CGIAR Review 2018

CCAFS Case study

Climate Change, Agriculture and Food Security

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Executive summary

1. This review was commissioned to evaluate European Commission (EC) contributions to the CGIAR Research Programme (CRP) on Climate Change, Agriculture and Food Security (CCAFS) in 2013-2015. EC contributions were €2.5 million per year, which represented around 3% of the total budget of the CCAFS during this period.

2. The review is framed around evaluation of processes and tools which can lead to impact, and on the contribution of the CCAFS to building/enriching a theory of change around the challenges of adaptation to and mitigation of climate change by agricultural systems. The team considers that focusing on direct impact is however insufficient in the case of an International Agricultural Research Center, and that the contribution of the CCAFS to building scientific knowledge through actions is also part of the mandate. The review focuses on three programmes in the West and East African regions: the *Climate-Smart Villages*, an emblematic programme which is widely reproduced in all CCAFS regions, the *Climate Information Services* in Senegal (which is supposed to be key for adaptation purposes) and the *Dairy NAMA* in Kenya (which is assumed to impact significantly on mitigation). Data collection was based on documentary analysis, site visits in Kenya and Senegal with direct field observations and interviews of selected partners and target stakeholders, and visits to the CCAFS Programme Management Unit in Wageningen. Due to the importance given to adapt to local specificities (institutionally and ecologically), the findings directly connected to the local environment might have been slightly different in South-East or South Asia, or Latin America, the three other regional programmes of the CCAFS. However the team believes this would not have affected the final conclusions nor the recommendations.

3. Established as a Challenge Programme in 2009, CCAFS has been fast-tracked for development as a CRP, and it resulted from direct efforts to build a transversal programme responding to a global challenge. It is now organized around five Regional Programmes and five thematic programmes (four Flagship Programs and one cross cutting theme) which are all transversal to Centres, which is rather not common within the CGIAR conventional structure of research. Although the organisation was slightly different in 2013-2015 than the one observed in August-September 2018, we consider this does not have a major impact on the conclusions of our assessment.

4. CCAFS' Program Management Unit (PMU) is partly based at Wageningen University, partly at CIAT (Colombia). This central unit is extremely light, and a large delegation is given to the Regional or Thematic (FP) programmes. Some FP leaders are based at Universities or Research Institutes outside the CGIAR Centres. The Program Management Committee (PMC) comprises six members: the Program Director and five members selected between Regional Program Leaders and Flagship Leaders".

The organisation of the research programmes on the field also mobilises a large number of partnerships to take over some elements of these programmes: national research organisations, NGOs, stakeholder (farmers) organisations… The CCAFS hence offers a good opportunity to look at the mechanisms of agricultural research in partnerships, and to draw lessons from a rich experience.

On this matter, one regrets that the number of high level partnerships with Advanced Research Institutes (like universities) as programme leaders has been reduced in the past three years, due to their financial inability to face constraints of uncertain funding.

5. Although the initial EU/IFAD contract certainly attempted to influence the programming of CCAFS' activities, f.i. by concentrating the funding on Africa or not considering one of the thematic programmes of the CCAFS, the current EC/IFAD funding

arrangements clearly do not have a significant impact on CCAFS programming directions. The fungibility of the resources together with the importance of the Window 1/2 core funding make this strategy poorly efficient. In the meantime, delays in disbursing funds do add to the programme's financial uncertainty and pose a reputational risk to EC/IFAD. However, the issue of climate change is a political issue in which Europe has legitimate interests and where it demonstrates advanced positions in the international negotiations. If the EC wishes to increase influence on CCAFS programming, it should consider other means such as participating in stakeholder meetings, encouraging the participation of EU research and development institutions in CRPs, or facilitating joint programmes and partnership mechanisms.

6. The core programme of research starts by testing, especially in the CSVs but not only, a portfolio of diverse CSA technologies and practices that have been identified in a participatory way with farmers. The processes of adoption/reorganisation of these innovations are then permanently assessed, tentatively to generate both impact and knowledge about the conditions of innovation and change. The technologies proposed are actually not that innovative as such, since a number of the varieties or animal breeds proposed did exist much before the CCAFS started. The original contribution of the CCAFS is therefore not in the design of technologies themselves, but in their integration on the ground with participatory methods to address the climate risk, and in the capacity of monitoring their results in an integrative (systemic) manner. However the review team has noted that the capacity to elaborate a systemic vision of the transformations and the innovations is actually unequal, and a number of partners, including CGIAR centres, with a core competence in one domain may have difficulties to integrate research questions that become more integrative when the research progresses every year. More efforts are anyway required in building the capacities of the partners, especially through training of young researchers in integrative research.

More complex paradigms are also expected to come from the last results of the phase 1 of the programme. This is one of the comparative advantages of leaning on assets of nine years of efforts in research, and this is also one more reason to recommend continuing with the support on the long term to such a programme.

7. Innovations promoted have to be evaluated against different levels of intensification. Research on CSA would certainly benefit from considering more the social diversity of the stakeholders and also the diverse ecological conditions in which innovations are extending. CCAFS research should consider more systematically the diversity of the stakeholders beyond gender and youth, when analysing/leveraging the individual strategies of change.

The Review Team has concerns that attempting to rigorously *quantify* impact assessment would divert M&E resources and intellectual energy from priorities on the *understanding* of the mechanisms of change. Within the M&E system, the current focus on quantitative techniques should be balanced by more qualitative methods which can strengthen understanding of decision-making processes.

8. CCAFS research on Climate Information has led to major scientific breakthrough that should be commended. Information services on climate can have a huge impact potential (7 million farmers announced as "potentially reached") that becomes in turn a topic for research.

9. Research on mitigation is certainly the weakest component in terms of outcomes. This certainly reflects the low level of priority generally given to the question of mitigation in Africa. Also, the review team considers that the somehow excessive pressure of the donors to the CGIAR system towards impact leads to give higher priority to adaptation, compared to mitigation. The review considers that this is worth to be

compensated and that more direct efforts on the mitigation programme should be supported.

One of the most integrated efforts in this direction has been the preparation of an integrated development project of the whole dairy value chain in Kenya. Dairy NAMA is now being presented to donors for funding, especially to the Green Climate Fund and to IFAD by the Ministry of Agriculture, Livestock and Fisheries (MoALF). Internationally, such a project will certainly be a pioneer example of how climate change mitigation and adaptation can support agricultural development objectives. The project demonstrates that an intensification action, which should lead to tripling the milk national production in 2030, could be done while saving between 24% and 59% of the production of GHG compared to the "Business as usual" scenario.

However, beyond the production of an integrated value chain project with a significant impact on mitigation, CCAFS should be encouraged to concentrate on producing more explicit and recognised scientific knowledge about the preparation (innovation platforms) and impact foresight of such actions.

10. Partnerships being at the centre of CCAFS strategy, they are the critical component of the impact pathways. Partnerships constitute a privileged vector for capacity strengthening and knowledge management. Globally speaking, CCAFS has successfully demonstrated that quality research –impactful- can be better done by mobilising a large array of complementary competences rather than doing this directly. Partnerships are the space where new policies and practices are tested and implemented. Strengthened efforts in capacitation of partners and (resulting) efficient management of activities are recommended.

The success of a certain number of programmes led by partners and the effective lobbying by CCAFS for scaling up and out, could lead to overloading these partners with tasks and responsibilities that they may not always be able to fulfil, sometimes putting the quality of the interventions at risk. The mission recommends that CCAFS takes care of mastering the growth in domains/sector where the potential demand is high and/or where the capacities of the partners will take a certain time to grow. It also encourages donors to refrain from catching too easily and too widely the most impactful actions when the capacities of implementation are limited.

11. CCAFS contributed to develop a methodology for Monitoring and Evaluation (MARLO) which is now well recognised and being used widely outside the CGIAR system to monitor the dynamics of change. The approach gives privilege to a baseline which is rather limited to descriptive statistics of the target area, and to building a common database that can be used in a second stage by the various thematic projects for the assessment of their own impact. The current quantitative approach however takes little advantage of the diversity of social and agro-environmental positions of farmers in the villages, and may lead to a series of static images more than a dynamic picture of the trends of change. Yet respecting the diversity of situations is known to condition the potential adoption of innovations. We therefore recommend completing the current M&E methodology with more qualitative approaches based on the identification of various stakeholders' strategies and on the understanding of their dynamics of change.

12. In 9 years, CCAFS has therefore successfully created a knowledge basis and a network of situations on the field representing a unique asset for the international scientific community. Beyond the punctual aspects that may require adjustments as suggested above, the mission hence warmly recommends positive consideration to continuing this effort for a coming phase 2 of the programme.

1. Introduction

This report presents a review of the EC/IFAD contribution to the CGIAR Research Program (CRP) "Climate Change, Agriculture and Food Security" (CCAFS). The review was conducted during August and September 2018, based on visits to CCAFS headquarters in Wageningen and field sites in Senegal and Kenya, and written documentation. Full lists of persons interviewed and literature reviewed are given in Annex 4.

CCAFS, one of the major CRPs of the CGIAR, and a continuous 9 years long effort of research

CCAFS addresses the challenges that global warming poses on food security and agricultural producers, production systems, policies and institutions. The Program 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".

One of the guiding concepts for the implementation of CCAFS activities is climate-smart agriculture (CSA). CSA is to respond to the challenges of climate change with responses that optimize the balance between three objectives that are often –but not always- conflicting: productivity, adaptation to and mitigation of climate change. CCAFS implements a large proportion of its work on CSA through climate-smart villages (CSV) where CSA options are tested by working with partners. CCAFS also seeks policy influence and direct engagement with governments.

CCAFS began as a Challenge Programme in 2009, collaboration between the CGIAR and the Earth Systems Science Partnership (ESSP). The nature of the collaboration led to a unique structure and level of participation by non-CGIAR organisations.

In February 2011, CCAFS was approved as a CGIAR Research Program (CRP), with a total project budget of USD 392.5 million for Phase 1 (2011-15). CCAFS was held as the focus for collaboration on climate change by all 15 CGIAR Centres. Whereas most CRPs were established under a lead Centre from their inception, CRP7/CCAFS was instead designed by the governing bodies of the Challenge programme, and then CIAT won a competition to host it.

CCAFS grew from USD 14 million as a Challenge Programme in 2010 to USD 56 million expenditures as a CRP in 2011.The core Challenge Programme research activities continued in the Thematic and Regional Programmes, with 2011 budgets remaining roughly stable at USD 15 million. However, transition to a CRP added a third category of programming, the "Centre-led activities": all of Centres was expected to contribute to one or more of CCAFS' themes, which amounted to around USD 40 million in 2011, and therefore represented more than two thirds of the total CCAFS' budget, partly on Window 3 (W3) funding, partly on Window 1&2 funding following competitive allocation.

The initial portfolio therefore consisted of projects that Centres chose to map to CCAFS on basis of perceived relevance to climate change. In 2012 the expenditure rose to USD 63.5 million then to USD 66 million in 2013 and to USD 69 million for 2014. From 2013, the first step into a more performance based allocation of core funding was taken. This involved evaluating the centres, and then the projects' performance, against a number of CCAFS-led indicators.

Finally, until the end of 2015 a total of USD 311 million has been spent, which makes CCAFS one of the largest CRPs.

Compared with other CRPs, CCAFS also has the largest share of Window 1/2 funding as a proportion of total funding. The largest part of the budget has been spent by the lead centre CIAT (27%), followed by ILRI, ICRAF, Bioversity International (with around 10%), ICRISAT and CIMMYT (8%), followed by smaller shares by the remaining centres[1].

In the 2011-2015 programme, the EU contribution of 7.5 million Euros (roughly USD 9 millions) was officially for the three years 2013-2015, thus it represented around 3% of the total budget of the CCAFS for that period. In addition, a number of Member States (Netherlands, Ireland, UK, Denmark and Portugal) also contributed to the funding of the CCAFS at different moments.

In 2015, the CGIAR had to face a reduction of the funding, which impacted the CCAFS as the other programmes. Instead of moving to a second phase of funding after the first phase, the CGIAR Research Programme on *Climate Change, Agriculture and Food Security* was extended for two additional years, while a second phase proposal was prepared for 2017–2022. This full Phase II proposal was submitted to the CGIAR Consortium in March 2016 and was finally approved in November 2016[2].

From its inception in 2011 until the end of 2013, CCAFS has been structured along five Regional Programmes (West Africa, East Africa, South-East Asia, South Asia and Latin America) and four Research Themes:

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

In 2015, following recommendation by the CGIAR Consortium office, CCAFS introduced a structure based on five Flagship Programmes (FP), which also meant shifting some of the major output groups:

- **FP1: Priorities and Policies for Climate-Smart Agriculture** seeks at improving evidence and tools on enabling policy environments and priority-setting for targeted investment to support the scaling of CSA technologies to ultimately contribute to food and nutritional security under climate change. The FPL is based at ILRI.
- **FP2: Climate-Smart Technologies and Practices** provides the evidence on the synergies and trade-offs among technologies and practices, towards the achievement of the distinct pillars of CSA across a range of agro-ecologies and social contexts. The FPL is based at CIAT.
- **FP 3: Low-emissions development** tests the feasibility of reducing agricultural GHG emissions intensities at large scales while ensuring rural food and nutrition security in low-income and middle-income countries. The FPL is based at University of Vermont.
- **FP4: Climate information services and safety nets** addresses critical gaps in knowledge, methodology, evidence, and capacity needed to effectively implement a set of scalable interventions that use climate-related information to manage climate-related risk. The FPL is also based at a non CGIAR partner, IRI.
- **Cross-cutting : Gender equality and Social Inclusion** (including youth)is a recent FP that cuts across all thematic areas (flagships) of CCAFS' research – from climate-smart agriculture, to climate risk management, low emissions development, and policies and institutions.

[1] A part of these expenses however goes to non-CGIAR partners, as we shall detail later.
[2] With a USD 57 million total budget in 2017, and 5% increase in budget per annum in the following years.

Since the present evaluation is –in principle- related to the 2013-2015 funding of the European Union, it may often refer to the initial thematic structure. However, since the activities and have been for long organised along the FPs, and since the second phase is also organised along this structure, a number of the recommendations may be presented in line with this new organisation.

CCAFS' Programme Management Unit (PMU) is partly based at Wageningen, partly at CIAT (Colombia), whilst some FP Leaders are based at different Institutes (not only CGIAR) in the world where they are employed. CGIAR institutes host Regional and other Theme Leaders, including ICRISAT (W Africa), ILRI (E Africa), IRRI (South-East Asia), CIMMYT (South Asia, replacing IWMI) and CIAT (Latin America). The Program Director and five members selected between Regional Programme Leaders and Flagship Leaders comprise the Programme Management Committee (PMC).

These factors – CCAFS' prior existence as a Challenge Programme, the strategic participation of non-CGIAR research institutions, and the competitive process to fund specific projects, make CCAFS unlike other CRPs.

The Review

This review was commissioned to evaluate EC/IFAD contributions to the CCAFS CRP in 2013-2015. This was budgeted at €2.5 million/year for three years to be compared to €4.9 million in 2010 valued under the Challenge Programme.

As CCAFS in 2018 results from such a 9 years old continuous effort, and that it started from the beginning with ambitious objectives of scientific integration, partnership mobilisation and impact oriented research, this evaluation has put focus on the impact pathways and on the lessons learned from the partnership experience over medium duration. Hence, the review is framed around the evaluation of processes and tools leading to impact – or restricting it, rather than on a quantitative analysis of the results in terms of outputs. In particular the review was intended to focus on the adequacy of the program monitoring and evaluation framework, assessing the quality of indicators and baselines, and the relevance of the system-wide CGIAR M&E criteria.

This review has limited scope due to restricted time and the focus on the West and East African Regional Programmes. Activities in Asia and Latin America were not considered, and coverage of the Thematic Programmes was limited to selected case studies. As a result the review is necessarily a snapshot rather than a comprehensive assessment.

The standardized reporting template does not entirely equate with these review objectives. Section 2 presents evidence, conclusions and recommendations from the review of CCAFS in a logical manner within the standard reporting template. Section 3 offers conclusions and recommendations.

Recommendations presented in Section 3 are numerically cross-referenced in the main text so: **(R1)**

The case studies: Climate Smart Villages in the two countries, Climate Information Services in Senegal and Dairy NAMA in Kenya.

As the EU funding to the CCAFS was supposed to especially target Africa, Kenya and Senegal were selected as the two countries in which case studies for field evaluation would complement the general desk study that had been done about CCAFS. The reason for that choice is that these two countries have hosted a diversified number of CCAFS thematic researches, some of them being common between the two countries, which allows possible comparisons, and some of them being different, which enlarges the panel of projects that could be looked at.

Choosing a case study in an Anglophone country while the second one is a Francophone country was justified by the wish to test the "scaling out" beyond the borders of the

country, and also the scientific culture, in which where these results have been obtained. The mutual benefit drawn from the international character of the CGIAR system is seen as one parameter of the evaluation. By doing this choice, we assume that the creation of *scientific* knowledge, and its capacity to be re-used in different environments, is still an objective for the EU/IFAD funding of the system, which goes further than just the direct local development impact.

The programmes that were chosen for the field evaluation were the *Climate Smart Villages* (CSVs) in the two countries, *Climate Information Services* in Senegal and *Dairy NAMA* in Kenya. Such choices were justified by the fact that:

- *CSVs* are probably the most emblematic CCAFS programmes where the impact pathways and the theory of change can be best questioned/ observed/ assessed.
- *Climate Information Services* are supposed to be among the one having the most important impact on adaptation and scaling up potential (7 million farmers announced as potentially involved).
- Whereas mitigation is generally seen as one sector that has been least addressed in the first phase of the CRP[3], *Dairy NAMA* is presented as one research impacting a whole value chain (the dairy one) and one case where mitigation is highly considered, jointly with adaptation.

2. Review Criteria

1. Summary of the conclusions of the desk study regarding CCAFS and questions raised

The Agrinatura's desk study dealing with the overall EU contribution to the CGIAR 2013-2015 much appreciated that CCAFS ensured effective engagement with rural communities and institutional and policy stakeholders, to ground CCAFS in the policy context, and provide, through a demand-driven process, downscaled analyses and tools for future climates. Policy makers at global, national and local levels were one of the main target groups of the project.

Considerable attention was seen to ensuring coherence across the scales of operation while scaling up impact. The project partnered with some of the major international multi-lateral and local non-governmental agencies, while at the same time being grounded in work with national agricultural, natural resource, environmental and meteorological agencies, and the private sector.

The planned outcomes hence covered an inter-woven package of technologies, approaches and policies for both adaptation and mitigation, and were targeted at various levels, from the farm to the global policy arena. To ensure that these outcomes were achieved, the project defined impact pathways working back from the outcomes desired, to the outputs needed to achieve those outcomes, the partners needed to deliver the outputs and to help foster the outcomes.

The project partnered for engagement and communication approaches with a number of stakeholders, and strengthened capacity of farmers' organizations, government and regional organizations to facilitate evidence-based and forward-looking strategies and planning. In particular, diverse climate-smart solutions were examined and delivered benefits in climate-smart villages (CSV). CSVs are considered as effective local innovation platforms, whereas they also become learning-sites. Additional efforts seem however needed to draw more complete impact pathways; this should include

[3] The possible weakness on mitigation is somehow already identified by the CCAFS itself in its final report to the EU/IFAD at the end of the project, and it is confirmed by the evaluation desk study.

achievements in regional and national level climate smart planning as well as changes in local level technologies, institutional frameworks, market environments and sociodemographic interfaces that enable more sustainable and resilient local development trajectories. Starting from these remarks, the case studies aimed at confirming or questioning these assumptions by looking at the selected projects from different points of view:

- How the research results have been translated into direct impacts and options for scaling up and out (putting research into use).
- Review the initial theory of change for the project/intervention, and comparing this with actual change. By doing so, analysing the mechanisms that generate outcomes and impact for different target groups.
- Analyse the impact pathways from an environmental, social, and economic perspective, and the linkages between project outputs, outcomes and developmental changes - economic, environmental and social aspects.
- Assess the impact pathways related to the contribution of the research to informing evidence-based public policies.

2. Putting research into use.

Nobody can contest that the CCAFS research outputs/ findings are numerous and diverse[4]. This question is therefore not a matter of debate, and even less of an evaluation.
The question to this evaluation is rather:

(i) how far these outputs have been transformed into actions that were socially, environmentally and economically sound,

(ii) how much the research framework is designed so that the lessons learned from action can generate global knowledge, i.e. a scientific set of concepts and theories about adaptation and mitigation pathways that can be relevant beyond the borders in between which this knowledge has been elaborated.

For readability purpose, outputs can be sorted according to the 4 themes that structured the CCAFS programme during its *Phase I*:
1) Theme 1 "Adaptation to progressive climate change";
2) Theme 2 "Adaptation through managing climate risk";
3) Theme 3 "Pro-poor climate change mitigation";
4) Theme 4 "Integration for decision making".
Activities related to themes 1 and 2 can hardly been distinguished as they are generally strongly articulated. They focus mostly on the adoption of CSA technologies and practices by smallholder farmers. In theory, this requires to identify the relevant technologies and practices in a given context, to test them under "real" conditions, to adapt them if needed, and to provide information to farmers so that they can make relevant decisions.

The research starts then by the identification of what portfolios of climate-smart interventions at farm and at institutional level can deliver benefits at scale for adaptation (including climate risk management) to a changing climate. Through action research, diverse CSA technologies and practices have been identified by screening them for their relevance to the climatic challenges, and then selecting them in a participatory way with farmers after a sensitization process, using in particular the "farms of the

[4] See Annex A4 for literature review

future" approach[5]. The interventions are then permanently being evaluated to measure adoption, but without taking in consideration the social diversity among the farmers, except the gender parameter[6].

The results are systematically presented on the central CCAFS website, which has become the overall reservoir of the knowledge that can be shared. After nine years of research, an impressive number of publications, covering conservation agriculture, agroforestry, water management, drought adapted varieties and breeds can testify that the research has been productive in each of the various domains addressed. All publications are in open access.

CCAFS should also be commended for sharing its results in various formats more adapted to non-research public than the traditional scientific papers: news, briefs, infonotes, working papers, reports, atlas, videos, an active blog etc…. allow to share on-going research long before the results are formally published in journals. Such an effort of communication goes beyond the objective to share, on a wide scale, the outputs of the programme. It is also a mandatory mean of research for a multidisciplinary and multistakholders programme like CCAFS, where each of the partners needs to be associated very early to the research in progress done by the others. The website and the blog have obviously become a tool for exchange between the various partners involved on one site, and also between the sites.

Looking more precisely at the publications validated in scientific journals, one can note (in Kenya more than in Senegal) that most of them are still disciplinary oriented. The integrative knowledge coming out from the research is well represented in the briefs, infonotes or grey literature, while it seems to have more difficulties to reach the stage of full scientific publications. This is not really surprising, since different institutions are generally in charge of the different components of the programme, and each of them is publishing in its own domain. However, the capacity to integrate and to elaborate a systemic vision of the transformations and the innovations seems unequal. Another reason can also be that the currently published literature comes from the research done at the initial stages of the CCAFS, which was rather conventional (see below). More complex paradigms might also be expected from the last results of the phase 1 of the programme, and this is one of the reasons to recommend going on with the support on the long term.

An assumption to explain the differences between the two different countries may finally be that Senegal beneficiates from a long tradition of systemic agrarian researches for more than 30 years (especially supported by the Department of Agrarian Studies at ISRA), which is now extremely helpful to analyse the systemic changes whereas a similar experience does not exist as much at KALRO or ILRI in Kenya.

(R1): To intensify the scientific valorisation of the knowledge considering the increasing complexity (systemic integration and interactions in the processes) of the outputs and outcomes observed (in the CSVs mainly but not only). Assist the capacity building at the partner institutions in charge of the sectoral researches with regard to their ability of integration and of assessing their results in a global and systemic perspective.

[5] The method is based on the "climate analogue" tool; this consists in identifying (through modelling) areas where the current climate conditions are close to the ones that a given region will face within 30 years. Then CCAFS organizes a visit with a group of farmers so that they get a picture of their possible future, In that context, Ghanaian farmers visited places in Centre of Burkina, and Senegalese from Kaffrine region went to Linguere- see Annex 2C-. These trips revealed to be very supportive in rising awareness of farmers about the possible consequences of climate change.

[6] About this question, see the chapter 2-7 *Monitoring and Evaluation*

Indeed, the programme of testing/revising/extending the technological and institutional innovations in the villages does address more complex issues every year. This leads CCAFS to a number of challenges:

1 - From drought resistant breeds to integrated agronomic questions on land management

Initial research questions that resulted from the first needs assessments in the CSVs, eight years ago, mostly dealt with the selection and testing of biological materials: species and varieties which are adapted to the current and to the up-coming natural conditions. Practically, many trials and tests initially common in the CSVs aimed at identifying or testing early and/or tolerant to drought varieties, or at testing short-cycle crops.

Therefore, actions in the CSVs indeed generally started by what the CGIAR Centers know at best: breeding or testing "new" varieties of crops or "new" races of livestock: short term sorghum or millets in Senegal, short cycle cereals also in Kenya's CSVs, new breeds of small ruminants which are assumed to be more adapted to the supposed "new" environmental conditions than the traditional ones…

However, these tests being done *with* and often *by* the local farmers, very quickly the questions raised in the successive cycles have moved from testing varieties and breeds to the question of designing integrated *cropping systems*, or *animal rearing systems* and even more now *farming systems* (crop/livestock integration, like fodder resources management or waste/manure management). The varieties tested generally require adapted care, in terms of date of sowing, land preparation, fertilisation, water management and irrigation, weeding. The more the technical innovation tested becomes integrated, year after year, the closer the intervention is to impact, but the further it is from the core competencies of some institutions or partners that were initially selected to be in charge of these tests.

In other words, the institutions / partners in charge of these programmes have long been dominated by breeding competences or varietal extension. They are not as strong when the research questions come to considering *integrated* systems.

In the Kenyan CSVs for example, KALRO (Kenya Agricultural and Livestock Research Organization) has been put in charge of the testing and extension of the drought tolerant crops in the 7 CSVs of Nyando, whereas ILRI took in charge the research on the testing and extension of new breeds of goats and sheep. Both did certainly extremely well at the first cycles. Now the scientific questions have been transformed by the success: the choice of the varieties as such is no longer a dominant research question, but the challenge has become to enlighten *how a set of varieties* of different cycles can best take advantage of the diversity of water/fertility access conditions when some land development has been done and when access to water (by building reservoirs) has become an opportunity: some parts of the land holding can be better valorised by long term varieties when other parts, where the access to water is more complicated, will require shorter cycle varieties or even different crops. The fertilisation requirements, or the optimisation of the limited fertilisation resources that one specific farmer may have, will also not be the same in the two parts of the land.

Similarly, in Kenya again, ILRI has moved from testing and assessing the performance of new breeds of goats and sheep with the first contact farmers to optimising the management of fodder resources under various levels of labour availability constraints at the farm level, possibly crossed with different types of land development.

It is clear that such paradigms do not fit as well the capacity of sectoral research institutes as the first questions raised did. However, the partnership has generally not been adjusted, or human resource development and capacity building within the

partners institutions have not allowed to fully respond to the questions raised now. Since this generally requires a quite different perspective of and in research, short term trainings at institutes are poorly effective in this regard. The adaptation capacity of partner institutions would rather require innovative training of young-PhD-researchers, mostly on the field.

(R2): Strengthen, within the partner institutions, capacities to research on integrated paradigms. Going forward CCAFS should more aften directly consider building in house capacity through training of young staff members of national institutions through innovative MSc and PhDs programs together with its strategic European University partners.

As the early varieties are in general less productive, or new value chains (for new crops) are not always yet well in place, what is observed is not a *general adoption* of this material, but rather the *use of it as an alternative choice* for when the risk appears to be high (f.i. when the seasonal forecast predicts a poor rainy season, as it was the case for 2018 in Senegal). This means that proposing new breeds is as much effective and (probably) more efficient when farmers have access to information on the probable cropping conditions (Climate information for instance). An additional challenge is the maintenance of convenient large range (species and varieties) of seed stocks.

(R3): Enforce the linkage between the action-research on adaptation which is currently addressed in the CSVs with climatic information actions, possibly via climate smart landscapes in West and East Africa, respectfully.

In some areas (especially in West Africa) promotion of forestry and agro-forestry has been a major domain of both technical and social testing. In Senegal in particular this came from the motivation of farmers for "keeping trees" after visiting the "climate analogue area"[5]. This led to establish a protecting area (128 ha), to promote Farmer Managed Natural Regeneration (FMNR) techniques and to test domestication of "wild" species producing interesting non ligneous products(Tamarindus Indica, Ziziphus Mauritiana and Adansonia Digitata) (see Annex 3c).

2- Towards intensification: consider interactions and diversity of (socio-ecological) situations

From a CCAFS point of view, more efficient crop management generally means intensification i.e. concentrating the use of inputs (fertilizers, labour) on secured areas (irrigated plots, inland valleys, or lower plots), where the other best bet practices (crop density, weeding) are also concentrated. Technical innovations such as new irrigation techniques or practices of soil tillage can be combined with this intensification of practices. These innovations result in higher and more stable yields and are thus quickly adopted by a large range of farmers, as long as the required inputs (seeds) are available.

However, most of the regions where the CCAFS has developed the CSVs are regions in which a general process of intensification is occurring, with an increasing population pressure (reduction of the land holding per household to less than 0,4 ha in Western Kenya) and a higher integration into markets. This encourages a number of strategic changes in the agrarian systems, like the water control of the inland valleys in the semi-arid West Africa, or the multiplication of ponds and reservoirs to catch run-off water and extending irrigation in the highlands of Western Kenya. Such dynamics are largely independent of the CCAFS intervention. Even though these big trends of change are

[5] See previous page

practically supported by the CCAFS in the CSVs, they would of course have occurred even without it. This movement has two consequences in terms of research:

- One is that the assessment of the progresses of the innovations should now address the *whole crop management* (the cropping systems) more than the *crops results* as such. This includes the crop calendar management, i.e. choice of sewing dates, as well as weeding management. To get real improvement on these points, farmers have to get access to efficient climate information services.

- Two is that the innovations promoted have to be evaluated against different levels of intensification. Partly by culture and partly due to the nature of its scientific paradigm, CCAFS has always been more looking to assessing the results with regard to representative mean values of their impact, rather than exploring the interactions with the social diversity of the stakeholders and also the diverse ecological conditions in which they are situated.
An illustration of this is given in the Nyando CSV in Kenya where an agroecological zonation has indeed been published in the Atlas of the CVSs, although this has been done at a scale of 1/750000. This scale is quite relevant to illustrate the position of Nyando villages in the diversity of agroecological conditions of the Lake Victoria basin, but which is far too small to allow considering the variability of conditions within the territory of the seven CSVs. In the meantime, it is obvious that these conditions (at least soils and rainfall) vary within this territory and that this may have an interaction with the progress of the innovations.
On the socio-economic point of view, a typology of the wealth situation seems to have been recommended in all CSVs but neither the monitoring of the thematic programmes nor the evaluation of the overall impact are designed so that they can take this variability into consideration[7].
This bias is extremely visible when looking at the M&E system[8], which is designed to express more the mean values of the results rather than their variance.
A major exception to this relates to the gender-oriented data, when the data of the practices by women are disaggregated from those of the rest of the society. This is for sure relevant, but gender is certainly not the only source of diversity when considering the stakeholders' decision taking, may be not even the main one (in Western Kenya, the amount of land/household or the financial capacity to engage in land development seems to have major impact, for both men and women of the household). It is recommended to correct this.

(R4): To consider more systematically the diversity of the stakeholders beyond gender and youth, when analysing the individual strategies of change and capacities for innovation.

3-Climate information products, knowledge, tools, methods[9]

Scientific evidence of increasing reliability of climate information has been proven progressively from the late 90s-early 2000s. Climate Information appeared then as a powerful tool to support farmers in their adaptation to climate change.

At the eve of CCAFS, in most of the countries, weather forecasting was not oriented towards services to agriculture. CCAFS decided then to support the production and broadcasting of Climate Information relevant to farmers. For that purpose, partnerships

[7] This said, there is no reason why a typology on the wealth (that would commonly distinguish the rich, the medium and the poor) would be the most relevant one to consider. What would be required is the identification of the intensification strategies of the stakeholders, and, only then, to identify what are their different drivers(among which the wealth, but not only).
[8] see chapter 2-7
[9] see also annex A1

were initiated with agencies able to and keen in developing climate services to agriculture. This has been done at national level when possible (like in Senegal with ANACIM) and/ or at regional level (with AGRYMHET in West Africa f.i.) through ENACTS activities (Enhancing National Climate Services).

One can say that CCAFS and its partners contributed to a breakthrough in terms of knowledge: Crosscutting scientific based and indigenous knowledge based forecast revealed to be fruitful; thanks to the mid-term experience developed in different countries (in particular in West Africa), the reliability and usability of forecasts have progressively improved, and the prediction models themselves have been improved too.

In fact, the CCAFS CIS activities in Senegal, initiated in 2011 with 17 farmers in the Kaffrine region, have been used as a pilot. This was made possible thanks to the commitment and interest of an ANACIM researcher, who tested the process and worked continuously afterwards to improve it and scale it up and out.

But broadcasting weather forecasts alone is not that helpful for farmers; capacity strengthening at the beginning and regular technical advisory are required to put farmers in position of making profit from the Climate Information Services (CIS). If this is properly implemented (i.e. training in time, and technical advisory developed by a multidisciplinary group of technicians and farmers able to analyse potential interactions at plot level), the management at farm level is substantially improved, and the performances are better. Moreover, the experience accumulated year after year through these training and monitoring activities leads to a real capacitation of farmers (and advisors) in strategic planning and risk management.

(R5): Maintain and even reinforce the training and advisory activities to allow farmers to use climate information efficiently and to better manage the risk.

In Senegal, CIS experience encountered a large success all over the country and was quickly scaled up to a larger number of farmers in Kaffrine and other regions (see annex A1), thanks to a large broadcasting (through community radios and SMS networks). Climate Information is now considered "officially" as an agricultural input, as well as seeds or fertilizers. With support of CCAFS, Colombian farmers visited Senegal in 2015; they discussed with their Senegalese colleagues about the CIS experience and took inspiration from this exchange to engage in the same process.

As said above, CCAFS supported provision of reliable data by the national or regional agencies in different regions and countries (in Africa: Ethiopia, Tanzania, Ghana and Madagascar) through ENACTS project (Enhancing National Climate Services). Complementary activities consisted in training agricultural extension staffs and other intermediaries to the PICSA approach (Participatory Integrated Climate Services for Agriculture). This approach has been developed by partner University of Reading and proposes a combination of tools to support farmers in using Climate Services.

In collaboration with research institutions, different capitalization studies have been implemented on delivery of climate services. Lessons from experience have been synthetized. CCAFS is also involved in several frameworks that promote climate services for agriculture, such as the GFCS Adaptation Program (Global Framework for Climate Services) in Africa (and worked in Tanzania and Malawi through this channel).

(R6): Continue effort on Climate Information Services using the models now already established in the most advanced countries in this regard.

Pro-Poor Climate Change Mitigation

As noted in the final report of the CCAFS to the EU/IFAD, this component is indeed probably the one on which the production of outcomes by CCAFS is the least abundant. Taken globally, this reflects both:

- the low level of priority generally given to the question of mitigation in Africa,
- an excessive pressure of the donors to the CGIAR system towards impact, which leads to give higher priority to *adaptation*, compared to *mitigation*. By nature, mitigation does not directly lead to precise measurable impact on stakeholders, and the pressure for impact may result in less concern to the actions in this category.

However agriculture -including land uses changes- is the second source of Green House Gases after energy, and the need to reduce the GHG emissions and to sequestrate carbon is registered in the Paris Agreements and in the INDCs that most of the African countries have committed to. These obligations should normally impact on CCAFS' objectives. Even more, because mitigation is really a pure *international public good* (CO2 has no border, no impact can really be measured at national level), nobody but public international institutes can address it in terms of research and it is hence even more relevant that CCAFS does this significantly.

Until recently, global negotiation processes on climate change have however maintained separate tracks for adaptation and mitigation, based on the concept of common but differentiated responsibilities among UNFCCC parties. CCAFS, through its communication channels, has consistently challenged this strict delineation, highlighting that many opportunities exist for co-benefits between adaptation and mitigation in farming and food systems. The external policy environment for climate change and food security is increasingly integrative across adaptation and mitigation, and across the whole food system. For example, Parties delivered integrated plans for both mitigation and adaptation to the UNFCCC call for INDCs to the post-2015, and the GCF now invites funding proposals to deliver simultaneously on both goals.

In a partnership with IIASA, regional stakeholders, and several CGIAR Centres, CCAFS generated climate mitigation scenarios and targets consistent with the IPCC AR5 scenario process. Research identified that participation by all regions in mitigation actions will be needed to meet climate goals. Decision support tools were used at local levels to identify mitigation options and implement mitigation actions.

CCAFS also contributed to the scientific basis for estimating emissions and mitigation potentials in smallholder farming with more than 20 new emissions factors, a project to improve estimates of N2O emissions, estimates of soil C sequestration potentials, and guidelines for emissions measurement. New data sets of greenhouse gas measurements and emissions factors now exist for intensified rice, maize, wheat, mixed crop and livestock systems of smallholders.

(R7): Raise efforts to develop a higher share of mitigation research actions, even though it may appear as not as close as adaptation to impact.

Finally, in Kenya, CCAFS supported the development of a three years long study (dairy NAMA = *Dairy Nationally Appropriate Mitigation Action*) that, in collaboration with several stakeholders of the dairy value chain, led to an important integrated development project of the dairy value chain: *Low-emission and climate resilient dairy development in Kenya*, presented to donors (Green Climate Fund and IFAD) by the State Department of Livestock of the Ministry of Agriculture, Livestock and Fisheries (MoALF)[10].

[10] For a more complete analysis of the Dairy Nama component, see Annex A2

When it is implemented, this project should have an important impact on the release of GHG by the different processes of the production, collection, processing and transformation of the milk in Kenya. The project demonstrates that an intensification action, which should lead to tripling the milk national production in 2030, could be done while saving 24% and 59% of the production of GHG compared to the BAU scenario. This is an example, rather unique, that mitigation, adaptation and intensification can be envisaged jointly.

In Kenya, the dairy sector is of major social and economic importance: it contributes about 14% of agricultural GDP and 3.5% of total GDP. About 2 million farming households – or 35% of rural households – produce milk, and women play a major role in dairy production throughout the country. 70% of milk is produced on smallholder farms, and milk sales contribute significantly to farmers' incomes, including income for rural women.

Milk production has grown at an annual average rate of more than 3% in the last decade. Demand for dairy products is projected to continue to rise rapidly. Per capita milk consumption in 2010 was about 100 litres per year, but is projected to reach 220 litres by 2030. Kenya's population is expected to increase from the current 48 million to 65 million in 2030. Demand for chilled, high quality processed milk will increase, with growth in demand projected at 5% per year, and total milk demand growing from 5 up to 12 billion litres by 2030.

In the meantime, relatively extensive rearing practices tend to generate more methane production from ruminants than more intensive ones. Indeed, following the calculations by Dairy NAMA, livestock GHG emissions contribute about 90% of Kenya's agricultural emissions, of which about 20% are from the 4.3 million dairy cows. On-farm manure management also impacts on cow health and productivity, and it contributes to environmental pollution at local scale, as well as to GHG emissions. Water and energy use in milk collection, cooling and processing facilities are high, with machinery often outdated, inefficient and reliant on high emission energy (e.g. fuel wood, diesel, oil, electricity…).

Assessment of technical options in milk processing plants reveals significant GHG emission reduction potential with positive benefits for production costs, reduced milk losses and water consumption. In processing plants, there is significant potential to reduce consumption of electricity, as well as diesel and oil used in steam generation. Cost-effective options for reducing energy use in Kenya's 597 cooling centres and satellite coolers also requires appropriate development actions.

Last but not least, because energy efficiency is a relatively new field, dairy processing companies and banks are wary of investing. Provision of technical assistance to both processors and banks and concessional credit lines could help both dairy processors and banks to invest in the significant energy conservation opportunities available.

The strength of this project is certainly to have considered the whole value chain in an integrative and very professional manner. All operations have been assessed both for their current impact on GHG release and for their potential for intensification: the production of fodder, such as commercial hay in the Rift Valley, the husbandry systems, the collection, cooling, pasteurisation and transformation, the management of the waste at different stages (biogas production). This was done with a participatory manner, involving a number of meetings between the stakeholders concerned.

Internationally, the project will certainly be a pioneer example of how climate change mitigation and adaptation can support agricultural development objectives. The project's experiences will be relevant in the dairy sector in East Africa and other

developing countries, and to climate smart agriculture initiatives in developing countries more generally. The AE's knowledge management functions will be brought into play to ensure that lessons learned are widely shared.

Would the project be funded and implemented, capacity building and sharing best practices and lessons learned for adoption and replication are foreseen. Activities under this component should ensure that knowledge from good practices is made available in appropriate formats for incorporation in ongoing capacity building activities during the project implementation period, and will disseminate lessons learned more widely in Kenya's dairy sector.

There are however limitations within the project's preparation process.

The Dairy NAMA component has been mainly delegated to one international consultancy company (UNIQUE Forestry and Land Use, from Germany), which has demonstrated an excellent capacity of inclusivity in the project preparation but had lower interest in the scientific production itself. The process of preparation, extremely interesting for its integrative and participatory character, has not led to any recognised publication, and this is certainly a miss. The calculations of the expected impact on mitigation were done by using the classical FAO standards, which can be criticised since they poorly integrate the diversity of production systems. No research on alternative evaluation methods was initiated. Methodologically, looking for innovations in the impact assessment of agricultural and animal breeding practices would have been worth capitalising more than it has been done yet.

(R8): Encourage the Dairy Nama team in Kenya to better valorise scientifically and methodologically the science lessons and international public good aspects of the Dairy Nama project preparation phase.

Integration for Decision Making Objective

There are two complementary types of activities related to theme 4:

- Activities that aim at rising awareness of decision makers, especially at higher level (National and Sub-Regional level), and lead to inclusion of CSA objectives in National policies and policy documents (Support to States in writing national contributions to COPs of the UNFCCC…).

- Activities that contribute to institutionalize the concern for climate change, such as the creation of coordination platforms around this topic; for instance in Senegal the C-CASA platform was created in 2012. It gathers representatives of Ministry of Agriculture, State Technical Services, specialized medias, members of Parliament, Civil Society Organizations including FOs & NGOs, and agricultural research.

CCAFS did play an important role to produce regional scenarios, including narratives and quantification, that have become an important policy engagement tool in most regions, with a potential of use for planning agricultural adaptation under climate change.

New approaches to engagement at various scales were tested (e.g. Dairy NAMA exchange platforms, op. cit. or learning alliances in Uganda and Tanzania, stakeholder platforms at local and national levels in WA) and are helping to improve the effectiveness of science policy linkages to increase evidence-based decision making. In Kenya and Senegal as well, the CCAFS' support to climate-agriculture policy at national level had an obvious impact on the elaboration of the Climate National Strategy for the Rural/Agricultural Sector.

CCAFS also played a major role in the emergence of the Global Alliance on Climate-Smart Agriculture (GACSA) and the Alliance for Climate Smart Agriculture in Africa, supporting policy partners to participate effectively on the basis of scientific evidence. However the

GACSA happened to be considered with much reluctance by the major civil society stakeholders, which now limits its effectiveness.

Working with COMESA and ACPC, CCAFS continued to support the African Group of Negotiators (AGN) to have inputs into the UNFCCC.

(R9): Continue efforts at the same level, to link with policies on mitigation and adaptation.

3. Theory of Change

CCAFS has focussed on driving change at all levels, a key assumption being that climate change challenges can only be dealt with through multi-level approaches. The overall Theory of Change (ToC) includes the assertion that global negotiations and advocacy around climate change and agriculture can change paradigms and approaches and increase public and private investment in CSA, while farm level impacts of climate change, and positive on-farm adaptation and mitigation experiences can help shaping the policy debates. Climate change adaptation and mitigation policies have been at a very early stage in most jurisdictions since the early 2010s, and CCAFS could indeed have a significant opportunity to mobilize thinking and action during the project period.

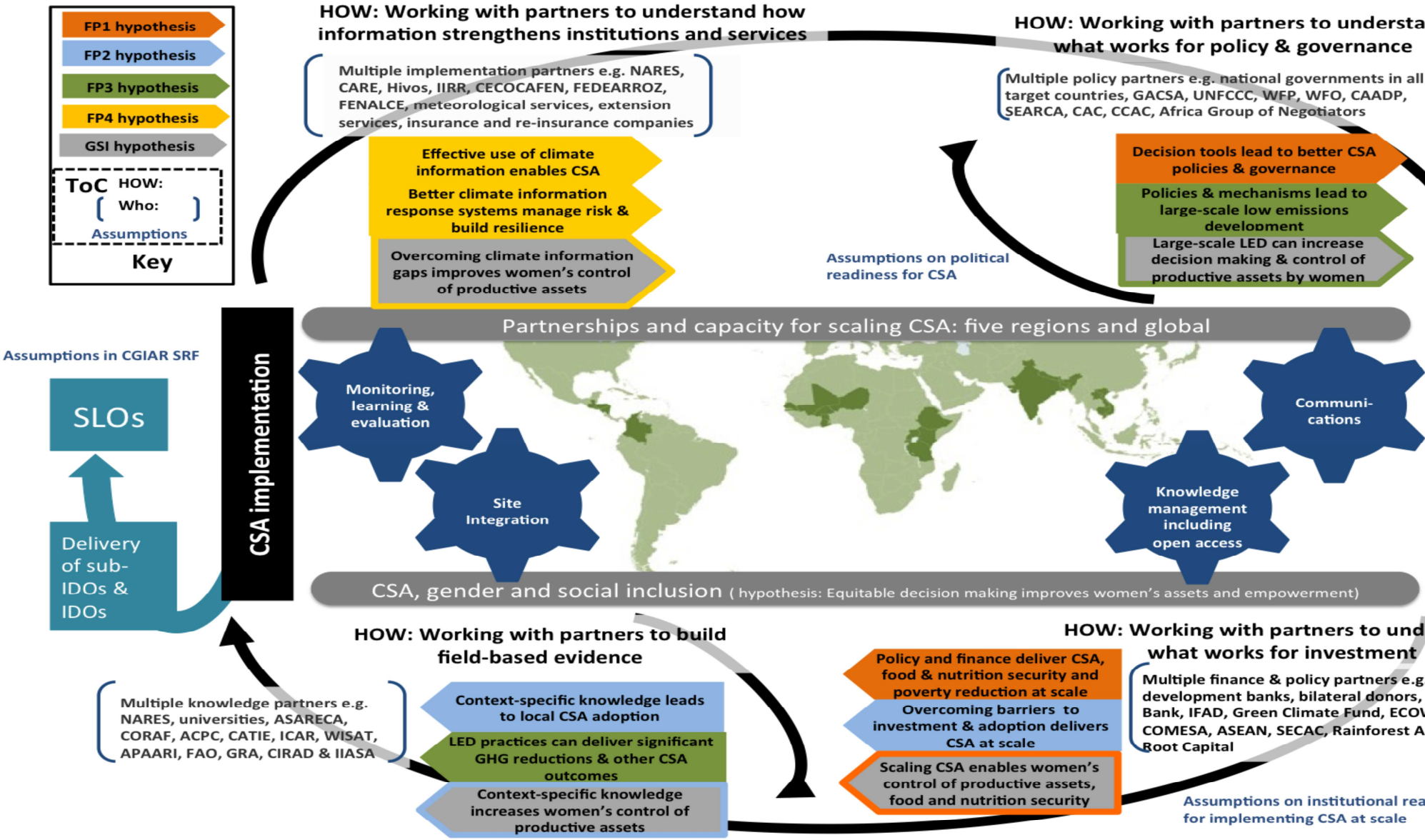
Various assumptions seem to be guiding the CCAFS actions, transversally to the different themes and regions. All of them are extremely consistent with the ToC and they are worth being cited here

- CSA is not mainly a matter of adequate technologies (although developments have still to be made, especially in terms of mitigation). It is rather a matter of integration and synergy between complementary decisions relevant to different levels of systems.
- CSA includes a collective dimension, especially in terms of NRM.
- Adaptation to CC supposes awareness and understanding of the mechanisms at stake.
- Information is critical to stakeholders to make them actors of their own change.

Fundamental to CCAFS is a series of nested "impact pathways" that link research activities and outputs to desired outcomes and impacts on people's wellbeing, up to the global level of the SDGs. The impact pathways depend in turn on a comprehensive ToC at program level, which recognizes impact pathways as non-linear, dynamic and polycentric (CRP Figure 4). The program-wide ToC is linked to theories of change for the four nested FPs.

CCAFS has subsequently reduced the number of hypotheses across the CRP, and has sought to standardize these as a set of hypotheses about the impact pathway from research to uptake. Eight of these hypotheses are summarized in the ToC diagram (CRP Figure 4). The CCAFS ToC, as shown in CRP Figure 4 hereafter, locates twelve of the CCAFS hypotheses within the four areas of action:

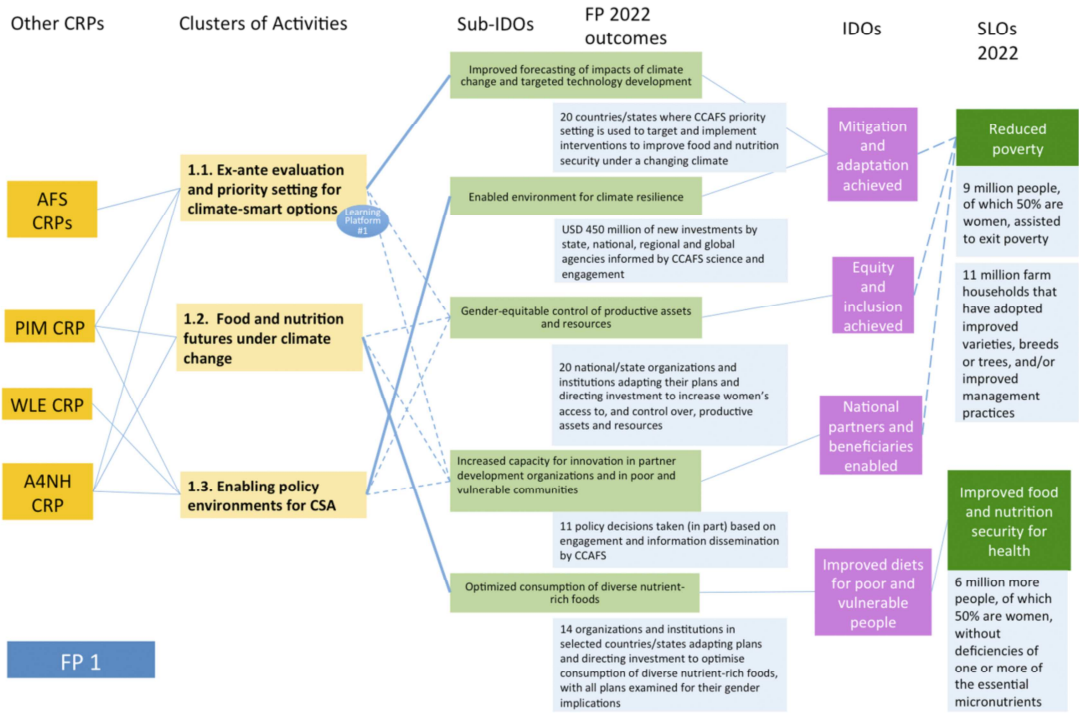
- Working with partners, especially implementing partners and local organizations, to **build field-based evidence** (bottom left corner of CRP Figure 4)
- Working with partners, especially climate risk management service providers, to figure out how to **strengthen institutions and services** through better use of climate information (top left corner of CRP Figure 4)



CRP Figure 4. Theory of Change diagram for the CRP, with envisaged change mechanisms, hypotheses and some key partners

- Working with partners, particularly policy partners, to figure out what works for **coordinated policy and governance** (top right corner of CRP Figure 4)
- Working with partners, particularly the large agencies and companies driving implementation, to figure out what works for **investment to reach scale** (bottom right corner of CRP Figure 4)

Key assumptions relate to maintained political will and readiness to tackle challenges of future food security under climate change and institutional capacity to meet these political aspirations (CRP Figure 4). Project-level impact pathways within each FP specify assumptions at a more detailed level. Regular evaluation and, on the basis of monitoring change, qualitative research that examines outcomes, processes and stakeholder perceptions in their diversity is crucial (see recommendations on the M&E).
Capacity development is theoretically pivotal to the impact pathways of CCAFS as a whole and the individual FPs, providing the mechanisms whereby increasing abilities to demand, undertake and utilize research lead to sustainable improvements in capacity to manage climate change.
CCAFS also understands knowledge management (including open access) and communications as central drivers of change (shown as gears CRP Figure 4). Integration of CCAFS with other CRPs is also a critical driver, in terms of Site Integration but also at all levels up to the global arena (e.g. UNFCCC, GCF, GACSA) to provide an unified voice and powerful body of science on agriculture under climate change.



FP1 Figure 1. FP1 Impact Pathway. Under each CoA there will be several research outputs (see Section 2.1.1.6). This FP contributes to the SLO targets (with other CCAFS FPs) but is accountable for delivery, with external partners, of the sub-IDO outcome targets.

4. Impact pathways from an environmental, social, and economic perspective at farmer, community and landscape level.

Global CCAFS logics regarding the impact pathways are clearly formulated on its website:

"Our research focuses on supporting major players in the CSA space with research-informed knowledge to bring CSA to scale effectively. We work with partners at all levels - from the farm to national governments- and across a range of agro-ecologies and social contexts to test, evaluate, promote and scale up CSA technological and institutional options that meet the needs of farmers – including women and marginalized groups.
By integrating and applying promising methods, tools and approaches for equitable local adaptation planning and governance, and developing innovative incentives mechanisms we help build adaptive capacity and resilience to climate variability and change, while increasing food availability and generating mitigation co-benefits.
The primary target beneficiaries of our work are climate-vulnerable, food insecure and poor men and women smallholder farmers in twenty one focal countries. Research also benefits development agencies working from grassroots through to national scales, as well as local and subnational institutions involved in agricultural planning, and the private sector that can support scaling up."[11]

What the mission has observed in the field is consistent with these principles. Most of CCAFS activities are implemented with a systemic and multidisciplinary approach. Thus, it is impossible to analyse CCAFS impact pathways from an environmental, social and economic perspective, while ignoring the technical dimension, for at least two reasons:

- Technical results are often an entry point for getting economic and social results, especially at farmer level;
- Assessing the environmental impact of different technical options is one major dimension of CSA development.

Looking at CCAFS activities, the mechanisms at work in the impact pathways rely mainly on partnerships:

- Within CCAFS, as in many other research programs and projects, the impact pathway starts at the diagnosis phase. Choosing participatory methods at this stage gives to most of CCAFS projects the highest chances to propose results that will be adopted by the stakeholders. From this early stage, involvement of stakeholders contributes to building a future balanced partnership rather than a top-down relationship.

- The Research Partners are at the core of the following stage, i.e. the knowledge generation. In some cases knowledge generation means producing and testing new technologies or developing new tools or new processes; elsewhere it's rather a matter of adaptation, i.e. testing and fine-tuning existing knowledge to make it relevant to address the issues identified with the stakeholders. Once again when participatory methods such as action research are used, the transition from research results (outputs) to outcomes (results used in practice by SH) is easier. Research partners might be more or less familiar/ comfortable with such methods. When needed, CCAFS provides the necessary support for implementation, M&E and/or publication of the results.

When relevant and performing technologies or social innovations have been tested and validated by the users, the facilitation role becomes critical to sustain the adoption and organize interaction with Researchers (monitoring and evaluation aiming at continuous

[11] https://ccafs.cgiar.org/flagships/climate-smart-technologies-and-practices/about

improvement). In general, this part of the job is insured by support and extension organizations (State Technical Agents, NGOs and/or Project or FOs staffs).

- Same actors but also small farmers and other rural actors could play a pro-active role in scaling up, at the first stage of results dissemination.
It is not yet really the case, and it is not always that easy: for instance women processing baobab fruits in Daga Birame have been asked for "learning to others" but they are still reluctant as they insist on the risk of having other processors not respecting safety and thus compromising the reputation of the whole product…

- Scaling out is often beyond the possibilities of local actors involved in the projects. It's why CCAFS coordination uses the opportunity of "external" projects (such as CINSERE in Senegal for CIS- see Annex 3a)

-Final impact depends also on communication related to outputs, outcomes and impact (and not only to dissemination of results). To target a large public (non-scientific/ non specialists) requires specific accessible supports such as leaflets or brochures. A few projects have developed this type of material (CINSERE in Senegal for Climate Information for instance) but they are still lacking in other cases (CSV).

One could wish to distinguish different impact pathways according to the different activities or projects, especially when they are related to the different themes. It is not that simple as there are generally strong interactions: for instance, CSV constitutes a privileged place to assess the impact of CI and could be used for a pilot experience of weather based insurance; on the same line the C-CASA national platform in Senegal contributes to scaling out and impact of CIS (preventive food security measures taken by the government, see annex 3a); the CSV experience has been used as a show case for C-CASA to reach the outcome "improved awareness of the complex challenges resulting of climate change and possible leverages to face them"…

In fact, CSVs should not be considered only as a sub-program of the CCAFS framework, or just as the field location where the theme 1 activities are implemented (where the technologies are tested). The Senegal example proves that CSVs are much more than that: these are the core space where most of the CCAFS activities are integrated (mainly those related to Themes 1 and 2 until now, but also to Flagship 3- Low Emissions development- in the future), and where most of the partnerships are developed and put in action; in addition, the CSVs are a good places to make evidence of the impact pathways; Because of the collective dynamics supported by CCAFS activities, they can be considered as local development incubators (social innovation). Last the CSVs constitute critical showcase to be used for Theme 4 activities.

As said above, the CSVs constitute a laboratory for innovation in the environmental and social areas; because of this statute, the researchers are keen in remaining involved in the processes on mid or long term; that way, they are able to make lessons from the experience jointly with the stakeholders; this is a key for scaling out. In the meantime, this continuous presence of researchers could be seen as a lack of autonomy of the stakeholders; although this challenge is common in action research, proper answers have to be looked for, probably through a proper positioning of researchers compared to other actors.

5. Impact pathways related to public policy

CCAFS pays a strong attention to its impact on public policies, attested by the symbolic shift of Public Policy from Theme 4 in Phase I to Flagship 1 in Phase II. These theme and flagship include several types of activities:

- Rising awareness of decision makers at national and sub-regional level about the challenges faced by their countries due to CC, and the potential they have to contribute to address these worldwide issues.;
- Support at national level for countries to develop their reflection upstream and prepare their contribution to international events such as COPs;

1) Tools for supporting decision makers: In 2013 CCAFS prepared a guide to the UNFCCC negotiations on agriculture (for COP 19), largely directed at civil society groups so that they could better target their advocacy efforts. In the build-up to the critical COP 21 in Paris in 2015, CCAFS updated the guide, and with partners CTA and Farming First, distributed this widely and ran a series of webinars and training events for policy-makers and farmers.

CCAFS also produced four well-received policy briefs immediately before and after COP21.

2) Global target for mitigation in agriculture: Using scenarios for a 2°C limit world, CCAFS worked with more than 30 scientists and policy makers to produce a global target for mitigation of 1 GtCO2e/year by 2030 that would be compatible with meeting future food security needs.

3) Combined socio-economic/climate scenarios developed for East Africa, West Africa, South Asia, South East Asia, the Andes, Central America and the Pacific region: In several regions, these regional scenarios have been linked to the IPCC's Shared Socioeconomic Pathways (SSP) scenarios. CCAFS scenarios seem to have become a strategic policy guidance tool across the two African regions. Seven countries have used these socio-economic scenarios to formulate national policy.

4) Submissions to UNFCCC SBSTA Call on Agriculture: in 2015 and 2016 CCAFS prepared and submitted four observer submissions, four info notes (Improving early warning systems for agricultural resilience in Africa; Impact of climate change on African agriculture: focus on pests and diseases; Climate change adaptation in agriculture: practices and technologies; Measures for climate change adaptation in agriculture) and eight background papers in response to the UNFCCC SBSTA call for submissions on issues related to agriculture under climate change. Through focused engagement with country partners, this knowledge did contribute to inform parties' positions and submissions to SBSTA on agriculture.

5) Shamba Shape Up: In Kenya, the scaling out of climate smart practices was experimented via a Kenyan reality TV show on farm makeovers, with support from CCAFS. The show was said to be watched by over 9 million viewers monthly. Although an impact assessment of SSU indicates that it reached nearly 13% of the rural and peri-urban population targeted, and that more than 428,000 households have benefited from the information disseminated, we do not expect that real transformative pathways can just be generated by such massive information mechanisms. The theory of change adopted by CCAFS itself considers that processes of change result from a much more complex set of integrated conditions for innovation.

6) In Senegal, one can consider that CCAFS contributed to the institutionalization of the CSA problematics: the national CCASA platform (Platform for a science-policy dialog for a Climate Smart Agriculture) was officially created in December 2015 and is hosted in Ministry of Agriculture. After its creation, CCAFS supported C-CASA through capacity strengthening activities, support to facilitation, provision of means for implementing activities, such as visioning and planning,

7) Beyond CCAFS portfolio activities (Theme 4, phase I, then Flagship Programme 1, phase II) regional staffs are regularly required to provide training sessions about CSA for ministries executives or other decision makers.

(R10): Pursue continuous efforts to extend science based information towards policymakers and parties of the climate regulation framework, at all levels (national, regional and international) as in the case of CCAFS support to the African Group of Negotiators (AGN) at SBSTA and other UNFCCC forums including COP. Assistance to developing countries' expertise should be continued on the current basis and their capacity should also be strengthened further. Similarly, efforts towards the general public via various radio and TV shows such as Shamba Shape Up in EA could be less considered.

6. Partnerships

CCAFS has taken advantage of its ability to 'outsource' the management of key components of the Program to non-CGIAR specialist organizations, and, by so doing, to bring into CCAFS specialists in key fields of climate-related science. It has done this through partnership with leading organizations, and two of the four FP leaders are based in non-CGIAR centres. The FP3 leader is from the Gund Institute for Ecological Economics of the University of Vermont, and FP4 leader from the International Research Institute for Climate and Society of Columbia University. Both are part of the CCAFS PMC. FP management includes defining and communicating strategic direction, managing staff, administering management and partner research funds, overseeing research activities, developing partnerships, capacity enhancement, contributing to research, reporting, communication, and resource mobilization.

Indeed, partnerships are at the centre of CCAFS strategy:

- It is the basis of the operational structure, (to implement research and related activities) as CCAFS regional or central teams are small;
- Moreover, it is the critical component of the impact pathways: the partnerships constitute a privileged vector for capacity strengthening and knowledge management. They are the space where new policies and practices are tested and implemented.
- -Last, the governance issues are addressed within partnerships that are simultaneously research objects, experimentation places and outcomes to impact leverages.

Partnership management within CCAFS can be considered through different angles. First regarding the ***object of partnership and nature of partnering organizations***, one can identify:

- Research partners: CG Centers, (especially ICRISAT, ILRI, ICRAF in Africa) and CGIAR researchers (who can be project leaders for CCAFS funded projects, such as PAR project in Phase I then BRAS-PAR in phase II), with NARS, with other "research institutions" (ANACIM). These partners are fully responsible of research implementation, and related M&E. i.e. production of outputs;
- Operational partners (at local level): non-research persons/organizations that are involved in practical activities in the field. This includes support actors: Extension services (such as ANCAR in Senegal f.i.), Government deconcentrate agencies (such as Water& Forestry, Agriculture, Livestock), NGOs (IED Afrique), Civil society members (such as community radios, journalists,…), local authorities and platforms at different levels (Multistakeholder Working Groups that are part of CIS).

A special mention has to be made on partnership with villagers within the CSVs (both in Daga Birame, in Senegal and in Nyando in Kenya). One can speak of partners and not any more of "beneficiaries" with the "passive" connotation linked to it. In fact, we observed

at the village level that local actors are able to propose innovations, to discuss options to be tested and to make their own lessons from experience. These partners are involved in output generation (more or less according to the topics and to the sites) as participatory research is the norm in CCAFS. But, moreover, they are at the centre of transition from outputs to outcomes, and this has been clearly observed in the field.
They should also constitute the first relay for scaling up, which we didn't notice yet in Senegal, except for the Climate Information activities.. In Kenya on the contrary, the three Community Based Organisations existing in Nyando are already key actors of the scaling up
In a few countries, some private actors can join this category: agrodealers (like Magos Farm Entreprises contracting with the Nyandos CBOs for opening a local shop), phone companies (for CI)…

(R11): Reinforce the first level of scaling up, by providing local partners with appropriate support and stimulating experience sharing at local level (CSV). For that purpose, be proactive in involving organizations rather than individuals, in particular existing FOs.

- Institutional partners: organizations/ institutions that (should) play a role in scaling up and out, through policy decision making; these are mainly actors at the national or supra-national level: government representatives, NARES, FOs, big NGOs, ECOWAS, NEPAD.
CCAFS is supporting the reflection at national level to create the conditions for CSA development through adequate policy formulation; beyond enhanced awareness and capacity strengthening of policy makers generally observed, institutionalization of the process is on-going in some countries through effective multistakeholder platforms at national level (such as C-CASA in Senegal).
CCAFS also supported some countries (Mali and Kenya in particular) in adaptation planning, and others in development of specific tools aiming at supporting smallholding farmers to adapt (Climate Information Services, Weather related Insurance…).
At a more global level, CCAFS supported 28 countries in Africa in submissions to UNFCCC of National Adaptation Plans (NAPs) and Nationally Appropriate Mitigation Actions (NAMAs).
At regional and continental level, CCAFS participated to co-development of the Alliance for Climate-Smart Agriculture in Africa with NEPAD and to the West African Alliance for Climate-Smart Agriculture with ECOWAS; CCAFS contributed to launching the Climate Services Adaptation Programme in Africa.

- Global organizations : CCAFS partners with several world organizations to develop tools and/or share experience. This is the case for instance of the Learning Alliance with IFAD for the Adaptation in Smallholder Agriculture Program (ASAP), the participation in the Global Alliance on Climate-Smart Agriculture (GACSA, where CCAFS took the lead). CCAFS also partnered with CARE on the Gender and Inclusion Toolbox. Two other major global partnerships were with the World Bank, for example on the development of prioritisation tools for CSA, and with the Global Alliance for Research on Agricultural Greenhouse Gases (GRA).

The second aspect to consider in terms of partnerships is related to the ***mechanisms*** at stake. CCAFS partnerships are generally based on projects. Some of these projects are initiated and built by CCAFS itself (looking then for partners to implement these projects together); Projects can also be attributed through call for tender processes (at global or regional level). In all the cases, CCAFS M&E system has to be adopted, which makes easier common lesson making.

The CCAFS scheme includes also "affiliated" projects that are not funded through CCAFS: CINSERE in Senegal for instance (USAID FtF), or the up-coming project to support the processing activities in Daga Birame, supported by IED-Afrique and the Decentralised Green Climate Fund (DFID).

In general the partnerships are developed and implemented in a way that aims at and results in capacity strengthening of partners, and mutual learning as well, whatever the type of partners:

This can be observed in the field, f.i. in the CSVs where both scientist partners on one side and villagers and related extension services on the other side have been capacitated. For instance, CSV villagers' understanding of the complex challenges at stake is impressive; their ability to consider possible solutions to the new issues is remarkable as well. In fact villagers interact with researchers and provide regularly ideas for innovations or improvements to be tested within the CSV framework (cropping groundnuts to control weeds in the domestication plots in CSV in Senegal f.i.). In the meantime evolution in some researchers' practices (more and more participatory oriented) is observed. Scientists mention also mutual learning with and contributions from farmers and technical agents.

The same capacity strengthening is observed with policy makers, although the turnover in this category requires for CCAFS to remain proactive in order to keep contributive partners. It's why a national platform such as C-CASA is really interesting.
This type of activities, aiming at rising awareness or strengthening the capacities of decision makers is not limited to the CCAFS focal countries not to current CCAFS projects; this investment is seen by CCAFS as full part of its policy engagement.

Capacitation of partners and (resulting) efficient management of activities is the proof of successful partnerships.

Specific attention is given to gender issues and it results in a good representation and real implication of women in the activities. In fact, women's capacities have been strongly reinforced thanks to their involvement in CCAFS projects (CI project, CSV and future Dairy Nama as well). During the mission this was testified by the proportion of women participating to the visits and meetings, the clear understanding and the quality of the presentations made by many women, and by their strong and relevant participation in collective discussions as well.

Up to now, there is still progress to be made on gender ratio among high-level decision makers but this is beyond CCAFS possibility. Let's mention that in Senegal, one farmer woman that was capacitated within the CI framework and called " "Mrs Meteo" in her locality, has then been elected as a deputy in Senegal Assembly (apparently thanks to the capacities and exposure she got through her involvement in CCAFS activities)!

Nonetheless, regarding disadvantaged categories of people, the involvement of young non-married men in the CSV dynamics remains sometimes weak. CCAFS staffs are aware of it and are looking for addressing this issue. The challenge is to motivate them in joining the collective process so that the community benefits from their contribution to innovation and they benefit from the on-going capacitation dynamics.

There are still **challenges** faced in partnership development and implementation:
- Partner organizations have different work places and "cultures" (reporting requirements, f.i.); this supposes to adapt to avoid tensions or misunderstanding, especially between development partners (extension services, NGOs) and research partners, but also between different research organizations.
- On the same line, to get impact on its global objective, CCAFS expects the commitment of all stakeholders (see TOC). Participatory methods are hence not optional but

compulsory. However, CCAFS research partners are not all familiar or really comfortable with these methods. When support (often coaching) from regional staffs is required for this reason, the capacitation of researchers on these topics can be seen as a side-impact of CCAFS.

(R12): Sustain/ reinforce the capacitation of all the partners in participatory and integrative research methods and in stimulating multi-institutional processes

- More limiting is the limited size and means of several partner organizations compared to the work to be implemented, as much as scaling up and out are on-going; this is the case of the ANACIM team involved in CIS for agriculture in Senegal for instance; the number of people to address the increasing demand is small. It is difficult then to maintain the quality of intervention, in particular to implement all the pre-season training and facilitation in time.

- Lack of means or gaps in funds release is an issue for certain partners who are not able to prefinance the activities; this has been observed since the end of Phase I both at local and global level. In the recent years several Northern Universities went out of the CCAFS for this reason.

- The partnerships scheme is often complex, CCAFS being an umbrella for chains or combination of partnerships; beyond the financial implications (if each level charges overheads) this can slow down the decision chain and jeopardize the efficiency of the partnership. The complexity tends to increase with the budget reduction in Phase II; the number of projects funded through core CCAFS budget is going down as the number of "external" projects is increasing. This can be seen as a good point for CCAFS, as it testifies the interest of donors for the results and tools developed by the program and it is a powerful path to scaling out; but, in the meantime, the constraints are higher to match the combination of requirements (for instance, the CINSERE M&E system in Senegal which combines USAID and CCAFS systems).

- As CCAFS considers these "partners projects" as a part of its activities, the regional teams monitor them from a distance, and, if needed, they coach the staffs; this represents an additional burden over a sum of work that is already high. To summarize, developing partnerships is effective to reach outcomes and to scale up, it contributes to capacity strengthening of partners but the cost must not be underestimated.

(R13): Before looking for further multiplication of partnerships, develop some strategic reflection to focus on the more relevant and seemingly fruitful ones.

-The last remark is linked to the personal dimension of the partnership: Although, speaking of partnership, one often speaks of organizational or institutional partnersip, in certain (many) cases one given partnership relies mainly on one charismatic or very committed person; this person reveals to be critical for the project which might threaten the sustainability (this is the case for instance with the platform facilitator at CSV level and the CIS focal point in Senegal).

(R14): CCAFS regional teams should rise awareness of partners on the sustainability issue and supports anticipation of the handovers, including by making efforts to raise bilateral funds for partners on their climate oriented projects and offering technical and scientific support to these projects.

7. CCAFS monitoring and evaluation system.

The CCAFS M&E system has evolved between phases I and II to address some of the recommendations of diverse internal and external assessments. The main change has been the adoption of the MARLO system for M & E. CCAFS has been a forerunner on this topic and, given the satisfactory results, the other CGIAR are now using MARLO.

The CCAFS website now speaks of "Monitoring, Learning and Evaluation (ML&E) system". The MARLO system has been (is still being) developed with the support of the Statistical Services Centre, Reading University, UK. It provides practical mechanisms and tools to ensure balanced quantitative and qualitative monitoring. It adopts "*a results-based management (RBM) approach and supports a culture of reflective learning, experimentation, and adaptive management; ensuring that ML&E becomes an integrated mechanism throughout the program.*
The RBM approach helps to build logical chains of transformation in which projects produce tangible outputs in support of desired outcomes. These outcomes include changes in practices, skills and behaviour of researchers, policy makers, national extension services, farmers and other user groups."[12]

Thus the MARLO system aims at going beyond the traditional monitoring of measurable indicators; It uses an interactive online platform that allows the management of a database at regional and global level: at the beginning of the year, each project leader indicates what are the deliverables expected for the coming year; then the researchers enter data as they are available; it can be quantitative or qualitative data, at different levels of proven evidence… The documents that support the evidence of the results can be very diverse: scientific publications (numerous, especially in West Africa), briefs, blogs, films… At a first stage, the information is used by the regional leader as a basis for exchange with researchers, and then it is validated and becomes available on the website.

The MARLO system includes standard monitoring data such as results of experiments and field tests, results of baseline and following studies. The scale depends on the project purpose: in the CSV project for instance, the baseline and midline[13] studies have been conducted at village and household level. The data collected at the household level would provide quantitative elements for impact assessment in terms of yields and income by comparison with the results similar studies occurring around the middle (midline study has been implemented as a pilot in some places[14]) and at the end of the projects.

The data collected at village level provide more qualitative information about environmental and social context, stakeholders' perceptions and mechanisms of change; in CSV projects for instance they are used as a basis for participatory diagnosis, to develop a collective vision for the future, then to design action plans at village level. These data are laid out in user-friendly[15] flyers that will be automatically updated (standard format developed for all the WA CSVs by ICRISAT).

In addition to the regular monitoring insured by CCAFS staffs and their direct partners through MARLO, external experts implement regularly more in depth assessment studies. These studies are related to specific projects or programs. They are funded by CCAFS (core budget), and chosen through calls at global or regional level. In Senegal one

[12] Paragraphs in italics are copied from the CCAFS website
[13] Till now, the WA CSV midline surveys were implemented only in Ghana first half of 2018; results and analysis are not yet available.
[14] in the CSV Ghana project for instance (surveys first half of 2018, i.e. Y + 7) results and analysis not yet available
[15] unfortunately, available only in English, even for francophone countries

of this studies assessed the impact of the Climate Information Project[16]. A participatory impact study at household and village level related to CIS in Senegal will be implemented from end of 2018 to 2019 by ICRAF and CIRAD.

Beyond the M&E scheme, the lessons learnt are capitalized through different ways:

- As said above, CCAFS activities have led to a lot of scientific publications and this continuously since almost the beginning of the program;

- Numerous communication supports have been developed: posters, films, briefs, leaflets… Nonetheless, in some projects (CSV f.i.) there is still a gap in userfrienly communication supports to be used with the partners in the field; these supports should be available in French in the francophone countries, which is not yet the case;

- The CCAFS website is rich: all the documents that have been once published about CCAFS activities can be found here: scientific publications, public and internal reports, project documents, diverse types of briefs, notices and leaflets, pictures and films… But the abundance of information makes the navigation somehow difficult, as much as the use of key words in the search engine is not efficient. Then it becomes difficult to get a clear general picture of the program or one of its components (regions, themes) through this channel.

The implementation and use of the ML&E system at the local level (in CSVs in particular) has still to be improved on two aspects:

1) The current quantitative approach is not sufficient, as it doesn't explore the farming systems diversity and the various strategies for change of the stakeholders in a locality. Yet this diversity is known to condition the potential adoption of innovation and to weigh on social dynamics

2) Moreover, in principle, the CCAFS baselines were built on the same model in all regions to allow comparison across the entire sample of CSVs[17].
The relevance of such comparison at this scale has not been demonstrated yet. When innovations were borrowed from one place to be tested in another one (see the Senegal's CI for example), such ideas were certainly not the result of the comparison of the baselines that but were rather generated by the theoretical models of change that some of the actors may have had in mind at the right moment.
Locally, the standardised model of baseline limited the interest of the data that were collected to a series of descriptive statistics unable to catch the diversity of stakeholders' strategies and to assess the initial situation of groups on which the monitoring of change could be based afterwards[18].

3) To put in practice the relevant strategy of *focusing on users, utilization of ML&E and accountability,* it would be relevant (in terms of potential impact) to identify the lessons learnt in the field and capitalize on them with ground actors. In Senegal, the ICRAF-CIRAD assessment already mentioned would go that way for CIS and partly for the CSVs.

[16] See Lo and Dieng 2015
[17] See Thornton et al. (2018), Global Environmental Change 52, 37
[18] The result is that now, when the programme tries to assess the quantitative economic impact of the CSVs , it cannot base its comparison on the 2011 baseline but has to define a different set of villages, out of the reach of the CSV actions, to be compared with them.

(R15): CCAFS should complete the current ML&E approach by elaborating a typology of the farming and livelihoods systems, specific to each site, based on the criteria that are identified as relevant in each of the sites with regard to the dynamics of change. The monitoring system should relate the innovations' relevance and their impact to each of the types, thus building models of innovation that are diversified rather than based on means.

Nota : The EU/IFAD evaluation 2011 of the CCAFS already brought forward a similar recommendation when looking at the baseline study that had just been done then. This has not been really corrected, and one does miss that now…

(R16): Systematic adoption of participatory processes involving stakeholders in the ML&E system.

3. Conclusion and recommendations

Conclusion

CCAFS is certainly one of the most emblematic programmes built at the overall CGIAR level to address in an innovative way the new challenges that the world is facing in the Post Green Revolution era.

Built nine years ago as a Challenge Programme transversal to the conventional Centers-based organisation of International Agricultural Research, CCAFS has obviously built an organisational framework that now allows to test, in various conditions, integrated pathways for innovation and change in agriculture that address the need of adaptation to the climate change and, on a more modest basis, the ambition to mitigate the climate change itself.

Technologies that are tested are certainly not that innovative as such, with the notable exception of climate information systems, since most of them did already exist in labs or in other regions of the world long before the CCAFS started. But their integration on the field, within participatory processes that allow permanent feedback to fine tuning the research, is a real breakthrough. The condition for finalising this success is that the results obtained on the field in terms of adoption/non adoption/reorganisation of the CSA elements are now well documented, compared and assessed so that it leads to real scientific outcomes. Then the conditions are fulfilled to go beyond producing a list of the results achieved (outputs) to contribute to a full theory of change. With such an ambition, being able to test the new knowledge created -in places different than the one in which it was created- is mandatory. This has been already initiated but is not yet achieved nor well documented everywhere, as much as new challenges (social, environmental) rise, as CSA practices are progressively adopted. This is where the worldwide dimension of the CCAFS happens to be a real advantage compared to conventional local impact-oriented research.

Beyond the impact oriented research, which is now the most common target objective linked with the CCAFS funding, the mission has insisted on the need to produce real *scientific knowledge* dealing with the conditions and mechanisms of the adaptation / mitigation processes. The task is not that easy, and it is becoming more and more complex, systemic and integrative each additional year when the research progresses. The capacity of some partners to follow the complexification of the paradigms may be an issue that raises concern to maintain or develop the existing partnerships. Clear strategies are required to support the partners to adapting their human resources to such new challenges, by training and renewing the competences initially mobilised. Reasonable growth of ambitions has to be found to avoid overheating in the areas where

success is the most attractive to donors, while the areas showing the less direct impact, like mitigation programmes, may be of equal interest to be considered.

Finally, the asset constituted so far in terms of field access, knowledge basis established on the ground, networks of effective partnerships and corresponding organisational structure, should clearly be preserved. Breaking that capital by stopping the actions at the moment they are the most productive in terms of knowledge generation as well as of direct impact, would represent an obvious loss of a strategic public good. Therefore, with the recommendations recalled below, the review team calls for consideration to be given to the continuation of the effort started in 2009 into a CCAFS Phase II new programme.

(R17): Beyond the punctual aspects that may require adjustments as suggested above, the mission hence warmly recommends positive consideration to continuing the effort started nine years ago for a coming phase 2 of the programme.

Recommendations

(R1): To intensify the scientific valorisation of the knowledge considering the increasing complexity (systemic integration and interactions in the processes) of the outputs and outcomes observed (in the CSVs mainly but not only). Assist the capacity building at the partner institutions in charge of the sectoral researches with regard to their ability of integration and of assessing their results in a global and systemic perspective.

(R2): Strengthen, within the partner institutions, capacities to research on integrated paradigms. Going forward CCAFS should more aften directly consider building in house capacity through training of young staff members of national institutions through innovative MSc and PhDs programs together with its strategic European University partners.

(R3): Enforce the linkage between the action-research on adaptation which is currently addressed in the CSVs with climatic information actions, possibly via climate smart landscapes in West and East Africa, respectfully.

(R4): To consider more systematically the diversity of the stakeholders beyond gender and youth, when analysing the individual strategies of change and capacities for innovation.

(R5): Maintain and even reinforce the training and advisory activities to allow farmers to use climate information efficiently and to better manage the risk

(R6): Continue effort on Climate Information Services using the models now already established in the most advanced countries in this regard.

(R7): Raise efforts to develop a higher share of mitigation research actions, even though it may appear as not as close as adaptation to impact.

(R8): Encourage the Dairy Nama team in Kenya to better valorise scientifically and methodologically the science lessons and international public good aspects of the Dairy Nama project preparation phase.

(R9): Continue efforts at the same level, to link with policies on mitigation and adaptation.

(R10): Pursue continuous efforts to extend science based information towards policymakers and parties of the climate regulation framework, at all levels (national, regional and international) as in the case of CCAFS support to the African Group of Negotiators (AGN) at SBSTA and other UNFCCC forums including COP. Assistance to

developing countries' expertise should be continued on the current basis and their capacity should also be strengthened further. Similarly, efforts towards the general public via various radio and TV shows such as Shamba Shape Up in EA could be less considered.

(R11): Reinforce the first level of scaling up, by providing local partners with appropriate support and stimulating experience sharing at local level (CSV). For that purpose, be proactive in involving organizations rather than individuals, in particular existing FOs.

(R12): Sustain/ reinforce the capacitation of all the partners in participatory and integrative research methods and in stimulating multi-institutional processes

(R13): Before looking for further multiplication of partnerships, develop some strategic reflection to focus on the more relevant and seemingly fruitful ones.

(R14): CCAFS regional teams should rise awareness of partners on the sustainability issue and supports anticipation of the handovers, including by making efforts to raise bilateral funds for partners on their climate oriented projects and offering technical and scientific support to these projects.

(R15): CCAFS should complete the current ML&E approach by elaborating a typology of the farming and livelihoods systems, specific to each site, based on the criteria that are identified as relevant in each of the sites with regard to the dynamics of change. The monitoring system should relate the innovations' relevance and their impact to each of the types, thus building models of innovation that are diversified rather than based on means.

(R16): Promote systematic adoption of participatory processes involving stakeholders in the ML&E system.

(R17): Beyond the punctual aspects that may require adjustments as suggested above, the mission hence warmly recommends positive consideration to continuing the effort started nine years ago for a coming phase 2 of the programme.

Annexes: **Preliminary remark**

The description and analysis below are based on observations and interviews conducted in August-September 2018, i.e. more than 2 years after the end of the period of activities to be evaluated (Phase I). The activities have never been interrupted and are still going on, although the funds available are lower during Phase II than Phase I. Then it is not possible to make a distinction in the outcomes/ impacts observed in the field between what has to be credited to Phase I or Phase II.

The structure of CCAFS evolved from Phase I to Phase II: during Phase I CCAFS comprised 4 "themes: Th1/ adaptation to on-going CC, i.e. mainly CS technologies development; Th2/ Risk management, Th3/Mitigation, Th4/ Policies; In Phase II, one is speaking of 4 Flagships: F1/Priorities and Policies for CSA, F2/ Climate Smart technologies and practices, F3/ Low emissions development, F4/ Climate services and safety nets (i.e. risk management)

A1. The Climate Information Services project in Senegal [19]

Presentation of the project

Climate change increases the vulnerability of small- holder farmers and makes it more difficult for them to manage the risk. Nonetheless, for many years, in most of Sub-Saharan countries, climate information was not really used in the agricultural sector. In Senegal, weather forecast has been available for a long time. Staffs of the National Civil Aviation and Meteorology Agency (ANACIM) have been in front of the research on the predictability of rainfall in the Sahel in the 2000s. Then, from 2011, CCAFS developed a partnership with ANACIM and other partners to downscale climate information and enhance the transmission of climate information and agricultural advice for farmers in Senegal. The pilot project was initiated in Kaffrine and later expanded to other regions, on the following logics:

Climate Information useful for farmers includes different time-scale forecasts:

Seasonal forecast gives a probability of deficit/normal/rainy season, and indications about the dates of beginning and end of the season. Making use of this information is not immediate: farmers have to understand the probabilistic dimension of the seasonal forecast, i.e. to consider the different possible scenarios, to be able then to make decision in terms of risk management (e.g. choice of species and varieties to be sown). The decision-making options are highly context specific and have to be developed case per case.

- **10 Days forecast** helps to identify dry spells and is useful to optimize crop management, especially crop calendar management (sowing date: avoiding to sew before a dry spell to limit seed waste).

- **Daily forecast** helps farmers in making short-term decisions related to cropping interventions, e.g. avoid cleaning or applying fertilizer applications just before a rainfall.

[19] Reference documents:
CCAFS. 2015. The impact of Climate Information Services in Senegal. CCAFS Outcome Study No. 3. Copenhagen: CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS). Available online at: www.ccafs.cgiar.org
LO,HM, DIENG,M, 2015. Impact assessment of communicating seasonal climate forecasts in Kaffrine, Diourbel, Louga, Thies and Fatick (Niakhar) regions in Senegal. *Final Report for CCAFS West Africa Regional Program* Available online at: www.ccafs.cgiar.org

- **Instant forecasts** announcing extreme events such as lightning, high rainfall, strong winds, off-seasons showers of rains... contribute to prevent accidents or losses.

But Climate Information per se is not easy to use by farmers, because: 1) all forecasts remain uncertain, especially because of the spatial variability which is one of the dimensions of climate change; 2) To make decision in crop management is never a matter of a recipe, one has to analyse complex interactions between natural environment and available techniques; 3) The recommendations are compulsory site specific.

This is why the Climate Information Services Project in Senegal includes two groups of complementary actions: provision of information and support to farmers to make use of this information.

1) Initially the climate information went through agricultural services, but it appeared quickly not to be sufficient. Currently, in addition to this, there are two main parallel information chains after data are made available by ANACIM:

-Community radios receive the information by email (and/or mobile phone), they broadcast it in the info bulletins (or urgent announcements in case of alerts); these radios use local languages, which contributes to a large dissemination towards all categories of potential users (illiterate people in particular).

- "Relay" farmers receive the info by SMS or vocal phone message and transfer it to a number of other farmers by SMS or word-of-mouth (observed in the field on 29th August 2018).

2) The project pays strong attention to awareness rising and capacity strengthening through:

- Training sessions with farmers and extension agents organized a few weeks before the rainy season (e.g. ideally in May for the Kaffrine region) to:
    - remind the principles (probabilistic dimension of the previsions) and present seasonal weather forecast,
    - cross-cut the previsions with indigenous knowledge and predictions
    - consider the decisions to be made to optimize crop and farm management under the different probable scenarios; in particular, the choice of species and varieties to be sown (more or less long cycle) in the different natural areas is discussed.

- Regular weather broadcasting (10-Days, daily, alerts) through diverse information channels;

- Site-specific technical recommendations developed by MWGs (multidisciplinary working groups), put in place with the support of the project. These groups gather representatives of local development agencies (agriculture, breeding, environment and forest, advisory services), NGOs, local authorities (communal level, district level), farmer representatives and community radios, under the authority of the prefect in the locality. They meet every 10 days and on the basis of the forecast they develop recommendations for farmers for crop and farm management (e.g. (sewing dates, cleaning management, harvesting dates). This advice is disseminated through community radios, extension services and by-the-mouth channel.

To insure the quality of the messages broadcasted by community radios, training sessions were organized in 2014 and 2016 for community radio staffs. It revealed to be very helpful (even critical) for them as they are in charge of translation of CI to local languages. Nonetheless maintenance of these capacities is a challenge as there is a high turnover in these positions, because of the financial fragility of the community radios.

The pilot activities of the CIS project showed very good results and farmers were highly motivated to maintain their participation to the project. Then the activities have been

consolidated in the Kaffrine region and expanded to four additional regions (Diourbel, Fatick, Louga and Thies); in addition, complementary channels have been developed to insure the optimal dissemination of information;

The success of the project has been rapid and huge, as much as the reliability of the predictions was revealed to be good. As a consequence, more and more people asked for Climate Information.

The project was then expanded to four additional regions and complementary channels have been developed to ensure the optimal dissemination of information. The information chains are the following:

- Community radios receive info by email (and/or mobile phone), they broadcast it in the info bulletins (or urgent announcements in case of alerts) and organize debates also;
- "Relay" farmers receive the info by SMS or vocal phone message and transfer it to a number of other farmers by SMS or word-of-mouth (observed in the field on 29th August 2018).

In 2014 CCAFS West Africa identified a team of external experts, M.H.Lo and M. Dieng, to assess the impact of CIS activities in Senegal.

These expert[20] found that "nearly 3.9 million rural people had access to Climate Information". They noted too: "The innovation adoption level of the people is clear. CI is now regarded as the primary agricultural input by farmers who request for it before embarking on any initiative. There are several types of changes in the management of farming processes: (i) adoption of short cycle varieties depending on the seasonal forecast, (ii) conduct of farm work based on the intended actions, (iii) abandonment of dry planting and fertilizer application during earing, especially when dry spells are announced, or (iv) promotion of assisted natural regeneration. The advice applied by farmers significantly improves agricultural yields and thus income from agriculture, which is reinvested in other productive sectors to enhance social welfare."

In 2018, the interest for Climate Information Services is continuously increasing. More and more projects are interested in including Climate Services in their program. This dynamic is translated into an expanding partnership:

- At the local level: MGWs are ruled by a decree signed in 2014. They are operational in 11 localities (departments); in the end, 53 are planed to be functional.

- At national level, the original key partners ANACIM, and UCAR (Rural radio association), are still there but diverse projects and/ or donors joined the dynamics and contribute to scaling out. In particular, the CINSERE project (Information Services for Increased Resilience and Productivity in Senegal) has been designed upon USAID request; CINSERE (phase I: 2017- 2019) will develop climate advisory services to beneficiaries of four USAID projects that are part of the Feed the Future Initiative in Senegal: these beneficiaries include in particular fishers whom use of weather forecast already contributed to save dozens of lifes per year.

The outputs of CIS project are reliable forecast and related capacity strengthening tools. They led quickly to observed outcomes with the real use of CI by farmers as observed when discussing with two of them in Sikilo village: Mariama Keita and Cheikh Diaby received an alert about heavy rainfall upcoming; they checked that the information has

[20] In 2014 CCAFS West Africa identified a team of external experts, M.H.Lo and M. Dieng, to assess the impact of CIS activities in Senegal.

been received by the local radio through email, forwarded the information to other relay farmers (structured chain of information) and informed also herders to come back home with animals.

Lo and Dieng met many people that attested to qualitative impact[21]. These testimonies confirm the performance improvement and diminution of risk by using CI: losses are lower, yields are higher (especially in dry years). We verified by discussing with farmers that they have quite a clear understanding of what seasonal, 10-days and daily forecasts are usable for, and under what conditions. They are aware of the probabilistic character of weather forecast (especially seasonal forecast) and they understand well the implications. Nonetheless, if the seasonal previsions reveal to continue to be close to the reality for serial years, there is a risk to see the trust in weather forecast to grow up too much, i.e. the awareness on uncertainty shut down. This might compromise the efficiency of the process to support SH farmers to adapt to climate variability.

Quantitative impact is more difficult to assess as yield is the combination of different factors, among which risk management can be hardly isolated from capacity strengthening and other changes in crop management. Nonetheless, farmers that we met tend to consider that the decisions made thanks to CI were the driving factor of their better than average incomes in the past years; they mention in particular the choice of adequate varieties (contributing to get at least fair yields in poor rainy seasons) and proper fertilization practices (improving the efficiency of the money invested).

MGWs are active and useful and stakeholders are committed to make them work efficiently. Making use of indigenous knowledge as well as scientific contributions, these groups contribute to develop locally collective knowledge and to strengthen the capacities of their members, which is a longer term outcome.

Lastly, outcomes can be observed at National level too: in 2018, the seasonal forecast predicted a very poor rainy season in the Northern part of the country. Thus, the government decided to anticipate this by constituting security stocks of cereals and preparing application of food security measures in the affected areas.

Nonetheless, beyond the doubtless success (and partly due to this success) the sustainability of the dynamics has still to be questioned:

- The enthusiasm generated by CIS led to an increasing demand all over the country; yet we stress that CI is not usable without capacity strengthening of and advice to farmers. Thus, the challenge is to have enough trainers or advisors available in the different locations. The project team must give priority to training of trainers, rather than trying to do everything themselves.

- There is a risk of sub optimal use of climate information as not all the people who have access to it (through radio or by-the-mouth channels) benefit from the required up-stream capacity strengthening, or adequate advisory services.

- The team in charge of CIS at ANACIM is small compared to the huge demand. Will staff's commitment remain high enough on longer term? The current charismatic leadership makes challenging the handover that has to be anticipated, through the consolidation and even the reinforcement of the current team (number of staffs, organizational framework, financial means…).

- To insure the sustainability of CIS, funding mechanisms have to be developed beyond CCAFS framework. Stakeholders would be keen to pay, at least for capacity strengthening, but the willingness to pay should be estimated more precisely, both for training, and for access to CIS. The example of other countries such as Ghana where a partnership has been developed with private phone operators could be inspiring.

- If CI is considered a public good, the production of information should be insured on the long term through a sustainable mechanism involving public organizations. This could be at stake especially if new products requiring new data have to be developed. For instance discussions are on-going with the ENDA NGO to propose specific CI services to rice farmers in the Senegal valley area. These farmers are cropping irrigated rice in a relatively northern area and prediction of temperatures maxi and mini would be very helpful for them, but these data are not yet available.

-Last, the dissemination of the information could become the weak link; in fact the number of community radios are regularly increasing but, in the meantime, they are financially fragile. This generates a high turnover of staffs (poorly paid); this, in turn, should require regular training of new journalists to maintain the quality of the messages that have to be translated to local languages before broadcasting. In the worth scenario, community radios could disappear or become unable to fulfil their roles. Obviously, disseminating CI is only a small part of it, but CIS efficiency relies on their regularity and it could be jeopardize as much as not all SH have got phones and/or access to charging, and network is not available everywhere.

The CIS activities are monitored and evaluated through diverse complementary processes. Outputs and progress to outcomes are reported through the MARLO system which is regularly informed by the partners. In addition specific in-depth assessment studies are organized by CCAFS: this has been the case of the study implemented by Lo and Dieng in 2014 (see above). Another participatory assessment study of the CIS will began for one year from November 2018; it will be implemented jointly by ICRAF and CIRAD, and will use in particular the ImpreSS approach.

In the case of the CINSERE project, the M&E system is a bit more complex as it addresses both USAID and CCAFS requirements, which might makes it heavy to inform compared to the use that will be made of it.

A2. The NAMA dairy programme in Kenya

The Dairy NAMA (Nationally Appropriate Mitigation Action) project in Kenya corresponds to a flagship action that targets to combine development objectives for the dairy value chain with significant positive impacts in terms of mitigation of the GHG emissions.

This research project has supported private and public stakeholders at local and national levels to develop pilot actions, and scale up activities that promote dairy development. In particular, this research has supported activities that combine higher productivity while reducing emissions. The project also contributed to the development of an institutional framework and financing mechanisms negotiated with the concerned stakeholders, identifying best practices at farm level and in extension services, and identifying some existing tools to develop monitoring and evaluation approaches that can comply with both the need of providing data that can demonstrate effectiveness in complying to Kenya's progresses in international mitigation commitments while contributing to the knowledge on the theory of change and the impact pathways.

A relevant topic for combining economic development and mitigation objectives

Such topic is certainly very justified for CCAFS. Kenya is one country where the dairy industry is historically very strong. It represents 14 % of agricultural Gross Domestic Product (GDP) and 3.5% of the total GDP. Smallholders engaged in milk production represent about 35 % of rural households and 26 % of total households in Kenya. Milk production in Kenya is predominantly managed by small scale farmers, who own one to three dairy cows, and produce about 70% of the milk in the country. The sector currently contributes to the livelihoods of many smallholders through generation of income, employment and food to 2 million people across the dairy value chain.

With an amount of 115 kg per person, Kenya is one of the countries in the world where milk consumption levels are among the highest. However, the Kenyan Dairy Master Plan has set a target to increase per capita consumption of milk to 220 kg per person by 2030. Added to this, Kenya's population is expected to increase from the current 48 million to 65 million in 2030, of which more than one-third will be urban residents. When one combines these scenarios, milk consumption is expected to grow from 3.4 to 12 billion litres of milk in 2030.

Given that the extension of grazing land and pastoral areas is not possible, such an increase of production can only come from a huge progress in productivity levels and intensification. Technically, this indeed seems possible. The current productivity of dairy animals ranges from almost 2 litres per cow per day in extensive systems to 12 litres per cow per day in intensive systems. Milk yields remain low and diverse even in semi-intensive and intensive systems that keep supposed high yielding exotic breeds and cross-breeds. Beyond the genetic factor, other factors, like the management of the resources, more complex to address, obviously limit the productivity.

In the meantime the dairy value chain, from production to consumption, going through the different operations of cooling, pasteurisation and transport, is one of the most important contribution to the current release of GHG by the agricultural sector in Kenya. The dairy cattle sector itself is responsible for about 12.3 million tonnes CO2 eq, highly dominated by methane (95.6 percent) resulting from enteric fermentation by the ruminants.

What is interesting to note is that emissions decrease with the intensification levels (on average, 7.1, 2.1, and 4.1 kg CO2 eq./kg FPCM for extensive, intensive, and semi-intensive systems, respectively). Hence intensification may be not only a mean of

fulfilling ambitious development objectives for the dairy sector, it can also be a leverage for reducing the emissions.

In processing plants, there is also significant potential to reduce consumption of electricity, as well as diesel and oil used in steam generation. Cost-effective options for reducing energy use in Kenya's 597 cooling centres and satellite coolers also require appropriate development actions.

> *Indeed, adopting a low-carbon growth pathway for the dairy sector could help Kenya to meet its Intended Nationally Determined Contributions (INDC) in the global efforts to limit temperature rise to 2 degrees. These mitigation actions could thus play a key role in realizing the transition to a low-carbon, climate-resilient economy.*

In such a context, the most significant action that CCAFS has produced in this domain is certainly to have supported the development of a three years long study (dairy NAMA = *Dairy Nationally Appropriate Mitigation Action*) done in collaboration with several stakeholders of the dairy value chain. The coordination of the action was given to a German consultation company, Unique Gbmh, who indeed had an extensive experience of project preparation and climatic impact studies, rather than being a research organisation *per se*.

The first outcome of this action has certainly been to confirm, with the data recalled above, how relevant an integrated action on the whole dairy chain could be, both for the economic development and for the mitigation of GHG emissions.

The second outcome has been to develop the culture of sectoral discussions by the main stakeholders about the diagnosis that was raised, and the possible solutions that could be encouraged. This has addressed really the whole of the value chain, starting from the input market and supply of fodder, going through the technical operations at the farm level with the extension organisations, addressing also the management of the manure and the waste and the development of biogas miniplants at the household level, and finishing with all the possible sources of energy savings in the cooling, transportation and transformation process.

On all these sectors, the strategy has been not to directly do research on these issues, but rather to mobilise the actors of the sector so that they themselves document what could be done in their sector and what would be the results, validated by their experience. For example, the experience of the *Rift Valley Hay Growers Association* was wisely used to identify what could be done in terms of increase of the commercial production/transformation of fodder and for the development of exchanges with the more intensive dairy zones of the highlands. The experience of a number of NGOs working on the extension of biogas plants at the farm levels, using different technical models, was collectively assessed to produce recommendations for the NAMA with regard to the waste management.

> *It is interesting to note that, by doing so, CCAFS does not do research in the classical way: there is no experimental plan that is designed, no creation of any technology that is compared to others. On the contrary, most of the knowledge that is created comes from supporting and using the results from experimental development actions that are led at different levels of the value chain by different stakeholders that pursue their own mandate and professional objectives; these are not mainly- the creation of knowledge, but rather the direct impact on the ground.*

An integrated development project as the major output

The final output is to have led to an important[22] integrated development project of the dairy value chain: *Low-emission and climate resilient dairy development in Kenya*, which has been presented by the State Department of Livestock of the Ministry of Agriculture, Livestock and Fisheries (MoALF) to a number of donors, the first of which being the Green Climate Fund and IFAD[23].

The strength of this project is certainly to have considered the whole value chain in an integrative and very professional manner. Internationally, implementation of such a project, if it finally occurs, would certainly be a pioneer example of how climate change mitigation and adaptation can support agricultural development objectives. The project's experiences can be relevant in the dairy sector in East Africa and other developing countries, and to climate smart agriculture initiatives in developing countries more generally.

Would the project be funded and implemented, capacity building and sharing best practices and lessons learned, for adoption and scaling out, are also foreseen. An important component addresses Monitoring and Evaluation. Activities under this component would ensure that knowledge from good practices is made available in appropriate formats. This may be not enough systematic to become a permanent source of *scientific* knowledge, but at least it can raise assumptions that can then be researched more systematically by ad-hoc organisations. Such a knowledge is certainly also valuable for incorporation in ongoing capacity building activities during the project implementation period, and will disseminate lessons learned more widely in Kenya's dairy sector.

Experimental development actions and scientific knowledge generation

All these considerations being said, the Dairy NAMA case research is however raising a number of issues. These concerns do not address the relevance of the action, which we consider as very high given the potential for mitigation and development, nor the potential impact of the proposed actions, but rather their contribution to research and knowledge generation.

As we highlighted before, knowledge generation in this case is done by taking lessons from experiential actions that are led by partners in their current activity. Beyond their contribution to generating the assumptions on which an integrated development project can be built, the question is how these results are contributing to global, i.e. scientific, knowledge. This would require confronting these results against existing theoretical frameworks that would be enriched – or questioned- by these additional inputs. In the case of the CCAFS Dairy NAMA components, there have been attempts to do so, however:

[22] Total budget of 73 million US$, to which should be added a contribution calculated at 150 million US$ from the main stakeholders of the chain, including the banks allowing loans to the farming and transformation sectors.

[23] It is unfortunate to note that, in September 2018, 20 months after its submission, no funding response has been received yet by the Ministry.
Analysing the donors' response to development projects generated by CCAFS' research was not in the terms of reference of this evaluation; hence we did not investigate at this in details. However, the mission considers this is part of the impact and scaling out question, and hence, that CCAFS should be encouraged to address it, as such, as a relevant matter of research. It seems there is a real interest by the Green Climate Fund but that IFAD, whose function is to carry the project as the Accredited Agency, is less supportive. It would be interesting to understand more how the connection is made –or not- within the Fund between what is supported in research (the CCAFS through the EU/IFAD grants) and what is then supported in terms of development projects that have a significant impact on mitigation of climate change (such as the Dairy Nama).

(i) They are limited. Although the materials are obviously rich and relevant, while a number notes have been published on the CCAFS blog on these issues, or "CCAFS InfoNotes" in the programme's journal, no real formal and accredited publication has been published in a scientific journal (some seem to be "in preparation"). The organisational framework and the existing partnerships favours generation of information that is clearly *more oriented* for *impact* that *oriented on the production of science*.

(ii) They are little oriented on the dairy production per se. Obviously, more seems to have been capitalised on the energy issues –especially on the transformation sector (Wilkes, van Dijk and Odhong, 2018, a CCAFS InfoNote), than on the dairy production itself. None of the notes mentioned above is addressing the question of the innovations and changes at the farms level. There is one publication "in preparation" about the adoption of technologies and management practices[24], this is all, whereas the domains that are impacted by the needs of intensification are very diverse: the breeds, the reproduction and selection strategies, the feeds management, the production of fodder (including transformation through hay) and the question of where it has to be produced (in the dairy areas themselves or in the places with less pressure on land and then transported), the optimisation of the use of the manures, wastes and biogas residues with regard to the associated cropping systems, the milking practises, the marketing strategies, the different forms of the collecting centres…

Actually, a team of national experts identified 10 key areas to address low productivity in dairy systems, based on what had already been implemented or in use at least at farm level in Kenya. The selection of technical options for the main dairy cattle production systems and their assessment was done "by expert opinion" and calculation of cost/benefit ratios against the three main production systems considered (extensive, semi-intensive, intensive). Six of these areas were considered relevant for the intensive and nine for semi-intensive systems. Four of the five interventions selected for extensive systems were included in the prioritization process.

This system of prioritisation based on expert opinion seems enough to respond to the needs of the preparation of an integrate development project, but it does not show the same capacity in terms of production of knowledge. Scientifically, the use of cost-benefit analysis as the only tool to classify the proposed technologies can be discussed, as far as the decision taking at the farm level is certainly depending of more complex factors, especially among the smallest producers

(iii) Integration of sectoral researches one with another –a domain in which CCAFS is supposed to have a comparative advantage –, is difficult to address in partnership since generally the partners are specialised in one sector only. For example, the interaction between the fodder and feeding management and the quality of the manures and biogas residues for fertilisation would not be easily addressed since the partners in charge of the feeding practices are specialised in extension whereas the NGOs and companies dealing with the extension of the biogas are good on the energy production, but somehow weak on the question of the quality/management of the waste. Another example is related with the quality of fodder: how parameters of quality can be reached with certain cultivation practices (irrigation and time of cutting,

[24] Kiff L, Wilkes A, van Dijk SM, Bateki C. (in prep). *Technology adoption in Kenya's dairy sector: A review of factors influencing the adoption of technologies and management practices by smallholder dairy producers in Kenya.*

drying practices) can certainly be handled. But the quality of the hay, at the users' side, results of complex patterns linked with his own system of feeding. The interaction between the circumstances for the production of the hay and the feeding practices at the dairy farm level can only result from a direct intervention of the CCAFS in research which does not exist in the dairy NAMA framework.

(iv) Intensification is just assumed to be possible, but how to reach the objective of tripling the productivity has not really been investigated. Given the diversity of the conditions of production in terms of environment (from the semi-arid rift valley to the humid highlands, with different levels of demographic pressure and land access), the solutions can only be diversified also. The expectations of increasing the productivity at the production level have been assumed to be known, based on a very rough typology of farming systems used by the FAO, distinguishing extensive, semi intensive and intensive systems. This is certainly not enough if the diversity of the farm and herd management strategies have to be considered.

Questioning the existing models of GHG release impact

Many of the biological effects of the envisaged innovations are interrelated and interdependent and, accordingly, the changes in enteric CH4 emissions per unit of milk (kg CH4/ kg FPCM) are multiplicative rather than additive. The use of a combination of feed practices (combining use of non-conventional feed resources, feed conservation and feeding of high energy/protein and an additional one including the use of nonconventional feed resources and feed conservation) returned the highest impacts on methane and milk production. The two interventions were designed to evaluate the impacts of feed management practices that improve consistency and minimize variability.

Impact of non-conventional feed resources, feed conservation and feeding of high energy/protein was calculated to lead to a 26–28% reduction in methane emission intensity and to a 34–36% increase in milk production. Strategic supplementation with sweet potato vines and sorghum silage in intensive and semi-intensive systems reduces enteric methane emissions by 48–50% and results in milk production increases between 93–97%.

In the Dairy NAMA project preparation, the calculation of the above mentioned mitigation impacts results from the use of the existing FAO methodologies and models, and not from any original experimental design. Methodologically, looking for innovations in the impact assessment of agricultural and animal breeding practices would have been worth capitalising more than it has been done. In terms of research, the FAO models can be criticised since they poorly integrate the diversity of production systems. The Dairy NAMA has however innovated not by renewing the models themselves but in the way the models were used. Unfortunately beyond the annexes to the project document that describe how the calculations of mitigation were done, these have been insufficiently capitalised, and one can certainly regret the lack of formal publication in this domain or the absence of feedback, in return, on the FAO set of methodologies.

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The Dairy NAMA programme therefore appears as of a high potential in terms of combination of economic and social impact and impact on mitigation of the GHG release by the agricultural sector in Kenya. An original and integrative vision of the needs for

innovations and change has been produced, and it was practically formatted in recommendations that are packaged in a development project proposal of high quality level.

The outcome in terms of research and knowledge is less convincing at the current stage. The programme has been mainly delegated to one international consultancy company (UNIQUE Forestry and Land Use, from Germany), which has demonstrated an excellent capacity of inclusivity in the development project preparation itself but had less interest in scientific production. The implementation of the preparation activities to separate sectoral partners allowed multiplying the references of the possible actions that could have impact, but it also complicated the transformation into integrated scientific knowledge.

There also, continuation of the effort is recommended, with a priority being put in the capitalisation and valorisation of the results into methods, models and theoretical outcomes, a domain in which such an *international research programme* could certainly contribute more.

A3a. The CSVs in Senegal

Context and process

The CSV approach aims at testing and validating through a participatory process a range of integrated innovations (technical, economical, social) to sustainably improve food security and to enhance the resilience of smallholder farmers in a context of Climate Change.

In Senegal the CSV activities are currently concentrated in Daga-Birame and the adjacent village of Ngouye, located in the Kaffrine region.

As all CSV locations in other countries, this area has been chosen, on the basis of a prospective climatic study, as an area seemingly particularly vulnerable to climate change, being in the transition zone between the Sahel and the Sudano-sahel zones. In addition Kaffrine is located in the groundnut basin which has been historically the strategic agricultural zone for the country. The identified area was about 30 km x 30 km large (13.9-14.2 Lat. North and 15.4-15.68 Long. West).

In (2011), baseline studies at village and household level[25] led to identify the villages where the activities would be implemented, initially Toune Mosquee and Daga-Birame/Ngouye. The baseline study at household level gave a picture of (mainly average) welfare, natural resources status and management, farming systems and agricultural practices. This study highlighted the fragility of the agro-eco systems: low fertility of the soils, climate uncertainty induce irregular (and often poor) yields generating a low food security level, and leading to unsustainable natural resource management.

Then the participatory CSV process was engaged at village level to establish a first agro-economical, environmental and social diagnosis and to develop a vision for the future. Among a list of challenges and problems faced by the villagers, the following points have been highlighted: the main climatic risks were droughts, floods and winds; farmers registered poor yields, destruction of crops, post-harvest losses mainly due to pests and diseases, erosion and low fertility; Vegetable cropping and livestock were declining; the difficulty to access credit was very limiting; last, the level of organization was poor.

At this stage, the CCAFS "Farms of the Future" project organized a trip to Linguere with 20 farmer representatives (men and women). Linguere is located at about 300 km North West of Kaffrine and has been identified as a Climate Analogue[26] for Kaffrine. When the villagers came back, they shared their impressions with others during a general assembly organized at village level. Thus, all the village people got a picture of what could be their future. One major point was related to the very low number of trees in the Linguere area, a situation that they want to avoid for themselves. Beyond this, they also brought back ideas about possible activities to make use of their current resources as well. In particular, Daga Birame people have appreciated a lot the bouye juice made from baobab fruits (that Linguere women came to buy in Kaffrine region) and they realized the potential of Baobab fruits processing.

Based on the diagnosis from the baseline study and the vision developed after the trip to Linguere, an action plan was developed to reach the desired future. To make it short, it means getting improved livelihood in an improved environment, even with uncertain (or poorer) climatic conditions. The logic was then the following: better productivity of sustainable farming systems, is required to avoid overuse of natural resources; specific

[25] see : Yacine,N., & al Summary of Household Baseline Survey Results : Kaffrine, Senegal

[26] i.e. an area where the current climate conditions are closed to the ones that the Kaffrine region will face within 30 years according to climate analogues tool

actions are needed to restore and sustain the natural resources (wood and non lignous forest products in particular); Improving livelihoods and insuring inclusivitiy of the development process, new income generating activities (and new jobs) have to be developed. These different actions must be coordinated and even more integrated to be efficient and this requires strong social dynamics involving all categories of stakeholders at village level and beyond (support services in particular).

Gaps in knowledge or organization to achieve this objective were identified and needs for innovation listed. Then, the CCAFS team and its partners supported the implementation of a combination of field tests, new economic activities and social innovations. The activities in Toune Mosquee stopped quickly due to insufficient social dynamics at the village level.

Activities

In Daga Birame the main field tests concern different domains

- Creation of a protected area of 128 h from 2014. This has been done by collective commitment, without fences. Villagers decided to authorize grazing but not logging nor burning. These rules Have been quite well respected by the population of Daga Birame (a few problems had to be solved by the chief of the village in the early stages). It took a bit more time to inform (convince) the neighbour villages of the new regulations but apparently, the situation is now under control
  In fact, beyond the protected area, the villagers, decided to forbid any cutting of "public trees" (in opposition to private trees that are located in family yards and can be used freely) in the village territory[27].

- Agroforestry with 1) domestication of wild fruit trees (mainly Tamarindus Indica, Baobab, and Ziziphus mauritiana, but also Guayava and Annona); Different "varieties" are currently being tested (indigenous and imported origins, including grafted ones) as well as crop management practices such as grafting (to get faster "productive" baobabs), and 2) Farmer-managed Natural Regeneration in the cultivated plots with test of different densities of trees and different species (linked to better fertilization practices see below);

- Adoption of agricultural smart practices to improve the productivity, the sustainability of the farming systems and increase the incomes, thus reinforce the resilience of smallholder family farms; within this category, one can mention: demonstration of drought tolerant and short cycle crops varieties (mainly maïze and millet) and integrated soil fertility management practices associating soil tillage, microdosing (smaller quantites of fertilizer located at the pit level) and FNRM (see above).

- Gardening, to improve both the incomes and the nutritional status. There is a bit of rainfed cropping during the rainy season but mainly irrigated cropping (salt tolerant species) during the dry season; pumping uses a solar system (funded with support of CILSS). A tree nursery would be installed soon in the same area.

[27] Trunks are marked with red crosses to make it clear also to the "foreigners".

In addition to the tests and demonstration plots listed above (implemented by the villagers themselves), CCAFS provided support through capacity strengthening and facilitation in different domains:

- Decision making in crop management based on climatic forecast (seasonal, 10-Days and daily forecast) combined with indigenous knowledge: choice of adequate species and varieties, crop calendar, … (see the Climate Information project, annex 1).

- In addition, in order to generate resources and provide incentives for tree protection, processing of baobab fruits was progressively developed: training of women about transformation process and hygiene, measures to increase the resource (maintaining or even increasing baobab population, favour quality fruit production by avoiding using leaves as forage, control of harvesting dates), support to value chain management.

- Social organization with an innovation platform at village level, gathering all the villagers involved in the activities and representatives of different support agencies and partners. It has to be mentioned that no strong social organization (especially farmer organization) existed in the village before the initiation of CCAFS activities.

Outcomes

Almost all the results of action research activities (outputs) resulted in outcomes, and have already produced local impact in Daga Birame:

The protected area is now clearly visible in the landscape, with a large range of indigenous species (Parkia Biglobosa, Pterocarpus among others) that re-appeared spontaneously. The first local impact is the reduction of strong hot winds in the inhabited area. As there has not been any exploitation of the forest from 2014, except grazing in the area, one can't say that there is an improvement of the natural resources such as wood (at least of the usable natural resources); nonetheless reflection is being intiated to develop a set of regulations to be put in place in the coming months/ years to exploit sustainably the forest; this reflexion will be facilitated by the Water and Forestry service (definition of plots to be exploited on a rotational basis). Not only vegetal species but also wild animals such as monkeys, warthogs, guinea fowls, jakals… are back too. Although this can be seen as pleasant ("life is back") there are also negative side effects such as thieves in the fruit plantations by monkeys or damages due to warthogs in maize plots…). The collective organization at village level is then critical to look for acceptable solutions to these new challenges.

A number of young trees can already be observed in the cultivated plots of the village area. It is an impact of the Farmer Assisted Regeneration largely adopted by villagers. Although some firewood is provided by management of these trees (selected branches cut on the young trees), this doesn't really impact yet the pressure on natural vegetation. It is also too early to observe any impact on fertility.

Having proven their efficiency in the tests, best bet practices[28] are now adopted by many farmers, including women; Associated with FMNR, the intensive cropping management

[28] Use of organic manure when possible, better management (microdosing) of mineral fertilization, soil tillage, weeding, choice of species and varieties on the basis of weather seasonal forecast.

allows individual farmers to reduce their cultivated area and contribute to a lower land pressure. Slash and burn has been completely abandoned, resulting in increasing biodiversity…

In addition to the protected area, the more spectacular result is the bouye production. Starting from 150 kg of fruits in 2013 it came to 1 ton this year, that have been processed to 200 kg of "bouye powder", to be sold at 5000 CFA F/ kg. Twenty women are involved in the activity, with the support of men for harvest (climbing trees) and packaging in Kaffrine town, 17 km from Daga Birame. For the moment the geenrated income has been reinvested in the activity. But a quick increase is planned with building of an improved processing unit. This development of the activitiy will be supported by the decentralised green fund for a total amount of about 20 millions CFA F.

A solar powered system has been put in place for the borehole pump. This is used for vegetable cropping – salt tolerant species- and tree nursery.

Another important outcome is related to the process/ method: researchers and extension officers, together with villagers and other local actors, have progressively improved the functioning of the platform. Technical sub-committees were put in place and decision-making appears to be effective. As a result of the process initiated by CCAFS, the solidarity and the dynamics at the village have improved. This has been testified during our meeting in Daga Birame by a woman who said that the main result of CCAFS for her was the stronger solidarity within the village (thanks to collective meals organized when the researchers come). According to the facilitator and researchers the know-how in terms of collective management (including NRM) has also increased a lot.

The social dynamics could be quite different in case of strong pre-existing organizations in the village. In that case, the challenge would be to integrate these organizations in a new structure (village level IP) and to find a balance in the functioning of this structure between the already organized and non yet organized categories… (to give room to these last ones).

Impact pathway

Daga Birame experience appears to be a good example to observe a CCAFS impact pathway**.** This pathway relies both on partnership and capacity strengthening:

Discussions with villagers prove that they are now aware of the challenges at stake, and they have understood the complexity of ecosystems and the potential influence of climate change.

In front of these challenges, they are keen in interacting with researchers to look for solutions. But, what's most, they propose innovations, and are engaged in a co-learning process. They are keen in putting in place field tests (and able to do it) then in analysing the results: for instance they measure the harvest by themselves (to get quickly an idea of the results), before transmitting the samples to researchers.

The extension officers directly involved in the process make use of the knowledge and information they get there: it is the case in particular of the ANCAR staff in charge of the village, who plays a critical role in the dynamics. His colleagues have been trained on the CC topic, which should facilitate the handover in case of affectation change. Nonetheless, improvements can still be made in this domain: most of ANCAR staffs didn't visit yet the place. The Livestock Ministry staffs are not yet involved at all in the activities at Daga Birame; in fact, the farmers in Daga Birame don't breed cattle, only a few small ruminants and poultry. As there are herds in the area (mostly managed by

Fulani), and on the mid-term, the interactions between breeding and agriculture will have to be addressed.

Sustainability and scaling

From our visit to Daga-Birame we got the feeling that the sustainability of the process at the village level is probably quite good: we observed stakeholders' ownership, their autonomy in testing; with support of local partners, they have looked for external funding and got support from the Decentralised Green Fund to develop Baobab fruit processing; they are exploring self-funding opportunities…

Nonetheless, both scaling up and out have still to be questioned:

- Discussing with farmers in the neighbourhood, we were surprised to realize that they had heard about Daga Birame experience, but almost none of them visited the village and discussed directly with its inhabitants. We noted too that the local institutional chain didn't work well in circulating information; for instance the ARD (Public Structure in charge of supporting decentralized territorial units) became aware of the experience only in early 2018, the Prefect can speak of Climate Change at global level but is not aware of the pilot experience on going in his territory (although the Sous-Préfet is an active member of the Daga Birame platform) …

- The reproducibility of the experience is not yet evident: in fact, several technologies or practices tested in Daga-Birame could (and will) probably be disseminated; but it is not clear yet regarding the social dimension of the process, in particular the platform and decision making regarding NRM; what is the required level of social cohesion at the village level to enter successfully in the CSV process? Who (organization and persons) is able to facilitate the process and what capacity strengthening actions are still needed to get the required competencies?

The up-coming experience of CSV within the CINSERE program will certainly contribute to make lessons on these aspects. This could help to answer properly to the numerous requests made to CCAFS and its partners for "having a CSV in our place".

Monitoring, Learning and Evaluation

According to CCAFS, lessons from the experience are reported in synthetic documents posted on the MARLO website[29]. A part of these works have been published in different journals. These are mainly collective publications, signed by CGIAR staffs (CCAFS teams and beyond) together with national partners. It is worth to note that many of these documents, are related to social questions, processes and methods and not only to technical results (testing varieties f.i.). This is especially true in the two past years, which is not surprising: speaking of social processes, the experience is still as its beginning, although remarkable outcomes are already observable.

Would it be possible to be more ambitious in ML&E? This means to develop a more inclusive ML&E system, associating the field partners (villagers and support staffs) to the reflexion and capitalization process? Obviously the cost would be higher, but the impact would be reinforced too: participatory ML&E is a powerful tool for capacity strengthening, itself contributing to sustainability of actions…

[29] See in particular: Sanogo,D., & al, 2016, The Climate-Smart Village approach: what research and insights from current implementation in Daga-Birame CSV in Senegal?

A3b The CSVs in Kenya

The justification of the programme

In Kenya like in Senegal, CCAFS introduced the concept of Climate-Smart Villages (CSVs) at the same moment (2011), mostly to accelerate uptake of climate-smart agriculture technologies and innovations in Eastern Africa, specifically in Lushoto in Tanzania, Borana in Ethiopia, Hoima and Rakai in Uganda, and Wote and Nyando in Kenya. From the beginning, the objective of production of scientific knowledge through revised processes of action–research was also present, although it was clearly limited to a secondary objective compared to the wish to demonstrate impact.

The approach brought together research institutions, agriculture sector stakeholders and the farming communities to test a portfolio of CSA technologies, identify the locally appropriate ones and to promote their uptake. While uptake of these CSA technologies has increased over the years, their impact on livelihood of the farming households remains less clear, and the processes that lead to adoption within the diverse farming systems of the area are not yet clarified.

The most ancient CSV programme in Kenya stands in 7 villages of the Nyando basin, which is a rich agricultural flood plain around the Lake Victoria, and a part of the surrounding hills. Altitude ranges from 1100 m in areas near the lake to 1300 m above sea level. The climate is humid to sub-humid with average annual rainfall of 900–1200 mm, distributed in a bimodal pattern: March to May and September to November.

Agriculture remains a major source of livelihood for households in Nyando, providing food and a major source of income. The farming system is largely subsistence mixed rainfed crop-livestock system. Main food crops are beans, maize, green grams, pigeon pea, cowpeas, sweet potatoes. Other crops include sorghum, finger millet, tomatoes, kales, cassava, and bananas. Local zebu cattle are also kept alongside local poultry and small ruminants of sheep and goats.

These 7 villages belong to two different counties on the administrative point of view, which themselves include a total of 106 villages that represent the first step of the potential scaling up. The population density exceeds 400 inhabitants/km^2, making it one of the most populated rural areas in East Africa.

According to the local farmers, and confirmed by the assessment of long term data done by CCAFS, the expected onset of seasonal rainfall in Nyando appears to have drifted from what farmers perceive is a start, on or about 15 February to a true onset on or about 15 March. The probability of encountering a dry spell of 10 days in the subsequent 30-day planting window also increased for this period, which reduces the length of the main growing season. The indigenous varieties traditionally grown in the area, which may have been adapted to the agro-ecological conditions of the past, may not be adapted any longer to a shortened growing season.

On their side, livestock rearing systems, based on extensive grazing associated with supplementation with fed with crop residues from the harvested fields but since the yields are low and herbage of poor quality, farmers have difficulties to bridge dry season feeding, resulting in a loss of condition for the local livestock.

Outputs and outcomes

The CSV model focuses on facilitating the testing of a portfolio of climate-smart agriculture interventions, starting by shorter cycle maize and sorghum varieties, allowing farming households to make progressive changes to their cropping systems. New breeds of sheep and goats are also extended, which are supposed to withstand heat stress, better utilize low quality fodder, cope with the disease burden, recover from

drought with faster compensatory growth, therefore maturing to market weight in shorter rearing periods compared to the local breeds. Being climate-smart therefore means farming households are able to combine these individual innovations with changes from adaptive management to address climate related risks and build resilience at local scales. The new breeds are introduced while respecting the existing organisation of the farmer's system, or would it require new conditions for being successful, it is introduced at an experimental scale first, then progressively scaled up when the farmer is able to progressively modify his whole system.

Currently, the proportion of farm households growing maize and sorghum crops for subsistence remains high but nearly all households are incorporating drought tolerant varieties of both crops. In other words, there is no replacement of the traditional varieties, which still have some advantages, but the panel of cultivated varieties has been diversified, which allow to minimise the risks of no harvest in case of negative pattern of rainfall for one specific variety. In any given year, at least one half of all households monitored in Nyando now combine the cereals with legumes. Overall, less than six percent of households will sell crop produce therefore most of what is produced in consumed on-farm.

More recently the portfolio of crops proposed to the farmers have also been diversified, including pigeon pea (leaves can be a fodder for small ruminants), mosaic resistant cassava, sweet potatoes, tissue culture bananas resistant to bacterial wilt and mangoes/pawpaw trees.

Following participatory assessment in 2011, resilient breeds of Galla goats and Red Maasai sheep were introduced by ILRI. The aim was to cross selected Galla goat and Red Maasai sheep with the small local East African breeds for resilience. The cross breeds mature earlier compared to the local breeds. Female Galla goats show good milking ability and may often continue to breed for up to 10 years. In the local markets, they may attract up to three times the price of the local breeds. The Red Maasai sheep is a breed reared for meat and is renowned for its faster growth, resistance against internal parasites, and good tolerance to trypanosomes, drought and heat stress. It also takes less time and labour to raise small ruminants compared to large cattle, and the meat and milk gains of small ruminants far exceed cattle because they have shorter reproductive cycles and maximize grass and fodder use from grazing sheep and browsing goats.

The direct impact in the villages is clearly established. Six years after the first introductions, around half of the herd has shifted to cross breeds. At this rate, it is anticipated that the current total population sheep and goats (on average 57% of households keep sheep and goats) in the 106 villages could be replaced by new Galla and red Maasai crosses in the next five years.

In the case of the goats and sheep, the system seems to be moving towards a real replacement of the traditional breeds by the new ones, although it is not completely sure that some of the existing extensive rearing systems may not remain outside of this movement (the monitoring system does not allow to have specific data disaggregated for the various types of farmers' strategies). What is sure however is that the change of breeds strongly encourages changes in the feeding system; more supplementation is required which can be given under the form of cut and carry forage, including irrigated forage and tree branches during the dry season. The progresses in precocity and productivity do have a cost in terms of labour management strategies and agroforestal resources use, but this is less documented since the monitoring and evaluation system is poorly adapted to understand the complex mechanisms of change.

However, the extension of the challenges identified leads to extend the range of actions that are supported by the CCAFS. The development of agroforestry (initially for providing the fodder to the new breeds during the dry season), the rainwater harvesting

and the irrigation practices (following a spontaneous movement by certain local farmers) were added to the range of interventions. The CCAFS now nicely presents the catalogue of the actions done by identifying six major leverages of intervention:

- Weather-Smart (seasonal weather forecast and agro-advisory services);
- Water-Smart (rain water harvesting and soil erosion control);
- Carbon-Smart (agroforestry, fruit and fodder trees and waste management);
- Crop-Smart (short term cereals, legumes, tubers and fodder crops, and improved cultivation practices),
- Livestock-Smart (breeds and rearing practices, community para-veterinary),
- Knowledge-Smart (collective action groups and farmer-to-farmer learning).

Without entering in the details of each family of interventions, but rather looking at the impact pathways, three observations can be done at this stage.

1. Whatever they address crops or small ruminants, the first actions in the CSV in Nyando have thus been technical oriented, and focused on delivering improved varieties and breeds, a domain where the CGIAR more easily the know-how. This has certainly been successful in terms of adoption (all surveys since 2015 indicate that around 90% of the households have partly used the proposed crop materials, whereas the improved animal breeds impact 80% of them), but this does not mean that this was the only impact pathway.
   Indeed, in the meantime, the systems in Nyando have also experienced another trend of change: the development of land improvements when some farmers started to build dams and reservoirs for storing the run-off waters and storing them until the next rainy season, or getting equipped for pumping water from the river or even from the underground. When the water becomes available for farming in the dry season, many changes become possible: fodder cultivation for a herd of improved breeds of sheep, but also cultivation of fruit crops (mangos and papaya), special cash crops, or intensive production of bananas, beans or vegetables… The land use is totally transformed.
   Since it was not at its origin, the CSV project seems to have not immediately realised the potential of innovation that was carried by this movement of intensification. The baseline survey in 2011, mostly focused on descriptive statistics, did not raise any mention of it. The CSV started to support that movement only when it appeared to raise the opportunities for distributing seeds or extending the breeds of animals. Still it remains ignored as a topic of research for evaluation, and it is still outside the range of financial systems that CCAFS has supported to help with the scaling up of the innovations.

   Such movement is certainly not as general as the adoption of the short cycle varieties and other species: not more than 10% of the households only have yet started such development. But when it is done it has revolutionary impact in the sense that it does not only allow marginal adaptation to the reduction of the length of the rainy season, it totally changes the farming systems with completely different levels of productivity. Starting from this dynamic, which is certainly to be extended widely in the future, under the pressure of the growing population and need of intensification, could have been a *different impact pathway* in the same area.

2. In the programme actually put in place in the Nyando villages, innovations did not come from the CSA themselves, as all of these varieties and breeds did exist long before the CSV started. It did not come either from the methods of introduction themselves, since participatory and community based approaches were already rather common among the good NGOs when CCAFS started. What has been original is certainly more the *combination of all these technological supplies* at the same moment all *together* with the appropriate participatory

methods of intervention.
Offering a wide array of technological choices presents two main advantages compared to the previous sectoral approaches that were extended before, including in the same area:
- in front of the diversity of the farming systems, there is more often one option that may be adapted to each particular farming system case. The participation can be inclusive, everyone finding his (her) own advantages, which avoids generating social oppositions within the community ;
- the multiplying effect, the innovations having more impact when they can be combined than the addition of their individual results (f.i. fodder species and irrigation and fertilisation…).

3. The more the impact progresses, the more the questions that are raised for the applied research become complex to serve at best the movement of change. Since all the innovations require more of at least one resource of the farm/household system, the final questions need to address the management of these resources. Initially limited to analysing the *quantitative impact of the outputs* (the extension of the number of the users and the technical results - growth/prolificity/yields- obtained), the associated research had first to be extended into the *modalities of the change* (how the new breeds were reared) to finally get up to *management questions*. In other words, questions are no longer "*how can the variety or the breed that the project proposes to be cultivated or reared at best for having the highest impact (with diverse criteria of impact)?*" but rather: "*Given the resources available at the farm/household level, what is the best allocation of these resources that can fulfil the social/economic objectives of the households which are themselves diverse"*, which is far more complicated to handle. This has immediate consequences on the methodological side (for the M&E system, so that it can respond to these new questions) as well on the institutional side, in terms of partnership (the partners having the capacity of handling the first questions at the beginning may not have the capacity to continue on the last ones at the second or third stages).

Social organisations and institutional development

Beyond the technical innovation at the household level, institutional changes have also occurred with the support of the CSV. Three strong community based organizations (CBO) are now also operating in the initial seven villages: – the Friends of Katuk Odeyo (FOKO), North-East Community Development Programme (NECODEP) and Kapsokale. They expand collective action for agricultural innovations in investments from rural savings, table banking schemes and loaning from revolving funds. They are umbrella to a number of mixed farmer, women and youth groups. More than 80% of these are indeed women or youth below the age of 25.

Most of these groups were formed for the purposes of pooling financial resources through Rotating Savings and Credit Schemes, along a model that had started to be tested before CCAFS arrived.. In addition, the CBOs have set up experimental and demonstration plots that showcase greenhouse farming and solar-drip irrigation involving horticultural crops, legumes, fruit crops and fodder production, fisheries and apiary. They also undertake seed multiplication for the community in the open field demonstration plots, and farmers receive training via field days and trade fairs through the CBOs. These community groups can provide a platform for innovative partnerships for new knowledge and skills. Through the groups, new technology can be tested and, in return, be used for demonstration purposes. The groups also provide effective avenues for members to pool financial resources for savings, administer innovation funds, provide farm labour and enhance efficient delivery of extension services and farm inputs.

In partnership with Maseno University during a period, The CBOs have facilitated access to climate information, benefiting about 70% of farmers to make on-farm decisions. However the reduction of the funding from 1995 seems to have put an end to the partnership with Maseno, which is certainly regrettable[30].

This social organisation through CBOs and development groups is not either totally new. The CCAFS built in Nyando on villages where previous actions of community development had already been led by local and international NGOs[31]. But this was clearly extended and deepened by the opportunities offered by the CSV project: in 2011, when the baseline study was done, 17 "groups" only were identified and 20% of the respondents reported to belong to a group. Now, the number of groups has more than doubled up to 55 with membership moving up from 306 to 1800 households. Lending activity is the major engine for mobilizing these groups, while individual females and youth have difficulties, in the traditional society, to access loans from money lenders, and even more from the formal banking system. The solidarity collateral mechanisms inside the development groups create totally new opportunities to borrow funds and to develop an individual activity. More than 120000 US$ are said to be now available in a community innovation fund (compared to 14000 in 2011), and about 90% of the farmers have borrowed from the fund The leading uses for the loans include purchase of food, procurement of farm inputs, payment of school fees and start up for small trade.

In partnership with a local enterprise of the town of Kisumu, the CBOs have also set up a local Agrovet shop to enhance access to high quality inputs at affordable prices. This has reduced the number of farmers using non-certified seeds by up to 50%.

The outcomes and the mechanisms for impact : the role of Monitoring & Evaluation

While monitoring and evaluation data from Nyando indicate that these CSV activities may have led to improved livelihoods (e.g. the proportion of food secure households improved from 1.4% to 9.7% between 2011 and 2016), the broader impacts on food security, resilience and adaptive capacity of the smallholder communities in these CSVs has not been characterised.

Such quantification of impacts is important for identifying the viable components for replication and scaling up.

A recent study was undertaken to compare the seven CSVs' situation to the one of "similar" villages, in the same region, assumed to be in the same agroecological and socioeconomic conditions than the seven Nyando villages so that to have a baseline situation to be compared with. This happened to be necessary since the M&E data since the "baseline study" done in 2011 were collected only for the "participating" households, and thus not suitable for impact assessment.

The results of this study are not published yet, but the data are there. It is at least possible to look at the relevance of the information that will result from this work, compared to the objectives of:

(i) measuring the economic impact on the households economies,
(ii) better understanding the mechanisms of adoption and transformation of the farming systems and of the livelihood that lead to these economic result,

[30] And in contradiction with recommendation coming from the lessons learned on the other CSVs , like in Senegal, where it is clear that there is a multiplier effect between the meteorological information services and the other services to intensification.
[31] For example VI agroforestry, which was already working in Nyando when CCAFS started and which, since then, has been contracted by CCAFS to employ the project's technical staff.

(iii) generating empirical evidence on the determinants of adoption of adaptation practices, impacts of adoption, be it of a single or a combination of multiple CSA technologies and practices,

(iv) use the evidence to develop a knowledge framework that matches different CSA technologies with biophysical and socio-economic and socio-cultural characteristics of characteristics of different agro ecological conditions.

First, one regrets that the baseline done in 2011 was so much limited to a series of descriptive statistics of the villages and of the households, without any qualitative elements on the organisation of the farming and livelihood strategies in place – with the range of diversity highlighted, instead of desperately calculating mean values and their standard deviation. Only such a picture of the diversity would have allowed using these results as a description of the situation at the start of the action, and a basis for the analysis of the changes in the following steps.

This remark and comment was already done following the previous CCAFS evaluation in 2012 (based on the Ghanaian CSV), but unfortunately no correction was brought. The result is that the 2011 baseline is now almost totally useless, both for the objective of impact measurement and for the objective of comprehensive analysis of the dynamics of change.

Second, the last study recently done will allow to precisely measure the economic differences between the sample of monitored farms in the CSVs (what is called the "adopters") and the sample in the non CSV farms. It will highlight a number of correlations between variables between the two groups.

The promoters of the innovations (the CCAFS team) tend to consider that a demonstrated correlation between a variable measuring adoption and an economic result can demonstrate that first explains the second. However, this can be wrong in many cases (a correlation is not an explanation). For example, in the case of Nyando, the results show that, at the household level, adoption of drought-tolerant crop varieties goes together with an increase of income of about USD 140 per adult. This may be that the adoption has generated better income, but it can also be that the adopters have adopted just because they had more income due to another activity that they pursued. This is to highlight that the results of such surveys give indications, but that these indications have to be triangularised with other observations to get the status of an established linkage.

The only way to overcome this limitation is that, together with the type of quantitative surveys of the type undertaken by CCAFS, other (empirical) observations can systematically be organised, on a more qualitative basis, to confirm the explicative correlations. Or, more often, these empirical observations will help to formulate the relevant assumptions of linkages that the quantitative survey will confirm.

The results show that drought-tolerant crops and improved small ruminants had significant impact on welfare outcomes. Farmers adopting drought tolerant crop varieties and improved small ruminant livestock breeds had access to more types of food and accumulated more household assets than the non-adopting households. These results can either indicate that these CSA technologies are successful in helping households to increase their income or either that the richer farmers more easily adopt than the poor. Actually qualitative observations tend to suggest that both mechanisms happen to be true at the same moment!

In such circumstances, we strongly recommend that CCAFS complements its analysis by a dynamic assessment of the farming systems involved in the current changes. Building a typology of these systems could help the various sectoral studies to refer the same diversified set of farmers systems and strategies which would also be scientifically

sounder than the current reference to a virtual "mean" Nyando farmer who does not really exist.

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To conclude, the Nyando case confirms that active **dynamics of change** (intensification, organisation) are in place although it is impossible to say whether they are adaptation strategies in front of CC, or in front of other drivers of change (demographic pressure, reduction of the size of the holdings, new social needs, different market opportunities….).

These dynamics of change are more and more complex to analyse in order to highlight the impact pathways. A seven years long intervention as the Nyando CSV now raises much **more complex questions (systemic and integrative)** on the processes of change than younger interventions, or than what was raised at the beginning of the CSV. The innovations supported are individually not really "new", but **what is new is the combination and the integrative processes.** The dynamics on land development may carry the most significant impact socially and economically, while they are not the most considered in the M & E and in the associated impact oriented research. **CCAFS is obviously more comfortable on the conventional innovations** (breeding…) than on the integrated ones (land management), whereas climate concerns rise more challenges on integrated knowledge than on analytical and sectoral questions. By putting different partners in charge of the different programmes, the managerial framework of the CSV increases this risk. All levels of research questions cannot be handled through partnerships, and direct involvement of the CCAFS remains mandatory, especially for handling the M &E of processes of change in complex systems.

Finally, once the dynamics of change will have been clarified, the question of the "scaling out" will soon be raised. The success of the first innovations promoted in the CSVs, and the existing dynamics on the land development, will contribute to put CCAFS under pressure for building, or helping to build, a larger development project at the scale of the basin. If it is certainly recommended that a research programme like CCAFS manages such an extension, it would certainly be wise to envisage from now the operational framework in which this could be prepared.

A4. Acronyms used

(*: Senegal specific, ** Kenya specific)

ACPC	African Climate Policy Centre
AGN	African Group of Negociators
AGRHYMET	Regional Centre for Training and Application of Agrometeorology and Operational Hydrology
ANACIM*	National Civil Aviation and Meteorology Agency of Senegal
ANCAR*	Agricultural and rural advisory national agency
ARD*	Regional Development Agency
ASAP	Adaptation in Smallholder Agriculture Program
AWD	Alternate Wetting and Drying
BRAS-PAR	Building Resilient Agro-Sylvo-Pastoral systems in West Africa through Participatory Action Research
C-CASA*	Platform for a science-policy dialog for a Climate Smart Agriculture
CC	Climate Change
CCAFS	Climate Change Agriculture and Food Security
CI	Climate Information
CIAT	International Center for Tropical Agriculture
CIMMYT	International Maize and Wheat Improvement Center
CINSERE*	Information Services for Increased Resilience and Productivity in Senegal
CIRAD	French Agricultural Research Centre for International Development,
CIS	Climate Information Services
COMESA	Common Market for Eastern and Southern Africa
COP	Conference Of Parties
CRP	Consortium Research Program
CSA	Climate Smart Agriculture
CSV	Climate Smart Village
CU	Coordination Unit
Dairy NAMA	Dairy Nationally Appropriate Mitigation Action
DFID	Department for International Development
E&F*	Water and Forestry Service
ECOWAS	Economic Community of West African States
ENACTS	Enhancing National Climate Services

ESSP	Earth Systems Science Partnership
FAO	Food and Agriculture Organization
FMNR	Farmer Managed Natural Regeneration (RNA in french)
FO	Farmer organization
FP	Flagship Project
FtF	Feed the Future
GACSA	Global Alliance on Climate-Smart Agriculture
GCF	Green Climate Fund
GDP	Gross Domestic Product
GFCS	Global Framework for Climate Services
GHG	Creen House Gas
GRA	Global Research Alliance on Agricultural Greenhouse Gases
ICRAF	World Agroforestry Centre
ICRISAT	International Crops Research Institute for the Semi-Arids Tropics
IED Afrique*	Innovations, Environment, Development
ILRI	International Livestock Research Institute
INDC	Intended Nationally Determined Contribution
IPCC	Intergovernmental Panel on Climate Change
ISRA*	Senegalese Institute of Agricultural Research
IUCN	International Union for Conservation of Nature
IWMI	International Water Management Institute
KALRI**	Kenyan Agricultural and Livestock Research Institute
M&E	Monitoring and Evaluation
MARLO	Managing Agricultural Research for Learning and Outcomes
MGW	Multidisciplinary working group (=GTP in French)
ML&E	Monitoring Learning and Evaluation
MoALF**	Ministry of Agriculture, Livestock and Fisheries
NAP	National Adaptation Plan
NARES	National Agricultural Research and Extension Systems
NEPAD –	New Partnership for Africa's Development
NRM	Natural Resource Management
PAR	Participatory Action Research
PICSA	Participatory Integrated Climate Services for Agriculture
PMC	Program Management Committee
RBM	Results-Based Management

SBSTA	Subsidiary Body for Scientific and Technological Advice
SSP	Shared Socio-economic Pathways
ToC	Theory Of Change
UNFCCC	United Nations Framework Convention on Climate Change
URAC*	Union of Community and Associative radios
USAID	United States Agency for International Development

A5. Programme of the mission and persons met

Joint mission to the CCAFS headquarters in Wageningen : August 23, 2018

Participants : Agrinatura : Marie-Jo Dugué & Didier Pillot

CCAFS : Bruce Campbell, Anette Friis, Marissa van Epp

Programme of the Senegal mission (Marie-Jo Dugué)

Date	**Time**	**Activity**
Friday 24th August 2018		Travel from Paris to Dakar
Saturday 25th August 2018		Literature review
		First meeting with Mathieu Ouedraogo
Sunday 26th August 2018		Working session with Mathieu Ouedraogo (review of the workplan for the 2 weeks) Literature review
Monday 27th August 2018	Morning	-Meeting with ISRA team: Diaminatou Diakhite, Moussa Sall, Mohamadou Diop -Meeting with Ousmane NDiaye ANACIM
	Afternoon	Meeting with CINSERE (Issa Ouedraogo, Seynabou Diouf)
Tuesday 28th August 2018	Morning	Travel to Kaffrine
	Afternoon	Meeting with Deputy Major Meeting with Lieutenant DEME (Water & Forestry Admin.)
Wednesday 29th August 2018	Morning	Visit to the Préfet of Birkelane Meeting with ADR Director
	Afternoon	Meeting with El Hadji DIABY and Mariam KEITA, farmers from Sikilo village, users of CI services
Thursday 30th August 2018	Morning	Meeting with IED/Afrique staffs in Kaffrine who implement the Decentralised Climate Funds project Discussion with Responsible of Agriculture service Discussion with Paul Marie Sene, ANCAR (extension service) staff and facilitator of the Daga Birame PF
	Afternoon	Meeting with producers (3 women, 4 men) in Darou-Nandjigui, a village close to Daga Birame, but not involved in CSV activities neither in CI
Friday 31st August 2018	Morning	**Visit to Daga Birame** Visit of activity sites presented by members of the related committees: protected area, ANR, Domestication of fruit trees, farmer field school
	Afternoon	Presentation of the processing activity by the secretary Presentation of the platform by the president Discussion with village association members and platform members (around 20 men and 40 women)
Saturday 1st Sept. 2018		Travel to Dakar
	Night	Debriefing with Diaminatou Diakhite, CSV Focal point

Sunday 2nd Sept. 2018		Working on documentation and Reporting
Monday 3rd Sept.2018	Morning Afternoon	URAC (community radios): Discussion with the president Reporting
Tuesday 4th September 2018	Morning Afternoon	Ministry of Agriculture: Meeting with the coordinator of the C-CASA platform ANACIM: Meeting with CIS Focal point
Wednesday 5th September 2018	Morning Afternoon	Working session with Mathieu Ouedraogo about M &E Discussion with Seynabou Diouf about M&E (CINSERE)
Thursday 6th September 2018	Morning Afternoon	Discussion with Mohamodou Diop, ISRA assistant Debriefing session (skype) with Robert Zougmore
Friday 7th September 2018	Morning Afternoon night	Discussion with Henri Lo about the impact study implemented in 2014/2015 Reporting Return flight to Paris
Saturday 8th September		Train to Montpellier

Persons met

CCAFS West Africa Regional team

Mathieu OUEDRAOGO
Agro-economist
Patricipatory Action research specialist
ICRISAT, Bamako

Email: M.ouedraogo@cgiar.org

Meeting with ISRA CCAFS partnering team

-Mrs Diaminatou DIAKHITE SANOGO
Ecology specialist
Chief of Forestry department ISRA
CCAFS CSV Focal point
Email: sdiami@yahoo.fr

-Mr Moussa SALL
Agro-Economist ISRA BAME
Responsible of CCAFS CSV ML&E
Email: gaban_sn2000@yahoo.fr

-Mr Mohamodou DIOP

Geography specialist
Assistant Forestry department ISRA
CCAFS CSV Assistant

-Mr Baba Ansoumana CAMARA
PhD Student (theme related to impact of CSV activities)
ISRA Dakar Han
Email: ansou1988@yahoo.fr

Meeting with ANACIM -Mr. Ousmane NDIAYE Climatologist ANACIM Dakar CIS Focal point Email: ondiaye70@gmail.com ousmane.ndiaye@anacim.sn
Meeting with CINSERE Project team -Mr Issa OUEDRAOGO Project Coordinator ICRISAT, based in ANACIM Dakar Email: I.Ouedraogo@cgiar.org -Mrs Seynabou DIOUF M&E manager ICRISAT, based in ANACIM Dakar Email: S.Diouf@cgiar.org
Individual discussions in Kaffrine and region -Mr Aliou DIA Deputy Major, in charge of development Darou Nandjigui -Lieutenant DIEME Chief of Departmental Water and Forestry Service Birkelane -Mr Saïd DIA Prefect Birkelane -Mr Samba Faye DIOP Director, regional Agency for Development Kaffrine -Mr Cheikh DIOUF Chief of Departmental Agriculture Service Kaffrine -Mr Paul Marie SENE Extensionist ANCAR (Mabo) Kaffrine Email: paulmarie66@yahoo.fr
Meeting with IED Afrique team - M Papa Souleymae Koulibaly Coordinator IED AFrique Kaffrine Email: papakoulibaly@gmail.com - M Seydou Waly DIEYE - M Hamédine DIOUF

- Mrs Sokhna DIENG
Field visit to CIS relay farmers in Sikilo village -M El Hadji DIABY -Mrs Mariama KEÏTA
Meeting in Darou Nandjigui - M Abdou GUEYE) - M Serigne DIA) - M Papa NDAO) - Mrs Ndeye SEGNANE) Farmers - Mrs Gass DIA) - Mrs Aïcha DIA) - MrsYacine NDAO)
Climate Smart village Daga Birame : field visit then meeting with farmers involved in CSV activities - M Ousmane THIALL president of the platform - 40 female farmers - 20 male farmers
Meeting with UCAR - M Talla DIENG UCAR President Dakar Email: Diengtalla05@yahoo.fr
Meeting with C-CASA - **M** Bounama DIEYE Ministry of Agriculture National coordinator of the C-CASA platform Dakar Diamniadio Email: bounama1968@gmail.com
Individual discussion - M Henri Mathieu LO Responsible of training and CS department, Ministry of Environment President of GAIA (NGO) Consultant (led the CIS Impact assessment study in 2015) Email: henrimathieulo02@gmail.com

Skype discussion

- M Robert ZOUGMORE
CCAFS Region leader
ICRISAT Bamako,
Email: R.Zougmore@cgiar.org

Programme of the Kenya mission

Date	Time	Activity
Friday 31st August 2018		Travel from Montpellier and arrival at Nairobi
Saturday September 1st 2018	Morning	Meeting with Prof Adipala Ekwamu, Ruforum executive secretary (Kampala)
	Afternoon	Meeting with John Recha and Charles Odhong – Discussion and review of the work plan for the 10 days presentation by CO of the Dairy NAMA programme
Sunday 2 nd September 2018	All day	Literature review
Monday 3rd September 2018	Morning	Dairy NAMA programme: Meeting with State Department of Livestock, Ministry of Agriculture, Livestock and Fisheries, Nairobi
	Afternoon	Dairy NAMA programme: Meeting with Kenya Dairy Board, on Nairobi
Tuesday 4th September 2018	Morning	Dairy NAMA programme: Field visit to Takamoto Biogas -Githunguri, in Kiambu County
	Afternoon	Travel drive to Nakuru
Wednesday 5th September 2018	Morning	Dairy NAMA programme: Field visit to Rift Valley Hay Growers Association -Nakuru county
	Afternoon	Field visit to New Kenya Cooperative Creameries, Molo in Nakuru County
Thursday 6th September 2018	Morning	Road drive towards Nyando (western Kenya) from Nakuru Climate Smart villages -Nyando (western Kenya):
	Afternoon	Field visit to farms with diverse CSA-activities: • Improved small ruminant (sheep & goats) breeding and management • Agroforestry and livestock fodder • Improved beekeeping • Smart-farms with greenhouse, water harvesting and solar powered micro-irrigation system for horticulture & field crops • Soil and Water conservation activities
Friday 7th September 2018	All day	Climate Smart Villages -Nyando (western Kenya) • Meeting with Kenya Agricultural and Livestock Research Organization (KALRO) -Kibos Centre in Kisumu County (research partner) • Meeting with Kisumu County [Nyakach Sub-County] Department of Agriculture, Livestock & Fisheries (extension services partner) • Meeting with Kericho County [Soin Sigowet Sub-County] Department of Agriculture, Livestock & Fisheries (extension services partner) • Meeting with Vi Agroforestry (extension services partner) • Meeting with Magos Farm Enterprises (private sector)

Saturday 8th September 2018	All day	Climate Smart Villages – Nyando (Western Kenya) • Meeting with Women Groups and Youth Groups implementing CSA-activities and Village Savings Schemes • Meeting with Umbrella Community Based Organization (CBO) Leaders from Kericho and Kisumu Counties
Sunday 9th September 2018	All day	Flight back from Kisumu to Nairobi Preparation of the Feed Back session with John Recha
Monday 10th September 2018	Morning Afternoon	Preparation of the Feed Back session Feedback session at ILRI-Nairobi campus: Meeting the UNIQUE forestry and land use team and CCAFS East Africa team in Kenya

Persons met

John Recha (PhD) Participatory Action Research (PAR) Specialist, CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS), East Africa, International Livestock Research Institute, P. O. Box 30709 - 00100 Nairobi, Kenya Email: j.recha@cgiar.org Tel: +254 20 422 3449 Mobile: +254 721 264936 Charles Odhong (PhD) Unique Forestry and Land use Charles.Odhong@unique-landuse.de Mobile: +254 721 541257
Meeting with State Department of Livestock. The Ministry of Agriculture, Livestock and Fisheries Mr. Robin Mbae Ministry of Agriculture, Livestock and Fisheries Deputy Director, Livestock Production (Climate Change Unit) P.O. Box 34188 Nairobi Email: robinmbae@yahoo.com Cell: +254 722 381931
Meeting with Kenya Dairy Board Mr. Kituto Kitele, Dairy Inspector Kenya Dairy Board P.O. Box 30406 -00100 Nairobi Email: kituto.musyoki@kdb.co.ke; kkitele@gmail.com cell: +254 712625822, +254 717 997456 Mr. Joshua Kibuka Standard & Enterprise Development Officer Kenya Dairy Board P.O. Box 30406 -00100 Nairobi Email: Joshua.kibuka@kdb.co.ke Cell: +254 727104285

Field visit to **Takamoto Biogas** - in Kiambu County

Mr. Harrison Ikunda
Manager,
Email: hm.ikunda@gmail.com
Cell: +254 784401300

Ms. Margret Wangare
Manager, Fundraising Outreach and Networking
Takamoto Biogas
Email: info@takamoto.org
Cell: +254 786 547129

In addition, made a field visit to Biogas farmer in Githunguri area of Kiambu County.

Field visit to Rift Valley Hay Growers Association, Nakuru county
P.O. Box 247 -20100 Nakuru
Email: rifthaygrowers@gmail.com
Office: +254 742 641692; +254 715 906955

- Mr. Noah Chemirmir (Chairman. Cell: +254 710289933)
- Mr. Joseph Thiga Karuiki (Vice Chair. Cell: +254 722 735735)
- Mr. Enock Kiptoo (Secretary. Cell: +254 725 948208)
- Mr. Joseph Njoroge (Vice Secretary. Cell: +254 725 201351)
- Mrs. Mary Ngetha (Treasurer. Cell: +254 720 044932)
- Mr. Waweru Nyangi (Coordinator. Cell: +254 722 602942)
- Ms. Angela Wangeci (Manager. Cell: +254 727 084679)
- Mr. Wycliffe Murunga (General office and Sales. cell: +254722937638)

Field visit to **New Kenya Cooperative Creameries**, Molo in Nakuru County

Mr. Raphael Mugo
Extension Coordinator.
New Kenya Cooperative Creameries Molo Plant
Cell: +254 729527673

Mr. Samuel Musembi
Plant Manager, New Kenya Cooperative Creameries Molo Plant
Cell: +254 734023412; +254 720123412

Climate Smart villages -Nyando
Field visit to farms with diverse CSA-activities:

- Improved small ruminant (sheep & goats) breeding and management
- Agroforestry and livestock fodder
- Improved beekeeping
- Smart-farms with greenhouse, water harvesting and solar powered micro-irrigation system for horticulture & field crops
- Soil and Water conservation activities

Climate Smart villages -Nyando

Meeting with **Jimo Ogwedh Self Help Women Group** implementing CSA-activities and Village savings schemes. A total of 24 women participated in the event.

- Rose Onyango
- Judith Okwaro
- Selestine Opiyo
- Lyne Ochieng
- Faith Omolo

- Maren Oburu
- Teresa Otieno
- Caroline Awiti
- Beatrice Oyugi
- Consolata Ojuka
- Irine odongo
- Sharon Oloo
- Margaret Otieno
- Pamela Omwandho
- Pauline Odhiambo
- Monica Opaya
- Grace Ochieng
- Roseline Omondi
- Pamela Ouma
- Rose pudo
- Margaret Obala
- Seline Awiti
- Pamela Otieno

Meeting with **Kisumu County** [Nyakach Sub-County] Department of Agriculture, Livestock & Fisheries (extension services partner)

- Ms. Enice Anyango (Nyakach Subcounty Agricultural Officer. Email scaonyakach@gmail.com. Cell +254713081330)
- Ms. Gladys Nyanchama (Ward Agricultural Officer, Nyakach Subcounty. Email glany2005@yahoo.com. Cell +254723746335)
- Mr. John Robert Ouko (Nyakach Subcounty Agribusiness officer. Email robertojohn57@gmail.com. Cell +254716438938)
- Mr. Brian Bodo (Nyakach Subcounty Livestock Officer. Email mifugonyakach@yahoo.com. Cell +254714732763)
- Mr. Josephat Ochieng Juma (Agricultural Intern)

Meeting with **Kericho County [Soin-Sigowet Subcounty] Department of Agriculture, Livestock & Fisheries** (extension services partner)

- Mr. Reuben Chirchir -Subcounty Agricultural Officer. Email chirchir.reuben@yahoo.com. Cell +254729081777)
- Ms. Josphine Timdo. Subcounty Livestock Officer. Email josephinetimdo@gmail.com. Cell +254726916476)
- Francis Kurgat -Ward Agricultural Officer, Soin-Sigowet Subcounty. Cell +254723231151)

Afternoon:
Meeting with **Kenya Agricultural and Livestock Research Organization (KALRO)** -Kibos Centre in Kisumu County (research partner)

- Dr. John Ojiem. Centre Director. Email johnojiem@gmail.com. Cell +254735531391 and
- +254710335830)
- Mr. Newton Okech. Deputy Centre Director. Email okechjno@yahoo.com. Cell +254722252683)
- Mr. Aore Wilson (Soil Scientist Research Officer. Email waore42@gmail.com. Cell +254707170521)
- Mr. Paul Omolo (Soil Science Research Officer. Email ochiengomolo@gmail.com. Cell +254722656483)
- Dr. Mary Oyunga (Crop Scientist. Email - oyungam2010@gmail.com)
- Ms. Davine Ondede. (Communications Officer. Email - davineloycer@gmail.com)
- Ms. Teresa Okiyo (Crop Breeding Officer. Email – tokiyo2006@yahoo.com)

Youth Groups implementing CSA-activities in Kericho and Kisumu County

- Rosemary Omae
- Caroline Langat
- Vincent Koros
- Tony Kemboi
- Dainel Orwa
- Fredrick Odoyo
- Remmus Odhiambo
- Shem Odhiambo
- Duncan Ogwang
- Scolarstica Odiambo
- Elizabeth Adhiambo
- Okello Were
- Jacob Owuor
- Stephen Matinde
- Joshua Omollo

FOKO-CBO Leaders from Kisumu County

- Michael Awuor Ogara
- John Omondi Obuom
- Margaret Adero Kiswa
- Elizabeth Bodo Okello
- Luca Ochieng Oluoch
- Emma Akinyi Abok
- Pamela Akoth Pedo
- Peres Anyango Owiti
- Edward Ouko
- Elizabeth Olum
- Carren Onyango
- Caroline Atieno Odera

Magos Farm Enterprises

Mrs. Beatrice Odongo
Magos Farm Enterprises
P.O. Box 9167 - 40100 Kisumu
Tel: +254720246357, +254707071224, +254725041987
Email: magosfarm@gmail.com

CCAFS and ILRI at Nairobi office

- Dr. Dawit Solomon (CCAFS East Africa Regional Program Leader)
- Dr. Maren Radeny (CCAFS East Africa Science Officer)
- Dr. John Recha (CCAFS East Africa Participatory Action Research)
- Ms. Catherine Mungai (CCAFS East Africa Partnerships and Policy)
- Mr. Ayalneh Mulatu (CCAFS East Africa Assistant to Program Manager)
- Mr. Gebermedihin Ambaw (CCAFS East Africa Research Associate)
- Dr. Julie Ojango (ILRI Livestock Breeding Scientist)
- Mr. James Audho (ILRI Livestock Breeding Technician)
- Ms. Winfred Sila (ILRI Livestock Breeding Technician)

A6 - Selected references from literature reviewed

CCAFS, 2012 Consolidated logframe of activities 2012-2015 https://ccafs.cgiar.org/publications/consolidated-logframe-activities-2012-2015#.W6EgipMzZR0

CCAFS, 2013 Climate Change, Agriculture and Food Security, with a focus on East and West Africa Full Proposal Programme Year 2013-2015

CCAFS, 2015 Final Technical Report. Project Title: Climate Change, Agriculture and Food Security (CCAFS), with a focus on East and West Africa

CCAFS, 2016 CGIAR Research Program on: Climate Change, Agriculture and Food Security; Full Proposal 2017-2022

CIRAD, ICRAF, 2018 Assessing impacts of climate information services in Senegal through a systemic evaluation at the institutional and farmer level; Project proposal

Bayala J., & al 2018. Methodological Guide: Community participatory inventory and prioritization of climatesmart crop-livestock-agroforestry technologies / practices. ICRAF Technical Manual. Nairobi: World Agroforestry Centre

Dinesh, D., & al, 2018 Facilitating Change for Climate-Smart Agriculture through Science-Policy Engagement, *Sustainability 2018, 10, 2616*

Partey, S.T., & al, 2017 Developing climate-smart agriculture to face climate variability in West Africa: Challenges and lessons learnt *Journal of Cleaner Production 187 (2018)*

Aggarwal, P.K. & al, 2018 The climate-smart village approach: framework of an integrative strategy for scaling up adaptation options in agriculture *Ecology and Society 23(1):14*

Richards, M., & al 2015 How countries plan to address agricultural adaptation and mitigation *CCAFS Info Note*

Hedger, M., & al, 2015 Progress on agriculture in the UN climate talks How COP21 can ensure a food-secure future *CCAFS Info Note*

Meadu,V. & al 2015; The Paris Climate Agreement: what it means for food and farming *CCAFS Info Note*

Förch et al. Back to baselines: measuring change and sharing data *Agriculture & Food Security 2014, 3:13*

Anderson, S. & al, 2016 Evaluation of the CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS)

Wollenberg, E. & al, 2016 Assessment of Climate Services work by the CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS) *Global Change Biology (2016) 22, 3859–3864,*

Thornton, PK, & al, 2017 Responding to global change: A theory of change approach to making agricultural research for development outcome-based *Agricultural Systems 152 (2017) 145–153*

Abdoulaye T, & al 2017 Smallholder farmers' perceptions and strategies for adaptation to climate change in Brong Ahafo and Upper West Regions of Ghana. *CCAFS Working Paper no. 207.*

Ash, A., 2013 Managing the CCAFS Theme by Region matrix for international public goods and development outcomes

Zougmore, R., & al, 2018 Facing climate variability in sub-Saharan Africa: analysis of climate-smart agriculture opportunities to manage climate-related risks *Cah. Agric. 2018, 27, 34001*

Senegal

Climate Information Services

Lo, H.M, Dieng, M, 2015 Impact assessment of communicating seasonal climate forecasts in Kaffrine, Diourbel, Louga, Thies and Fatick (Niakhar) regions in Senegal. Final Report for CCAFS West Africa Regional Program Available online at: www.ccafs.cgiar.org

CCAFS. 2015. The impact of Climate Information Services in Senegal. CCAFS Outcome Study No. 3. Copenhagen: CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS). Available online at: www.ccafs.cgiar.org

Ouedraogo, I., 2018. Closing the Gap between Climate Information Producers and Users: Assessment of Needs and Uptake in Senegal *Climate 2018, 6, 13;*

Dayamba, D.S., & al Assessment of the use of Participatory Integrated Climate Services for Agriculture (PICSA) approach by farmers to manage climate risk in Mali and Senegal *Climate Services (2018)*

CSV

Yacine, N., & al, 2011, Summary of Household Baseline Survey Results : Kaffrine, Senegal

Sanogo,D., & al, 2016, The Climate-Smart Village approach: what research and insights from current implementation in Daga-Birame CSV in Senegal?

Sanogo, D., & al, 2016, Modèle de village climato-intelligent : un outil de renforcement des capacités d'adpatation et de résilience des petits producteurs au Sénégal *Info Note INSAH*

Sanogo, D., & al 2017, Participatory diagnosis and development of climate change adaptive capacity in the groundnut basin of Senegal: building a climate smart village model *Agric & Food Secur (2017) 6:13*

Kenya

Dairy Nama

Wilkes A, Rosenstock TS, Namoi N, Fraval S. 2018. Suitability of project M&E systems to support agricultural MRV: The case of the Kenya dairy NAMA. CCAFS Working Paper no. 231. Wageningen, the Netherlands: CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS).

Charles Odhong', Andreas Wilkes and Suzanne van Dijk. Public private partnerships can play key roles in scaling up low emissions agriculture CCAFS East Africa Info note n° 4, May 2018

Andreas Wilkes, Suzanne van Dijk and Charles Odhong'. The potential for reduced consumption of high emission energy in Kenya's dairy sector - Assessment of technical options in milk processing plants reveals significant GHG emission reduction potential with positive benefits for costs of production, reduced milk losses and water consumption. CCAFS East Africa Info note n° 4, May 2018

Government of Kenya. 2016. Low-emission and climate resilient dairy development in Kenya. Concept note for the Green Climate Fund.

van Dijk S, Tennigkeit, T, Wilkes A. 2015. Climate-smart livestock sector development: the state of play in NAMA development. CCAFS Working Paper No. 105.

CCAFS. 2015. Scaling up climate-smart dairy practices in Kenya through Nationally Appropriate Mitigation Actions. CCAFS Outcome Case.

Gallina A. 2016. Gender dynamics in dairy production in Kenya: A literature review. CCAFS Working Paper no. 182.

Tavenner, K. and Crane, T.A. 2016. Best practice guide to socially and gender-inclusive development in the Kenyan intensive dairy sector. ILRI Project Report. Nairobi, Kenya: ILRI.

Reading University, 2014, Assessing the Impacts of Shamba Shape Up

CSVs

Radeny M, Ogada MJ, Kimeli P, Recha J, Rao EJO, Solomon D. 2018. Uptake and Impact of Climate-Smart Agriculture Technologies and Innovations in East Africa. CCAFS Working Paper in preparation..

Gbegbelegbe S, Serem J, Stirling C, Kyazze F, Radeny M, Misiko M, Tongruksawattana S, Nafula L, Gakii M, Sonder K. 2017. Smallholder farmers in eastern Africa and climate change: a review of risks and adaptation options with implications for future adaptation programmes. Climate and Development, 10(4) 289-306.

Kimeli P, Nyasimi M, Radeny M. 2017. Strengthening Farmer Adaptive Capacity Through Farms of the Future Approach in Nyando, Western Kenya. In: Filho WL et al (eds.). 2017. Climate Change Adaptation in Africa: Fostering Resilience and Capacity to Adapt. Part II. Cham, Switzerland: Springer International Publishing. pp 629-645.

Mungai C, Opondo M, Outa G, Nelson V, Nyasimi M, Kimeli P. 2017. Uptake of Climate-Smart Agriculture Through a Gendered Intersectionality Lens: Experiences from Western Kenya. In: Filho WL et al (eds.). 2017. Climate Change Adaptation in Africa: Fostering Resilience and Capacity to Adapt. Part II. Cham, Switzerland: Springer International Publishing. pp 587-601.

Nyasimi M, Kimeli P, Sayula G, Radeny M, Kinyangi J, Mungai C. 2017. Adoption and Dissemination Pathways for Climate-Smart Agriculture Technologies and Practices for Climate-Resilient Livelihoods in Lushoto, Northeast Tanzania. Climate 5(3): 63.

Recha JW, Radeny M, Kinyangi J, Kimeli P. 2017. Uptake of Resilient Crop Interventions to Manage Risks Through Climate-Smart Villages Approach in Nyando, Western Kenya. In: Filho WL et al (eds.). 2017.

CCAFS Documents

-CCAFS Climate-Smart Village Approach Synthesis of lessons learned

- Scaling up climate advisories in Senegal and Colombia *Outcome case* 2015

- CCAFS. 2015. The impact of Climate Information Services in Senegal. CCAFS Outcome Study No. 3.

- Vermeulen, S., Campbell, B., 2015 Ten principles for effective AR4D programs Strengthening individual and program behaviours to achieve outcomes in climate change adaptation and mitigation *Info Note*

Jost, C. & al 2014 Gender and Inclusion Toolbox: Participatory Research in Climate Change and Agriculture.

Climate-Smart Village Kaffrine (Senegal) *CSV Profile*

A7. The review team

Marie-Jo DUGUÉ

3 avenue des Cistes

34270 SAINT MATHIEU de TREVIERS (France)

Tel : +33 (0)4 67 59 95 12

Cell : +33 (0)6 20 68 80 86

E-mail : duguepmj@wanadoo.fr

Key qualifications

Agronomist, 64 years old, 42 years of experience

Topics: Agronomy, cropping and farming systems, resource management, land development, inland valleys development, rice cropping, Farmers' Organizations, rice and cotton sectors

Diversified Experience in training (initial training, adults' training, development of pedagogical materials), support to Farmer Organizations, facilitation of multi-stakeholders processes in rural development, evaluation

Countries worked in: Western, Central and Eastern and Southern Africa, France, Cambodia

EDUCATION

June, 1970	Baccalauréat C
June, 1975	Diplôme d'Ingénieur Agronome de l'INAPG, Diplôme d'Agronomie approfondie Mention « Sciences et Techniques des Productions Végétales »

LANGUAGES

French	Native speaker
English	Working knowledge (read: very good, written and spoken: good)

WORK EXPERIENCE

January 2011 to Date — Consultant

France

- Professional associate at ICRA: capacity strengthening for collaborative rural innovation and facilitation of multi-stakeholders processes
- Training on support to farmers' organizations and writing a book on this topic
- Facilitation of a capitalization process by AVSF (French NGO) on adaptation of small scale farmers to Global change, writing the synthesis document

Feb 2003 to Dec 2010

France

Coordinator of CIEPAC (Montpellier) a NGO specialized in supporting local development and farmers' organizations in France and Southern countries

- **Activities related to agronomy, support to farmers' organizations (FOs) and collaborative innovation, rice and cotton sectors**, especially:

- Consultancy for ICRA: capacity strengthening for collaborative rural innovation (mainly in Benin, Senegal and France)
- Teaching in CNEARC (National centre for agronomical teaching for hot regions, Montpellier) on support to farmers' organizations topics;
- Participation to PRIAF (Program for reinforcement of information of actors from rice sector, funded by the French Foreign Affairs Ministry and targeted toward seven West African countries), collaborative development of pedagogical materials;
- Support to the CCR B (Beninese rice farmers framework) and other farmers' organizations
- Implementation of a strengthening capacities process for a FO Task Force in Cambodia
- Organization and facilitation of a training trip in France for Beninese farmer leaders
- Support to the SAIN Farm School in Benin (training young men to become agro-ecological farmers)
-

- **Evaluations and feasibility studies**:

- Feasibility study for the French embassy in Mali: putting in place a unit to support the regional development in Gao et Kidal regions Mali 2004)
- External evaluation and capitalization of the provincial coordination centers (CPCE) put in place by the PNDSA II project (World Bank funded), Burkina Faso, 2004
- Mid-term evaluation of the FO component of the Food Security and Rice Producers' Organizations Project funded by the French embassy in Accra Ghana 2005
- Evaluation and feasibility study for AFD(French Agency for Development): Evaluation of the 2nd phase and proposition for a 3rd phase of the support program to Coton producers' organisations; work involving the "Union Nationale des Producteurs de Coton du Burkina" , Burkina 2005
- Contribution to the feasibility study of a AFD support program to federations of farmers'organizations at national and regional level,Burkina Faso and Benin, 2007
- Mid-term evaluation of PSSDRI, a strengthening capacity program for rice farmers, implemented in Madagascar by the Agha Khan Foundation, 2010

- **Coordination** tasks: management, team facilitation, communication

Dec 2000-Dec 2002

Ivory Coast

Regional Coordinator of Inland Valleys Consortium (IVC) at WARDA (West Africa Rice Development Association) Bouaké,

- Facilitation, communication, technical and financial management of IVC (10 West African countries, 8 international institutions) within a team of four staffs;
- Organization of annual meetings and thematic workshops, support to partners in developing projects, technical and financial follow-up of these projects, and scientific assessment, edition of IVC publications, development of communication tools (website, newsletter)

June 1998- June 1999

France

Consultant for CIEPAC (Montpellier)

- Development of a **pedagogical tool on gender issue** in sub-Saharan countries

April 1994-July 1997
Northern Cameroon

Coordinator at CERN, (Centre d'Education Rurale de Ngong, an early stage farmers' organization):

- Coordination, facilitation and training of facilitators and farmers' leaders, on technical and management topics, **including environmentally sound farming and agroforestry**
- Partnership development with institutional and financial partners (administration, donors…).

Consultant for CIRAD **(**from November 94 to March 95)

- Support to the development of PRASAC (regional research project for the development of central Africa savannas): preparation and organization of a regional workshop, writing preparation papers and project documents.

January 1993-June 1993
France

Engineer at CIRAD SAR

- Edition of a manual on animal traction

Consultant for CIEPAC

- writing of a basic agronomy manual (to be used by FO's support agents in Casamance, Senegal)

Trainer at CNEARC (Centre National d'Etudes Agronomiques pour les Régions Chaudes, National agronomical training Centre for hot areas)

- Teaching activities on different topics: Cropping systems, Agrarian systems, Resource management, Regional Development…

May 1990- June 1992
Senegal

Consultant for CIRAD

- Support to CADEF, a farmers' organization in Casamance, to put in place a network of pilot farms as a part of a research-development project (developing tools, training) within a long-term project of development
- Several appraisal and synthesis works on territory management and local development.

January- August 1988 ***France***	**Agronomist at CIRAD** Bibliographic study on adaptation of cropping systems to drought
July 1984- October 1987 ***Burkina Faso***	Trainee in the Research and Development Project in Yatenga for CIRAD • Appraisal of an agrarian system at village level, comparative study of agrarian systems at regional level, • Development of a bibliographic file related to Yatenga province
Juin 1981- June 1984 ***France***	**Adjoint de Direction** (Headmaster Assistant) pour les Productions Végétales at ESITPA (Agricultural engineers' school) • Management of one department (Crops) • Participation in agronomy courses, development of pedagogical documents • Vocational training for agricultural extension staffs
October 1975- June 1981 ***France***	**Agronomy assistant at INAPG** (Institut National Agronomique Paris-Grignon, the main agronomic school in France) • Teaching in 1st, 2nd and 3rd years; • Assistance to J. BOIFFIN and M. SEBILLOTTE in research on organic matter and cropping rotations sequences in a long term field experiment,; • Researches on farming systems and farmers' strategies in collaboration with A. CAPILLON.

COMMUNITY ACTIVITIES

Between October 90 and October 2000	Chair position of French schools' board of trustees: in Kaolack (Senegal), Garoua (Cameroon), and Bouaké (Côte d'Ivoire) Management, facilitation, public relations
From 1981 to 1984	Participation to a GAEC ("Groupement Agricole d'Exploitation en Commun", i.e. Agricultural group for joint farming) in Picardie (France)
From 1974 to 1980	Giving evening literacy classes for immigrates

MAIN WORKS AND PUBLICATIONS

DEFOER, T, DUGUÉ, M-J, LOOSVELT, M, AND WOROU, S. 2017. Smart-valleys : Trainer-facilitator's manual. *Abidjan, Côte d'Ivoire: Africa Rice Center (AfricaRice). 130 pp.*

DEFOER T., DUGUÉ M.-J, 2012 Apprendre ensemble pour innover : le cas des plates-formes multi-acteurs dans des bas-fonds au Mali Sud *Echos du COTA n° 135 pp 7,13*

DUGUE M.-J., 2012 Caractérisation des stratégies d'adaptation au changement climatique en agriculture paysanne, Etude de capitalisation réalisée sur les terrains de coopération d 'AVSF *Document AVSF 50 pp*

DUGUÉ M.-J, PESCHE D., LE COQ J.-F., 2012 Appuyer les organisations de producteurs *Collection Agricultures Tropicales en Poche, Editions QUAE 144pp*

DUGUÉ M.-J, LIAGRE L., DAVID-BENZ H., MINLA J. 2006 Analyse des filières riz par les organisations professionnelles d'Afrique de l'Ouest *Document Ministère français des Affaires Etrangères / DGCID DCTEPS*

WINDMEIJER P., DUGUE M.-J., JAMIN J.-Y., van de GIESEN N., Editors, 2002 Describing hydrological characteristics for inland valley development / Proceedings of the second scientific workshop of the inland valley consortium (bilingual Edition) *WARDA*

Collectif, ouvrage coordonné par G. LE THIEC, 1994 Agriculture africaine et traction animale *Collection TECHNIQUES CIRAD MONTPELLIER 355 pp*

BERTHOME J., DUGUE M.-J., Juin 1993 Introduction à l'étude des pratiques agricoles *Livret n°13 Document CADEF-CIEPAC-CIRAD-SAR*

DUGUE, MJ, Décembre 1986 Variabilité régionale des Systèmes agraires au Yatenga. Conséquences pour le développement *Rapport INERA/CIRAD-DSA pour la commission « dynamique des systèmes agraires » du Ministère de la recherche et de la Technologie*

DUGUE, M-J, 1986 Fonctionnement des systèmes de production et utilisation de l'espace dans un village du Yatenga : Boukéré (Burkina Faso) *Collection « Documents Systèmes Agraires », n° 1 CIRAD-DSA*

CAPILLON, A., TAGAUX, M-J, 1984 La gestion des prairies naturelles en marais Poitevin de Vendée. Les difficultés d'une intensification *B.T.I., n° 389, pp 229,238*

CAPILLON, A., TAGAUX, M-J, 1983 Typologie des exploitations agricoles du marais Poitevin de vendée. Trajectoires d'évolution et contraintes du milieu *Compte-rendu de l'Académie d'Agriculture de France, 4 mai 1983, pp 595-605*

CAPILLON, A., TAGAUX, M-J, 1980 Rendements des prairies et systèmes de production : analyse de la conduite de la production fourragère dans 7 exploitations du Pays de Caux Maritime *Compte-rendu de l'académie d'agriculture de France, 27 février 1980, pp 335-347*

Europass curriculum vitae

Personal information

Surname(s) / First name(s)	**PILLOT Didier**
Address(es)	*Montpellier SupAgro - International Centre for Higher Education in Agricultural Sciences - Centre international d'Etudes Supérieures en Sciences Agronomiques*, B.P. 5098, 34093 Montpellier Cedex 5 - France
Telephone(s)	+ (33) 4 67 61 70 69 + (33) 664005098
Fax(es)	+ (33) 4 67 61 70 67
E-mail(s)	pillot@agrismundus.eu
Nationality	French
Date of birth	08/05/1954
Gender	Male
Occupational field	**40 years of experience in Agricultural Research for Development** **Design, monitoring and evaluation of training and research projects in agriculture and rural development in developing countries** **Scientific coordination of research in agriculture, agricultural economics and rural development.** **Define and lead strategies for professional and higher education institution in agriculture : building the programmes, curricula and degrees, mobility of students and staffs, organisation of joint trainings** **Farming systems, agricultural policy, agricultural economics.**

Work experience

Dates	Since 2016
Occupation or position held	International training Officer at *Institut des Regions Chaudes – Montpellie SupAgro)* http://www.supagro.fr/web/
Main activities and responsibilities	Coordinator of Agris Mundus, European Master of Sciences in *Sustainable Development in Agriculture* (http://www.agrismundus.eu/) a European Erasmus mundus Master Course; teaching Environmental services in the course Coordinator European Master *Agriculture, Climate change, Transitions (http://www.master-act.eu)* French supervisor in *Agtrain* (http://www.agtrain.eu/), European PhD on *Innovation in Agriculture for Development* (Erasmus mundus); Deputy Chair of Agrinatura, the Association of 31 European Universities involved in Agricultural Research for Development : Research and capacity building in ARD / Natural resources management

Name and address of employer	- Montpellier SupAgro, BP 5098 34093 Montpellier - AGRINATURA headquarters are based at Czech University of Life Sciences, Prague
Type of business or sector	Higher education and research management in agriculture and rural development for the tropics and subtropics
Dates	2010 up to 2015
Occupation or position held	Chief Executive Officer International networks, *Agreenium (International Centre for Higher Education in Agricultural Sciences- Montpellier)* http://www.agreenium.org
Main activities and responsibilities	Extend international partnership in education for Agriculture, mostly Southeast Asia and in Africa. Agrinatura/EC/IFAD reviews of the CGIAR programmes funded by EU: - In 2012, Review of the *Climate Change, Agriculture and Food Security* (CCAFS) research Programme (10-year research initiative of the CGIAR and Future Earth, one of the first CGIAR Research Programmes (CRP), evaluation done for IFAD and the European Commission. - In 2013-2014, Review of the Icrisat led project Development of a robust commercially sustainable Multiple Uses Sorghum (MUS) value chain in Kenya and Tanzania
Name and address of employer	- Montpellier SupAgro, BP 5098 34093 Montpellier - Agreenium headquarters are based in Paris, France
Type of business or sector	Higher education and research management in agriculture and rural development for the tropics and subtropics
Dates	2007 up to 2010
Occupation or position held	Director for International Relations, *Montpellier SupAgro*
Main activities and responsibilities	Organisation and management of international projects led by Montpellier SupAgro in the field of higher education and research in agriculture. Facilitation of academic and research partnerships.
Name and address of employer	Montpellier SupAgro, BP 5098 34093 Montpellier Cedex 05
Type of business or sector	Higher education in agriculture and agricultural research for development
Dates	2002 - 2006
Occupation or position held	Deputy Director , *Centre National d'Etudes en Agronomie des Régions Chaudes*
Main activities and responsibilities	Organisation and management of MSc and postgraduate level education systems in tropical agriculture and rural development
Name and address of employer	CNEARC, 1101 av Agropolis, BP 5098 34033 Montpellier - France
Type of business or sector	Higher education in agriculture and agricultural research for development

Dates	1996– 2001
Occupation or position held	General Director, *Groupe de Recherches et d'Echanges Technologiques* (GRET), Paris
Main activities and responsibilities	- Management of a team of 80 staff, specialised in agriculture, environment and rural development; - Negotiation of partnerships and joint projects in the developing countries; - Financial management of the organisation, with an annual budget of Euros 10 millions;
Dates & position held	1989 –1996, Program officer for agronomy, farming systems and South-East Asia (GRET)
Main activities and responsibilities	The monitoring of research and development programs on smallholders agriculture and transition to market economy in Cambodia, Vietnam and Thailand; A research program in agroforestry : *Dynamics of hedges in the highlands of Africa*; The coordination of one European project funded by the Commission (4th Framework Program for research) : *Agriculture familiale et gestion des ressources du milieu dans le bassin du Fleuve Rouge au Viêt Nam* (1992-1995) (TS 3- CT 920054); The edition of scientific publications
Name and address of employer	GRET, 213, rue Lafayette, 75010 PARIS
Type of business or sector	Technical and scientific support to development aid programmes
Education and training	
Dates	1988
Title of qualification	Doctor of Philosophy
Principal subjects/	Economics, Farming systems
Graduating institution	MacGill University
Dates	1976
Title of qualification	Ingénieur agronome INA P-G
Personal skills and competences	
Mother tongue(s)	**French**

Other language(s)	**Understanding**		**Speaking**		**Writing**
European level (*)	Listening	Reading	Spoken interaction	Spoken production	
English	C2 Proficient user	C2 Proficient user	C2 Proficient user	C2 Proficient user	C2 Proficient user
Spanish	A2 Basic user	A2 Basic user	A1 Basic user	A1 Basic user	A1 Basic user

(*) Common European Framework of Reference (CEF) level

Additional information

MEMBERSHIP IN SCIENTIFIC OR PROFESSIONAL ORGANISATIONS:

Since 2010 : Steering Committee member of *European Forum for Agricultural Research for Development (EFARD)*

Since 2005 : Member of the *Scientific Board* of ITS (*Institute for the Tropics and subtropics*, Czech University of Agriculture, Prague)

2004 -2012: Member of the *Board of Directors* of ICRA (*International Course for Research in Agriculture*), a multilaterally funded (DE, CH, UK, NL, FR) institution for capacity building in agriculture.

1992-1998 : Member of the *CGIAR's NGO Committee*

1997-2000 - Vice-President *Fonds d'Etudes et d'Evaluation* (F3E) (Institution specialised in evaluation of development programmes).

1999-2002 - President of *France-Pays du Mekong* and Vice-president of the French Committee for International Solidarity (CFSI) (NGO).

Books & main publications in relation with the topic « *Assessing Transformation in Smallholder Agricultural Systems and Natural Resources Management* » (ATSAM)

1. **Kahane R., Pillot D.**. 2012. Tertiary agricultural education capacities in Africa: A case study on horticulture. *Chronica horticulturae*, 52 (2) : 9-11. [20121031]. http://www.actahort.org/chronica/pdf/ch5203.pdf
2. **Proyuth Ly, Pillot D., Lamballe P., de Neergaard A.,** 2012. Evaluation of bamboo as an alternative cropping strategy in the northern central upland of Vietnam: Above-ground carbon fixing capacity, accumulation of soil organic carbon, and socio-economic aspects *Agriculture, Ecosystems and Environment 149,* pp.80– 90
3. **Chongtham I., R., de Neergaard A., Pillot D**., 2010. Assessment of the strategies of organic fruit production and fruit drying in Uganda. *Journal of Agriculture and Rural Development in the Tropics and Subtropics,* Vol. 111 No. 1 (2010) 23-34
4. **Pillot, D.** (2008). *Rizières et jardins du Cambodge. Les enjeux du développement agricole*, Karthala/Editions Gret, Paris, 522 p.
5. **Pillot D., Perret S.**. 2003. The fields of intervention : The non-agricultural sector. In : Perret Sylvain (ed.), Mercoiret Marie-Rose (ed.). *Supporting small-scale farmers and rural organisations : Learning from experiences in West Africa. A handbook for development operators and local managers*. Pretoria : Protea Book House, p. 307-320.
6. **Bal P., Castellanet C., Pillot D.**. 2002. Accompagner le développement des exploitations agricoles : faciliter l'émergence et la diffusion des innovations. In : *Mémento de l'agronome*. Montpellier : CIRAD, p. 373-405.
7. **Pillot D**., **Lauga Sallenave C., Gautier D.**. (2002). *Haies et bocages en milieu tropical d'altitude : des pratiques au projet* - Editions GRET, Coll Le point sur, Paris, 239 p.
8. **Pillot, D.** (1995). *Bringing down the barriers; francophone and anglophone approaches in system-oriented agricultural research and rural development*, Rural Extension Bulletin nº 7, University of Reading.
9. **Pillot D**. (1994) - *Yo sé con quien yo estoy en desacuerdo, pero siempre busco con quien estoy de acuerdo ; reflexiones sobre la diversidad de los enfoques sistemicos en el medio rural* - in H. NAVARRO GARZA, J.P. COLIN, P. MILLEVILLE , ed.: *Systemas de produccion y desarollo agricola* (ORSTOM/CONACYT), pp 21-35.
10. **Pillot D., Sibelet N.**. 1994. Proximité de systèmes de production et reprises techniques. Examen de la pertinence d'un concept à partir d'un cas d'innovation aux Comores. In : Sébillotte Michel (ed.). *Recherches-système en agriculture et développement rural : communications*. Montpellier : CIRAD-SAR, p.627-633. Symposium international recherches-système en agriculture et développement rural, 1994-11-21/1994-11-25, Montpellier, France.
11. **Pillot D. et Bellande, A**., ed. (1993) - *Paysans, systèmes et crises; travaux sur l'agraire haïtien*. - 3 volumes, ed. Université Antilles Guyane, Pointe-à-Pitre, 365, 298 et 476 p..
12. **Bonnefoy, M. et Pillot, D**. (1991). *Manuel d'agronomie tropicale appliquée à l'agriculture haïtienne*, Editions GRET/FAMV, Paris, 490 p.
13. **Pillot D.**. 1990. Francophone and anglophone farming systems research : similarities and differences. In : Trébuil Guy (ed.). *Farming systems research and development in Thailand. Illustrated methodological considerations and recent advances*. Songkla : Prince of Songkla University, p. 3-25.
14. **Pillot D., Wibaux H.**. 1986. Agriculture-élevage : concurrence ou complémentarité en zone à forte pression démographique; le cas des hauts plateaux de l'Est éthiopien = Agriculture-animal husbandry: competition or complementarity in areas submitted to heavy population pressure: the case of Eastern ethiopian plateaus. In : *Relations agriculture élevage*. Montpellier : CIRAD-DSA, p.173-176 (4 p.), n. 4). Séminaire du département systèmes agraires du CIRAD. 2, 1985-09-10/1985-09-13, (Montpellier, France).