3 management systems for tracking the progress of research made it very difficult to correlate funding to outputs. Information is in multiple systems. There is a formal CCAFS information management system. CCAFS is administered through the CGIAR center International Center for Tropical Agriculture (CIAT) and the Theme leadership staff are located at the University of Vermont. Theme 3 also uses the CAIT and University of Vermont systems, as well as maintaining an overview of projects in an independent Excel spreadsheet. The spreadsheet combines budget information from multiple sources and allows managers to include information that they need but that is not supported by the CAIT or CCAFS systems. The CCAFS intranet contains a variety of program-wide documents, and planning and reporting information organized by center and logframe milestones. There is a separate on-line CCAFS planning and reporting system.

The planning part of the on-line planning and reporting system is divided into “Theme Led Activities,” “Previous Activities,” and “Theme 3 Activities.” Searching is within these categories, so if one is looking for work on a particular topic, all categories should be searched. All activities have an entry, and include a brief description of the activity, the start date, funding amount, objectives, program goal supported, and expected deliverables. However, activity numbers are annual, and a new activity number is assigned each year. As a result, a multi-year project typically reports results that in a later year and different activity number than the year and activity number of the funding of initiation of work. See Table 1 for an example of planned versus reported deliverables.

Many activities do not have results reported in the planning and reporting system. In the “Planning” section of the planning and reporting tool there are total of 636 activities listed in the “Planning” section of the site and 7 activities have reports in the “Reporting” section. Of the activities in the “Planning” section, 9 activities listed under the category “Theme led activities”, 308 under “Previous activities” for 2012, 284 under “Previous activities” for 2013, and 35 under “Theme 3 activities.”

From 2012 on, most funded activities had deliverables specified in the planning system, and many had anticipated dates for deliverables. Activity budgets are annual. Theme 3 staff do their day-to-day management of Theme activities on a shared Excel file, not the planning and reporting systems, because the planning and reporting systems do not provided the tracking functionality needed by program managers.

Multiple years of ongoing projects could not be linked except by interviewing program managers or principal investigators. Outputs delivered could not been clearly linked to funding or commitments to do work, except by comparing reports to plans. And this capacity is limited. Multiple efforts to compare plans to what was

delivered revealed 636 planned activities, but only 7 reports of what was delivered by these activities in the "Reporting" section of the system.

A new planning and reporting system has been adopted. The new system was not examined in this evaluation.

Table 1. Deliverables documented in the CCAFS planning and reporting system for first five of the 18 activities present in the Theme 3, 2012 folder, of the planning and reporting system.

Activity ID	Project Description	Planned Deliverables	Deliverables Reported
218	Production of bioenergy demand scenarios and hosting of workshop with global modelers to pilot intermodel comparison. Develop links between global and household models	2 model/software 2 reports 2 workshops	6 workshops 2 reports
219	Test articulation of household and global models at the regional level to assess impacts of global bioenergy trends	2 reports 1 workshop 1 presentation	None entered in reporting system
220	To support national governments to prioritize agricultural mitigation options in Kenya, Uganda, and Ethiopia	1 methodology 3 workshops 1 final report 3 journal article 1 presentation	None entered in reporting system
221	To understand women's role as drivers of innovation for climate change adaptation and mitigation	1 workshop	1 workshop
222	Training for 8 national policy researchers in modified DNDC and scenario analysis to assess national and project mitigation options	Training syllabus, workshop, Analyze data from workshop participants, case studies	None entered in reporting system (though the trainings were performed and case studies completed, and a thorough report is in Theme 3 files)

When there was a work schedule and work was behind schedule, or little work was being produced relative to the funding for an activity, the program office did contact principal investigators and request work. It is appropriate that researchers be allowed some flexibility in what they deliver and when they deliver work. This evaluation did not conduct a detailed analysis of conditions that led to program manager interventions into activities. The Theme leader reports that the program does not pay if contracted deliverables are not

delivered. Six out of about 25[5] reviewed activities delivered late or appeared to deliver none of the intended publications and it was unclear if a significant amount of data gathering or analysis was done. In three of those cases, the timing and strength of the interventions seem reasonable. It often takes more than one year to implement biological research, analyze data, and get an article published, even adhering to a tight schedule.

The activity tracking information systems do not distinguish between activity funding provided by CCAFS and funding from other external sources that activity leaders may choose to report. As a result, amounts of funding listed in the tracking systems may be large relative to the amounts of work planned or delivered.

All interviewees who commented on the degree of strength of management of the program stated that the program is strongly and effectively managed. There was considerable variation in whether the informants liked the strength of the management, but all said the management is strong. There is considerable effort to pursue synergies between adaptation and mitigation. Researchers realize that mitigation actions will not be effective if they are not adapted to the climate. If anything, Theme management should pay attention to whether the focus of work is shifting too far away from emission mitigation. Many developing countries are asserting that they will not give up any amount of development for mitigation of GHG emissions. Some CCAFS staff and programs have explicitly shifted to focusing on reducing the emissions intensity of agricultural production, away from pursuit of reductions in net emissions. Developing country agricultural production, especially in Africa, is forecast to rise and if production increases faster than emission intensity decreases, total emissions will rise. However, by raising productivity on agricultural lands in Africa to levels achieved in Latin America, it might be possible to serve the rising demand while keeping emissions on agricultural lands about constant, and sequestering carbon on non-agricultural lands. This landscape view is being analyzed by some Theme 3 activities, but others only consider emission intensity.

C. Efficiency

CCAFS uses the word “efficiency” to refer to administrative and transaction costs of the program.

The information provide for this evaluation shows indirect cost rates mostly ranging between 6% and 16% of base spending, and no higher than 20%. This analysis has not confirmed whether amounts passed to centers were subjected to further indirect cost charges by the centers. When not constrained by funders’ policies that limit overhead charges, most universities charge overhead rates more than 50%. Without expressing an opinion about the legitimacy of university overhead rates, based on the data provided, it appears that CCAFS overhead rates are substantially lower than university overhead rates on research grants.

One year of funds passed to University of Vermont for program management was examined in this review (due to the limited amount of time available for this review, other years were not examined). In the year that was examined, program management spending was 3% of the total program spending for the year. This is modest percentage, especially given the number of briefs written by program staff, the number of publications where program staff are first authors or co-authors, coordination of meetings and workshops, getting publicity materials produced, and program administration. Program administration includes awarding

[5] Determining the number of activities reviewed is rather subjective because many activities have multiple budget identification numbers (both within a particular year and between years) and it is somewhat subjective do decide that different identification numbers should be counted as a single project.

and tracking budgets, tracking deliverables, and managing regions, and addressing issues that may arise with funded activities or centers. Given the substantial number of publications where program managers are authors, and the number of meetings coordinated by the program management office, a 3% cost rate is highly efficient.

Partners and field offices reported that payments are processed in a timely manner.

Two interviewees expressed opinions that the number of CCAFS managers and administrative staff is high, counting staff in the program headquarters office, region managers, and region science officers. However, this opinion appears to address CCAFS as a whole as Theme 3 has one manager, one science assistant, and one administrative person.

D. Impact

Ideally, the impact of CCAFS research would be measured as the effects it has the livelihoods of poor people who are dependent on agriculture or forests, net greenhouse gas emissions from lands, and the long-term ecological functioning of terrestrial systems. CCAFS guidance for this evaluation ("Framework for CCAFS Review") asks if the outcomes or incipient outcomes of the program are of sufficient scale for a US$10 million per year program, whether the work products are influential, and the likelihood that the work products will lead to enhanced food security, benefits to women and marginal groups, increase adaptation to climate risks, lead to policies supporting climate-resilient agriculture, reduce GHGs, and conserve forests.

However, for research published today, it is likely to take years for the results to be broadly incorporated into land management, and—by definition—the long-term outcomes of land management cannot be determined for a long time. Also, as noted above, some outputs from 2011-2013 work are still in the process of being produced.

As a result, mainly this assessment looked for proxy indicators of expected future impacts.

Some effort was made to discover outcomes and impacts, but the limited amount of time available for this evaluation did not allow for new field surveys or significant surveys of policy makers who might use CCAFS outputs. US government development policy statements and selected development activities relating to climate change, land use, and agriculture were observed for indications of use of CCAFS outputs. CCAFS was asked for names of policy makers and other potential beneficiaries of Theme 3 work and attempts were made to contact and interview these people. Fields staff working with farmers were asked for information about adoption of new practices or technologies following exposure to farmers who worked with CCAFS research programs.

One impact is the use of CCAFS materials and staff by policy makers and resource managers, and positions developed by CCAFS being incorporated into land management policies and practices. Investigation did reveal CCAFS staff participating UNFCCC science meetings, and contributing to UNFCCC publications, particularly IPCC publications. One specific notable outcome is that the Intergovernmental Panel on Climate Change 5th Assessment report Working Group 3 on mitigation, Chapter 11 on Agriculture, Forestry and Other Land Use (AFOLU) cites CCAFS Theme 3 research on livestock emissions. Citation by the IPCC report is significant it is the default reference that will be used globally as a source for emission factors, and to identify opportunities for emission mitigation. CCAFS outputs also have influenced IPCC guidelines on peat

emission accounting. Nine program impacts are listed in the document "CCAFS Theme 3 summary of outcomes and impacts 2010-2013."

Policy makers were interviewed and they expressed support for implementation of climate smart agriculture practices researched by CCAFS, and several analyses of mitigation options were jointly published by a CGIAR entity and a ministry. Also, policy makers indicated that they look to CCAFS staff for guidance on what policies might be effective for both promoting development and mitigating GHG emissions. CCAFS activity staff have presented in US Agency for International Development (US AID) trainings, and CCAFS results have been used in AID trainings to suggest actions to AID mission staff for implementation in countries where the AID staff work.

Another proxy for the impact of CCAFS work is journal article impact statistics. Impact statistics were checked for four journal articles that were expected to have high impacts. The sample is biased toward articles that were expected to have high impacts, so it is not possible to extrapolate from these observations to all CCAFS Theme 3 publications. Also, many journals report impact statistics only for the journal, not for individual articles. None of the articles for which the metrics were found had been published for more than 20 months. Different journals report different metrics. One article had 2891 downloads and another had 7420 downloads and views. One article had an Altmetric score of 46, putting it in the top 5% of articles. Another had an Altmetric score of 105, putting it in the top 2% of articles.

Two other articles were checked that were expected to have low impact scores and these articles had fewer than 10 downloads. These impacts are almost certainly affected by access cost. The articles with high impact factors were open access and the articles with few views were limited access where the user had to buy the article or gain access through a library that has a subscription to the journal. Many of the people CCAFS intends to reach are government policy staff in developing countries who do not have the resources to buy journal articles at $25-40 each. Having articles be open access makes them available to this target audience. In 2013 CCAFS adopted an open access requirement for publications, making them free to anyone with internet access, even people who are not affiliated with a university or major research institution.

This very small sample provides some basis for estimating the number of high impact articles. The high impact articles were of relatively broad interest. One is a global review, and the other a global analysis estimating the impacts on natural resources of alternative policies.

Impact scores should not be the only judge of the quality or importance of science. Measurements of particular systems may get few downloads, but having measurements in a broad diversity of systems is essential to having confidence about the robustness of theories and the extent to which models can be applied to different situations.

One of the activities identified by program managers as a key activity is work on developing low cost methods for quantifying GHG emissions from agricultural mitigation measures at the farm and landscape scales. Part of this work—funded in part by Theme 3 and in part by other sources—is one year of sampling of nitrous oxide, methane, and carbon dioxide fluxes from soil, measured at several locations using chambers for several different agricultural practices. It appears that the nitrous oxide and methane measurements are the first measurements of these emissions in Africa, or the first measurements for the land use scenarios being promoted by CCAFS, or the most comprehensive data set for characterizing temporal variation in fluxes. This field sampling is now being used to calibrate less expensive field measurement methods, and is

planned to be used for calibrating models for future estimation of emissions. Soil nitrous oxide emissions are non-linear and aspects of soil texture, nutrient status, management, weather, and microbial communities interact in complex ways to determine nitrous oxide emissions. Some of the climate smart agriculture practices advocated by CCAFS that increase nitrogen inputs, decrease tillage, and increase soil moisture could increase soil nitrous oxide emissions and this work is important for quantifying greenhouse effects of changes in farming practices.

It is not clear that current CCAFS carbon dioxide flux measurements, biomass measurements, and biomass and soil carbon stock measurements will fill the needs for accurate and inexpensive quantification of emissions and carbon stock changes. Soil methane and nitrous oxide measurements are providing what are possibly the best tropical data sets in the world. However, soil gas flux measurements alone do not fill the needs for quantifying smallholder farm greenhouse gas fluxes. Most smallholder carbon dioxide emissions are from loss of woody biomass or soil organic matter. Theme 3 work developed allometric equations for estimating the biomass of trees from the diameter of the tree at the point 1.3m above the ground, and the wood density. These equations are a contribution to the knowledge because existing equations poorly represent trees that are grown in agroforestry systems (instead of forests) and where tree branches are cut off. However, plot protocols and stratification protocols are needed to determine which trees to sample and how to scale from the sampled trees to the farm or landscape. The existing SAMPLES work does not include stratification protocols, a plot design, or specification of calculation procedures for efficient estimation of biomass or soil carbon stocks at the farm or landscape scale. The SAMPLES draft book does include literature reviews assessing these issues. The plot design used in the allometry work gives reliable numbers for research and calibration, but would not be efficient for broad-scale measurements. The SHAMBA tool, a separate project, does include step-by-step protocols for soil carbon sampling and analysis.

Globally, enteric methane emitted from the digestive systems of ruminant livestock is also a significant component of the warming effect of agricultural greenhouse gas emissions. Like nitrous oxide emissions, enteric methane emissions are the result of complex dynamics, hard to measure, and poorly documented in tropical smallholder agriculture systems. Existing Theme 3 work on livestock enteric emissions uses generic global emission factors. With the Theme 3 emphasis on reducing livestock emissions intensity, there is a strong need for measurements of enteric methane emissions from new livestock breeds, under new management practices, in new smallholder farming systems.

E. Sustainability

CCAFS defines sustainability as the knowledge and tools developed by CCAFS having lasting applicability and utility, and the resource management practices shown to be beneficial by CCAFS research continuing to be regarded as beneficial over time. And presumably, the practices continuing in use over time.

Although predicting the future is uncertain, we can make some forecasts. If land management practices do not benefit the users of land, it is unlikely that land users will continue to use those practices. For example, if farmers are producing much less food or making significantly lower incomes than their neighbors who use different practices, they are unlikely to keep doing what they are doing. Practices that benefit land users might continue. Analysis of potential carbon incentives has indicated that greenhouse gas emission mitigation payments are likely to be very small. CCAFS is studying yields and finding practices that increase yields, are tractable to implement, and reduce or hold constant GHG emissions. These practices might

continue to be used over time. However, other practices might have higher financial returns, and practices recommended by CCAFS might be discarded. Having better information about financial returns to land users, as a function of land management practices, would be useful in evaluating what policies would be needed for particular practices to be widely used and kept in use over time. Financial assessments might be relative returns of different land management systems, rather than absolute returns in dollars per hectare.

CCAFS measurements of nitrous oxide emissions as a function of land management in Africa are likely to be used for a long time. Greenhouse gas emissions from agriculture are becoming increasingly important, and these are the best existing measurements of soil nitrous oxide emissions in Africa. For the foreseeable future, it is unlikely that anyone will do another set of nitrous oxide measurements that is more robust, because of the cost and difficultly of making these measurements.

One could argue that one of the most sustainable investments is developing new scientists. CCAFS is developing young scientists in The Climate Food and Farming (CLIFF) network, an international research network that links researchers and doctoral students working on climate change mitigation and adaptation in small-scale farming and food systems. The program gives grants to support students. At least one significant publication has been produced by a CLIF student, Arias-Navarro, et al. 2013. Also, graduate students are employed by some of the CCAFS activities.

F. Quality of Science

Journal impact metrics are a proxy indicator for the quality of a scientific article. As discussed in section 2.D., above, articles that were expected to have high impact ratings did have high ratings. The articles that were expected to have high impact ratings generally had high ratings. Attributes of articles with high impact ratings are:

- Rigorous research design
- Reporting actual data or analysis, and results
- Clearly drawing conclusions from the data
- Saying something new and relevant, or
- Broad surveys of a literature with clear synthesis of the implications of the literature, and
- Being open access

Considering the attributes of articles with high impact factors, approximately a quarter of CCAFS journal articles reviewed have these attributes and are expected to have at least moderately high impact. Some publications that are not expected to have high impact ratings are still high quality science. If an article addresses a topic of only very narrow interest, it is likely to have a low impact rating even if it is high quality science. It is not clear how there would be an objective standard of what as a reasonable amount for fraction of funded work that produces high quality science. One quarter to one half of articles being moderately high impact or high impact (top 5%) is well above average and seems like a reasonable result for a top research institution.

The evaluation guidance also asks whether the quantity of outputs is commensurate with a US $10 million per year research program. Some activities do not produce outputs in the form of research publications. For example, the Low Emissions Develop Strategies activity has shifted to being a mechanism for engaging policy makers, not a research program. Also CCAFS has borne some start-up costs of new programs, both in staff

learning and buying equipment. And CCAFS has some activities that do not produce research but instead are capacity building or engage stakeholders. Estimating from the goals and outputs in Theme 3 budget and planning documents, a more appropriate metric is to assess whether the research publications are commensurate with a research budget of US $6-7 million per year, not the full $10/year budget.

Program staff provided a list of publications by year, for 2011 through 2013. Counts of publications by type and year are in Table 2. "Other technical publications" are mostly working papers published by CCAFS. Appendix 4 contains tallies, by author, of the numbers of authorships of individuals with at least one first authorship (separate tallies of journal articles or non-journal articles) and (for these individuals with at least one first authorship), a tally of non-first authorships.

Table 2. Counts of Theme 3 publications by type and year.

Year	Journal Articles	Proceedings and Book Chapters	Other Technical Publications	Total Technical Publications
2011	7	3	28	38
2012	16	6	15	37
2013	45	4	21	70
Total	68	13	64	145

As noted above, science and publication of scientific articles takes time. There are publications in process now (near the end of 2014) that are based on work funded and conducted in 2013 and earlier. Also, when CCAFS was created in 2011, it inherited a program of work. Thus, this tally of publications does not exactly reflect the outputs of work funded in 2011 through 2013 and excludes some publications resulting from 2011 through 2013 funding.

Journal articles remain the most enduring type of scientific product, because of indexing and electronic search tools. Estimating from Theme 3 budgets, attributing $6 million per year of Theme 3 spending to research (versus capacity building, development, communications, program management, and other non-research activities), and dividing by 68 journal articles, the average cost would be about $265,000 per journal article, the productivity seems low. But quality should count for more than quantity, and it may be that article production is undercounted, and/or the amount of funding attributed to research is over counted.

If a quarter of 23 journal articles per year are high impact, it would mean about 5-6 high impact articles published per year. If 2 of 33 articles reviewed are high impact and this ratio applies to the entire Theme 3 production, then 1-2 articles per year would be high impact. Other science related activities are 10-20 graduate students and post-docs funded (some in the CLIFF program and others with research activities), some state-of-the-art facilities, and building research capacity. The program also does some research that no other entity has the willingness or capacity to do. For example, quantification of changes in nitrous oxide emissions resulting from changing crops, tillage, residue management, manure handling, and chemical fertilizer use have complex, non-linear dynamics and no other entity is likely to make these measurements. CCAFS is measuring nitrous oxide and methane emissions from a suite of alternative vegetation and management combinations.

Also, the program is engaging with farmers to identify and evaluate changes that are beneficial to farmers, and engaging with policy makers to promote adoption of policies that support agricultural practices that research has shown to increase farmer wellbeing and practices that reduce greenhouse gas emissions or emission intensity of agricultural production. There is some evidence that the work is affecting what policies that are being proposed. This assessment did not evaluate whether CCAFS work is changing what policies are being implemented.

There is uncertainty about the actual amounts of work accomplished across the total program because the sampling used in this review is biased, thus the total amount accomplished cannot be estimated by simply scaling up from this sample to the program as a whole. Also the relationship between the amount of work produced and the effects this work will have on the world is unclear.

IV. Discussion

Conclusions are in the next section.

A. The Magnitude of CCAFS Goals

CCAFS Theme 3 seeks to change a significant fraction of the world by reducing poverty of smallholder farmers while reducing greenhouse gas emissions. This is an admirable goal. It is challenging to discern whether these outcomes are being achieved. However, it is possible to assess whether the science and program management follow program goals, and whether the science is high quality.

One challenge is that the magnitude of the problem is huge. As a result, for changes to be discernable either the changes have to be large, or they have to be very accurately measured.

A bigger challenge is determining cause and effect. Particularly for ideas in politics, it is very hard to tell where they come from. Typically, many people claim credit for causing the adoption of any particular new policy. Given the complexity of political processes, it may be true that many different actors make significant contributions to a policy being enacted. CGIAR generally reports when it contributes to a policy outcome, rather than trying to determine who or what caused the outcome.

Another challenge is that the goals CCAFS is trying to achieve will take years to accomplish. The process is ongoing, and lasts longer than any one program.

B. Scale

There are hundreds of millions of hectares of crop and range land in the tropics and about 800 million smallholder farmers in the developing world. Climate and growing conditions vary around the earth, requiring different crops and practices. CCAFS is working with government, civil society and farmer stakeholders to identify promising cropping and resource management strategies, and promising institutional interventions to move toward achieving the CGIAR mission of reducing poverty and hunger, improving human health and nutrition, and enhancing ecosystem resilience through high-quality international agricultural research, partnership and leadership.

CCAFS researchers are explicitly focusing on interventions at multiple scales, from plot to national and international levels. They are developing cost-effective methods for quantifying GHG emissions at landscape

to regional scales. They are beginning to measure the effectiveness of interventions, to see what causes farmers and policy makers to innovate towards beneficial practices and policies. They are also looking at interactions between different land uses at landscape to global scales. It is well understood that deforestation is the largest single component of global anthropogenic terrestrial GHG emissions and is widely viewed as one of the more cost effective and shorter-term avenues for mitigation (though it is yet to be seen whether this view is correct). It is well understood that, in many locations, agriculture is the primary driver of deforestation. But the dynamics are very different for smallholder deforestation and large scale commercial deforestation, and the dynamics are different across political and institutional systems. Smallholders often respond to government policies differently than large scale operations. Their access to capital is different, and their ability to alter infrastructure to meet their needs is different. Sometimes smallholders ignore resource management laws, and sometimes it is large operations that get laws overruled. Further work is needed to better predict the long-term GHG implications of implementing different practices and policies across landscapes, regions, and the globe. Most importantly, there is a significant level of debate about what policies or other factors will result in forest conservation if agriculture is made more efficient and profitable. If agriculture is more profitable, in the absence of mechanisms for conserving forest, the economic incentive is to convert more forest to agriculture.

CGIAR is a research organization, but it has an applied mission, of reducing poverty, increasing food security, and enhancing ecosystem resilience. Appropriately, it works with entities that do extension and technical transfer to change forest management, cropping, and livestock systems in increase farmer welfare and improve the environment. There is no single "right" amount of effort that CCAFS and CGIAR should be spending on extension work. Given that there are about 800 million smallholder farmers in developing countries, if each farmer reached by extension work affects 10-100 other farmers, to affect most farmers would require direct contact with 8-80 million farmers. Even without data about how many farmers are now being reached by extension workers and other technology transfer mechanisms, it appears that the level of effort would have to be scaled up by orders of magnitude. Given the research emphasis of CGIAR it is not clear that CCAFS and CGIAR should not scale up their extension work by orders of magnitude. If a decision is made to scale up extension work by orders of magnitude, this decision should be approved by top level decision makers of CGIAR.

But continuing participatory action research appears to be a robust strategy for guiding research toward land management systems that can produce widely applicable benefits.

Research on what makes interventions effective is also a promising avenue for work. This work is needed in the policy environment, institutions at local to national scales, and at the farmer scale. This work should be experimental research, where different interventions are tried at different locations, and the outcomes compared. This experimental research should seek effective ways to get farmers to adopt more beneficial practices and systems. Also it is recommended to do experimental research to see what strategies are more effective at getting policies adopted and implemented.

C. A Note on Greenhouse Gas/Carbon Credit Markets

An implicit assumption behind CCAFS activities funded in 2011 is that poor farmers could generate and sell GHG/carbon credits, and either gain income to help bring them out of poverty, or get access to new crop varieties, get information about farming practices, get support for sustainable practices, or obtain other

social or livelihood benefits. In particular, CCAFS funded activities to support community-based management of carbon market projects (EcoAgriculture, Western Kenya, Uganda), including seeking to develop cost effective protocols for carbon crediting projects.

CCAFS has recognized that the prospects are very limited that farmers could accrue benefits from generating and selling carbon credits. Demand for credits is small. To date, global retirement of VCS agriculture, forestry, and land use credits, from the start of VCS (the leading global voluntary carbon credit program) crediting in 2007, is about 11 million tons of credits. This is a small global market and the demand is being fully supplied by existing projects.

Even if farms could generate and sell credits, revenues per farm are small. The number of credits generated per hectare per year is from a fraction of a credit to a few credits. A substantial amount of the market price would go to validation and verification, and to pay for project activities and transaction costs. Revenue per smallholder farmer would be cents to a few dollars. Somewhat more promising is to use GHG revenues for local collective goods (such as building community water systems, or paying school fees for children in the community. In the future, use of national scale or subnational scale (but larger than project scale) GHG mitigation programs could provide support for increasing farmer access to information, land tenure security, rule of law, technical transfer, and capital. However, these benefits are unlikely to accrue as the supply of credits is already greater than demand.

Appropriately, CCAFS has altered its strategy. Some farm scale-work continues. However, a significant amount of emphasis is being placed on landscape-scale assessments, including evaluation of interactions between multiple land uses, and methods for extrapolating emission estimates from point measurements to landscapes. Farm scale quantification of GHG reductions would require extremely low cost quantification of the areas within each crop, pasture, and trees. For farms of a hectare or two in size, having a trained human measure these areas would cost more than the value of the resulting credits. However, it might be possible to add carbon crediting on to an extension service monitoring program and have the farmer report areas by use and season, and have a statistical sampling system that quantifies fluxes in different types of land use.

In 2011 farmer crediting looked promising. Now focus on the economic benefits farmers accrue by producing crops and livestock is more promising. Using policies to cause forest conservation or other land management changes across large areas appears to be a promising approach to mitigating greenhouse gas emissions from land use. Thus the decrease in emphasis on farm-scale quantification and increase in emphasis on landscape-scale quantification is reasonable. Landscape level quantification of GHG fluxes could support national or subnational incentive systems, including Nationally Appropriate Mitigation Actions (NAMAs). International incentive payments for NAMAs could pay for extension services and supporting farmer access to higher yielding seed and livestock breeds.

V. Conclusions

A. A Vision for a Transformation Pathway

CGIAR and CCAFS need to articulate a vision of how their work can achieve their goal of alleviating poverty. If the goal is to alleviate poverty, this means moving people out of smallholder farming. If your primary livelihood is producing your family's food on 0.5 to 2 ha, you will be poor. There are some specialty

horticultural crops that can provide an income for a family on 2 ha, but growing cereals on 2 ha farms will keep the farmers in poverty.

This report does not argue for any particular pathway for reducing rural poverty. Instead, this report argues that achieving food security is a necessary first step, but by itself is not sufficient for broad alleviation of poverty. Probably millions of people need to find livelihoods other than smallholder farming. The shift will likely be generational, where current mature farmers continue to farm, while their children obtain skills and make livelihoods other than farming. Those who remain in farming will farm large areas, or raise high value, labor intensive crops, or farm as a lifestyle choice rather than a primary source of income. Europe and North America made this transition from smallholder farming, China is making the transition, and these experiences may inform options for developing country pathways to dramatically less reliance on smallholder farming.

One possible pathway is what CCAFS partner Vi Agroforestry is now doing: teaching farmers to evaluate the returns from their labor and compare returns from alternative uses of their labor, and assist farmers in accruing assets (such as through the group savings) so that their children can go to school and eventually leave smallholder farming. The next generation could make their livelihoods either doing larger scale farming or by non-farming livelihoods.

For larger scale farming to emerge, a mechanism is needed for durable transfer of rights to use land. Some places have this, and in other places it would have to be created. If such a mechanism does not exist, creating it will be a major institutional change. Related to this, where common property exists, often capital and institutions are needed to enable investment in making that common property more productive. Even switching from unmanaged open access grazing to intentional management of livestock to increase the quality and productivity of grazing land is a significant social and institutional change.

The article by Neufeldt et al. (2013) “Beyond climate-smart agriculture – toward safe operating spaces for global food systems” provides a starting point for constructing a vision for transformation. The CCAFS statement of “how we work” states that CCAFS will define and implement a uniquely innovative and transformative research program that addresses agriculture in the context of climate variability, climate change and uncertainty about future climate conditions. The Theme 3 foci on benefiting the poor and collaboration remain valid. These elements serve as a foundation for constructing a truly transformative vision for development. Because agriculture will fail unless it is adapted to climate change, it may be desirable to combine mitigation and adaptation work when addressing land use.

B. Adjustments to Ongoing Work

CGIAR, and CCAFS within it, have unique research capacity. CCAFS is able to do highly technical measurements requiring expensive equipment, such as a year of sampling of soil nitrous oxide fluxes. CGIAR is able to investigate hundreds of issues concurrently, and work around the globe.

Few organizations have both the will and the resources to measure the effectiveness of different interventions with smallholder farmers in developing countries, accomplishing the logistical work of getting to farms and building relationships with farmers, addressing the technical issues of farm operations, and deploying the scientific capacity to design and implement experimental research to evaluate the relative returns from different farming systems and uses of labor. Most organizations struggle just to quantify

outcomes, and don't have the ability to scientifically measure the effectiveness of interventions. CGIAR and CCAFS currently work with development organizations to measure the effectiveness of interventions. The CCAFS "Climate Smart Villages" activity is an example of CCAFS including assessment of outcomes into the program. This work merits expansion, to help figure out how development organizations can efficiently scale up their work by orders of magnitude.

CCAFS is examining the landscape interactions between multiple land uses, including greenhouse gas emissions. Many policies are proposed without understanding of how they will affect other lands and other sectors of the economy. Broadening and deepening this work would make it less likely that policies are implemented that have unanticipated negative consequences elsewhere in the landscape.

In 2011, CCAFS Theme 3 decided to design low cost carbon sequestration quantification protocols that are reasonably accurate and suitable for the fine scale heterogeneity of smallholder landscapes. This work started in 2012. Carbon is in biomass and soil, so these protocols would be for quantifying soil and biomass stocks. After a significant amount of inquiry, this evaluation was able to find no evidence of such protocols. Current SAMPLES work on biomass measurement are methods reviews, not protocols. Interviews revealed that, during the work, the goal was changed to focus on reviews of methods options and discussion of when particular approaches are efficient, rather than designing protocols that would be used to quantify farm-scale emissions. The current SAMPLES draft publication provides reviews of methods for quantifying different types of agricultural greenhouse gas emissions, but is still labeled as protocols. The SHAMBA project (a separate activity) developed a soil sampling protocol (that looks like it would benefit from field testing). Another activity developed allometric equations for estimating biomass of agroforestry trees from measurements of diameter and wood density. However, no sampling design or protocol was found for determining what trees to measure, and how to measure them.

Completing the planned work would be helpful because there is substantial interest in using agroforestry to sequester carbon, and the efficiency of applying existing sampling designs for woodland and forest has not been evaluated in the agroforestry context. Agroforestry is where tree carbon measurement protocols are needed. Existing protocols are efficient for closed stands of trees. In agroforestry, the trees are often in unevenly spaced lines, and an efficient sampling system is needed for these sorts of patterns of trees.

It is probably too soon to judge the outcomes of the CCAFS Theme 3 program. The number and quality of publications in 2010 through 2013 was moderate, but more publications are coming out. And the more important measure is effects on the livelihoods of millions of smallholder farmers, and greenhouse gas emissions. And there has not been enough time for the outputs of Theme 3 work to have much of the effects on land management that they may have over time.

C. Program Administration

Annual planning and budgeting periods are too short to implement scientific research, analyze results and get papers published. This is particularly true in biological research where plants or animals may take months or years to grow and mature. Activities should be allowed to plan (and presumably be funded) for periods longer than one year, and reporting systems need to explicitly address and reflect work that is done in years before a particular deliverable is reported. Theme 3 leaders currently manage multi-year projects, but the

relationship between multiple years of funding, plans, and deliverables is not linked and clearly reported in the CCAFS information management systems used for 2011-2013.

Multi-year projects should have observable work goals for each budgeting period. Theme 3 appears to have goals for all budgeted activities, so if annual budgeting is kept, then having annual work goals would not be a change, even if multi-year work plans are made explicit.

There are activities that had modest documented plans for the levels of funding allocated to the activities. It may be appropriate to more consistently require greater amounts per unit of funding. If funding is needed to set up new capacities that do not result in work products being delivered in a given funding period, these longer term plans should be recognized and made explicit.

VI. Recommendations

Recommendation 1: CCAFS Theme 3 should clearly articulate a vision for a pathway or pathways where hundreds of millions of food insecure smallholder farmers can escape from poverty. This escape likely will involve transitions, over a few decades, to non-farming livelihoods, high value agricultural products, and larger scale farming.

Recommendation 2: CCAFS Theme 3 should continue with efforts to develop emission factors and inexpensive methods for assessing nitrous oxide emissions from a variety of smallholder farming vegetation types, management practices, and soil conditions, including emission rates several years after practice changes. Nitrous oxide emission generation is complex and nonlinear, and estimates and models for emissions resulting from climate smart agriculture practices could be wrong by a significant amount. We need to reliably estimate the net greenhouse gas effects of the land management changes we are proposing.

Recommendation 3: CCAFS Theme 3 should increase the measurement of the effectiveness of interventions with smallholder farmers and policy makers, and ensure that measurement of effectiveness is incorporated in all capacity building and policy change activities undertaken by CCAFS, and this work should be done comparatively in multiple countries. Measuring the effectiveness of different interventions is different from impact evaluation. It is to assess what interventions work better. “Climate Smart Villages” are a promising venue for conducting much of this work on effectiveness of interventions.

Recommendation 4: CCAFS Theme 3 should dramatically increase the quality of financial analysis of returns to different smallholder farming practices and systems, including comparisons of alternative systems. Cropping systems that increase yields or make yields more reliable won’t be broadly adopted if the increase in costs is greater than the increase in benefits, relative to conventional systems.

Recommendation 5: CCAFS Theme 3 should continue work to develop methods to make inexpensive and accurate estimates of GHG emissions from landscapes that include smallholder farms.

Recommendation 6: CCAFS Theme 3 should develop efficient sample selection systems and plot designs for measuring biomass carbon stock change in smallholder farming and agroforestry systems. This is a relatively small project.

Recommendation 7: CCAFS Theme 3 should consistently implement its requirement that publications supported by CCAFS be open access. CCAFS should investigate procedures for working with partners to get open access to partner publications that are partially the result of CCAFS-funded work.

Recommendation 8: CCAFS Theme 3 should request that CGIAR provide all its units, including CCAFS Theme 3, a work and budget planning and reporting system where work plan commitments can be directly compared to delivered work, activities may have durations longer than one year, deliverables may be due in year later than initial funding, and expansions of prior activities are clearly linked to those prior activities. The new tracking system was not reviewed and may have these capacities.

Appendix 1. Framework for Evaluation.

1. FRAMEWORK FOR CCAFS REVIEW

2. Managing CCAFS Theme 3: Pro-poor Climate Change Mitigation

Endorsed by the Reference Group on 21 May 2014.

3. Introduction

This is the Framework for the implementation of the CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS) review on *CCAFS Theme 3: Pro-poor Climate Change Mitigation.* The review has been planned and will be carried out in line with the guidelines for CRP-Commissioned External Evaluations (CCEEs). The Reference Group (see below) has provided input for the Framework, and it was approved at the CCAFS Independent Science Panel (ISP) meeting in May 2014.

4. Evaluation Manager and Evaluation Reference Group

- Evaluation Manager – CCAFS Head of Program Coordination and Communications, Torben Timmermann (t.timmermann@cgiar.org)
- Evaluation Secretary – CCAFS Program Manager, Martin Lund (m.lund@cgiar.org)

A Reference Group is a structure set up to work with the evaluation manager to ensure good communication with, learning by and appropriate accountability to primary evaluation clients and key stakeholders, while keeping the independence of evaluators. The Reference Group can be thought of as a 'sounding board', giving views and inputs at key decision stages in the evaluation design and implementation process. The full CGIAR Independent Evaluation Arrangement (IEA) guidance note on Evaluation Reference Groups can be found here:
In the dropbox.

The Reference Group consists of the following people:

- Governance – CCAFS Independent Science Panel (ISP). ISP is made up of representatives from research, NGOs, private sector and international organizations. ISP member, *ex officio*, CIAT Board of Trustees – Chuck Rice (cwrice@ksu.edu) is Chair of the Reference Group
- Management – CCAFS Program Director, Bruce Campbell (b.campbell@cgiar.org); CCAFS Theme Leader 3, Lini Wollenberg (lini.wollenberg@uvm.edu); CCAFS Regional Program Leader East Africa, James Kinyangi (j.kinyangi@cgiar.org)

- External partners - Specialist, Institute of Agricultural Environment, Vietnam, Mai Van Trinh (maivantrinh@gmail.com); Executive Director of Climate and Land Use Alliance (CLUA), Chris Elliott (chris.elliott@climateworks.org)

5. Evaluation, reporting and approval process

The evaluation and reporting process will consist of the following steps:

6. Briefing of evaluator
7. Inception and implementation of evaluation
8. Reporting
9. Approval

1. Briefing of lead evaluator

There will be two evaluators for the evaluation. The Evaluation Manager will brief the lead evaluator before the actual evaluation starts. The briefing will take the evaluator through the general Framework and provide an overview of key documents and information, including possible people to interview. This will be further developed for the "Inception" (see below) phase. The briefing will also include information about the standards and ethics expected in CGIAR evaluations, an overview can be found below in Annex 2. The briefing of the evaluator also includes key framework documents, including:

- "Overall IEA Guidance document" regarding external reviews of CGIAR Research Programs (CCEEs). This includes an overview of what CCEEs should address; key roles and responsibilities; planning, design and management; follow-up; and evaluation design matrix:

- "Template for an Evaluation Report (T2)". It outlines the elements that the evaluation report needs to contain:

- "Quality assurance checklists (T3 and 4) for evaluation reports". These are FYI as to how reports will be assessed by the Reference Group

- "Standards for Independent External Evaluation in the CGIAR".
  They are intended primarily as a reference work by those planning, commissioning and carrying out 'e-valuations'

All of the above documents are found in the dropbox.

2. Inception and implementation of evaluation

An inception report and evaluation workplan, including proposed visits, will be prepared by the evaluators for approval during the first two weeks of work. The inception report will be sent to the RG for comment.

For the inception and implementation of the evaluation, CCAFS has prepared a package of key documents and information. An overview of the bulk of the documents and information is included in Annex 3 below with links to the CCAFS website and Dropbox.

10. Evaluation matrix template

The evaluation matrix template outlines the evaluation criteria, evaluation questions to be addressed, expected evaluation product and expected approach and sources of information. Using this matrix template is a requirement in the CGIAR guidelines.

Definitions of the evaluation criteria can be found in the drobox. (p. 7ff)

For the content of the evaluation matrix template see Terms of Reference in Annex 1 below.

11. Interviews

It is recommended that interviews be conducted with some of the following people:

12. CCAFS management members with considerable Theme 3-related work

- Bruce Campbell – Program Director – b.campbell@cgiar.org
- Lini Wollenberg – Theme 3 Leader - lini.wollenberg@uvm.edu
- Theme Leaders - Jim Hansen (jhansen@iri.columbia.edu) Leader of Theme 2 ; Andy Jarvis Leader of Theme 1 (a.jarvis@cgiar.org)
- Regional Program Leaders - James Kinyangi (J.kinyangi@cgiar.org), RPL for East Africa; Leo Sebastian (l.sebastian@irri.org) RPL for SE Asia, Ana María Loboguerrero (a.m.loboguerrero@cgiar.org) RPL for Latin America

13. CCAFS governance

- Thomas Rosswall – Independent Science Panel, Chair – thomas.rosswall@gmail.com
- Mary Scholes – Independent Science Panel - mary.scholes@wits.ac.za

14. CGIAR Centers

- Reiner Wassmann – CCAFS Contact Point at IRRI, SAMPLES and CCAC project – r.wassmann@cgiar.org
- Alex de Pinto – CCAFS Contact Point at IFPRI - a.depinto@cgiar.org
- Clare Stirling – CCAFS Contact Point at CIMMYT – c.stirling@cgiar.org
- Todd Rosenstock ICRAF scientist co-leading SAMPLES project – t.rosenstock@cgiar.org
- M.L. Jat - CIMMYT scientist in India supporting N management and protocol development - M.Jat@cgiar.org

15.

CCAFS partners

16. *More comprehensive list available in Appendix 4, organized by Theme objective and project*

- Ministry of Agriculture, Colombia - Nestor Hernandez nestor.hernandez@minagricultura.gov.co
- Climate and Clean Air Initiative, Government of Canada - Sunny Uppal sunny.uppal@ec.gc.ca
- Ministry of Agriculture Bangladesh – Sultan Ahmed sulbul2002@yahoo.com
- International Institute for Sustainability (Brazil) - Helena Nery helenanap@gmail.com
- Vi Agroforestry – Amos Wekesa amos.wekesa@viafp.org
- Unique Forestry and Land Use - Timm Tennigkeit Timm.Tennigkeit@unique-landuse.de

- EcoAgriculture Partners - Sara Scherr sscherr@ecoagriculture.org
- Maseno University - Prof. Collins Ouma Director of Research, Publications and Innovations, couma@maseno.ac.ke
- University of Michigan - Arun Agarwal arunagra@umich.edu and Peter Newton newtonp@umich.edu
- Duke University - Lydia Olander lydia.olander@duke.edu
- Climate, Food and Farming (CLIFF) network - Ngonidzashe Chirinda n.chirinda@cgiar.org, formerly at Aarhus University
- FAO - Christina Seeberg Elverfeldt, now at BMZ (Christina.Seeberg-Elverfeldt@bmz.bund.de).
- Global Research Alliance on Agricultural Greenhouse Gases –, Andy Reisinger Andy.Reisinger@nzagrc.org.nz, Brian McConkey Brian.McConkey@AGR.GC.CA , Alan Franzluebbers ajfranzl@ncsu.edu, Kazuyuki Yagi kyagi@affrc.go.jp
- CIAT Board of Trustees – Geoffrey Hawtin - geoff.hawtin@croptrust.org
- Future Earth - one of the following: Mark Stafford-Smith mark.staffordsmith@csiro.au , Carolina Vera - carolina@cima.fcen.uba.ar

3. Reporting

A draft report will be delivered by the evaluators no later than 24 September 2014. At the ISP meeting in October, the RG will consider the draft evaluation report. The final report will be delivered no later than 28 November 2014.

As mentioned above the evaluator should use the above mentioned "Template for an Evaluation Report (T2)".

Evaluation procedures (in dropbox) outline that evaluation Recommendations should be clearly supported by evaluation evidence, action-oriented, practical and specific, with where possible clearly-defined responsibility for each action. Although there is no set limit on the number of Recommendations, they should be focused on a practical number of priority issues to be addressed mainly by management or governing bodies. More detailed working-level suggestions can be usefully made by the evaluators in separate communications or annexes, but will not have the status of recommendations with an official response and follow-up.

4. Approval

The final report will be noted and the draft management response will put on the agenda for endorsement by the ISP at its meeting in May 2015, and will subsequently be tabled for approval by the CIAT BoT at its meeting also in May 2015. Once approved report and response will be placed on the CCAFS website.

Annex 1

TERMS OF REFERENCE

CCAFS CCEE REVIEW 2014

CCAFS Theme 3: Pro-poor Climate Change Mitigation

Introduction

In 2012, the first external evaluation of CCAFS was conducted by the European Commission (EC) which focused on how CCAFS was performing in relation to the CGIAR reform process. A review of the CCAFS governance and management functions commissioned by the CIAT Board of Trustees (BoT) was carried out in the first half of 2013. In the latter part of 2013, as commissioned by the Independent Science Panel, the CCAFS management of its Theme by Region matrix for international public goods and development outcomes went through an external review as the first CRP-Commissioned External Evaluation (CCEE) for CCAFS, though all the guidelines could not be followed in this first CCEE.

At its 3rd meeting in October 2012 the CCAFS Independent Science Panel (ISP) decided that CCAFS should undertake at least one programmatic external review per year commissioned by the ISP in addition to possible annual reviews on administrative, legal and/or financial issues commissioned by the CIAT BoT. These external reviews should be designed so that they can be inputs into the major evaluation expected to happen in 2015, commissioned by the Internal Evaluation Arrangement (IEA). This follows the policy approved by the the CGIAR Fund Council that includes a regular Independent External Evaluation of each CGIAR Research Program (CRP) managed by the Independent Evaluation Arrangement (IEA). One of the key building blocks for this external evaluation is the CRP-Commissioned Independent External Evaluations (CCEEs).

According to the guidelines CCEEs should cover a minimum of 50% of the budgeted activities of the CRP over a five-year cycle. A provisional plan for CCEEs should be put in place. Independence of the CCEE evaluations is promoted through: (a) A reference group (RG) that represents the views of a variety of key stakeholders; (b) the Chair of the RG being from the governance structures of the CRP, rather than management; (c) transparency in documenting and publicising the decisions taken on CCEE design, scope and selection of evaluators; and (d) the management of the design process being the responsibility of an Evaluation Manager who will normally work in the CRP but with some structural independence from CRP management.

Evaluation focus

At its meeting in October 2013 the ISP decided that the second CCEE should take place in 2014, and would evaluate CCAFS' research Theme 3 on pro-poor climate change mitigation. The focus would be on the degree

to which original objectives and deliverables have been achieved, an assessment of how successful CCAFS has been in co-designing research with partners and stakeholders, the role of global environmental change community in the research process, and the degree to which the Theme has fostered productive inter-Center relationships.

The argument for focusing on Theme 3 was as follows. Theme 3's work has been ambitious in its aim, involving complex linkages between environment and development goals, synergies with adaptation, sensitive international politics, and a dearth of data that has required expensive investments. The program was initiated practically from ground zero in the CGIAR and has been the Theme to pioneer and go furthest with cross center collaboration. It is also in some ways the most challenging and risky of the CCAFS themes, given the priority that most countries and development organizations give to climate change adaptation. Many actively oppose mitigation. Evaluation of Theme 3 should therefore shine an early light on how well CCAFS is addressing the challenges of the program and the strengths and weaknesses of new features of research that have been made possible by the current phase of reform.

Objective

To undertake an evaluation of how the CCAFS Theme 3: Pro-poor Climate Change Mitigation is being managed to deliver on International Public Goods (IPGs: publications, databases and other knowledge products) and development outcomes.

Evaluation matrix template

Evaluation criteria	Evaluation questions to be addressed	Expected evaluation product	Expected approach and sources of information
1. Relevance	a. Is Theme 3 being managed in line with the vision in the CCAFS Program Plan and CCAFS Theory of Change?	Analysis of whether the theme's resources, strategy, outcomes and IPGs are in line with the CCAFS Program Plan and CCAFS Theory of Change How do Theme 3 strategy, outcomes and IPGs contribute to understanding of mitigation related to agricultural landscapes and land use?	Program Plan and Concept Note; see Annex 3 documents under Basic Information about CCAFS; Interviews of program participants and partners See Annex 3 documents under Theme 3 International Public goods; Theme 3 Management; Annual Technical Report 2010-2013; Interviews of program participants and partners; See "Inter-Center collaboration" under "Theme 3 IPGs"
	b. Is Theme 3 management in line with the reform process in the CGIAR? This includes a) the degree to which the Theme has fostered productive inter-Center relationships; b) an assessment of how successful CCAFS has been in co-designing research with partners e.g. to what extent have external stakeholders been consulted in designing the research?)	Analysis of the Centers and partners involved in the management of the Theme and how this fits with the reform process (e.g. are there productive cross-Centre relationships?). Evaluation of how the Theme incorporates multiple land uses addressed by centers Assessment of the degree to which partner and stakeholder	Interviews of program participants and partners; example of workshop reports where stakeholders are engaged See Annex 3 under "Theme 3 Partnerships." Interviews of regional program leaders and partners

	c. Is there evidence of demand for the Theme from intended beneficiaries in CCAFS regions (low income smallholder farmers) and how is the Theme managed in relation to demand for thematic and regional topics?	concerns shape strategic directions and research products; and how the matrix is managed to get partner and stakeholder input. Analysis of constraints and opportunities created by lack of regional demand or engagement with mitigation relative to adaptation. How has Theme 3 managed countries' preference for adaptation over mitigation?	
2. Effectiveness	a. How successful is Theme 3's management in CCAFS in terms of progress made?	Analysis of scientific and development progress against the Theme's objectives: - Inform decision makers about the impacts about the impacts of alternative agricultural development pathways - Identify institutional arrangements and incentives that enable smallholder farmers and common-pool resource users to reduce GHGs and improve livelihoods - Test and identify desirable on-farm practices and their landscape-level	Theme 3 Annual Technical Reports; Interviews of program participants and partners

		implications	
	b. Is sufficient attention paid to ensuring synergies are achieved across mitigation and adaptation, and is their sufficient evidence of synthesis in the IPGs?	Analysis of cross-Theme interactions, particularly across (1) adaptation and mitigation, and (2) integration for decision making, and the evidence of synthesis in the IPGs	See Annex 3 under "Theme 3 IPGs"); Interviews of program participants and partners
	c. Does the Theme effectively connect to regional programs in planning, implementation and evaluation?	Analysis of theme- and cross-region interactions and synthesis products, with attention to the match with regional priorities, including capacity building.	IPGs (see lists in Annex 3 under "Theme 3 IPGs"); Interviews of program participants and partners
	d. How well is the local-to-global set of activities managed, in terms of having an appropriate mix of activities at different scales and managing the cross-scale connections, including engagement and communication activities?	Analysis of activities from field and household levels to landscapes, national government and international scales. Evidence of cross-scale products	See lists in Annex 3 under "Theme 3 IPGs"; Interviews of program participants and partners
	e. Are Theme 3's management systems tracking progress and proposing adjustments to research as necessary? Is this system working well?	Analysis of management procedures to assess how effective the systems are	See Annex 3 under "CCAFS planning processes," "Theme 3 IPGs." Interviews of program participants and partners

3. Efficiency	a. How successful is Theme 3 with respect to efficiency of its research achievements?	Analysis of program participants' perceptions of transaction costs relative to achievements. Cost and need for 3-5 year investments in GHG measurements, and the value thereof, and what the priorities are in terms of where the focus of measurements should be. Assessment of theme's administrative costs and arrangements versus funds for research. Assessment of University of Vermont as host.	Interviews of program participants and partners; budget for T3. See Annex 3 "Theme 3 IPGs." Cost of GHG measurement.
4. Impact	a. Are the initial outcomes or incipient outcomes being reported by Theme 3 of sufficient scale for its budget of about USD 10 million/year and staff? b. Are the IPGs influential? c. Is it likely that the IPGs produced and	Analysis of the number and significance of outcomes reported for 2012 and 2013 Analysis of outcomes and IPGs reported for 2012 and 2013 in relation to the degree to which they are or could be influential for achieving low emissions development in the AFOLU sector in CCAFS regions. Analysis of outcomes and IPGs	See lists and analysis in Annex 3 under "Outcomes"; Interviews of program participants and partners See lists and analysis in Annex 3 under "Outcomes" and "IPGs"; Interviews of program participants and partners

	outcomes will lead to impacts in regard to the CCAFS IDOs: Enhanced food security; benefits to women and marginalised groups; enhanced adaptive capacity to climate risks; policies supporting climate-resilient agriculture; reduced GHGs and forest conservation?	reported for 2011-2013 in relation to their relevance to the SLOs	See lists and analysis in Annex 3 under "Outcomes" and "IPGs"; Interviews of program participants and partners
5. Sustainability	a. To what extent are the benefits of the Theme expected to continue based on the international public goods and initial outcomes produced? Why or why not?	Analysis of outcomes and IPGs reported for 2011-2013 in relation to (a) the likelihood of outcomes leading to long-lasting impacts and (b) IPGs having long-term value.	See lists and analysis in Annex 3 under "Outcomes" and "IPGs"; Interviews of program participants and partners
6. Quality of science	a. Are the IPGs of sufficient number and quality for a Theme of about USD 10 million/year?	Analysis of the numbers of IPGs and the degree to which they are in "high impact" journals. Assess the quality of a sample of the IPGs.	See lists in Annex 3 under "IPGs"; Interviews of program participants and partners

Review process

The review will take place during the second and third quarters of 2014. Two evaluators will work on the assignment. The evaluators should be experts in research for development, preferably with experience in agricultural pro-poor climate change mitigation and from one or more of the three initial CCAFS regions (East Africa, West Africa and South Asia).The experts would be engaged for an estimated 30 and 20 working days, respectively.

The evaluators will work closely with CCAFS Evaluation Manager in Copenhagen, and will visit one of the CCAFS Regional Program Leaders. It is expected that most interviews will be conducted remotely. If feasible the evaluators may attend one of the meetings or workshops hosted by Theme 3. An inception report including proposed visits will be prepared for approval during the first two weeks of work.

A draft report will be delivered by the evaluator on 24 September 2014. The final detailed report should be delivered no later than 28 November 2014. Invoice will be delivered to the CCAFS Senior Manager Finance, Contracts & Liaison Angela Samundengo (a.samundengo@cgiar.org) no later than 10 December 2014 upon approval of work by the Evaluation Manager.

Annex 2

EVALUATORS

Evaluators should:

a) Conduct systematic, objective investigations based on evidence.

b) Communicate their methods and approaches accurately, clearly and in sufficient detail to allow others to understand, interpret and critique their work; making clear any limitations.

c) Ensure that the team contains the needed skills and expertise and decline to conduct evaluations for which the team is not adequately qualified.

d) Uphold ethical principles in their dealings with clients and stakeholders, including declaring and avoiding any conflict of interest.

e) Fairly and clearly represent their findings and conclusions. Within reasonable limits, they should attempt to correct misrepresentation or misuse of their work by others.

f) Respect the security, dignity and self-worth of respondents, program participants, clients, and other evaluation stakeholders, and protect sources.

g) Acknowledge intellectual property and the work of others.

h) Be prudent in using evaluation resources and account accurately for them.

i) Work for the public interest, and maintain a balance between client needs and those of other stakeholders.

**

More information can be found regarding formal description responsibilities in the dropbox – responsibilities for evaluators see page 19.

ANNEX 3

a. **Key CCAFS Document**
b. **Other resources**

A. KEY CCAFS DOCUMENTS FOR REVIEWER

The below table contains information about key CCAFS documents and international public goods (IPGs) for the reviewer. The reviewer can request more documents, IPGs and examples to be provided if available.

Document type/information source	Key documents and key content	Link/availability
Basic information about CCAFS	CCAFS website The primary repository for information about CCAFS governance, management, research and international public goods CCAFS Program Plan summary The Program Plan is the basic document of CCAFS about goals, objectives, research areas and governance. This is a summary, below is the full document. CCAFS Phase 2 – second order draft Describes vision, targets and Theory of Change for CCAFS in Phase 2 of the program (2016-2024). This includes a new organizational structure based on "Flagships" instead of "Themes" and "Regions". The basic structures of Theme 3 transform into Flagship 3.	www.ccafs.cgiar.org Dropbox Dropbox
Basic information about CCAFS	CCAFS Theme 3 website The primary repository for information about CCAFS	http://ccafs.cgiar.org/themes/low-emissions-agriculture

Theme 3	Theme 3 publications, activities, stories, events, partners, etc.	
Theme 3 International Public Goods	List of CCAFS Theme 3 publications 2011-2014 Contains list of all CCAFS-funded Theme 3 publications	Dropbox
	Annual technical report for T3 2010-2013	Dropbox
	Summary of impacts and outcomes	Hardcopy will be mailed to lead reviewer.
	Baseline studies and methods Baseline emissions methods	http://www.routledge.com/books/details/9781849713931 See examples of chapters: http://ccafs.cgiar.org/publications/designing-agricultural-mitigation-smallholders-developing-countries-comparative
	Major syntheses Climate change mitigation and agriculture, edited volume. About 1400 copies purchased and distributed.	http://ccafs.cgiar.org/publications/livelihood-and-environmental-trade-offs-climate-mitigation-smallholder-coffee
	GHG quantification special journal issue of ERL	http://iopscience.iop.org/1748-9326/focus/Quantification%20of%20Greenhouse%20Gases Dropbox
	NAMA Review and Guidelines (with FAO)	Dropbox In press (intro chapter is final component and under review) Dropbox

	Governance of agricultural drivers special issue	Dropbox
	Climate readiness report, CCAFS working paper 75 (in press)	Dropbox
	Corporate social responsibility and supply agreements in the private-sector	Dropbox
	Strategy for addressing gender in climate change mitigation and gender work	http://www.samples.ccafs.cgiar.org/ Two documents in Dropbox
	Cross-theme interactions and synthesis	Dropbox
	Cross-Center/region interactions and synthesis	Dropbox
	SAMPLES project	Dropbox
	SAMPLES funding 2012- 2014	Dropbox
	CLIFF network	Dropbox
	Likelihood of IPG impacts on CCAFS IDOs and long-term value and impacts of IPGs	
Theme 3 Partnerships	Theme 3 experience co-designing research with partners, including the global change community Overview of inter-Center collaboration and co-desgn of research with	Dropbox

	Partners Examples SAMPLES project and IITA-CIAT Tropical Perennials project	http://www.samples.ccafs.cgiar.org/ http://dapa.ciat.cgiar.org/launching-workshop-of-bmz-project-trade-offs-and-synergies-in-climate-change-adaptation-and-mitigation-in-coffee-and-cocoa-systems/
	Stakeholder engagement	Dropbox
	FAO-CCAFS workshop series	Dropbox
	Dialog on Food, Fiber and Fuel in Forests	Dropbox
	IPCC SBSTA panels (2011, 2013)	http://ccafs.cgiar.org/blog/meeting-global-food-needs-lower-emissions-ipcc-report-findings-climate-change-mitigation
	IPCC WGIII report release event with GRA and World Bank	Dropbox
	Participatory Action Research EcoAgriculture Partners with Vi Agroforestry and EcoTrust	http://ccafs.cgiar.org/climate-food-and-farming-network#.U2KFmCiu_go Also summarized on Dropbox
	Capacity building CLIFF PhD network	Dropbox
	Global Research Alliance greenhouse gas inventory training	

Theme 3 Management	Theme 3 timeline Management of local-to-global set of activities in terms of mix of activities at different scales and managing the cross-scale connections, including engagement and communication activities; role of participatory action research Case study of multiscale research: GHG quantification Transition to flagship: 2014 call for proposals and proposed portfolio Call issued to centers in response to planning workshop. Reflects expected 2015-2019 portfolio. Demonstrates evolution of T3 to address increased regional focus and concentration of projects with stronger impact pathways. Fundraising 2010-2014	Dropbox Dropbox Dropbox Dropbox
Theme 3 Administration	Budget, including breakdown of % administrative costs, partnerships and gender-dedicated work Staffing University of Vermont hosting of CCAFS	Dropbox Dropbox Dropbox
Resource and strategy documents	Scholes, Palm and Hickman CCAFS working paper 2013 Strategies for Mitigating Climate Change in Agriculture, Climate and Land Use Alliance report 2014	Dropbox Dropbox

Other Resources for Reviewers

Document type/information source	Key documents and key content	Link/availability
Basic information about CGIAR	A STRATEGY AND RESULTS FRAMEWORK FOR THE CGIAR	Dropbox
CCAFS planning processes	Business Plans 2013 and 2014 Outlines the annual CCAFS planning on research, synthesis, capacity enhancement, engagement, communication and budgets (format for 2012 onwards)	2013 http://ccafs.cgiar.org/publications/2013-business-plan#.Uk8BFtLdfsc 2014 http://ccafs.cgiar.org/publications/ccafs-business-plan-2014
	Governance and management discussions about the theme by region matrix (reference to minutes)	Dropbox (to be added)
	CCAFS management system – reporting, M&E	Dropbox
	Satisfaction survey Satisfaction survey based on feedback from Contact Points and CCAFS Management	Dropbox
Outcomes	All CGIAR Centers, Regional Program Leaders and Theme	

	Leaders have to report outcome stories annually. CCAFS Annual Report 2013 CCAFS Annual Report 2012 pp. 3-8 CCAFS Outcome Cases	 http://ccafs.cgiar.org/research/annual-report/2013#ar-chapter-intro Dropbox (to be added) http://ccafs.cgiar.org/publications/archive?keys=%22outcome+case%22
International Public Goods (IPGs)	List of CCAFS publications 2011-2014 Contains list of all CCAFS-funded publications in the period 2011 to 2014. CCAFS publications (usage statistics) Gives an overview of: top 25 publications downloads from CCAFS databases for 2012 and top 10 publications downloaded so far in 2013 Gender CCAFS Gender Theory of Change and Outcome Strategies	Dropbox (to be added) Dropbox (to be added) Dropbox (to be added)

Appendix 4

Partners for Potential Interviews, by Theme Objective and Project

Objective 3.1 Decision support

Colombia low emissions planning - Nestor Hernandez nestor.hernandez@minagricultura.gov.co Ministry of Agriculture; Cesar Cortes, coordinator of Colombian Low Emissions Strategy for Agricultural Sector cesar.cortes@minagricultura.gov.co; Erick Fernandes, World Bank efernandes@worldbank.org, Silvia Calderon Coordinator of Climate Change Group scalderon@dnp.gov.co, Sebastian Lema Colombian Low Emissions Strategy for Agricultural Sector mlema@dnp.gov.co

Setting LED agriculture priorities: scenario analysis and planning tools (new project)– IIASA, Michael Obersteiner michael.obersteiner@gmail.com, Petr Havelik havlik.petr@gmail.com.

Objective 3.2 Institutional arrangements and incentives

Development of nationally appropriate mitigation actions systems - Unique Forestry and Land Use - Timm Tennigkeit Timm.Tennigkeit@unique-landuse.de; Kenya Ministry of Agriculture, Esther Magambo ekrnagarnbo@yahoo.co.uk

Improving the viability of community-managed carbon projects EcoAgriculture Partners – Seth Shames sshames@ecoagriculture.org, Sara Scherr sscherr@ecoagriculture.org, Vi Agroforestry – Amos Wekesa amos.wekesa@viafp.org, Bo Lager bosse.lager@telia.com (now in Korea)

Upscaling mitigation practices through innovation networks, with a gender lens - Prolinnova and University of Virginia: David Edmunds dse7r@Virginia.EDU, Chesha Wettasinha c.wettasinha@ETCNL.NL or Ann Waters-Bayer waters-bayer@web.de.

Private sector investment in LED agriculture - Munden Project, Lou Munden lou@mundenproject.com

Governance of agriculture –forest landscapes for climate change mitigation Arun Agarwal (arunagra@umich.edu) and Peter Newton newtonp@umich.edu University of Michigan; Helena Nery helenanap@gmail.com International Institute for Sustainability (Brazil).

Scaling up Mitigation in Paddy Rice (new project) - Climate and Clean Air Initiative, Sunny Uppal, Government of Canada sunny.uppal@ec.gc.ca, Keiichi Sugita Government of Japan keiichi_sugita@nm.maff.go.jp, Kazuyuki Yagi kyagi@affrc.go.jp; Sultan Ahmed Ministry of Agriculture Bangladesh sulbul2002@yahoo.com

Objective 3.3 GHG mitigation quantification and feasibility

Standard Assessment of Mitigation Potential and Livelihoods in Smallholder Systems (SAMPLES) research and capacity building - Prof. Collins Ouma Director of Research, Publications and Innovations, couma@maseno.ac.ke Maseno University; Martin Herold, Wageningen University martin.herold@wur.nl (working with CG scientists Mariana Rufino and Todd Rosenstock)

Climate, Food and Farming (CLIFF) network - Ngonidzashe Chirinda n.chirinda@cgiar.org, formerly Aarhus University

State of Quantification for agricultural GHGs - Duke University - Lydia Olander lydia.olander@duke.edu; Francesco Tubiello Francesco.Tubiello@fao.org.

Emissions baselines at CCAFS sites - Applied Geosolutions, Bill Salas wsalas@appliedgeosolutions.com

General partnerships
FAO, with collaboration on FAO-CCAFS workshop series on establishing frameworks for mitigation in agriculture (four workshops, 2010-2012)- Mitigation, Climate Change and Agriculture (MICCA) project at FAO - Christina Seeberg Elverfeldt, now at BMZ (Christina.Seeberg-Elverfeldt@bmz.bund.de). See report on Expert workshop on NAMAs as example.

Global Research Alliance on Agricultral Greenhouse Gases with collaboration on GHG inventory training, quantification of GHGs, CCAC Paddy Rice project, seminar - Global Research Alliance on Agricultural Greenhouse Gases –Andy Reisinger (Andy.Reisinger@nzagrc.org.nz), Brian McConkey (Brian.McConkey@AGR.GC.CA) , Alan Franzluebbers (ajfranzl@ncsu.edu), Kazuyuki Yagi (kyagi@affrc.go.jp)

CIAT Board of Trustees – Geoffrey Hawtin - geoff.hawtin@croptrust.org

Future Earth - one of the following: Mark Stafford-Smith mark.staffordsmith@csiro.au , Carolina Vera - carolina@cima.fcen.uba.ar

Appendix 2. People Interviewed

Walter Adongo, Comart Foundation, Kisumu, Kenya
Georges Aertssen, Site Manager, ICFAF, Kisumu, Kenya
Jack Olango Arwa, Data Entry Technician, ICRAF, Kisumu, Kenya
Klaus Butterbach-Bahl, Senior Scientist, Livestock Systems and Environment Integrated Sciences, ILRI
Bruce Campbell, CCAFS Program Director
Alex De Pinto, Scientist, IFPRI
Carren Dulo, Farmer, Nyando, Kenya
Silas Dulo, Farmer, Nyando, Kenya
Polly Ericksen, Program Leader, Livestock Systems and Environment, ILRI
Daniel Escobar, Scientist, CAIT
John Goopy, Scientist, Livestock Nutrition, ILRI
Caroline Kibii, Extension Specialist, ICRAF, Kisumu, Kenya
James Kinyangi, CCAFS East Africa Program Leader
Daniel [Langat?], Kapsokale Community Benefit Organization, and farmer, Nyando, Kenya
Steven Matinde, Foko Agronet Community Benefit Organization, Jimo East Location, Nyando, Kenya
Robin Mbae, Policy specialist, Kenya Department of Livestock, Climate Change Unit
David Mysuya, Monitoring Specialist, ICRAF, Kisumu, Kenya
Wilson Nindo, Field Technician, Vi Agroforestry, Kisumu, Kenya
Risper Ogogo, Farmer, Nyando, Kenya
Alice Onyango, PhD student, Maseno University, working on livestock emissions
Jack Owuor, Chairman, Lower Kamula Youth Group, and farmer, Nyando, Kenya
Maren Radneny, Science Officer, East Africa Regional Program
John Recha, Scientist, East Africa Regional Program
Andy Reisinger, Global Research Alliance on Agricultural Greenhouse Gases
Todd Rosenstock, Scientist, ICRAF
Mariana Rufino, Scientist, CIFOR
Alloys Ruto, farmer, Nyando, Kenya
Christina Seeberg-Elverfeldt, former Mitigation, Climate Change and Agriculture project, FAO
Amos Wakesa, Vi Agroforestry, Nairobi, Kenya
Julianna White, Program Manager, Low-Emissions Agriculture, CCAFS
Lini Wollenberg, CCAFS Theme Leader, Pro-Poor Climate Change Mitigation

Appendix 3. Selected Documents Reviewed

Journal Articles

Agrawal, Arun, Eva Wollenberg, and Lauren Persha. Submitted to Global Environmental Change. Governing Mitigation in Agriculture-Forest Landscapes.

Arias-Navarro C, Díaz-Pinés E, Kieseb R, Rosenstock TS, Rufino MC, Stern D, Neufeldt H, Verchot LV, Butterbach-Bahl K. 2013. Gas pooling: a spatial sampling technique to overcome spatial heterogeneity of soil carbon dioxide and nitrous oxide fluxes. Soil Biology and Biochemistry 67: 20–23.

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Hensen A, Skibe U, Famulari D. 2013. Low cost and state of the art methods to measure nitrous oxide emissions. Environmental Research Letters 8:025022.

Herrero, Mario, Petr Havlík, Hugo Valin, An Notenbaert, Mariana C. Rufino, Philip K. Thornton, Michael Blümmel, Franz Weiss, Delia Grace, and Michael Obersteiner. 2013. Biomass use, production, feed efficiencies, and greenhouse gas emissions from global livestock systems. PNAS. 20888–20893. 110: 52. www.pnas.org/cgi/doi/10.1073/pnas.1308149110.

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Lloyd, Colin R, Lisa-Maria Rebelo, and C Max Finlayson. 2013. Providing low-budget estimations of carbon sequestration and greenhouse gas emissions in agricultural wetlands. Environ. Res. Lett. 8, 015010. doi:10.1088/1748-9326/8/1/015010.

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Neufeldt H, Jahn M, Campbell C, Beddington JR, DeClerck F, De Pinto A, Hellin J, Herrero M, Jarvis A, LeZaks D, Holger M, Rosenstock T, Scholes M, Scholes R, Vermeulen S, Wollenberg E, Zougmoré R. 2013. Beyond climate-smart agriculture – toward safe operating spaces for global food systems. Agriculture and Food Security 2(12).

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Olander, Lydia P, Eva Wollenberg, Francesco N Tubiello, and Martin Herold. 2014. Synthesis and Review: Advancing agricultural greenhouse gas quantification. Environ. Res. Lett. 9, 075003. doi:10.1088/1748-9326/9/7/075003.

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Rosenstock, TS, M C Rufino, K Butterbach-Bahl, and E Wollenberg. 2013. Toward a protocol for quantifying the greenhouse gas balance and identifying mitigation options in smallholder farming systems. Environ. Res. Lett. 8 (2013) 021003. http://dx.doi.org/10.1088/1748-9326/8/2/021003.

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Tubiello FN, Salvatore M, Rossi S, Ferrara A, Fitton N, Smith P. 2013. The FAOSTAT database of greenhouse gas emissions from agriculture. *Environmental Research Letters* 8:015009.

Vågen TG, Winowiecki LA. 2013. Mapping of soil organic carbon stocks for spatially explicit assessments of climate change mitigation potential. Environmental Research Letters 8:015011.

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Rufino MC, Atzberger C, Baldi G, Butterbach-Bahl K, Rosenstock T, Stern D. In review. Targeting landscapes to identify mitigation options in smallholder agriculture. 22 pp.

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Alves-Pinto H, Newton P, Pinto L. 2013. Certifying sustainability: opportunities and challenges for the cattle supply chain in Brazil. CCAFS Working Paper No. 57. Copenhagen, Denmark: CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS).

Bryan, E., A. De Pinto, C. Ringler, S. Asuming-Brempong, M. Bendaoud, L. Artur, N. Givá, D. T. Anh, N. N. Mai, K. Asenso-Okyere, D. B. Sarpong, K. El-Harizi, T. van Rheenen, and J. Ferguson. 2012. Institutions for agricultural mitigation: Potential and challenges in four countries. CAPRi Working Paper No. 107. Washington, D.C.: International Food Policy Research Institute. http://dx.doi.org/10.2499/CAPRiWP107.

CAIT-MADR. No date. Análisis integral de sistemas productivos en Colombia para la adaptación al cambio climático: Determinacion de reservas de carbono en sistemas productivos forrajeros y frutales en tres eco-regiones de Colombia. Clima y Sector Agropecuerio Colombiano. 19 pp.

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Jarvis A, Ramirez-Villegas J,Tapasco J, Navarro C, Peterson CA, Zapata-Caldas E, Fisher MJ. 2012. Are climate change adaptation and mitigation options eco-efficient? In: Hershey CH (ed.) Eco-Efficiency: From vision to reality. Cali, Colombia: Centro Internacional de Agricultura Tropical (CIAT).

Kissinger G. 2012. Corporate social responsibility and supply agreements in the agricultural sector Decreasing land and climate pressures. CCAFS Working Paper no. 14. CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS). Copenhagen, Denmark. Available online at: www.ccafs.cgiar.org.

Kissinger G, Patterson C, Neufeldt H. 2013. Payments for ecosystem services schemes: project---level insights on benefits for ecosystems and the rural poor. ICRAF Working Paper No 172. Nairobi: World Agroforestry Centre

Mango, Joash, Azinapher Mideva, William Osanya and Amos Odhiambo. 2011. Summary of Baseline Household Survey Results: Lower Nyando, Kenya. CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS). Copenhagen, Denmark. Available online at: www.ccafs.cgiar.org.

Milne E, Neufeldt H, Smalligan M, Rosenstock T, Bernoux M, Bird N, Casarim F, Denef K, Easter M, Malin D, Ogle S, Ostwald M, Paustian K, Pearson T and Steglich E. 2012. Methods for the quantification of emissions at the landscape level for developing countries in smallholder contexts. CCAFS Report No. 9. Copenhagen, Denmark: CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS). Available online at: www.ccafs.cgiar.org

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Onyango L, Mango J, Loo L, Odiwuor H, Mwangangi M, Mutua E, Mutuo T. 2013. Village Baseline Study – Site Analysis Report for Makueni – Wote, Kenya (KE0202). CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS), Copenhagen, Denmark. Available online at: www.ccafs.cgiar.org.

Peters M, Rao I, Fisher MJ, Subbarao G, Martens S, Herrero G, Tiemann T, Ayarza M. Hyman G. 2012. Tropical forage-based systems to mitigate greenhouse gas emissions. In: Hershey CH (ed.) Eco-Efficiency: From vision to reality. Cali, Colombia: International Center for Tropical Agriculture (CIAT).

Shames S. 2013. How can small-scale farmers benefit from carbon markets? CCAFS Policy Brief No. 8. Copenhagen, Denmark: CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS).

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van Wijk MT, Rufino MC, Enahoro D, Parsons D, Silvestri S, Valdivia RO, Herrero M. 2012. A review on farm household modelling with a focus on climate change adaptation and mitigation. Working Paper No. 20. CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS). Copenhagen, Denmark. Available online at: www.ccafs.cgiar.org

van Wijk MT, Rufino MC, Thornton PK. 2012. Farm-household modeling with a focus on food security, climate change adaptation, risk management and mitigation: a way forward. CCAFS Workshop Report. CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS). Copenhagen, Denmark. Available online at: www.ccafs.cgiar.org.

Wilkes A, Tennigkeit T, Solymosi K. 2013. National integrated mitigation planning in agriculture: a review paper. Mitigation of Climate Change in Agriculture Series 7. Rome, Italy: Food and Agriculture Organization of the United Nations (FAO).

Wilkes A, Tennigkeit T, Solymosi K. 2013. National integrated mitigation planning in agriculture: a guidance document. Mitigation of Climate Change in Agriculture Series 8. Rome, Italy: Food and Agriculture Organization of the United Nations (FAO).

Woollen, E., Berry, N., Cross, A., Hagdorn, M., Hughes, M., Ryan, C.M. No date. SHAMBA v 1.0 Methodology. The Small-Holder Agriculture Mitigation Benefit Assessment model for estimation of greenhouse gas emission reductions and removals that result from smallholder farmers using Climate Smart Agriculture and/or tree planting in sub-Saharan Africa.

Policy and Training Publications

Foster K, Neufeldt H, Franks P, Diro R, Munden L, Anand M, Wollenberg E. 2013. Climate Finance for Agriculture and Livelihoods. ICRAF Policy Brief 15. Nairobi, Kenya. World Agroforestry Centre (ICRAF).

Recha, J., Kapukha, M., Wekesa, A., Shames, S., and K. Heiner. 2014. Sustainable Agriculture Land Management Practices for Climate Change Mitigation: A training guide for smallholder farmers. Washington, DC. EcoAgriculture Partners.

Wollenberg E, Higman S, Seeberg-Elverfeldt C, Neely C, Tapio-Biström ML and Neufeldt H. 2012. Helping smallholder farmers mitigate climate change. CCAFS Policy Brief no. 5. CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS). Copenhagen, Denmark. Available online at: ccafs.cgiar.org/resources/reports-and-policy-briefs

Internal and Administrative Documents

CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS). 2011. Program Plan. Copenhagen, Denmark. Available online at: www.ccafs.cgiar.org.

CCAFS. No date. CCAFS Business Plan and Budget 2014. 19 pp.

CCAFS. No date. CCAFS Log frame – Year 2012 – 2015. 44 pp.

CCAFS, No date. REVISED CCAFS Logframe 2013 to 2015. 37 pp.

CCAFS. No date. Strategy for Priority Setting, Monitoring and Evaluation.

CCAFS. No date. CCAFS Theme 3 summary of outcomes and impacts 2010-2013.

CCAFS. No date. 2012 Technical Report per Activity, CCAFS Theme Led Activities Theme 3, Pro-poor Climate Change Mitigation. PDF of report from online planning and reporting system. 29pp.

CCAFS. 2012. Theme 3 Pro-Poor Climate Change Mitigation Annual Report 2011.

CCAFS. No date. Theme Leader 3, 2013 Technical Report. 36 pp.

CGIAR. 2011a. The CGIAR at 40 and Beyond: Impacts that Matter for the Poor and the Planet. Washington DC: CGIAR Fund Office. http://library.cgiar.org/bitstream/handle/10947/2549/cgiar%4040_final_LOWRES.pdf?sequence=1.

CGIAR. 2011b. A Strategy and Results Framework for the CGIAR. Downloaded from http://library.cgiar.org/bitstream/handle/10947/2608/Strategy_and_Results_Framework.pdf?sequence=4

Salas, William, Changsheng Li, and Alex Grais. No date. CCAFS training workshop: National and farm scale quantification of agriculture GHG emissions for the AFOLU sector. January 11-13, 2012 and March 21-23, 2012. Nairobi, Kenya. 76 pp.

Silvestri, Silvia, and Deborah Knox. 2012. Measurement and mitigation of greenhouse gases in African livestock systems: building capability to meet the challenge. Workshop report. Workshop 24-26 September 2012, ILRI Campus, Nairobi, Kenya. 25 pp.

Appendix 4. 2011-2013 Authorships

Numbers of authorships of individuals with at least one first authorship in the Theme 3 list of publications for 2011-2013. Sorted first by number of journal article first authorships, then by number non-journal first authorships (most to least) then by name (alphabetically). List excludes authors with no first authorship.

Name	Journal Articles, First Authorship	Non-journal Publications, First Authorship	Authorship, Not First	Total Authorships
Kahrl	3		1	4
Subbarao	2	1	4	7
Vermeulen	2	1	2	5
Mosquera	2			2
Ogle	2		3	5
Rosenstock	2		4	6
Smith P	2		3	5
Gockowski	1	2		3
Jat, ML	1	2	3	6
Misiko	1	2		3
Bryan	1	1		2
Jarvis	1	1	4	6
Jassogne	1	1		2
Milne	1	1		2
Negra	1	1		2
Neufeldt	1	1	9	11
Newton	1	1	1	3
Olander	1	1	1	3
Arias-Navarro	1			1
Berry	1		1	2
Burzaco	1			1
Cairns	1			1
Carvalho	1			1
Columb	1			1
De Pinto	1		3	4
Gaihre	1			1
Graefe	1			1
Harvey	1			1
Hensen	1			1
Herrero	1		9	10
Iiyama	1			1
Jussein	1			1
Kalame	1			1
Lloyd	1			1

Lobdell	1			1
Luedeling	1			1
Mapanda	1			1
Matthews	1			1
Minamikawav	1			1
Mitra	1			1
Modernel	1			1
Norgrove	1			1
Paustian	1		3	4
Rahn	1			1
Reisinger	1			1
Romijn	1			1
Rose	1		1	2
Saharawat	1		1	2
Sheil	1			1
Shi	1			1
Signor	1			1
Sileshi	1			1
Silva-Olaya	1			1
Stringer	1			1
Tang	1			1
Tubiello	1		3	4
Vagen	1			1
Valin	1			1
vanderZaag	1			1
Wollenberg		4	18	22
Kissinger		3		3
Peters		3	3	6
Samari		3		3
Shames		3	1	4
CCAFS		2		2
Havermann		2		2
Vehulst		2	2	4
Wilkes		2	1	3
Abdirizak		1		1
Alforte		1		1
Alves-Pinto		1		1
Arango		1		1
Barbier		1		1
Bernard		1		1
Beuchelt		1		1
Borner		1		1
Branca		1	1	2

Brown		1		1
Cohn		1		1
Davis		1		1
Dewi		1		1
Edmunds		1		1
Foster		1		1
Fox		1		1
Grahmann		1		1
Hansel		1		1
Labintan		1		1
McCarthy		1	1	2
Milori		1		1
Narasimhan		1		1
Neely		1		1
Rao		1	5	6
Raut		1		1
Robinson		1		1
Sapkota		1	1	2
Silvestri		1	3	4
Siopongco		1		1
Streck		1		1
van Rikxoort		1	1	2
van Wijk		1		1
Wagner		1		1
Wang		1		1
Wani		1		1
Weyerhaeuser		1		1
World Agroforestry Center		1		1
Jat, RK			3	3
TOTAL	67	77	96	240