

1. Activity Reporting.

Activity 721-2014

Contribution of tree diversity to livelihoods for climate change adaptation and mitigation

Status	On going	Milestone	1.1.1 2014
Start date	2012 Jul	End date	2014 Dec

Description: It is commonly accepted that diversity (particularly economic and functional biodiversity) at the level of farm, household and landscape contributes positively to the adaptive capacity of households and agro-ecosystems to external pressures such as climate change.

Combinations of trees, crops and animal production components in agroforestry systems are supposed to have a positive role on adaptation to climate change at the farm, household and landscape level; as well as positive impacts on climate change mitigation. For instance trees can increase adaptive capacity to climate change through the diversification of household consumption and provision of income. Trees can also have positive effects on; ecosystem services such as soil and water conservation and Carbon storage. There are also reasons to believe that the magnitude the contribution of the tree component depends not simply on tree presence per se but on the presence of an array of tree species with different ecological and economic functions. At the same time, beside a diversified natural resources basis, the adaptive capacity also depends on availability of, and access to multidimensional livelihood assets, e.g. human (e.g. knowledge), social (e.g. social support systems, policy), financial (e.g. credit or capital saving resources), and physical assets (e.g. infrastructure). Therefore, the contribution of trees and tree diversity to adaptive capacity at the farm, household and landscape level, has to be assessed through a broader framework that include the various assets that make up farm livelihoods and ecological functions and services provided at the various scales. That would also allow to integrate a mitigation component (e.g. increase of carbon stock service), and assess the efficiency and tradeoffs of the systems at the various scales of analysis.

Central America is one of the hotspots for climate change effects in terms of increase of temperature, reduction of rainfall and incidence of extreme events, as well as one of regions with higher tree cover in agricultural land. Costa Rica, Nicaragua and Honduras will be studied as representation of contrasting realities (e.g. development in the agricultural sector, environmental policies and markets) subject to a common threat.

Status: On going. Datasets have been collected and part of publications have been developed but others are still in preparation. Activities for 2015 were not funded, those are cancelled.

moreover, although not originally planned, due to the lack of climatic information in the study sites in Nicaragua, we decide to invest on small meteorological stations to see whether it will work to collect

such information with local organizations in the same blocks were baseline was carried out (La Dalia, Waslala and Siuna in Nicaragua). We have the 3 stations installed and organizations trained in installation and management of the weather station. data is uploaded in CATIE website. <http://catie.ac.cr/es/productos-y-servicios/estacion-meteorologica>

The following datasets have been generated:

1. CCAFS baseline for 4 blocks (3 in Nicaragua and 1 in Costa Rica) - already in dataverse
2. Datasets of detailed farm management and production (crops and tree resources) in 2 sites: Hojanca Costa Rica and Waslala-Nicaragua. Analysis on going and it is being complemented with information collected under FTA research. Not yet in dataverse.
3. Dataset of botanical and functional tree diversity, C stocks and coffee yields in coffee agroforestry systems in Hojanca Costa Rica. Data collected, analysis will be done in 2015. Not yet in dataverse.

Publication:

Report: Estudio de línea de base CCAFS a nivel de hogar en Nicaragua y Costa Rica: Fase de diagnóstico del estudio: "Contribución de la diversidad arbórea a los medios de vida para la adaptación y la mitigación al cambio climático"

Short report: Resumen línea de base CCAFS a nivel de hogar en Nicaragua y Costa Rica

Publication in preparation:

Abelleira Martínez O.J., Ramos-Bendaña Z. Galbraith S.M., Fremier A.K., Günter S., Vierling L., Bosque-Pérez N.A., Ordonez J.C. (in preparation). Scaling-up spatial variation in functional traits to inform ecosystem service management: concepts and methods.

Publication in preparation:

Climate change perception and adaptive capacity across the forest transition curve in Nicaragua and Costa Rica. Ordonez J.C., Leguia E., Somarriba E., Rapidel B. (in preparation)

Gender Component: Gender indicators on participation of men and women in farm activities, to whom land belongs (per land use) and participation of women in community organizations (for agricultural production).

Objectives:

1. Analysis of historic contribution of tree diversity and diversity of livelihood assets to climate change adaptation in Nicaragua (Bosawas), Costa Rica, and Honduras
2. Analyze how diversity of trees on farms and landscapes and tree management is related to key ecological processes that determine the capacity to face the effects of climate change and improve mitigation
3. Analyze whether there are under-explored options at farm and landscape levels (are there optimal functional diversity combinations) that could enhance the adaptive capacity of farm households

and its members, mitigation objectives and what are the possibilities and limitations (considering natural, human, social, financial and physical capacities) for these options to be fully utilized

Deliverables:

Description	Type	Year	Status	Justification
Review on data needs and methods functional diversity applied to AFS	Peer-reviewed journal articles	2014	On going	The last version of the manuscript is under revision of co-authors. We are working with a PhD student of the Idaho IGERT program. The publication will be part of his dissertation. We depend on the planning of the student, but he will graduate this year. We expect to have a submitted article this year.
Database of functional traits in 2 sites, 2 countries in Central America	Data	2014	On going	Data has been collected in one site, for coffee agroforestry systems. It will not be collected in another site. The data is ongoing because it has not been up loaded to dataverse yet. Revision (proof reading) and analysis will be carried out this year (2015). The analysis will study the relationship between tree diversity, coffee productivity and C stocks in coffee systems in Costa Rica.
Analyze the contribution of trees and their diversity to adaptive capacity (ecological processes and tradeoffs with other assets)	Peer-reviewed journal articles	2015	Incomplete	
Analysis of under-explored options at farm and landscape	Workshop	2015	Incomplete	
Analysis of under-explored options at farm and landscape (manuscript to be ready)	Peer-reviewed journal articles	2015	Incomplete	

Description	Type	Year	Status	Justification
On-farm tree diversity patterns result from a social-ecological process shaped by different actors. Farmer preferences, treesite matching, seed dispersal, tree domestication and delivery via nurseries all play important roles in forming these patterns. As part of a wider interest in tree cover transition curves that link agroforestation stages of landscapes to a preceding deforestation process, we here focus on 'tree diversity transition curves' i. as a conceptual framework to understand current processes and how shifts in drivers affect tree diversity and ii. to help identify constraints and opportunities for interventions. We provide some examples of current research efforts and make suggestions for databases and analyzes that are required to improve our understanding of tree diversity transitions. We explore drivers, consequences and entry points for tree diversity management to achieve multifunctional agriculture.	Peer-reviewed journal articles	2014	Complete	
3 Campbell Scientific CR800 meteorological stations have been installed in El Tuma-La Dalia, Latitude: 13° 3' 42" N, Longitude: 85° 44' 51" W; Waslala Latitude: 13° 19' 44" N, Longitude: 84° 22' 43" W and Siuna Latitude: 13° 43' 40" N, Longitude: 84° 53' 24" W. Collected information includes: Temperature (°C); Air Relative Humidity (%), Wind Speed (m/s), Precipitation (mm) and Solar Radiation (MJ/m2)	Data	2014	On going	Data will continue to be collected with local organizations and published at CATIE website.

Partners:

1- Centro Agronómico Tropical de Investigación y Enseñanza (CATIE):

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Location(s):

Countries: Costa Rica, Nicaragua,

Activity 782-2014

Documentation and comparative assessment of past and current local adaptive strategies and coping responses of local communities in Southeast Asian watersheds

Status	Complete	Milestone	1.1.2 2014 (1)
Start date	2012 Jan	End date	2014 Dec

Description: Many rural communities in the uplands of Southeast Asia are highly vulnerable to the impacts of climate change. They have limited resources and live in very fragile mountain environments. Through decades of experience, they have evolved ways of adapting to climate hazards such as droughts, delayed onset of rains, and tropical cyclones. We hypothesize that trees on farms (agroforestry) have played an important role in their coping mechanism to climate-related risks. To date, there is little empirical evidence of the role of trees in enhancing resilience of small holder farmers.

This project will expand the on-going ACIAR funded project in the Philippines to other countries in the region. The results are expected to document local adaptation practices and elucidate the role of agroforestry systems in enhancing the resilience of rural communities to climate change.

Status: Complete. All project activities completed in 2014.

Gender Component: (1) Integration of women among workshop and training participants; (2) Identify roles of women in farm decisions and agricultural policy implementation/development.

Objectives:

1. Review and synthesize available information on local adaptive strategies and coping responses of small holder farmers in Southeast Asian watersheds
2. Document and assess local adaptive strategies and coping responses of small holder farmers in target watersheds
3. Assess the role of trees and agroforestry in enhancing the resilience of small holder farmers in SE Asian watersheds

Deliverables:

Description	Type	Year	Status	Justification
Journal paper assessing local adaptive strategies and coping responses of small holder farmers	Peer-reviewed journal articles	2014	On going	Article being drafted, for submission this Feb 2015
Training of national and local partners on appropriate agroforestry systems for climate change adaptation	Capacity	2014	Complete	

Partners:

- 1- University of the Philippines Los Baños:
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Location(s):

Countries: Indonesia, Philippines, Vietnam,

Activity 784-2014

Select tree germplasm better adapted to drought

Status	Extended	Milestone	1.1.3 2015 (2)
Start date	2012 Jan	End date	2015 Dec

Description: Rural communities in Burkina Faso, Mali and Niger recognize the need to select and multiply tree germplasm that is better adapted to drought, however they need technical assistance in participatory tree domestication. Therefore, strengthening the capacity of rural communities, NARs scientists, extension and development agents to develop and implement participatory tree domestication is a major component of the IFAD-funded project (Parkland trees and livelihoods: adapting to climate change in the West African Sahel).

Status: Extended. We reported on the data collection in 2013. We did not collect data in 2014 because the IFAD project ended and there was no other source of funds. The data need to be synthesized. Hopefully we can produce at least one journal article in 2015. If the article is published, then we will archive the data.

Gender Component: Men and women do not always have the same priority for tree species. Therefore, the project identified priority trees that satisfy the needs of men (e.g. for construction and soil-fertility improvement) and priority trees that satisfy the needs of women (e.g. for food, medicine and fuel). The men and women decide which species they wish to establish and multiply on their farms, homegardens, etc. and receive training in all aspects of tree domestication.

Objectives:

1. Strengthen the capacity of rural communities and partners in practical aspects of participatory tree domestication (selection of superior trees, nursery production, establishment and evaluation of on-farm provenance/progeny tests) so that rural communities have better adapted tree germplasm for local use and sale.

Deliverables:

Description	Type	Year	Status	Justification
Data on growth and survival collected and analyzed in provenance/progeny tests in 2013 and 2014	Data	2014	Extended	We reported on the data collection in 2013. We did not collect data in 2014 because the IFAD project ended and there was no other source of funds. Data still need to be synthesized.
data stored in ICRAF database and agtrials.org	Data	2014	Extended	No budget in 2014 so everything is delayed. Hopefully we can produce at least one journal article in 2015. If the article is published, then we will archive the data.
Synthesis of results and recommendations in journal articles in 2015	Peer-reviewed journal articles	2015	Incomplete	

Partners:

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Location(s):

Countries: Burkina Faso, Mali, Niger,

Activity 785-2014

Enhancing the effectiveness of Climate Smart Agriculture through improved fodder shrubs and innovative extension approaches

Status	Extended	Milestone	1.1.3 2014 (2)
Start date	2012 Jun	End date	2015 Jun

Description: Climate smart agriculture (CSA) provides agricultural practices that sustainably increase productivity and resilience of agricultural production systems and help in reducing greenhouse gas (GHG) emissions. Evidence evaluating CSA adoption and extension is typically lacking, especially for developing countries and smallholder contexts.

This project proposes to promote climate smart agriculture (CSA) practices for smallholder dairy farmers in Kenya and Uganda and test the potential of the volunteer farmer trainer approach for scaling up CSA in Sirikwa, North Rift Valley, Kenya, and Wakiso, south-central Uganda. The project will foster diversification of forages by identifying and testing neglected local indigenous and exotic species and by helping to document and share traditional knowledge and experiences for improved forage production, a key CSA practice for dairy farmers. Fodder shrubs and herbaceous legumes (desmodium and lucerne) have many advantages: they provide protein for dairy cows (currently lacking in existing dairy diets); they require very little land, labor and cash, relative to other feeds. However, adoption of tree forage cultivation is constrained because the practice is relatively knowledge intensive. Fodder shrubs are also “climate-smart” in several ways: they are drought resistant (good adaptation to climate change) and maintain their protein levels during the dry season. Being woody, they contribute to climate change mitigation through sequestering atmospheric carbon. High quality, protein-rich feed also reduces methane emissions. Being leguminous, fodder shrubs improve soil fertility through nitrogen fixation and produce high-quality manure for nutrient recycling. Their root systems also stabilises soil and water conservation structures. Finally, farmers use fodder shrub branches for firewood, reducing pressure on forests and trees.

Identification and testing new fodder species is emphasized in this project because so far only two species, *Calliandra calothyrsus* and *Lecuaena trichandra*, are available for dairy farmers in the project site.

This project builds on two existing ICRAF projects, the EADD program, which promotes dairy production across Kenya, Uganda and Rwanda, and the Mitigating Climate Change in Agriculture (MICCA) Project, with a site in Kaptumo, Kenya. Sites in the proposed project will be in selected existing EADD sites in Kenya and Uganda, permitting this project to benefit from considerable co-funding and joint activities. Similarly, the proposed project will benefit from extension strategies and lessons learned from the existing MICCA project.

Status: Extended. The project has been extended for one year to allow completion of planned activities and deliverables.

Gender Component: Female and male farmers farmer trainers and nursery managers will be equally involved in all activities; youths will be encouraged to participate and capacity of female students will be enhanced. Data in all surveys will be disaggregated by gender and wealth level to assess impacts on gender and wealth levels. Key hypotheses we will test: (1) Women farmer trainers are as effective in dissemination as men trainers. (2) Women trainers reach more women than men trainers. (3) Fodder shrubs are more used by women and the poor than commercial concentrates 4\ Extension services can increase the proportion of women providing extension services by starting farmer to farmer extension programs because they can recruit women as farmer trainers more easily than as professional front line extension staff

Objectives:

1. Overall objective: To improve farmers capacity to adapt to climate change by increasing the cultivation of most adapted tree forage spp and assessing role of volunteer farmer trainer approach for promoting climate smart agricultural practices
2. To document existing and select potential priority fodder species
3. To develop strategies for improving access to quality planting material of priority tree forages
4. To disseminate knowledge and information on climate smart agriculture
5. To conduct research to assess the effectiveness of the volunteer farmer trainer approach

Deliverables:

Description	Type	Year	Status	Justification
Publication on the efficiency of the seed/seedling supply systems	Peer-reviewed journal articles	2014	Complete	
2 Msc and 1 PhD student trained; Farmer trainers and farmers trained in and using climate smart practices at the four target sites	Peer-reviewed journal articles	2014	On going	Publication in press - submitted to Development in Practice journal
2 reports and 2 journal articles submitted (2013, 2014) on effectiveness of farmer trainers in promoting dairy feeding practices and climate smart agriculture	Peer-reviewed journal articles	2014	Complete	
Working paper on agroforestry, fodder production and climate change adaptation and mitigation in East Africa	Non-peer reviewed articles	2014	Complete	
Book Chapter on mapping farmer preferences for gender preferences for tree and shrub forages	Book chapters	2014	Complete	
Franzel S., Kiptot E., and Lukuyu B. Agroforestry: Fodder Trees. In: Neal Van Alfen, editor-in-chief. Encyclopedia of Agriculture and Food Systems, Vol. 1, San Diego: Elsevier; 2014. pp. 235-243.	Book chapters	2014	Complete	
Carsan S, Stroebe A, Dawson I, Kindt R, Mowo JG, Jamnadass R (2014) Can agroforestry enhance the resilience of agricultural commodity production systems? Current Opinion in Environmental Sustainability, 6:35-40.	Peer-reviewed journal articles	2014	Complete	
Review on Fodder shrubs for improving livestock productivity and smallholder livelihoods in Africa.	Peer-reviewed journal articles	2014	Complete	

Partners:

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Location(s):

Countries: Kenya,

Activity 791-2014

Vulnerability and resilience of alpine rangelands to climate change on the Tibetan Plateau & Himalayas

Status	On going	Milestone	1.1.3 2015 (1)
Start date	2013 Jan	End date	2015 Dec

Description: The Third Pole, including the Tibetan Plateau and Himalayas is very vulnerable to climate change. Climate change has affected the water availability (amounts, seasonality), biodiversity (species composition and phenology), ecosystem boundary shifts (tree-line movements), and global feedbacks (monsoonal shifts, loss of soil carbon). Climate is a key factor for determining alpine rangeland, wetlands and treeline. Climate change will also have environmental and social impacts that will likely increase uncertainty in water supplies and agropastoral production for human and livestock populations in the region. A common understanding of climate change needs to be developed through regional and local-scale research so that mitigation and adaptation strategies can be identified and implemented. We apply a landscape approach and develop spatial mapping tools to analyze the interaction of rangelands, wetland and woody/tree vegetation (upward shift and invasion) across the region. Combined studies in both macro and micro scale by using remote sensing, modeling and field observation will give comprehensive and deep understanding of vulnerability and resilience of agropastoral systems, as well as environmental goods (productivities) and services (carbon) on the Tibetan Plateau and Himalayas to climate changes.

Status: On going. The major part of these activities have been completed. Several planned goals have been accomplished as well. Hybrid method combined multispectral and ecological characteristics has been developed for wetland mapping. A peer-reviewed paper related to this topic was published. Session about research on response of rangeland phenology to climate change is nearly completed as well. One related manuscript is currently under preparation and will be published in 2015.

Gender Component: Not defined

Objectives:

1. Delineate the temporal and spatial distribution of rangeland, wetlands (including lakes) and tree cover on Tibetan Plateau and Himalayas from 2002 to 2010. Analyze the effect of climate change on alpine agroecosystem including rangeland, wetlands and tree cover
2. Illustrate the response of alpine agro-ecosystems to climate change on the Central Tibetan Plateau
3. Estimate water cycle and carbon cycle under different climate change scenarios
4. Conduct landscape connectivity studies for tree cover including invasiveness of woody vegetation into rangeland, upward of treelines, potential contribution to carbon storage

Deliverables:

Description	Type	Year	Status	Justification
A PHD thesis and two journal papers on the method of extracting spatial patterns and the detection of change trend of wetland and other landcover such as rangeland and tree cover	Peer-reviewed journal articles	2014	On going	
Report and two journal papers on the vulnerability and resilience of grassland, wetlands and tree cover to climate change.	Peer-reviewed journal articles	2014	On going	
Train the coupling carbon and water model in Yushu	Workshop	2015	Incomplete	
Report and two journal papers on impacts of climate change on environmental goods (productivity) and services (carbon) of alpine agroecosystems, developed ecosystem based approach for landscape management	Peer-reviewed journal articles	2015	Incomplete	

Description	Type	Year	Status	Justification
In the greater Himalayan region, wetland ecosystems such as lakes, marshes, and peat lands play an important role in regulating the flow of major rivers. These ecosystems are often overlooked and not well represented on land-use planning and conservation maps. Wetland complexes are partly ephemeral and difficult to map accurately either with digital image processing or visual interpretation. This study developed a hybrid method of extracting spatial patterns of wetland areas which combines month-on-month multispectral classifications of Moderate Resolution Imaging Spectroradiometer data with a sample wetland extraction method based on knowledge of the spectral characteristics of satellite data and wetland ecological systems.	Peer-reviewed journal articles	2014	Complete	
	Data	2014	Incomplete	
	Research report (i.e. workshop report, consultant's report, discussion paper, project report, student thesis, etc.)	2014	Complete	

Partners:

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Location(s):

Countries: China,

Activity 792-2014

Sustainable Rural Development through High Value Biocarbon Approaches: Building Multifunctional Landscapes and Institutions in West and East Africa, focus on Agroforestry and on-farm interventions

Status	Complete	Milestone	1.1.3 2015 (1)
Start date	2013 Jan	End date	2015 Dec

Description: This activity will involve participatory prioritization of agroforestry systems and species which takes into consideration needs of men and women, resource endowments of farmers, product and service market opportunities, and likely climate change. A key emphasis of the Programme will be to develop local systems for supplying agroforestry tree germplasm in a sustainable way, which would include the anticipation of changing environments and the types of trees that will grow well in the future. In addition to species that can help to diversify and add to incomes, the Programme will also introduce complementary practices that will increase soil health and improve both land and water productivity in sustainable ways. The Programme will use well tested methods of development partner and group training and foster skill building in propagation, tree nursery management and on-farm management of agroforestry based systems.

Status: Complete. Participatory prioritization of agroforestry species has conducted taking into consideration the needs of men and women as well as the market opportunities and likely climate change. Sustainable supply system of tree germplasm of the prioritized species will be developed. Soil fertility restoration trials have been conducted in the fields of 80 farmers (20 in each of the four villages) in Burkina Faso. A demonstration plot of the effects of grafting and irrigating on the performance of fruit trees has been established in Burkina Faso: *Adansonia digitata*, *Tamarindus indica*, *Vitellaria paradoxa*, and *Ziziphus mauritiana*. Improved rice varieties have been introduced in Sierra Leone. Rural Resources Centers (RRC) have been constructed in four villages in Burkina Faso and that will allow the capacity development program to run at village level with a range of practical trainings

Gender Component: Gender aspects include consideration of woman preferences for the tree species but a also a range of gender specific activities like gardening, improved stoves, processing and marketing of non wood forest products, etc. Training sessions also involved both women, men and youth. Youth are important in this program as providers of the workforce and future beneficiaries of the long term investment being made

Objectives:

1. The aim of this activity is to increase the adoption of agroforestry and other carbon enriching farm practices that meet priority needs of beneficiaries and address climate change

Deliverables:

Description	Type	Year	Status	Justification
Reports on priority species survey, farmers and community training in plant propagation techniques and agroforestry management	Research report (i.e. workshop report, consultant's report, discussion paper, project report, student thesis, etc.)	2014	Complete	
Report on Rural Resources Centers: establishment and functioning and extension agent training.	Research report (i.e. workshop report, consultant's report, discussion paper, project report, student thesis, etc.)	2014	On going	The rural resources centers have just been established in Burkina Faso and the functioning is still to be monitored. These infrastructures have not yet been established in Sierra Leone due to Ebola outbreak. However, a training in leadership and group dynamics has been conducted in Burkina Faso and training report is available.
Protocols for nursery experiments	Models (i.e. Agronomic Trials)	2014	Complete	
Protocols for on farm experiments	Models (i.e. Agronomic Trials)	2014	Complete	
Manuals for extension agent training.	Articles for media or news (radio, TV, newspapers, newsletters, etc.)	2015	Incomplete	
Report on private seed and seedlings dealers and seed and seedling system	Peer-reviewed journal articles	2015	Incomplete	
Training of local villages and various actors	Capacity	2016	Incomplete	

Description	Type	Year	Status	Justification
Training of local villages and various actors	Capacity	2016	Incomplete	
Report on the establishment of demonstration plots in BIODIV villages	Peer-reviewed journal articles	2016	Incomplete	
Database developed and made available to partner organizations	Data	2016	Incomplete	
Publication on the evaluation of existing species trials in Sierra Leone and Burkina Faso	Peer-reviewed journal articles	2016	Incomplete	
PhD student involved	Capacity	2016	Incomplete	

Partners:

- 1- Institut de l'Environnement et de Recherches Agricoles (INERA):
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- 4- Institut d'Economie Rural (IER):
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- 5- Tree Aid:
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Location(s):

Countries: Burkina Faso, Sierra Leone,

Activity 793-2014

Apply the open-source mapping system to develop species (and variety) suitability maps for a minimum of 100 agroforestry tree species in East Africa; Test the recommendation domains of selected fruit tree varieties in Kenya by evaluating the early performance of materials from climate-analogue locations across the current climatic range of each variety

Status	Complete	Milestone	1.1.3 2014 (1)
Start date	2012 Jan	End date	2014 Dec

Description: Climate change will affect the suitable cultivation ranges of hundreds of agroforestry tree species. It is likely to constrain productivity of currently adapted germplasm, and open up new opportunities for introducing new, better adapted species and varieties. Ecological niche modeling has emerged as a promising tool for evaluating climate change impacts on species/varieties and for identifying better adapted germplasm for different climate change scenarios. However, applying this method requires specialized training; and running analyses for the huge number of species involved needs substantial time and effort. This proposal aims at establishing a framework to generate species suitability maps for hundreds of species at a time and to make these publically available. Mango varieties in Kenya will be used as a case study.

Status: Complete. Based on the results of modelling future suitabilities, 2 new mango varieties have been introduced in Kenya, that are currently propagated by the Kenya Agricultural Research Institute (KARI). Variety-specific mango distribution maps in current and future climates were produced for main Mango cultivars; these were presented during the 3rd World Agroforestry Congress and an update based on an extended range of downscaled GCM models will be presented during an international mango conference in Australia. Agroforestry species suitability maps were produced for 4 indigenous species (*Balanites aegyptiaca*, *Vangueria madagascariensis*, *Grewia bicolor*, *Grewia tembensis*) and 5 exotic species (*Carica papaya*, *Citrus limon*, *Citrus sinensis*, *Mangifera indica*, *Persea americana*) were also produced.

Gender Component: Not defined

Objectives:

1. Develop an open-source and interactive modelling and mapping system based on niche modelling and climate analogues to predict future shifts of suitable cultivation zones for agroforestry tree species (including selected varieties of commercialized species) under different CC scenarios. Apply the open-source mapping system to the total of tropical Africa for a minimum of 100 species

Deliverables:

Description	Type	Year	Status	Justification
Suitability maps publically available for a minimum of 100 agroforestry species in East Africa	Platforms - Data Portals for dissemination	2014	On going	Agroforestry species suitability maps were produced for 4 indigenous species (<i>Balanites aegyptiaca</i> , <i>Vangueria madagascariensis</i> , <i>Grewia bicolor</i> , <i>Grewia tembensis</i>) and 5 exotic species (<i>Carica papaya</i> , <i>Citrus limon</i> , <i>Citrus sinensis</i> , <i>Mangifera indica</i> , <i>Persea americana</i>) were also produced.
Mother blocks of selected mango varieties established in Kenya	Other	2014	On going	
Training materials developed and tested for capacity building of farmers, nursery managers and extension workers on vegetative fruit tree propagation	Capacity	2015	Incomplete	
Suitability maps publically available for 2030s and 2050s future climates (as available from http://www.ccafs-climate.org/data/ in 2015) for a minimum of 100 agroforestry species in East Africa	Other	2015	Incomplete	

Partners:

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Location(s):

Countries: Kenya,

Activity 794-2014

Climate-smart tree sourcing in East Africa - collaboration between research and implementing agencies in East Africa

Status	Extended	Milestone	1.1.3 2014 (1)
Start date	2012 Sep	End date	2015 Dec

Description: Tree crops are important for livelihoods and income generation of smallholder farmers in East Africa (Kenya, Tanzania and Uganda). For most species very little is known about genetic differentiation and ability to adapt to new ecological conditions. Therefore, current and future recommendation domains for wise mobilisation, use, transfer and conservation of even the most important tree species are poorly documented and of no practical value to planters. As a consequence, almost all planting stock is utilised without knowledge of its potential to adapt to a changing climate. The project will develop and test species and provenance specific recommendation domains, combining the expertise of national and international tree seed and research centres, high-resolution present and future climate data sets, newly developed high-resolution potential natural vegetation maps for East Africa (the VECEA project), species distribution records and recently developed approaches for habitat distribution mapping. For four important tree species occurring in the three countries (Croton megalocarpus: recently classified as superior biofuel producer for East Africa; Acacia senegal: excellent species for charcoal; Warburgia ugandensis: species with proven anti-malarial properties; Prunus africana: excellent timber species, also medicinal) we will refine and test provenance maps using early-screening trials and translocation trials across environmental gradients (distributed in relevant environment across countries). Results will guide the conversion of early-screening trials into seed orchards providing effective mobilisation of selected, diverse gene pools for wise use in planting programmes across the region. The project will enhance the national capacity of governmental and private partners to develop tree seed input supply systems that enable the delivery of superior tree planting materials to small-holder farmers, forest restoration and REDD projects. We envisage that provenance-sensitive recommendation domains will cut across national borders and investments in seed production should therefore involve regional collaboration between national tree seed centres in planning seed production and distribution of climate-adapted agroforestry species.

Status: Extended. Genotype X environment trials (testing materials from different expected provenance zones from each of the 3 countries) have been established by national partners at different trial sites (representing a temperature gradient) in each of the three target countries (Kenya, Tanzania, Uganda). At the end of 2014, these trials have been handed over to the national partners who will now continue with management of the trials, regular measurement of temperature, precipitation and relative humidity until completion of the trials when the trials are expected to be converted into quality seed production units (work package 1). The case for meaningful provenance delineation domains that support regional seed exchange of tropical tree species in East Africa (i.e.

based on natural vegetation types as investigated by this project) has been presented by national tree seed centres and the project coordinator during meetings of the OECD Working Committee to which representatives of the project were invited to (both Kenya and Uganda are members of the OECD and ICRAF invited to the advisory OECD Working Group for updating the OECD rules for transfer of Forest Genetic Material) - the results of the present project will contribute to regional evidence-based planning for higher productivity of indigenous agroforestry tree species (Work package 3). Seed-source suitability maps for current and future climates will be finalized for priority tree species in 2015 during the bridging phase of this project (Work package 2 is the only package supported in 2015).

Gender Component: Not defined

Objectives:

1. Overall Objective: Enhance tree productivity by developing provenance sensitive recommendation domains for agroforestry tree species for current and future climates through multi-locational adaptation trials, climate analogue analysis, provenance suitability modelling based on ensemble forecasting and regional planning of tree seed collection and distribution.
2. Multilocal testing of genotype x environment interaction (in growth, phenology, productivity and health) of 4 selected indigenous species (*Croton megalocarpus*, *Acacia senegal*, *Warburgia ugandensis* and *Prunus africana*)
3. Develop provenance-sensitive suitability maps and recommendation domains for potential future climates for all tree species of national or regional priority
4. Develop a climate-smart regional strategy for collaboration among partners in East Africa on optimal tree seed production and regional distribution to smallholder farmers

Deliverables:

Description	Type	Year	Status	Justification
Multilocal testing of genotype x environment interaction (in growth, phenology, productivity and health) of 4 selected indigenous species (Croton megalocarpus, Acacia senegal, Warburgia ugandensis and Prunus africana) = trial maintenance and measurement + gap analysis	Data	2014	On going	Confusion on release of funds caused a one year delay in collection of seed for establishment of trials (collection is only possible during the annual fruiting season) Budget cuts necessitated reduction of the number of species from 4 to 1 (Croton megalocarpus)
information portal	Articles for media or news (radio, TV, newspaper S, newsletters ,etc.)	2014	On going	We need the first analysis as a prototype dataset to be utilised in the information portal
Analysis and publication of preliminary results	Peer-reviewed journal articles	2015	Incomplete	
Provenance mapping for target and other species	Articles for media or news (radio, TV, newspaper S, newsletters ,etc.)	2015	Incomplete	
Workshop	Workshop	2015	Incomplete	

Partners:

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Location(s):

Countries: Kenya, Tanzania, Uganda,

Activity 796-2014

Exploring resilience to climate variability of *Faidherbia albida* to enable informed decision in promoting Evergreen Agriculture in the face of climate changes in Malawi

Status	Complete	Milestone	2.1.1 2014
Start date	2012 Dec	End date	2014 Dec

Description: Malawi faces many social, economical and environmental problems, which are threatening the sustainable livelihoods of family households and their environment. Agroforestry is seen as one of the avenues for increasing tree planting on farmland for various goods and services in Malawi. *Faidherbia albida* is one of the key agroforestry species commonly retained by smallholders in maize cropping systems in lowlands areas of eastern and southern Africa to provide nutrients for maize production. It is widely promoted as an option for adaptation of smallholder maize cropping systems to climate change, irrespective of agroecological differences between regions. Current studies have shown indicated that *F. albida* needs contact with ground water to thrive. If this is the case, can we promote *F. albida* in areas where ground water is not available? Therefore, there is a direct need to understand the water use strategy and responses to climate variability under natural conditions in space and time.

This information should be relevant to the central plain region, including areas of Malawi, Mozambique, and Zambia

Status: Complete. the project is completed, we published a paper and we have one under preparation.

Gender Component: Not defined

Objectives:

1. To develop scientifically rigorous data concerning resilience to climate variability and water use strategy of *F. albida*, across contrasting upland and lowland landscape positions over decades.
2. To publish at least one paper in refereed journal and one referred conference paper with analysis of the water use strategy and resilience to climate variability of *F. albida* and implications for recommendation domains of these species and associations in farming systems in different agro-

ecological zones in Malawi and bordering areas of Mozambique and Zambia

3. To develop manual in English and local languages for the use of smallholder farmers, government and NGO extension services guiding use and expectations for *Faidherbia albida* in different agro-ecological zones. The manual will incorporate results from the carbon sequestration and biomass studies in the region.

Deliverables:

Description	Type	Year	Status	Justification
manual translated into booklets in local languages on expected performance of the species in given agroecological settings	Articles for media or news (radio, TV, newspapers, newsletters ,etc.)	2014	On going	
Journal article : ALLOMETRIC EQUATIONS FOR ESTIMATING ABOVE-GROUND BIOMASS AND CARBON STOCK IN FAIDERBIA ALBIDA UNDER CONTRASTING MANAGEMENT IN MALAWI	Peer-reviewed journal articles	2014	On going	

Description	Type	Year	Status	Justification
The paper is based on the project Exploring resilience to climate variability of <i>Faidherbia albida</i> to enable informed decision in promoting Evergreen Agriculture in the face of climate changes in Malawi. <i>Faidherbia albida</i> (Del.) A. Chev., is one of the most important species among the deciduous leguminous trees, and widely distributed in Africa and the Middle East. The tree has a distinctive phenology: it bears leaves and flowers during the dry season and sheds its leaves during the rainy season. Consequently, cereal cropping under <i>F. albida</i> has a long history in Africa and this is particularly common in what are called <i>Faidherbia</i> parklands in the Sahel and southern Africa. There is increased interest in estimating the biomass of trees and their role in regulating the cycling of carbon and nutrients. In the context of climate change In recent years, carbon sequestration potential of mixed tree cereal cropping systems have recently attracted attention from both industrialized and developing countries following the recognition of trees on farms as a greenhouse gas mitigation strategy under the Kyoto Protocol. The sale of carbon sequestered through trees on farms to industrialized countries could be an attractive opportunity for subsistence farmers in developing countries in Africa who are the major practitioners of mixed tree cereal cropping systems. Hence, the paper reports growth rates and carbon sequestration potential of <i>F. albida</i> trees on the farmers' fields.	Data	2014	Complete	

Partners:

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Location(s):**Countries:** Malawi,**Activity 797-2014**

Adapting to extreme events in Southeast Asia through sustainable land management systems

Status	Complete	Milestone	1.1.1 2015 (1)
Start date	2012 Jan	End date	2014 Dec

Description: The Philippines and Vietnam belong to the top ten countries most affected by climatic extreme events worldwide (Germanwatch Climate Risk Index, 2009). The Philippines lies in the typhoon belt and an average of 20 typhoons pass through its boundaries annually, killing hundreds and destroying property. For example, in October 2010 typhoon Megi damaged US\$ 44 million of agricultural products and facilities while typhoon Ketsana caused \$130 million damage in the agriculture sector in 2009. The latter typhoon also caused \$800 million of damage to Vietnam. Smallholder farmers are already among the most vulnerable sector of society to weather extremes and future climate change will likely increase both the number and intensity of weather extremes such as drought, flooding and storms. It is therefore necessary to raise their resilience and adaptive capacities in order to sustain and improve livelihoods and reduce the risks of smallholders falling deeper into poverty owing to current and future weather extremes. The project is expected to assess sustainable land management options including agroforestry systems for adaptation to extreme climate events by smallholder farmers of Southeast Asia.

Status: Complete. Project activities completed in December 2014

Gender Component: The vulnerability and impact assessment studies including assessing the role of trees were documented through household interviews and focus group discussions following a gender-based approach with equal men and women being interviewed and participating in the FGD. A paper on gender roles in farm decision making, based on the survey results will be drafted.

Objectives:

1. Document indigenous agroforestry systems that farmers use in areas prone to extreme climatic events in Southeast Asia

2. Analyze the strengths and weaknesses of agroforestry systems in areas prone to extreme climatic events
3. Design agroforestry systems with improved capacity to cope with extreme climatic events

Deliverables:

Description	Type	Year	Status	Justification
Land use plans by local government units incorporating adapt to extreme climatic events	Capacity	2014	Cancelled	Philippines: The timeline of the project does not fit into the government mandated schedule of updating of the Comprehensive Land Use Plans of the two project sites. To compensate, the training and subsequent mentoring focused on the Barangay (village) Development Plan and the Protected Area Management Plan. Vietnam: Not possible as planned as 2013-22 land use plans completed before project had time to feed in adaptation concerns. However information from the project is being fed into a variety of other local government planning processes including those of agriculture and the environment as well as any local adjustments to land use plans. The project may feed into 2023-32 land use plans.
Journal paper on capacity building	Peer-reviewed journal articles	2014	Complete	
Policy brief on the role of local government units in facilitating small holders adaptation to extreme climatic events.	Peer-reviewed journal articles	2014	On going	Policy brief will be drafted upon completion of journal articles

Partners:

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Location(s):

Countries: Philippines,

Activity 798-2014

Promoting a pro-growth pathway for reducing net GHG emissions East Asia (China, Mongolia and North Korea)

Status	On going	Milestone	3.1.1 2014
Start date	2013 Mar	End date	2015 Feb

Description: The activities contribute to CRP7 Theme 3, focusing on building capacities of sub-national and national stakeholders to identify institutional, policy and finance mechanisms that support adoption of low-carbon agricultural options with economic benefits for smallholders. In each country, the constellation of existing institutions, policies and finance mechanisms differ, and considering differing national policy priorities and political possibilities, alternative combinations of local, national and international institutions and finance mechanisms are relevant to promoting uptake of low-carbon, pro-growth options that benefit smallholders. Adoption of options is largely driven by the institutions and economics of agricultural production, but payments for climate mitigation services may supplement national and existing international (e.g. donor) funds to support adoption. The opportunities for this in each country differ, e.g. in China there is potential to link with an emerging national emissions trading system; in Mongolia the relevant ministries are considering accessing climate finance for NAMAs; in DPRK recent pro-market policy reforms provide new opportunities to link climate-smart options with market incentives for improved production. In all 3 country cases, key stakeholders have limited awareness of alternative institutional, policy and finance options outside those currently in place. The activity will provide the analytical support and facilitation of multi-stakeholder discussions required to enable policy makers to deliberate a wider range of options than those already in place in each country. Outcomes will be relevant to more than a hundred million small-holders in China, around a million rural inhabitants in Mongolia, and about 9 million rural inhabitants of DPRK. All 3 countries are undergoing or about to undergo rapid transformations in rural areas and of food systems as a whole, driven to varying degrees by policy change, market growth and population transitions. In each country, ICRAF has ongoing relationships with partners active at sub-national and national levels.

Status: On going. The planned workshops have been held with the project partners and key stakeholders in Mongolia. Both the Climate Change Coordination Office of the Ministry of Green Development and the Policy and Planning Department of the Ministry of Industry and Agriculture indicated their strong interest in supporting and participating in the research activities. Based on the recommendation from the partners, the research is focusing on one sheep breed in the eastern aimags of Mongolia, with surveys of limited sample size and geographical scope and further analysis to extrapolate the results to a wider geographical scale. The results will be shared with national stakeholders and used to support their discussions on development of a livestock sector NAMA.

Gender Component: Identification of technical options will include targeted discussion with both men

and women, and analysis will include attention to gender impacts. Gender aspects of institutions will also be analyzed.

Objectives:

1. Overall goal: to increase stakeholders' awareness of institutional, policy and financing options to promote adoption of low-carbon agricultural options that bring economic benefits for smallholders
2. Analysis of low-carbon, pro-growth agricultural options
3. Analysis of current and potential support options
4. Support to policy deliberation

Deliverables:

Description	Type	Year	Status	Justification
1 policy brief on how agriculture M&E can support MRV of climate benefits	Research report (i.e. workshop report, consultant's report, discussion paper, project report, student thesis, etc.)	2014	On going	The deliverable includes several components, which are being drafted.
1 policy brief on how livestock development can attract climate finance	Articles for media or news (radio, TV, newspapers, newsletters, etc.)	2014	On going	
1 guidance document (i.e., like a manual) on developing GHG accounting, measurement, reporting and verification procedures for livestock development activities	Peer-reviewed journal articles	2014	On going	
National workshop on GHG MRV systems in livestock sector	Workshop	2015	Incomplete	
Analytical reports & policy briefs on current and potential policy and finance nationally suitable options for up-scaling low-carbon, pro-growth agriculture	Peer-reviewed journal articles	2015	Incomplete	

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Location(s):

Countries: China, Mongolia, North Korea,

Activity 799-2014

Sustainable Rural Development through High Value Biocarbon Approaches: Building Multifunctional Landscapes and Institutions in West and East Africa, focus on local governance and market institutions, Replicable tools and frameworks, National policies and capacity strengthening

Status	On going	Milestone	1.1.1 2014
Start date	2013 Jan	End date	2015 Dec

Description: Studying the impact of the local government and market institutions is a well-established requirement for any natural resource management project to be effective and sustainable. One of the particular concerns for the Programme is to ensure that local institutions and leadership are also able to manage landscapes more effectively under likely climate change and the possibilities for high value biocarbon development. The Programme will also pay attention to emerging markets in environmental services from biocarbon, especially carbon markets. This activity is related to governance. Thus, the project also aims at national institutions and global development organizations. At the national level, efforts are focused on understanding and enhancing national opportunities for biocarbon development within existing frameworks such as NAMAs and NAPAs and in connecting to global initiatives such as REDD+ and to strengthen linkages to wider development initiatives. Identifying approaches to improve sectoral and institutional cooperation barriers will be sought and support for a platform will facilitate this. Finally, the Programme partners recognize the need for longer term technical support for the countries and the region so an important output will be the development of a business model for a regional biocarbon support mechanism which would be regionally managed.

Eventually, the third work package is in essence the organizing and synthesizing work package for the Programme. A major activity at the outset of the Programme is to provide information on climate change and its likely implications in the benchmark sites. The work package will coordinate diagnostic tools used by other work packages with a view of synthesizing the results to feed into the development of site level plans with the villages. It will further lead the needs assessments for site level capacity strengthening and coordinate the training activities of the different work packages. The WP will interact with external projects and partners to seize opportunities for learning lessons through exchange of information and analysis. Lastly, the work package plays a key role in learning lessons from the integrated implementation of all work packages at the sites and to be a conduit for sharing these lessons globally.

Status: On going. The study of the impacts of the local government and market institutions has started both in Burkina Faso and Sierra Leone. A clear list of local institutions has been established as well as the main important products of trees. This was followed by a value chain analysis of *Mangifera indica*, *Elaies guineensis* and *Citrus sinensis* in Sierra Leone in one hand and in another hand *Parkia biglobosa* and *Vitellaria paraodxa* in Burkina Faso. A bio-carbon project is being elaborated to be submitted to Plan Vivo to help farmers to access to the carbon market. A capacity

development program has been elaborated after a large consultation with all key actors in both Burkina Faso and Sierra Leone including participants from Mali and Guinea. Innovation platform has been established in Vrassan in Burkina and that will be expanded to the remaining 3 villages in Burkina Faso and to the five villages in Sierra Leone in view to identify approaches to improve sectorial and institutional cooperation in the domains of natural resources management and climate change. CILSS has been approached to develop a business model for a regional biocarbon support mechanism.

Gender Component: Not defined

Objectives:

1. To strengthen local capacity in governance and market institutions for effective landscape management and market integration.
2. To develop the capacity and policy environment to facilitate wider scaling up of high value biocarbon development approaches.
3. To develop tools, integrated interventions, and frameworks for successful high value biocarbon rural development.

Deliverables:

Description	Type	Year	Status	Justification
Capacity building of the project staff and national partners	Workshop	2014	On going	The program and its budget have been elaborated and completed but the trainings are still to be run. Some trainings have already been conducted and these are: - Leadership and group dynamics of farmers of four villages in Burkina Faso - Workshop to strengthening the capacities of the negotiators for climate attended by west Africa representatives and CILSS organized in Geneva - Training on the science of climate change, adaptation and mitigation for various practitioners including extension agents, researchers and lecturers from universities of Burkina Faso and Mali.
Data on tree and forest products markets	Data	2014	On going	Value analysis is a long process including testing of new measures/procedures
National stakeholders' platform, where identified strategies and policies for equitable, efficient and effective REDD+ that generate co-benefits which are shared and disseminated to develop systems and policies for REDD+	Articles for media or news (radio, TV, newspapers, newsletters ,etc.)	2014	On going	Delayed by the political unrest in Burkina Faso and the Ebola virus outbreak in Sierra Leone
Networking and learning across biocarbon stakeholders and initiatives strengthened	Workshop	2014	On going	Delay in sub-agreement signing with the partner in charge of this activity
Strategy for capacity building for integrated sustainable development, including biocarbon and climate change, developed and implemented	Capacity	2014	On going	Delay in the sub-agreement signing with the partner leading this activity
Publications: scientific papers and policy briefs	Peer-reviewed journal articles	2015	Incomplete	

Description	Type	Year	Status	Justification
A business model for an African hub for information and expertise on biocarbon development is developed	Platforms - Data Portals for dissemination	2015	Incomplete	
Methods and mechanisms to promote synergies between adaptation and mitigation for sustainable biocarbon developed and disseminated to decision makers	Articles for media or news (radio, TV, newspapers, newsletters, etc.)	2015	Incomplete	
Decision support tools for assessing environmental and well being effects of agroforestry and forestry in different niches developed and used by partners and national and local stakeholders	Platforms - Data Portals for dissemination	2015	Incomplete	
Publication of compiled best practices in biocarbon methods and approaches and their dissemination	Peer-reviewed journal articles	2015	Incomplete	

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Location(s):

Countries: Burkina Faso, Guinea, Sierra Leone,

Activity 800-2014

Building a carbon neutral CGIAR

Status	On going	Milestone	4.2.1 2014 (1)
Start date	2013 Jan	End date	2014 Jun

Description: In keeping with ICRAF's global research priority of climate change mitigation and adaptation, the World Agroforestry Centre (ICRAF) has decided to take responsibility for its carbon emissions and to become carbon neutral. The Institution has undertaken an assessment of its carbon footprint as the basis of future greenhouse gas (GHG) monitoring, targeting and ultimately reduction. This carbon footprint will:

- Enhance ICRAF's internal and external corporate image, which might allow the Centre to attract more funds
- Inform ICRAF's initiatives and measures to reduce its organizational carbon footprint
- Demonstrate a commitment to sustainable practices

Using CAMCO's methodology, ICRAF is now assessing its emissions every year and working on reducing uncertainties around data used.

Status: On going. The yearly exercise of assessing ICRAF's carbon footprint is still going on. The World Agroforestry Centre (ICRAF) was the winner of the prestigious 2014 InsideNGO Operational Excellence Award in the Cross Operations Category, which goes to individuals or teams who represent multiple operational areas. ICRAF received the award for its activities in offsetting carbon emissions and its commitment to becoming a carbon-neutral organization

Gender Component: Not defined

Objectives:

1. Develop a framework for the carbon footprint at ICRAF
2. Raise a carbon levy in order to collect enough money to offset the majority of (ICRAF's) emissions
3. Purchase carbon credits in order to offset emissions
4. Implement mitigation actions to reduce the carbon footprint over time
5. Extend the exercise to ICRAF regional offices and to CGIAR centres

Deliverables:

Description	Type	Year	Status	Justification
Paper on carbon footprinting	Peer-reviewed journal articles	2014	On going	Lack of time
Report on ICRAF Global's carbon footprint 2013	Research report (i.e. workshop report, consultant's report, discussion paper, project report, student thesis, etc.)	2014	On going	Data collection in the regional offices is a challenge. The carbon footprint focal points are delaying the whole process by not sending the data on time.
Proposal sent to the Consortium office. The 2 pager concept note explains why the CGIAR should become carbon neutral and proposes various steps to reach this goal.	Research report (i.e. workshop report, consultant's report, discussion paper, project report, student thesis, etc.)	2014	Complete	

Partners:

Partners not defined

Location(s):

Global

Activity 801-2014

Analysis of the potential for smallholder communities to provide sufficient biomass for efficient pyrolysis liquid fuel production; Assess biochar potential for C sequestration and improved management practices

Status	Complete	Milestone	3.1.2 2015
Start date	2012 Jan	End date	2014 Dec

Description: The key problem addressed by the project is that energy sources are expensive in rural communities and thus energy use is low and whether some could be met through conversion of biomass that is found on farms.

Status: Complete. The research work that CCAFS contributed is completed. The main output is a Phd dissertation and subsequent publications of a Cornell student. She has finished the dissertation but will defend it in about April. This comprises 3 papers and plans are to submit those also in 2015. In terms of follow ups, the Cornell team tried to use preliminary work to fund a more development oriented proposal on testing pyrolysis input/output models in Kenya, but were not successful. There are still discussions with private sector companies to pilot approaches but none have yet taken effect.

Gender Component: Information on gender of household head and enterprise owner is collected so information will be analysed according to gender. However, gender is not the main focus of the research.

Objectives:

1. To test whether existing or potential biomass on smallholder farms and in communities could make a significant difference in meeting the energy demand of rural communities. This requires an assessment of existing biomass and the value of its uses, expected prices paid for biomass to produce liquid energy, and the potential for increasing biomass production.

Deliverables:

Description	Type	Year	Status	Justification
Development of demand-supply strategy for commercial pyrolysis plant to generate liquid biofuels and biochar	Research report (i.e. workshop report, consultant's report, discussion paper, project report, student thesis, etc.)	2014	Cancelled	This was never formally made into a separate product, but rather the analyses were used to shape further research or proposals.
Piloting of pyrolysis kiln to generate heat and liquid energy and biochar in W. Kenya	Other	2014	Extended	Cornell is still keen to raise the funds necessary to pilot this. Up to now they have not been successful.
Report from the agribusiness data collected above	Working Paper	2014	Complete	
PhD Thesis on Smallholder Use of Biomass in Western Kenya and Implications for Supply of Biomass for Energy	Peer-reviewed journal articles	2014	On going	Thesis draft is completed, meaning that all papers are finished. But defense is being planned in 2nd quarter of 2015 and papers submitted to journals at the same time.

Partners:

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Location(s):

Countries: Kenya,

Benchmark Site: Nyando (Katuk Odeyo),

Activity 802-2014

Implementing the mitigation of climate change in agriculture project activities in Kenya and Tanzania (MICCA)

Status	Complete	Milestone	3.3.1 2014
Start date	2011 Sep	End date	2014 Sep

Description: GHG emissions from temperate soils and landscapes have by now been well studied and there are good approaches to estimating the emissions from a variety of soils, land uses and cropping systems. On the other hand, tropical land use systems are still not well understood because there is a lack of measurement trials on different soils and land use systems. This research gap needs to be filled because it is important to understand the dynamics of GHG fluxes in tropical soils and their contributions to the total GHG emissions of tropical agricultural systems. It is expected that net GHG emissions are generally lower than those of temperate regions because of the low N fertilizer amendments they receive.

Status: Complete. This statement documents the activities conducted as part of the Mitigation of Climate Change (MICCA) Pilots Project over the 38 month period from 1 September 2011 through 30 October 2014. Of particular note are the following key achievements:

- More than 4,600 farmers (35% female) attended trainings on climate-smart agriculture (CSA) practices in the Kaptumo area, Kenya. This translates to thousands more farmers reached because of the innovative farmer-to-farmer extension approach used at this pilot site. Based on previous research, the World Agroforestry Centre (ICRAF) estimates each farmer-trainer engages approximately 20 additional farmers. Plus, through partnerships with Lake Victoria Basin Ecosystem Management Program (LVBEM), MICCA-East Africa Dairy Development Program (EADD) introduced 170,000 fodder shrubs seedlings. An additional, 108,000 fodder seedlings were established and tended by farmer trainers.
- Nearly 3,000 farmers were trained in the four practices that made up the co-developed 'menu' of CSA practices including conservation agriculture, improved cookstoves, soil and water conservation and agroforestry. CARE reports a difference in household food security for those implementing MICCA Project interventions in the Kolero area, Tanzania. Data recorded from six project beneficiaries showed that maize yields were two to three-folds higher than those using conventional practices. An average of 281 kg of grain maize was harvested from an area of 866 m² which is equivalent to 3.2 metric tons per hectare (more than double the local and continental average), while with conventional practices, 222 kg of grain was harvested in an area covering 1,545 m² equivalent to 1.4 metric tons per hectare. Furthermore, adoption of improved cookstoves has lowered the burden on women to collect firewood, improving livelihoods while mitigating climate impacts. In addition, there is new acceptance of multi-purpose trees especially nitrogen fixers (legumes) and fruit trees as a result of awareness raising and visualization of benefits at the centre for sustainable learning (CSL)/demo plots and exchange visits. Such successes catalyzed FAO to conduct an

adoption study to explore the barriers, incentives and benefits of selected practices in more-depth (results available in early 2015).

- The MICCA Pilot Project Science activities produced/collaborated on seven scientific papers that have been published or submitted to high-impact scientific journals, each with results that can inform low emissions development (LED) and CSA programming on topics ranging from the 'climate-smartness' of individual practices (e.g., conservation agriculture) to the dangers of using greenhouse gas calculators for ex-ante emissions estimates in developing countries. The scientific concepts and results from the pilots were published in the MICCA Series #10 titled Science to support climate-smart agricultural development, that received more than 1,000 'clicks' on the FAO Website and 100 requests for hard-copies in the first two weeks following its release.

- FAO created complementary assessments of the pilot sites that established key needs and opportunities for project activities (for example, socio-economic baseline surveys, capacity assessments, Ex-Act analysis, and CSA adoption studies). Furthermore, FAO promoted the connection of science-development through knowledge sharing at the national level through CSA workshops and a CSA scoping study to inform policy decision-making and programming, and also promote global dissemination through its networks related to agriculture and climate change.

MICCA Pilot Project's work has had cascading outcomes and impacts on partners including:

- MICCA's science for development work influenced the EADD to integrate CSA into Phase II programming. Note that EADD affected livelihoods of greater than 189,000 smallholder dairy farmers in Phase I and has even greater aspirations in Phase II. EADD's adoption of CSA concepts cannot be wholly attributed to MICCA; however, MICCA's work in Kaptumo was partially responsible. This is evidence of the achievement of MICCA Pilot Project's primary goal to mainstream CSA in regional development activities. In addition, MICCA Pilots contributed to successful national level workshops in both Tanzania and Kenya to share experience on CSA implementation.

- MICCA's 'targeting' research that aims to predict what CSA works where, helped catalyze ICRAF's research on this topic more broadly. ICRAF has since been awarded a new project titled 'Partnerships for scaling climate-smart agriculture' (P4S) funded by CCAFS (January 2015 - December 2018). The P4S project will build-on the Monte Carlo approach piloted as part of MICCA and will extend these ideas using additional tools to integrate uncertainty into CSA development planning. The P4S project will provide technical support to regional partners including Africa Union-New Economic Partnership for Africa's Development (NEPAD), regional economic communities, and international Non-Governmental Organizations (iNGOs) such as CARE, Concern International, Catholic Relief Services, World Vision and Oxfam as part of the African CSA Alliance (<http://africacsa.org>) and other CSA initiatives in Africa (for example, NEPAD's Vision 25 x 25). Thus, MICCA has had a catalytic effect linking science for CSA development.

Integrating research and development presents challenges and opportunities. For example, the time required to guarantee robust research results may exceed the time span allocated for development programs. Another concern is that research is not always aligned with development programs' needs. Joint planning at the outset and clear communication helps ensure integration of these two complimentary agendas in activities. Despite challenges, superimposing a research project onto a development project has several important benefits for all concerned including:

- The research project can take advantage of the existing project infrastructure such as field staff,

contacts with local officials and the information available on the site from key informants, project survey reports.. These translate into lower transaction costs, stronger partnerships with local officials and institutions and cheaper, more timely and more accurate information for the research project.

- A research project embedded in a development project gives it influence on development projects, which after all is its major rationale for being! For example, MICCA's presence in EADD (along with CCAFS efforts) was instrumental in EADD's adoption of CSA as a component of Phase II programming.
- The development project also benefits from the enhanced credibility that a science component brings and from the influence that the science project brings on project objectives and activities.

Based on our experience with the MICCA Pilots Project, it suggests that research and development stand to benefit from integration in future projects.

Gender Component: Not defined

Objectives:

1. compare GHG fluxes of different land use practices, including conventional cropping, improved fallow and agroforestry practices with N₂-fixing species and identify their drivers; and c) model the measured GHG fluxes with mechanistic and statistical modelling approaches.

Deliverables:

Description	Type	Year	Status	Justification
Training materials (Mathew Mpanda)	Capacity	2014	Complete	
journal article based on 12-15 months of measurement data	Peer-reviewed journal articles	2014	On going	The paper is in review at Journal of Geophysical Research, Biogeosciences.
Preliminary GHG process-based model calibration (Mathew Mpanda)	Research report (i.e. workshop report, consultant's report, discussion paper, project report, student thesis, etc.)	2014	Cancelled	This deliverable was cancelled based on discussion to refocus energy on other tasks in collaboration with the development partner (FAO).
Synthesis of global warming potential of key farming systems	Peer-reviewed journal articles	2014	Cancelled	This paper was cancelled because the data was combined with another analysis and put into the paper on greenhouse gas emissions from agricultural soils of East Africa.
final report	Peer-reviewed journal articles	2014	Complete	
Develop satellite nurserymen capacity (Mathew Mpanda)	Capacity	2014	Complete	
Report on results of socially acceptable CSA practices (including soil health status in farmlands along the slopes of Uluguru Mountains)	Peer-reviewed journal articles	2014	Complete	
training of farmers and farmer groups (Mathew Mpanda)	Capacity	2014	Complete	

Description	Type	Year	Status	Justification
Progress report: Biomass yield of intercropped maize and Gliricidia sepium under conservation agriculture practice in Uluguru Mountains, Tanzania (Anthony/Mathew)	Peer-reviewed journal articles	2014	On going	The paper is being revised for resubmission to Nutrient Cycling in Agroecosystems
Tree inventory	Research report (i.e. workshop report, consultant's report, discussion paper, project report, student thesis, etc.)	2014	Complete	
Satellite data processing and analysis, field ground truthing ; Data analysis	Data	2014	Cancelled	The data will be delivered as part of the publication which is listed as the next activity.
Journal paper: Above ground biomass dynamics in the agricultural landscape in the southern part of Uluguru Mountains, Tanzania	Peer-reviewed journal articles	2014	On going	This paper is in final stages of internal review and nearly ready to be submitted
Policy brief: Deforestation vs agricultural production in the southern part of Uluguru Mountains, Tanzania. Where does climate smart start?	Peer-reviewed journal articles	2014	Cancelled	The data that would have formed this paper was not finalized during the project period

Partners:

1- Food and Agriculture Organization of the United Nations (FAO):

Janie Rioux <janie.rioux@fao.org>

2- East Africa Dairy Development (EADD):

Josephine Kirui <j.kirui@cgiar.org>

3- Cooperative for Assistance and Relief Everywhere (CARE):

Thabit Massoud <thabit.masoud@co.care.org>

Location(s):

Countries: Kenya, Tanzania,

Activity 803-2014

Development of a protocol for quantification of smallholder agricultural GHGs (SAMPLES)

Status	Cancelled	Milestone	3.3.2 2014
Start date	2012 Jun	End date	2014 Dec

Description: Discussions of pro-poor mitigation options are limited by the lack of reliable data at spatial scales relevant to decision making. This activity establishes a multidisciplinary workgroup consisting of CGIAR and external experts tasked with developing a standard protocol for data collection, analysis, and interpretation of the greenhouse gas balance and livelihood indicators for smallholder systems at the whole-farm and landscapes scales. The significance of including multiple spatial scales and involving economic, social and ecological parameters cannot be understated. Many agricultural management practices have interacting—sometimes complimentary and sometimes antagonistic—impacts on greenhouse gas emissions and livelihoods. Thus, understanding cumulative impacts requires consideration of the various sources and sinks. Furthermore, aggregating biophysical effects to spatial scales larger than the field aligns them with decisions makers' influence; whole-farms with households and landscapes with communities and governments

Status: Cancelled. This activity was canceled because it overlaps with the other activity 'completion of protocol'. It can just be removed from the list.

Gender Component: Not defined

Objectives:

1. To develop guidelines to quantify greenhouse gas fluxes and identify mitigation options in smallholder systems at whole-farm and landscape-levels.

Deliverables:

Description	Type	Year	Status	Justification
Data collection and analyses	Data	2014	Cancelled	This activity overlaps with another and thus is reported there.
Paper	Peer-reviewed journal articles	2014	Cancelled	This activity overlaps with another and thus is reported there.

Partners:

- 1- International Livestock Research Institute (ILRI):
Klaus Butterbach-Bahl <k.butterbach-bahl@cgiar.org>
- 2- Center for International Forestry Research (CIFOR):
Mariana Rufino <m.rufino@cgiar.org>
- 3- International Maize and Wheat Improvement Center (CIMMYT):
ML Jat <m.jat@cgiar.org>
- 4- International Rice Research Institute (IRRI):
Bjorn Sander <b.sander@cgiar.org>

Location(s):

Countries: Kenya, Philippines,

Benchmark Site: Nyando (Katuk Odeyo),

Activity 808-2014

Gender impacts of water hazards in Yunnan, China: a Vulnerability and Adaptive Capacity Assessment

Status	On going	Milestone	4.1.2 2014
Start date	2013 Mar	End date	2015 Dec

Description: Mountain regions of Yunnan and the Himalayas have long been subject to water stress (flooding and associated risks (e.g. landslide) and drought). Recently, Yunnan faced successive years of severe drought and uncertain projections in the recent SREX report suggest drought may continue to affect the region. Previous small-scale surveys have found that households located at different elevations face different risks and have different capacities for addressing those risks. This is primarily because of the different production and management systems adopted at different elevations (e.g. irrigated agriculture in valleys, rainfed in uplands). Government support policies also vary. A survey focused on the role of trees-on-farm in coping with drought found that, while field crops are mostly affected, the role of trees as a economic buffer against drought impacts depends on tree species and their characteristics (e.g. water demand, drought and flood tolerance, reliance on other inputs i.e. fertilizer), the location of the trees planted, the age of trees etc. Thus, trees-on-farm are one option to farmers to minimize their vulnerability to water hazards in the region. Government policies can be improved on minimizing the promotion of vulnerable tree species and/or increase resilience of field and tree crops to drought and flood hazards by management options. Previous studies showed that households' most common response to drought and crop failure was seasonal migration for wage labour, which is a highly gendered activity, and therefore has impacts on gender aspects of remaining on-farm adaptation and coping options. To date there has been no in-depth study on these gender issues. Given the frequency of off-farm migration as a coping strategy in the region, it is necessary to better understand the role of and options available to women in adaptation to and coping with water related hazards. It is necessary to refine document and demonstrate the value of gender-sensitive adaptation research. A further rationale is seen in the light of the future incorporation of the region into CCAFS. The survey methods will be compatible with CCAFS adaptation research protocols and ICRAF's IMPACT model for adaptation research. This will provide an essential basis for future IPGs and a baseline for longitudinal studies.

Status: On going. The research field work has been done, and gender-disaggregated data has been collected and analyzed, and the research results have been presented at several international conferences. A journal article in English and a book chapter in Chinese is in the process for submission.

Gender Component: The primary purpose of the research is to identify gendered impacts of water stress, including ways in which specific groups of men or women are more vulnerable, and ways in which institutions and policies contribute to and potentially could further contribute to stronger

adaptive capacity among vulnerable groups in the face of probable continuing water stress.

Objectives:

1. Overall goal: to understand the roles of men and women in adapting to and coping with drought in Yunnan
2. collection and analysis of household-level VACA data, including gender specific data where appropriate
3. qualitative analysis of gender issues at household and community levels
4. analysis of institutions and policies related to gendered vulnerabilities and related issues.

Deliverables:

Description	Type	Year	Status	Justification
gender research skills capacity building among national partners	Capacity	2015	Incomplete	
publication on gendered aspects of VACA in the region	Peer-reviewed journal articles	2014	On going	
awareness raising and policy options discussion workshop with stakeholders in the region	Workshop	2015	Incomplete	
Report plus policy briefs on enhanced institutional / policy support for gender-sensitive adaptive capacity building in the region delivered to key stakeholders	Peer-reviewed journal articles	2015	Incomplete	

Partners:

- 1- Kunming Institute of Botany:
Fuyao <fuyao@mail.kib.ac.cn>
- 2- Yunnan Academy of Social Sciences (YASS):
Zou Yahui <zou-yahui@163.com>
- 3- Yunnan Agricultural University (YAU):
Ren Jian <renjian172@126.com>
- 4- Prefecture Agriculture and Forestry Departments:
Yang Yanping <yangyanping@mail.kib.ac.cn>

5- International Centre for Integrated Mountain Development (ICIMOD):
Neera Pradhan <nspradhan@icimod.org>

Location(s):

Countries: China,

Activity 809-2014

Uncovering the past climate, extreme events and impacts across regions to adapt and mitigate climate changes (2012-2014)

Status	Complete	Milestone	4.2.1 2014 (1)
Start date	2012 Jun	End date	2014 Dec

Description: Climate change is expected to place considerable additional stress on the biophysical, economic, political and social systems that determine livelihood security in Africa. To become sustainable, societies will have to avoid extreme climatic changes, and to adapt to the climate change that does occur. Accordingly, there is a growing need for proactive adaptation management of climate-change risk. Successful adaptation requires the best available information concerning the nature of future climate risks. However instrumental climate data are either absent or short in time scale. Although a number of proxy data series have been developed from temperate and subtropical regions to trace the course of environmental and climatological fluctuations, precise palaeo-climate records from the tropics, notably from Africa, are still sorely lacking. Therefore, it is vital to identify potential climate proxies that could provide empirical data regarding past climatic events. More data on African climate would greatly assist all efforts directed towards adaptation decision making.

Furthermore trees are important components of smallholder farming systems because of their potential to increase livelihood resilience in the face of climate variability and change, enhance human and animal nutrition, enhance nutrient cycling, retain carbon, improve water use efficiency, enhance and maintain a range of ecosystem services in farming landscapes. However, it is becoming increasingly evident that trees themselves are sensitive to climate variability. Hence there is a need to select resilient tree crops and to match the right species across sites and management options to adapt and mitigate climate changes.

The techniques of tree-ring and stable isotopes analysis have been widely used in ecology and climate change studies. By studying the long term climate growth relationships in temperate regions, past climate information ca 10000 years has been reconstructed. Unfortunately this technique hardly exists in Africa because of the previous misconceptions that trees in the tropics does not form rings. However, recently various studies have proved the formation of annual rings in African species and their potential as a climate proxy as a tool in understanding climate changes, Agroforestry, ecological hydrological research questions. Therefore it is necessary to transfer this technology from temperate regions to Africa where past climate information is scarce and develop the capacity of national research institutes and universities.

Status: Complete. completed successfully. state of the art dendro lab has been established in Nairobi. 4 PhD students are being trained

Gender Component: Not defined

Objectives:

1. To reconstruct long term climate data during the past ca. 100 years by tree-ring analyses including the wood parameters ring width, maximum latewood wood density, and stable carbon and oxygen isotope variations in wood cellulose. In doing so, our climate reconstructions carried out in Ethiopia under construction for 400 years, Tanzania (20 years) and west Africa Burkina Faso (30) years shall be extended in time span and compared, where so far no paleoclimatic data exist and where the natural long-term climate variation is largely unknown. Regional and continental climate tele-connections and impacts on the farming system will be traced.
2. To determine which tree species are most suitable to cope with future climatic conditions. This shall be accomplished by measurements of long-term changes of intrinsic water-use efficiency (water consumed by a tree per g produced biomass) by stable carbon isotopes trends in wood cellulose and Oxygen isotope measurements.
3. Tree laboratory in Nairobi established- to develop capacity building of National research organizations and Universities to understand the impacts of climate variability on African species

Deliverables:

Description	Type	Year	Status	Justification
Journal article on African regional past climate, impacts and teleconnections	Peer-reviewed journal articles	2014	Complete	
Journal article on resilience of agroforestry species across climate gradients	Peer-reviewed journal articles	2014	On going	

Partners:

- 1- La Universidad de Erlangen-Nürnberg:

Prof Achim Braeuning <bräuning, achim <achim.braeuning@fau.de>>

Location(s):

Countries: Burkina Faso, Ethiopia, Kenya,

Activity 810-2014

Using remote sensing for drought assessment and monitoring in the highlands of Asia

Status	Complete	Milestone	4.2.1 2014 (2)
Start date	2013 Jan	End date	2015 Dec

Description: Drought can have a major impact on vegetation, and causes a water deficit in the plant which inhibits cell division, enlargement, and differentiation, resulting in reduction of plant size and yield, or often plant mortality caused by severe drought. Traditional (i.e., non-remote sensing) methods of drought monitoring are generally based on drought indices derived from weather station data, such as the often used Palmer Drought Severity Index (PDSI) and Standardized Precipitation Index (SPI). However, there are limitations when using these indices for global or regional drought monitoring because of the sparse network of weather stations and the influences of complex terrain on spatial interpolation. Satellite sensor data has advantages over traditional methods of monitoring drought at global or regional scale, due to higher temporal and spatial resolutions and large area coverage. Several satellite sensors have been used to monitor regional drought (e.g., Advanced Very High Resolution Radiometer (AVHRR); Moderate Resolution Imaging Spectroradiometer (MODIS)). In this study, we used Global Land Surface Satellite (GLASS) LAI data, produced by the Center for Global Change Data Processing and Analysis in China, to assess drought-induced response by vegetation in Asian highlands from 2001 to 2010, along with monthly precipitation data from weather stations within the study area.

Status: Complete. This activity has extended to developing spatial and statistical analytical tools for climatic impact monitoring, which including: 1. bioclimatic Modeling of Climate Change Impacts on Terrestrial Ecosystems, and we made significant progress in developing a methodology to model climate change impacts on terrestrial ecosystems at the landscape scale. 2. Hydrological Modeling of Climate Change Impacts on Terrestrial Ecosystems. We developed and tested a regional scale methodology for the Asian Highlands using a multi-model ensemble of downscaled CIMP5-ESM. 3.3. Drought Analysis. We tested a methodology based upon a suite of recently available advanced remote sensing products to ascertain its use in data-sparse areas, i.e. areas with few weather stations, such as the Asian Highlands. Using data from 2001-2010 in Yunnan Province, we found that this method was useful in drought monitoring when the area was stratified by ecoregions or bioclimatic zones.

Gender Component: Not defined

Objectives:

1. To assess the distribution of drought occurrence
2. To assess the spatial-temporal distribution of vegetation response to drought

3. To analyze the responses of vegetation across various land cover types and elevation ranges to severe drought conditions over the past decade

Deliverables:

Description	Type	Year	Status	Justification
hydrological modeling	Platforms - Data Portals for dissemination	2014	Complete	
drought impact assessment system	Platforms - Data Portals for dissemination	2014	Complete	
synthesis report	Peer-reviewed journal articles	2015	Incomplete	
develop online platform	Articles for media or news (radio, TV, newspapers, newsletters, etc.)	2015	Incomplete	
We developed and tested a robust approach using a multi-model (63) ensemble of downscaled Couple Model Inter-comparison Project - Phase 5 (CIMP5) Earth System Models. This has given improved results for our climate change projections. Our analysis highlights significant impacts expected in this mountain ecosystem by 2050, including rapid and substantial shifts in the mean elevation of both bioclimatic strata and bioclimatic zones.	Platforms - Data Portals for dissemination	2014	Complete	

Partners:

- 1- Kunming Institute of Botany:

Wang Mingcheng <wangmingcheng@mail.kib.ac.cn>

2- National Climate Center (NCC):

Prof.Dr. Jiang Tong <jiangtong@cma.gov.cn>

Location(s):

Countries: China,

Activity 816-2014

Completion of a protocol for quantification of smallholder agricultural GHGs and data to assess mitigation options (SAMPLES)

Status	Extended	Milestone	3.3.2 2014
Start date	2014 Jan	End date	2014 Dec

Description: Discussions of pro-poor mitigation options are limited by the lack of reliable data at spatial scales relevant to decision making. There is a need for consistent, rigorous, and adapted methods, tools, and data capable of assessing the relationships between livelihoods and the climate system to inform sustainable development discussions. To support this, the Standard Assessment of Mitigation Potential and Livelihoods in Smallholder Systems (SAMPLES) project, will hire for a post-doc position to develop and test tools and approaches to quantitatively assess and prioritize farming practices that contribute to both GHG reductions and farmers' livelihoods at fields, household, village, and landscape levels.

Status: Extended. The SAMPLES protocol is nearly complete. Ten of the twelve chapters are through scientific review and the final two are nearly complete. The completed chapters have been formatted according the Springer publication guidelines. Springer will create a flyer to distribute at the Montpellier CSA conference. The protocol will be published in 2015.

Gender Component: Not defined

Objectives:

1. Generate robust and comparable data on the greenhouse gas emissions and removals, and livelihood indicators, for intensified smallholder systems with high mitigation potential, where data gaps exist, where the CG is active, and where there is high potential for policy impact.

Deliverables:

Description	Type	Year	Status	Justification
Tools and approaches for implementing integrated assessments at future SAMPLES sites.	Peer-reviewed journal articles	2014	On going	The deliverable has been delayed due to the difficulty in finding reviewers. Some chapters took four months or more for review. Still, there has been progress and the chapters/effort/protocol are nearly complete.
At least (2) peer-reviewed publications using spatial and trade-off analyses to identify mitigation options at the current SAMPLES sites.	Data	2015	Incomplete	

Partners:

- 1- World Agroforestry Centre (ICRAF):
Todd Rosenstock <t.rosenstock@cgiar.org>
- 2- Center for International Forestry Research (CIFOR):
Mariana Rufino <m.rufino@cgiar.org>
- 3- International Livestock Research Institute (ILRI):
Klaus Butterbach-Bahl <k.butterbach-bahl@cgiar.org>

Location(s):

Global

Activity 824-2014

Multi-disciplinary species distribution modeling – climate change impact projection and adaptation planning with climatic, environmental and socioeconomic factors (2013-2015)

Status	On going	Milestone	4.3.1 2014 (1)
Start date	2012 Jul	End date	2015 Dec

Description: Given the costs and complexities of running multi-locational and long-term trials, species distribution models are among the most powerful tools currently available for projecting the potential impacts of climate change on natural and agricultural ecosystems. This potential has recently been enhanced by an array of machine-learning algorithms and ensemble approaches. Typically, only climatic data are used for projecting climate change impacts, even though the distribution of natural and agricultural species also depends on other environmental and socioeconomic factors. This project will make use of the unique opportunities presented by a dataset available at ICRAF, which will be enhanced and thoroughly evaluated. This dataset comprises aerial imagery from 1983 covering most of the agricultural areas of Kenya, from the coast to the Ugandan border, a total of 80,000 km². For the entire range, agricultural crop prevalence has been recorded and linked to infrastructural (accessibility, distance to markets etc.) and socioeconomic (land tenure, household structure, age, gender, ethnicity etc.) datasets, derived from geospatial layers, as well as government census data. New imagery for 2012, covering Kenya's agricultural lands, parts of Uganda and DRC will also be collected to expand the climatic domain covered, and to provide a test dataset, with which species distribution projections based on 1983 data can be validated.

This dataset will be analyzed by climate analogue analysis and various species distribution modeling techniques to a) test, compare and refine species distribution modeling techniques; b) develop recommendations for more robust species distribution forecasts; c) explore the potential of climate analogues in guiding sampling for species distribution modeling; and d) explore the relative importance of climate information and socioeconomic data in explaining species distribution. Furthermore the project aims to produce open-access software tools for facilitating climate change impact projection and adaptation planning, and to familiarize national stakeholders with these new tools.

Status: On going. The project is now on task and additional funding will be sought to expand the current deliverables, namely, land use/cover classification will be crowd-sourced (online) and CC projections/scenario-building will be done in participatory manner with national decision-makers/international donors. I took over the project and its management was poor- namely the consultants who were hired did not execute their deliverables in a timely or usable format -- this led to great delays and has since been rectified.

Gender Component: The proposed activities will, as far as we know for the first time, allow using gender-disaggregated data in socio-ecological species distribution modeling. For this, all gender-

disaggregated information contained in national census data is available. This will also allow relating gender distribution with land tenure and a host of other variables that will be collected in the activities contained in this proposal.

Objectives:

1. Produce a detailed multi-temporal and spatial database of crop distributions, infrastructure and socioeconomic attributes spanning most of Kenya's agricultural areas, as well as parts of Uganda and DRC.
2. Using an insufficient range in collecting samples for species distribution modeling can be a problem, because potential future climates may not be included among the sampling locations. Climate analogue analysis will be tested for its potential to guide sampling schemes and to minimize the risk of under-sampling important areas. Another potential error in species distribution modeling derives from intra-specific differences in climatic requirements, which may limit the viability of plant specimens even within the suitability domain for a particular species. This source of error will also be investigated.
3. The presence of a particular crop in a particular location is determined not only by climate and soil but also by the local socioeconomic environment. This work package will quantify the relative importance of these factors and explore the likely impact of two alternative climate change adaptation strategies: a) introduce more suitable crops; 2) improve the socioeconomic environment (by e.g. land tenure reform or infrastructural development).
4. Make advanced modeling techniques available to stakeholders in an easy-to-use manner, contributing to climate change analysis capacity in Kenya, Uganda and beyond.

Deliverables:

Description	Type	Year	Status	Justification
Report and journal paper on best-practices in niche modeling-based climate impact projections	Peer-reviewed journal articles	2014	On going	The article is under review, but only captures certain aspects of the project deliverable. The remaining deliverable aspects have been extended to year 2015.
Improved methodologies for niche modeling and climate analogue analysis that incorporate socioeconomic information	Data	2014	On going	The data took longer to acquire, process, and store, so its analysis/modeling continues.
publication of relative potentials of adaptation strategies focusing on agricultural techniques vs. socioeconomic development measures.	Peer-reviewed journal articles	2015	Incomplete	
open-access modeling tools and accompanying training materials for climate change impact projections	Platforms - Data Portals for dissemination	2015	Incomplete	
researcher training workshop in use of the new tools	Capacity	2015	Incomplete	

Partners:

- 1- Tegemeo Institute of Agricultural Policy and Development (TEGEMEO):
Mike Norton-Griffiths <mng5939@gmail.com>

Location(s):

Countries: Kenya,

Activity 826-2014

Making use of Agroforestry through Asset Based Community Driven Development for Rural Poverty Reduction (COMART)

Status	Complete	Milestone	4.2.1 2014 (1)
Start date	2011 Sep	End date	2014 Aug

Description: Farmers in the Lower Nyando region of western Kenya have expressed the need for robust adaptation measures to reduce their vulnerability to climate hazards, irrespective of the type of climatic impact. However, from the analysis of current measures it is clear that they are not coping in a sustainable way (Thorlakson, 2011). Future climate change is expected to exacerbate current vulnerabilities in the absence of appropriate adaptation measures.

For the past 2 years, the COMART project has implemented activities in the Lower and Middle portions of the Nyando river basin, with main focus on tree nurseries establishment, tree planting, rehabilitation of degraded areas. Furthermore, ABCD training of communities (Mobilizing Assets for Community-Driven Development Programme) was carried out in 4 community groups. In addition an impact assessment was carried out to evaluate the effects of the interventions (Thorlakson, 2011). Interventions and training undertaken within the WKIEMP project (WKIEMP, 2010) were also analyzed.

Status: Complete. All project activities were finalized and deliverables submitted. Final project evaluation was carried out, a comprehensive report was submitted to the donors, a paper is under review and the proposal for the third project phase was accepted.

Gender Component: Women included in project groups and activities; group leadership and group dynamics training addresses gender issues directly and has contributed to the transformation of gender relations amongst project groups.

Objectives:

1. Analyze the value-chain to better relate agroforestry products and practices as well as other products (e.g. from livestock) to local and regional markets
2. Communicate on the methodology
3. training on Coady's Livelihoods and Market course
4. develop a full proposal for the second phase based on the lessons that can be learned from phase one

Deliverables:

Description	Type	Year	Status	Justification
A report on the value-chain analysis	Research report (i.e. workshop report, consultant's report, discussion paper, project report, student thesis, etc.)	2014	Complete	
A sort video	Articles for media or news (radio, TV, newspapers, newsletters, etc.)	2014	Complete	
Training of two ICRAF staff in Coady's Livelihoods and Market course	Capacity	2014	Complete	
Development of a detailed work plan and budget for phase two	Research report (i.e. workshop report, consultant's report, discussion paper, project report, student thesis, etc.)	2014	Complete	

Partners:

1- COADY International Institute (COADY):

Brianne Peters <bpeters@stfx.ca>

Location(s):

Countries: Kenya,

Activity 829-2014

Sustainable Rural Development through High Value Biocarbon Approaches: Building Multifunctional Landscapes and Institutions in West and East Africa, focus on Carbon measurement and monitoring systems

Status	Cancelled	Milestone	4.2.1 2014 (3)
Start date	2013 Jan	End date	2016 Jul

Description: This is a rather technical issue, but it is deemed by many to be a major obstacle in enabling smallholder agriculture villages from benefiting in a meaningful way from carbon markets. This issue is a key feature of the Programme because nearly all the international partners have been embarking on innovative approaches towards carbon measurement. There is high potential of making significant progress in efficiency over current systems. In particular, the partners aim to make most effective use of combining remote sensing images with ground measurements to be able to measure both above ground and below ground carbon. The testing of airborne LiDAR (Light deflection and ranging) methods for assessing biomass and carbon will be tested in one site, while very high resolution data will be tested in others. In all cases, these will be complemented by ground measurements to validate the accuracy of remote sensed data and to capture soil carbon. Another innovative feature of the Programme will be to test and identify ways to extend the traditional carbon measurement systems to encompass a range of other ecosystem services, which could then help villages gain access to a range of environmental service payment schemes. Such a tool will also provide a valuable tool for assessment of natural resource health at the baseline and in doing so also help to inform Programme interventions.

Status: Cancelled. Activity almost completed for the field work both in Burkina Faso and Sierra Leone. Soil samples and data processing is on-going.

Gender Component: Not defined

Objectives:

1. The aim of this activity is to develop effective and cost efficient carbon monitoring, reporting and verification systems that can enable smallholder villages to access carbon markets.

Deliverables:

Description	Type	Year	Status	Justification
Land health data collection based on LDSF in Burkina Faso and Sierra Leone	Data	2014	Complete	
Soil sample processing	Data	2014	On going	Ebola outbreak
Gathering of satellite and ancillary data from study sites	Data	2014	Complete	
Developing field guide for above- and below-ground carbon measuring	Platforms - Data Portals for dissemination	2014	Complete	
LiDAR data analysis	Data	2014	On going	Under review
Data and report on above and below ground carbon stocks in Taita Hills	Research report (i.e. workshop report, consultant's report, discussion paper, project report, student thesis, etc.)	2014	On going	Ebola outbreak in Sierra Leone
Data and report on above and below ground carbon stocks in Burkina Faso and Sierra Leone	Peer-reviewed journal articles	2014	On going	Ebola outbreak in Sierra Leone
Training on carbon measuring and monitoring tools	Capacity	2014	Complete	
Developing field guide for biodiversity measurement	Platforms - Data Portals for dissemination	2014	Complete	

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Location(s):

Countries: Burkina Faso, Kenya, Sierra Leone,

Activity 830-2014

CGIAR Center support to include climate change research in the "Global Futures for Agriculture" project

Status	On going	Milestone	4.3.3 2014
Start date	2011 Jan	End date	2014 Dec

Description: The Global Futures project aims to assist the CGIAR in identifying priority research investments through the use of quantitative forecasting models that can account for climate change scenarios. ICRAFs particular involvement is twofold: first to analyze agroforestry options in terms of expected impacts and second to improve the existing ex ante modeling framework to better handle natural resource management technologies -- the current platform of DSSAT and IMPACT is much better suited to analyzing impacts of new crop varieties. Several activities are required to enable this to be done, among them is collection of high quality data sets that will enable the parameterization of the models. The CCAFS funds in 2013 are being used to collect data that can be used for this purpose.

Status: On going. The collection of datasets was completed during 2012-13 as planned. However, a modeler was not hired until early 2014 and an additional one to work full time on this until August 2014. So that work was delayed. There was also a paper to be done on gender and fertilizer trees but the person assigned to that did not complete the paper on time.

Gender Component: Data are collected from men and women farmers enabling the testing of the effect of agroforestry on men and women. In terms of the forecasting of impacts, the DSSAT and IMPACT framework does not currently disaggregate by gender, but it is now possible to do so, if the required data can be generated.

Objectives:

1. To collect plot and household level data on agroforestry fertilizer tree practices in Malawi. Household data will be collected on several hundred households, while measured yield and soil data will be collected on about 160 households.
2. To analyze the effects of agroforestry on maize production and the differential effects (if any) between male and female farmers.

Deliverables:

Description	Type	Year	Status	Justification
Models improved for forecasting impacts of agroforestry under climate change; Empirical analyses available.	Platforms - Data Portals for dissemination	2014	On going	This is explained for the first output.
Empirical analyses available	Data	2014	Complete	
Develop models and platforms for better integrating agroforestry and NRM into CGIAR ex ante impact modeling systems	Platforms - Data Portals for dissemination	2014	On going	Explained for the overall activity, the long delay in replacing the modeler who left ICRAF in 2012. It was necessary to raise bilateral funds to support that staff time and it took considerable time to do that.
gender analysis of agroforestry and maize yields in Malawi	Peer-reviewed journal articles	2014	On going	The researcher assigned to the analysis and writing a draft only accomplished the former. Because the PI left ICRAF at mid-year it was difficult to ensure that the work would be completed on time.

Partners:

Partners not defined

Location(s):

Countries: Malawi,

Activity 831-2014

Multi-criteria and across-scales assessment of climate buffering functions of key tree-based farming systems in West and Central Africa region

Status	Cancelled	Milestone	1.1.3 2015 (1)
Start date	2014 Jan	End date	2017 Dec

Description: The already prevailing food insecurity is being worsened by climate change and a growing population that is predicted to reach 9 billion by 2050. To meet the needs of this population food production must increase by 70% by 2050 and the most challenging part of such increase is the changing climate, particularly in Sub-Saharan Africa where vulnerability is greatest. Agroforestry, a land-use system that integrates trees and shrubs with crops and/or livestock production, builds on the idea of ecological design to optimize beneficial interactions between the woody and other components leading to higher productivity. Therefore these systems are expected to reduce the vulnerability of the farmers to shocks and climate change. To continue to play their roles, these systems need to be resilient (species and system levels) to be able to support the livelihoods of the local populations through better coping strategies. Therefore, how these systems are able to help coping better will be at the center of this work across climatic zones of the west and central Africa (WCA) region of ICRAF. The idea is to assess the innovations we are testing with farmers in various projects in WCA region (MARS, BIODEV, etc.) and generate data that will support how the tested agroforestry options are contributing to a better resilience of the population using the same indicators across projects and climatic zones. This activity will apply new research approaches taking into consideration context specific conditions at community level involving the national agricultural research systems (NARS) and other bodies in charge of natural resources. These approaches will aim at developing the expertise of the involved actors through participatory action research methods to bring about changes in behavior. Our working hypotheses are: (1) multifunctional landscape with trees provides buffer functions at a number of ecological and socio-economical scales, that jointly reduce human vulnerability and negative impacts of climate change, (2) emerging best fit interventions of agroforestry at landscape scale through knowledge development can reverse the negative trend of natural resources degradation and thus reduce human vulnerability to climate change and (3) appropriate policy regulations are needed in parallel to create an incentive environment for long term investment of the local stakeholders.

Status: Cancelled. Activity conducted in two out three countries. The reports have been produced and are under review for the two countries covered which are Burkina Faso and Cote d'Ivoire

Gender Component: Women and marginalized groups are those who rely most on NR for their livelihoods and therefore will be the most affected as this activity will address their concerns with their involvement in testing the various options. At the end of the project gender related issues are clearly recognized by current institutions as key for resilient food production systems. For any upscaling

activities women should count for at least 50%.

Objectives:

1. understand the links between local livelihoods and climate
2. evaluate needs for community-level adaptive capacity
3. devise adaptation and mitigation options to reduce vulnerability and enhance the adaptive capacity across WCA

Deliverables:

Description	Type	Year	Status	Justification
Baseline data on livelihood parameters that will be affected by buffering climate change agroforestry interventions	Data	2014	On going	Ebola outbreak in Sierra Leone
Collecting existing property right regimes for landscape management options and climate change mitigation activities	Data	2014	On going	Ebola outbreak in Sierra Leone
Collecting existing institutional decision making systems across landscapes and ways identified to increase control by women and other marginalized groups of assets, inputs, information and decision-making	Data	2014	On going	Ebola outbreak in Sierra Leone
Collecting constraints and opportunities for marketing of products from climate buffering agroforestry interventions	Data	2014	On going	Ebola outbreak in Sierra Leone
Promising agroforestry systems tested for impacts in different ecological locations, and complementarities between agroforestry and other sustainably productive approaches to climate change assessed	Data	2015	Incomplete	
Management recommendations of complementary crops (cash and food) to cocoa	Articles for media or news (radio, TV, newspapers, newsletters, etc.)	2015	Incomplete	
Extension approaches, including rural resources and cocoa development centres, for linking farmers to markets	Articles for media or news (radio, TV, newspapers, newsletters, etc.)	2014	On going	Ebola outbreak in Sierra Leone

Description	Type	Year	Status	Justification
Government extension workers effectively trained to deliver high quality services that lead to increased and sustainable production	Capacity	2016	Incomplete	
Training of national and local stakeholders on decision support tools for assessing environmental and well-being effects of agroforestry interventions in different niches	Capacity	2016	Incomplete	
Experiences and lessons learnt from the different interventions implemented at the sites analyzed	Peer-reviewed journal articles	2016	Incomplete	
A journal paper comparing different adaptation strategies and livelihoods across WCA as being affected by agroforestry practices	Peer-reviewed journal articles	2016	Incomplete	
A workshop for sharing results and lessons learnt	Workshop	2017	Incomplete	
Manual of best practice guidelines from existing experiences across WCA	Peer-reviewed journal articles	2017	Incomplete	

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Location(s):

Countries: Burkina Faso, Ivory Coast, Sierra Leone,

Activity 832-2014

Climate smart agriculture for food security and resilience of smallholder agriculture in Southern Africa

Status	On going	Milestone	1.1.1 2015 (1)
Start date	2014 Jan	End date	2015 Dec

Description: Agricultural productivity in Southern Africa has been declining over the last decades. The main causes for this includes, declining soil fertility, low use of fertilizers, and lack of use of improved technologies. The region is also experiencing incipient climate change with extreme weather conditions, frequent droughts and floods, and reduced annual rainfall. This will exacerbate the food and nutrition insecurity in the region. Agroforestry as one of the climate smart agriculture practices has a major role to play in improving food security. ICRAF Southern Africa initiated the Agroforestry Food Security Programme (AFSP) for Malawi to improve smallholder livelihoods and food and nutrition security. The project on Building a Large Evergreen Agriculture Network in Southern Africa (BLEANSA) promotes the sharing of information and relevant agroforestry technologies among researchers, national agricultural research institutions, development practitioners and policy makers to support the widespread adoption of agroforestry, conservation agriculture and other climate smart agriculture practices in the region. This proposed work will strengthen the two programs (AFSP and BLEANSA) by providing information on the contribution of climate smart agriculture practices being promoted to increased agricultural productivity, adaptation and mitigation to the impacts of climate change and climatic variability, and enhanced resilience of smallholder agricultural systems. It will also explore the implications on gender roles, well-being of various social groups policies and processes required to support the the adoption of climate agriculture practices by large numbers of smallholders.

Status: On going. Bilateral project supporting the activity is on-going for another agricultural season. Some data gathering activities planned to take place over more than one season.

Gender Component: Many studies show that there is a relationship between gender, livelihood and poverty. In Malawi like in other developing countries the majority of the population depends on the natural resource base for their livelihoods. Studies on the implication of climate change have shown that natural resource based economic activities such as agriculture will be disproportionately impacted by climate change. The study /project will collect gender disaggregated data to help shed light on the questions of whether women and men in Malawi differently impacted by climate change. Interviews will be held with women and men separately during household surveys and focus group discussion to generate information and data which can be used for gender analysis to help improve our understanding of how women and men are impacted differently by climate change (e.g., impact on women and men's roles), the physiological, political, economic and societal causes for the differences experience among women and men in an environment of increased climate variability and climate change, the coping and adaptation strategies available to and employed by women and men,

and differences in their capacities. This knowledge can be used to develop more effective policies and programs to help strengthen the capacity of women and men to enable them to adapt to climate change and climate variability.

Objectives:

1. Assess of the impact of climate smart agriculture practices on soil carbon and soil properties
2. Assess contribution to above ground carbon in climate smart agriculture practices
3. Quantify the impact of climate smart agriculture practices on crop productivity
4. Assess impact of climate smart agriculture practices on women's roles
5. Evaluate the socio-economic viability of climate smart agriculture practices
6. Assess policy options to better support widespread adoption of climate agriculture practices

Deliverables:

Description	Type	Year	Status	Justification
Household data: on crop/ maize production for agroforestry/ climate smart agriculture practicing and non-practicing households, livelihoods and income, perceptions of climate change, and socio-economic characteristics	Data	2014	Extended	To take advantage of possibility to use multi-season data. Single season data does not allow to correctly measure impact of an intervention in the agricultural system. The bilateral project supporting the activity will run for 4 years.
Report/ Journal article on the contribution of agroforestry and climate smart agriculture practices on productivity of agricultural systems and household food security, and a benefit-cost assessment of climate smart agriculture practices versus conventional production practices	Peer-reviewed journal articles	2014	Extended	To take advantage of possibility to collect multi-season data
Report on gender and the impact of climate change among smallholders in Malawi	Non-peer reviewed articles	2014	On going	Pending finalisation
Report on contribution of agroforestry and climate smart agriculture practices to below and aboveground on smallholders' plots	Peer-reviewed journal articles	2015	Incomplete	
Report on the review of agricultural and natural resources management policies and their influence on the adoption of agroforestry and climate smart agriculture practices	Peer-reviewed journal articles	2015	Incomplete	
Policy brief on contribution of agroforestry and climate smart agriculture practices to improving in natural resource management, food security and resilience to climate change and climate variability	Articles for media or news (radio, TV, newspaper S, newsletters ,etc.)	2015	Incomplete	

Description	Type	Year	Status	Justification
Communications products – case studies and policy brief posted on the Building a Large Evergreen Network in Southern Africa (BLEANSA) website	Articles for media or news (radio, TV, newspapers, newsletters, etc.)	2015	Incomplete	
5. Workshop – To share research results on impact of agroforestry and climate smart agriculture practices on natural resource management, food security and resilience of farming systems to climate change. Participants to be drawn from government departments, non-governmental organisations, researchers from institutions of higher learning, farmers' organisations and associations, and community based organisations	Workshop	2015	Incomplete	

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Location(s):

Countries: Malawi,

Activity 833-2014

Enhancement of adaptation capacity and reduction of farm and landscape level vulnerability through innovative technological packages for expanding commodity crops in the Amazon

Status	On going	Milestone	1.1.1 2014
Start date	2014 Jan	End date	2015 Dec

Description: Commodity crops such as oil-palm and cacao, considered “strategic crops” by several regional governments, are rapidly expanding in the Peruvian Amazon with consequences for forest cover and CO₂ emissions. Expansion is driven mostly by migrant smallholders, supported by generous public incentives, national and international funds, NGO’s and private sector investment. Without effective research on the impact of CC on these crops distribution, migrant smallholders involved in commodity crop production based on current technological packages and government expectation of rural sector development in these areas run the risk of falling victim to the direct and indirect effects of climate change. Trees can be an option to enhance system resilience and producers adaptive capacity to CC through product diversification, income generation, buffering against extremes and through provision of ecosystem services. The ways of deploying trees to decrease vulnerability remains largely unexplored.

Climate change (CC) modelling and recent experience suggest that the Amazon will become on average drier, but with more extreme fluctuations: expectations are of droughts, higher fire risk, higher risk of flood events. As these changes will occur against a background of ongoing degradation of natural resources and ecosystem services (ES), including locally-caused changes in micro- and meso-climate regimes, major adverse consequences for local populations (rural, urban, “multi-located”) are expected.

The impact on local climate, on degradation processes and on household vulnerability will ultimately depend on the characteristics of the expanding systems, including establishment and management practices – and the use of tree resources- which are determined by the technological packages adopted by farmers, the compliance with good practices in micro-level land use planning, mediated by local knowledge and experience that determine decisions about land use and natural resources management, i.e. the way in which trees (vegetation in general) and diversity are managed in particular contexts and for particular purposes.

Determinants of biophysical and socio economic vulnerability of expanding migrant commodity systems and options for use of Agroforestry systems and trees resources at the plot and landscape level is the object of the activities proposed to develop a framework for Climate Smart Technological Packages. Synergies with mitigations options (reforestation, trees planting etc. and related standards) are explored.

Status: On going. this project was part of an FTA 6.4 CCAFS co-funding activities will be completed in 2015 under FTA 6.4 funds

Overall because of budget restrictions (note that budget here does not seem to correspond to POWB)

and challenges in the field, some activities have been delayed and some did not start because of the departure of ICRAF collaborators in charge for it that were replaced only at the end of 2014

Gender Component: a gender component will be integrated in HH surveys and tools for collection of local ecological knowledge, including disaggregated data collection and analysis

Objectives:

1. ESTABLISH THE BASE FOR ACTION: FARMING SYSTEMS, VULNERABILITY, HOUSEHOLDS AND ASSETS, LOCAL ECOLOGICAL KNOWLEDGE
2. ESTABLISH THE BASE FOR ACTION: SOCIAL AND INSTITUTIONAL CAPITAL
3. ESTABLISH THE BASE FOR ACTION: LOCATIONAL AND LANDSCAPE VULNERABILITY
4. KNOWLEDGE TO ACTION: FACILITATE CC-SMART SMALLHOLDER COMMODITY PRODUCTION

Deliverables:

Description	Type	Year	Status	Justification
ICRAF-LA "big issue"bulletin issue featuring the problem and our approach	Presentations	2014	On going	Event postponed to March 2015
Workshop	Capacity	2014	Complete	
Interim - Report on farming systems/livelihoods strategies	Research report (i.e. workshop report, consultant's report, discussion paper, project report, student thesis, etc.)	2014	Complete	
Research Report on Local Knowledge	Research report (i.e. workshop report, consultant's report, discussion paper, project report, student thesis, etc.)	2014	Complete	
Research Report on collective strategies (cooperatives/producers associations) for coping with CC	Research report (i.e. workshop report, consultant's report, discussion paper, project report, student thesis, etc.)	2014	On going	to be confirmed / researcher in charge for it has left ICRAF in 2014, budget restrictions in 2014 are not confirmed so it is not sure it will be possible to maintain this activity
Policy and technical briefs about risks related to current systems expansion	Presentations	2014	On going	delayed

Description	Type	Year	Status	Justification
GeoDB for Maps of CC scenarios on at least one identified crop and one tree species	Databases	2014	On going	Delayed, Available first half 2015
AKT, local knowledge data base for at least one community documented, and list of species and practices (per gender if the case) in spanish, available online	Data	2014	On going	activity was delayed to get inputs from first LEK reports (see output 2-3)
Manuscript, Policy Brief on Collective Actions on collective action	Peer-reviewed journal articles	2015	Incomplete	
Policy Brief on trade-off and synergies	Articles for media or news (radio, TV, newspapers, newsletters, etc.)	2015	Incomplete	
Manuscript on Tradeoffs in land and trees management	Peer-reviewed journal articles	2015	Incomplete	
models and tools developed and made available online	Platforms - Data Portals for dissemination	2015	Incomplete	
workshops with local producer associations and extension services, donors, technical agricultural roundtables and regional and national policy makers	Workshop	2015	Incomplete	
Modelling workshop	Workshop	2015	Incomplete	
Workshop with associations and development actors to discuss research outputs and present the framework developed	Workshop	2015	Incomplete	

Description	Type	Year	Status	Justification
Report and models for Climate Smart Technological package	Peer-reviewed journal articles	2015	Incomplete	

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Location(s):

Countries: Peru,

Activity 834-2014

Gender-sensitive analysis of climate change adaptation/mitigation measures undertaken by farmers across five dryland sites of East Africa (DGIS project)

Status	On going	Milestone	1.1.1 2014
Start date	2013 Sep	End date	2018 Aug

Description: Dryland Systems of Ethiopia, Kenya, Niger, Burkina Faso and Mali are the target zones of a new 5 year Dutch funded development program aimed at transforming farming systems and rural economies through improved land, water and soil management, increased commercialization and supporting policy and institutions. The requested CCAFS funding will enhance the likelihood of sustainable impacts through the enhanced capacity of farmers (women, men and youth) and local institutions (1) to adapt to climate change and shocks through an enriched set of climate smart agriculture innovations being co-developed; (2) to mitigate CC impacts through the adoption of practices to increase biomass production of annual and perennial crops on farm and at landscape; and (3) to adopt insurance schemes allowing them to undertake profitable but risky investment. The immediate outcomes towards these intermediate development outcomes are (1) the improved capacity of development partners in the five countries to undertake gender sensitive diagnoses related to climate change and to devise gender responsive solutions to test, and (2) the improved capacity of local and national policy makers in the five countries to make informed decisions on funding for climate smart agriculture and insurance mechanisms relevant to the drylands.

Status: On going. The inception year just ended in December 2014 with an extension to 31 January 2015. ICRAF submitted the inception report to the donor on 16 February 2015. During the inception year, ICRAF and implementing partners selected the project sites, carried out baseline and characterization studies, implemented quick wins targetting 18,536 female and 17,266 male farmers in the five target countries. In Burkina Faso, for instance, 87,257 ha was treated with climate-smart agricultural practices aimed at building the resilience climate to shocks. In Niger, farmer to farmer training was promoted to 140 female and 637 male farmers. In Mali, 4800 female and 44 male farmers planted and maintained 5,553 Moringa trees.

Moving forward ICRAF shall lead the options by context approach so as to ensure that rigorous research informs the efforts by development partners in this program.

Going forward, ICRAF has prepared the work plan and budget for the period 2015-2018.

Gender Component: Specifically targeting the needs of women, youth and other socially disadvantaged groups while addressing constraining factors for technology adoption (land and tree tenure, gendered perceptions on technologies, etc.) in marginal lands will ensure at least 50% of the benefits will accrue to these groups. The development oriented nature of the bilateral project emphasizes the achievement of outcomes as well as an inclusive approach to reach all types of farmers.

Objectives:

1. Adaptation:
 - baseline: better understanding of which climate change adaptation measures are undertaken by farmers (women, men, youth) and why they are undertaken, ex. as ex-ante (investment to reduce risks) vs. ex-post (coping) strategies to derive recommendations for solutions to be tested through the bilateral projects;
 - M&E: evidence on the degree to which these measures enhance the capacity of farmers and institutions to adapt to climate shocks through sound M&E systems.
2. Mitigation:
 - baseline: estimation of increased/reduced soil organic matter and GHG emissions under farming practices adopted by farmers through simple carbon measurement protocols to be devised;
 - M&E: evidence on how much development intervention can contribute to carbon sequestration at farm/landscape levels.
 - To tailor the tools to measure CC resilience capacity of farmers/groups
 - To collect the evidence on successful business models and enterprises
3. Insurance:
 - Feasibility analysis: evaluation of potentials for index insurance schemes to help farmers to make decisions to adopt highly profitable but more riskier investment in the context of climate variability.

Deliverables:

Description	Type	Year	Status	Justification
dialogue with the partners to develop the baseline and M&E tools to monitor the adaptation measures undertaken by women and men farmers in the intervention sites	Research report (i.e. workshop report, consultant's report, discussion paper, project report, student thesis, etc.)	2014	Complete	
training the partners to implement the baseline and M&E to collect and handle the data	Capacity	2014	Complete	
report/submit papers to journals on a case study in South Kitui of Makueni on the factors (with special focus on gender, institutional factors) affecting the adoption of trees and other adaptive measures on farm	Peer-reviewed journal articles	2014	On going	
report/submit papers to journals on a case study in South Kitui of Makueni on the patterns of tree/biomass adoption on farm/landscape	Peer-reviewed journal articles	2014	On going	
suitability modelling, climate analogues, species selection tools, interactive maps	Platforms - Data Portals for dissemination	2014	On going	
reports based on analysis and M&E	Peer-reviewed journal articles	2015	Incomplete	
policy recommendations on intervention to promote the best farming practices to increase household capacity to adopt to CC	Peer-reviewed journal articles	2015	Incomplete	

Description	Type	Year	Status	Justification
policy recommendations on intervention to promote the best farming practices to increase biomass production and carbon sequestration at farm/landscape level	Peer-reviewed journal articles	2015	Incomplete	
dialogue with partners	Other	2015	Incomplete	

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- 9- Cooperative for Assistance and Relief Everywhere (CARE):
Peter Wright <peter.wright@co.care.org>
- 10- Reseau Marp:
Issiaka SAWADOGO <issiaka24@yahoo.fr>
- 11- Sahel Eco:
Madame Ballo Mary Allen <saheleco@afribone.net.ml>

Location(s):

Countries: Ethiopia, Kenya,

Benchmark Site: Makueni (Wote),

Activity 835-2014

Scaling-up climate-smart agriculture in South Asia

Status	Complete	Milestone	4.1.2 2014
Start date	2014 Jan	End date	2014 Dec

Description: This activity will summarize 3 on-going activities taking place in India in the last four years. All those activities are supported by bilateral funding. The aim to scale-up climate smart agriculture in India

The 3 activities are :

- Enabling Small Holders to Improve their Livelihoods and Benefit from Carbon Finance (NAIP)
- Enabling small holder vulnerable communities to secure sustainable livelihoods under changing climate in India (NICRA)
- Integration of climate change in national agroforestry policy in India (API)

Status: Complete. The activity was completed successfully within the scheduled time frame. In the first activity, synthesis report of four years extensive work under the NAIP project was summarized in form of final report, that has been submitted to the donor. Interventions in the project covered 10% area by trees, 80% households by energy efficient gadgets, and 100% area by emission reducing farm practices. Tree interventions increased over time in the communities; more than 370,000 trees were planted in the four grids. At Jaffergudem grid for planting 103,701 trees farmers have been paid an amount of Rs.124 lakhs @ Rs. 120 per surviving tree. At the time of tree maturity at a very conservative value of Rs. 1000 per tree sold only as fuel wood, farmers would realize revenue of more than Rs. 100,000,000 at each grid. There has been substantial savings in energy expenses; fuel wood for cooking and heating by 50% (av. 7.3 tons wood /year), Rs. 830 in electricity bills per month and 18 liters of kerosene per month where used. There is enhancement in the farmers income & livelihoods, better environment through reduced emissions, and increased carbon sequestration. A prior consideration for all the grids submitted, accepted and registered at the CDM. Calculated CERs: 11,962 for Jaffergudem, 12,987 for Athagarh, 25,378 for Mavli and 7,428 CERs for Almorah grid.

In the second activity, NICRA project has generated a methodology paper, one fodder supply systems review paper for India, technology advisory notes on raising livestock wealth through enhancing fodder supply. All farmers in the project grids have been able to produce more than enough fodder for the entire year at the same or even higher livestock population. Last year some communities after keeping the required fodder for the entire year have been able to sale extra fodder. There is a significant increase in livestock population and milk production at Allahabad site; 6000 liters of milk is sold daily from Kaurihar block site

The third activity on National Agroforestry Policy was completed early in the year with the launch of National Agroforestry Policy of India by the President of India during the World Congress on Agroforestry, Delhi-2014. All the work in these activities was summarized during the workshop on scaling-up of climate smart technologies on 26-27 November, 2014.

Gender Component: The energy saving interventions, especially the shift to efficient cooking stoves have reduced the drudgery of women, as their wood consumption for cooking has reduced by 40% and have to carry less fuelwood. They have also saved time from efficient stoves. Few of them, now utilize this saved time by increasing the number of goats they handle. The women and men also received monetary benefits as paid labor for planting and taking care of the trees planted under agroforestry systems. The nutrition and food security will be enhanced in coming years when the fruit trees planted in the project will start bearing fruits.

Objectives:

1. Synthesize the work done in the past 4 years with the 3 projects:
 - Enabling Small Holders to Improve their Livelihoods and Benefit from Carbon Finance (NAIP)
 - Enabling small holder vulnerable communities to secure sustainable livelihoods under changing climate in India (NICRA)
 - Integration of climate change in national agroforestry policy in India (API)

Deliverables:

Description	Type	Year	Status	Justification
Assessment of agriculture based CDM applications success and failures in India.	Peer-reviewed journal articles	2014	On going	The documentation is complete and the paper is in the final review stage.
Analysis and synthesis of selected climate smart agricultural practices with focus on livestock and fodder systems in Rajasthan (NICRA), India.	Peer-reviewed journal articles	2014	Complete	
Synthesis of four years experiences on enhancing livelihoods and carbon finance in India through emission reduction and carbon sequestration activities in four ecological grids (NAIP), India.	Peer-reviewed journal articles	2014	Complete	
Final workshop for developing a monograph on Scaling up of climate smart agricultural practices	Workshop	2014	Complete	

Partners:

- 1- Central Research Institute for Dryland Agriculture (CRIDA):
JVNS Prasad <jasti2008@gmail.com>

- 2- Orissa University of Agriculture & Technology:
A K Sahoo <drashokkumars@yahoo.com>
- 3- Maharana Pratap University of Agriculture and Technology (MPUAT):
Amol Vasishth <vasishthamol@gmail.com>
- 4- Foundation for Ecological Security (FES):
Jagdish Rao <ed@fes.org.in>
- 5- Indian Council of Agricultural Research (ICAR):
A K Sikka <aksikka@icar.org.in>
- 6- Utthan Centre for Sustainable Development & Poverty Alleviation:
D N Tewari <dn.tewari@nic.in>
- 7- Ministry of Agriculture (MoA):
R B Sinha <rb.sinha@nic.in>
- 8- VIVEKANANDA PARVATIYA KRISHI ANUSANDHAN SANSTHAN (VPKAS):
Dibakar Mahanta <dibakar_mahanta@yahoo.com>

Location(s):

Countries: India,

Activity 928-2014

Programme for the Development of Alternative Biofuel Crops

Status	On going	Milestone	1.1.1 2014
Start date	2012 Nov	End date	2016 Dec

Description: The Programme will develop, in a phased manner, products that will enable the poor, including women, to improve their cash incomes, improve their food security and increase their access to affordable energy.

The first four-year phase of the Programme will aim to explore, through action-research support to a range of scalable cases, options for timely development of alternative biofuel production models and crops for use by small-scale farmers in the tropics. The main focus will be on perennial and tree-based systems because these are generally more productive and require lower inputs than first generation biofuel crops. Moreover, perennials have been shown to negate the controversies surrounding first generation biofuels.

The Programme will be implemented through pre-existing partners, by identifying gaps and providing research-based knowledge and modest financial support to bridge the gaps in order to meet the Programme's goals and objectives. The first phase aims to target a scale significant enough to demonstrate the 'Proof of Concept' and to carry out economic feasibility that will allow learning at near 'real life' conditions.

The Programme will provide financial and knowledge based support to the following components:

1. R&D, supervision, and M&E;
2. Local energy provision to enhance food security, through the development of at least three pilot projects that would compare alternative models for local energy provision; and
3. Knowledge sharing, capacity building, policy studies and advocacy, and information and awareness campaign.

Status: On going. On 18-21 August 2014 the Programme's independent Steering Committee (SC), in which IFAD participates as an observer, reviewed the Programme's implementation during its second year, based on its strategy as updated in 2013. As per the minutes of this meeting, all members recognized that the Programme is on right track towards delivery of its outputs, albeit with minor adjustments for improving its development impact. Progress was achieved in all output categories, especially in India and Brazil.

Gender Component: By piloting smart agroforestry systems for multiple products and services, the Programme will support the development of value chains in which women have increased decision-making and control of assets and inputs. The Programme will, for instance, support the development of women associations for the collection and processing of oilseeds, such as those already existent in some districts in Karnataka, India.

Also, by investing in the development of clean energy alternatives for cooking and other local uses,

the Programme will directly benefit women health, by decreasing indoor air pollution.

Objectives:

1. The Programme goal is to develop sustainable biofuels for food security and livelihoods of smallholder farmers
2. Conduct coordinated action research, in accordance with a time-bound plan, on non-food or multiple use biofuel crops that can be grown on degraded lands, including under saline conditions, along the entire value chain, in a partnership model.
3. Support local energy provision and offer policy options to governments that would like to undertake biofuel production without compromising food security
4. Disseminate knowledge and provide options to IFAD to mainstream biofuels as an instrument of agricultural development operations where possible.

Deliverables:

Description	Type	Year	Status	Justification
Assessments completed on the impact on livelihoods of rural communities (including economic viability and impact on income, food security, land, livestock/pastoral patterns)	Research report (i.e. workshop report, consultant's report, discussion paper, project report, student thesis, etc.)	2014	Complete	
Optimized methods for oil extraction from the seeds	Reference material (booklets and training manuals for extension agents, etc.)	2014	On going	Subagreements were signed with partners in 2014 for implementation of this activity. Deliverables are expected by the end of 2016.
Technologies developed to detoxify the cake for animal feed and produce other added-value products, and assessments completed on the use of by-products in animal feeding, pest control and crop fertilization	Platforms - Data Portals for dissemination	2015	Incomplete	
Technologies developed for a productive use of seed shell and other plant parts	Platforms - Data Portals for dissemination	2015	Incomplete	
Location-specific, high-yield, high-oil content, drought-tolerant varieties suitable to fragile agro-ecological conditions	Data	2015	Incomplete	
Assessments completed on effects on water use, soils/degraded land and carbon sequestration	Peer-reviewed journal articles	2016	Incomplete	

Description	Type	Year	Status	Justification
Packages of optimal natural resource management, particularly the land/water management and farming practices for better integration of oilseeds in smallholder farming/producing systems developed	Peer-reviewed journal articles	2016	Incomplete	
Workshop	Workshop	2014	Complete	
Workshop	Workshop	2015	Incomplete	
Annual progress report	Research report (i.e. workshop report, consultant's report, discussion paper, project report, student thesis, etc.)	2014	Complete	
Annual progress reports	Peer-reviewed journal articles	2015	Incomplete	
technical reports prepared by the partners	Research report (i.e. workshop report, consultant's report, discussion paper, project report, student thesis, etc.)	2014	Complete	
toolkits/agronomic handbooks to inform and train smallholder farmers as well as extension agents and government officials	Capacity	2014	On going	Subagreements were signed with partners in 2014 for implementation of this activity. Deliverables are expected by the end of 2016.

Description	Type	Year	Status	Justification
a website built to disseminate information on selected biofuel crops	Social media outputs (including web sites, blogs, wikis, linkedin group, facebook, yammer, etc.)	2014	Complete	

Partners:**1- Bangalore University:**

Dr. Balakrishna Gowda, Professor and Project Coordinator Biofuel Park <gowdabk@yahoo.com>

2- Empresa Brasileira de Pesquisa Agropecuária (EMBRAPA):

Dr. Manoel Souza, Head, Embrapa Agroenergia <manoel.souza@embrapa.br>

Location(s):

Countries: Brazil, India, Mozambique,

Activity 972-2014

Compendium of Climate smart practices and technologies from within and beyond the CGIAR

Status	Extended	Milestone	1.1.3 2015 (1)
Start date	2014 Jan	End date	2014 Dec

Description: The compendium will compile the data necessary to map and critically evaluate the available evidence (peer-reviewed literature) on climate smart agricultural practices and technologies. It will include information for both qualitative and quantitative analysis. The outputs will be a library/bibliography of the literature and data organized in a way to input into the database/tool under development by the CIAT and the CCAFS Data Management Team. It will provide a critical input for the use of the Climate-smart agriculture targeting and prioritization tool being developed and piloted by CCAFS Theme 1.

Status: Extended. It was a successful year for the Compendium that culminated with a very successful presentation of preliminary results at the Global Landscape Forum. At time of this writing, work on the Compendium is ongoing. Major achievements for 2014 were conducting the search for ~65 practices and ~20 outcome indicators which yielded more than 144,000 peer reviewed articles. A team of 10 consultants was recruited and trained to evaluate the papers according to apriori selected criteria (e.g., relevant to one of the practices by outcome combinations, compares a non-CSA control and CSA practices, and took place in a developing country). Through a two stage screening, nearly 6,000 papers were deemed relevant to the question at hand. We are in the process of cleaning data from 1,200 papers and have hired a new team of consultants to continue the data extraction. We are hoping to have extracted data from approximately 3,000 papers by the Montpellier CSA meeting. Despite the substantial progress, there has been substantial challenges largely in terms of technical challenges of paper screening and data extraction, which both have taken much longer than anticipated, and the tedium of the data extraction process that was described by one participant as 'soul crushing'. The technical and tedious nature of the work has contributed to challenges in retaining quality persons and slowed down progress. However, the work continues and we expect that this year (2015) the Compendium work will be finalized in its current form. Also, this year we expect that we will form new partnerships (e.g., FAO) to increase visibility and potentially extend to new practices, outcome indicators, and sources of data (e.g., grey literature).

Gender Component: While the Compendium does not include much detail on gender, we did search for data on the impacts of the various practices on labor (gender disaggregated) as one of the adaptation indicators. Thus, the literature that was compiled should contain information on gender impacts.

Objectives:

1. Development of an online database of CSA practices and technologies
2. Increase in number of practices and technologies available in the compendium
3. Integrate CSA Alliance indicators into database and broadening of definitions to accommodate CSA concepts

Deliverables:

Description	Type	Year	Status	Justification
Database on CSA practices and technologies	Data	2014	On going	The job is much larger and more difficult than originally imagined. Our initial search yielded 144,000 articles that needed to be reviewed and the data extraction has been both technical and tedious. Despite the challenges, we are continuing to move forward and the Compendium is likely to be a central component of the GACSA Knowledge work.
Report or scientific paper submitted	Peer-reviewed journal articles	2014	On going	We cannot write the paper prior to finalizing the database. The challenges in finishing the database have been discussed under the first deliverable.
blogs	Articles for media or news (radio, TV, newspapers, newsletters, etc.)	2014	Cancelled	This blog post was canceled because the Compendium is delayed and thus we will not be promoting it until it is sufficiently complete.

Partners:

- 1- Food and Agriculture Organization of the United Nations (FAO):
Aslihan Arslan <aslihan.arslan@fao.org>
- 2- World Agroforestry Centre (ICRAF):
Todd Rosenstock <t.rosenstock@cgiar.org>
- 3- Centro Internacional de agricultura Tropical (CIAT):
Caitlin Corner-Dolloff <c.corner-dolloff@cgiar.org>

Location(s):

Global

2. Succinct summary of activities and deliverables by Output level.

Output: 1.1.1

Summary: Capacity:

- (Philippines) training and subsequent mentoring focused on the Barangay (village) Development Plan and the Protected Area Management Plan.
- (Peru) Capacity building workshop of three days to train local facilitators on the methodology
- (Burkina Faso) Leadership and group dynamics of farmers of four villages in Burkina Faso
- Workshop to strengthening the capacities of the negotiators for climate attended by west Africa representatives and CILSS organized in Geneva
- (Burkina Faso and Mali) Training on the science of climate change, adaptation and mitigation for various practitioners including extension agents, researchers and lecturers from universities

Data:

- (Nicaragua) Weather information for 3 sites in Nicaragua (Temperature, Air Relative Humidity, Wind Speed, Precipitation and Solar Radiation).

Workshops:

- (Peru) Two days workshop that gathered 8 experts to discuss about the approach and identify the methodology to elicit Local Perceptions and Knowledge about Climate Change
- (India) Roundtable on biofuels: evidence-based discussion and potential

Reports:

- (Peru) Analysis of district level information on smallholders in Ucayali based on the agricultural census
- (Peru) Percepciones y conocimientos ecologicos locales para la adaptacion al cambio climatico en el departamento de Ucayali
- (India, Brazil) Assessments completed on the impact on livelihoods of rural communities (including economic viability and impact on income, food security, land, livestock/pastoral patterns)

Communication product:

- (Global) Programme for the Development of Alternative Biofuel Crops (a website built to disseminate information on selected biofuel crops)

Peer-reviewed publications:

- Constraints and opportunities for tree diversity management along the forest transition curve to achieve multifunctional agriculture
- Smallholder Farmers at Risk: Enhancing Capability Building Efforts to Cope with Extreme Climate Events

ON-GOING:

Capacity:

- Capacity building of the project staff and national partners for the BIODDEV project in West Africa
- Strategy for capacity building for integrated sustainable development, including biocarbon and climate change, developed and implemented (BIODEV project in West Africa)

Data:

- (Costa Rica and Nicaragua) Tree taxonomic and functional diversity, C stocks and Coffee yields in coffee agroforestry systems of Hojancha Costa Rica (Database of functional traits in 2 sites, 2 countries in Central America)
- (Peru) GeoDB for Maps of CC scenarios on at least one identified crop and one tree species - available first half of 2015
- (Peru) Local ecological knowledge of climate change adaptation in CACAO AFs in the Ucayali (Peruvian Amazon)
- (Burkina Faso, Sierra Leone, Mali) Value chain analysis
- (Malawi) Productivity improvements and viability of agroforestry and other climate smart agriculture practices

Workshops:

- (Burkina Faso, Sierra Leone, Mali) Networking and learning across biocarbon stakeholders and initiatives strengthened

Reports:

- (Peru) Research Report on collective strategies (cooperatives/producers associations) for coping with CC

Communication products:

- Innovation platform from the BIODDEV project
- (Peru) Presentation "Climate Change and AFs in the Peruvian Amazon: implications for the design of climate friendly/resilient systems"

Publications:

- Scaling-up spatial variation in functional traits to inform ecosystem service management: concepts and methods (Review on data needs and methods functional diversity applied to AFS)
- Policy brief on the role of local government units in facilitating small holders adaptation to extreme climatic events
- Contribution of agroforestry and other climate smart agriculture practices to improved agricultural production and household food security
- Gendered impact of climate change among smallholders in Malawi (Pending finalization)

Output: 1.1.2

Summary: Capacity building in Philippines: Training Workshops on Enhancing Adaptive Capacities of

Smallholder Farmers for Climate Change Adaptation

On-going:

Publication: A journal paper assessing local adaptive strategies and coping responses of small holder farmers in South East Asia will be submitted in 2015

Output: 1.1.3

Summary: Capacity:

- (Kenya, Uganda) 2 Msc and 1 PhD student trained + Farmer trainers and farmers trained in and using climate smart practices at the four target sites

Maps:

- (Kenya) Variety-specific mango distribution maps in current and future climates were produced for main Mango cultivars; these were presented during the 3rd World Agroforestry Congress

Methods:

- (Burkina Faso, Sierra Leone, Mali) Protocols for water stress experiments with priority tree species (describes the methods to be used in the nursery experiments (experimental treatments, experimental design, number of replicates and management of the experiments)

- (Burkina Faso, Sierra Leone, Mali) Agronomic trials for sustainable agricultural production (Document describing the experimental design and the management recommendations of the on-farm trials on soil fertility)

Reports:

- Response of phenology in *Kobresia pygmaea* meadow to climate change on the Tibetan Plateau

- Participatory identification of preferred agroforestry species (These reports contain the approaches used and the findings about the preferred agroforestry species in four villages of Burkina Faso and five villages of Sierra Leone)

- Farmers training on Leadership and Group Dynamic for Rural Resource Centre Establishment in Dao, Cassou, Kou and Vrassan (BIODEV sites)

Publications:

- Tree Seed and Seedling Supply Systems: A Review of the Asia, Africa and Latin America Models

- Farmer-to-farmer extension: Opportunities for enhancing performance of volunteer farmer trainers in Kenya

- Fodder shrubs for improving livestock productivity and smallholder livelihoods in Africa.

- Agroforestry, livestock, fodder production and climate change adaptation and mitigation in East Africa: issues and options

- Can agroforestry enhance the resilience of agricultural commodity production systems?

- Mapping wetland cover in the greater Himalayan region: a hybrid method combining multispectral and ecological characteristics

Book chapters:

- Mapping gender preferences for tree and shrub forages
- Agroforestry: Fodder Trees (in Encyclopedia of Agriculture and Food Systems, Vol. 1)

ON-GOING:

Data:

- (Burkina Faso, Ivory Coast, Sierra Leone) Baseline data on livelihood parameters + property right regimes + Institutional decision making systems + Constraints and opportunities for market access of tree products
- Database on CSA practices and technologies (the Compendium)

Maps:

- (Kenya) Agroforestry species suitability maps were produced for 4 indigenous species (*Balanites aegyptiaca*, *Vangueria madagascariensis*, *Grewia bicolor*, *Grewia tembensis*) and 5 exotic species (*Carica papaya*, *Citrus limon*, *Citrus sinensis*, *Mangifera indica*, *Persea americana*)

Communication products:

- Information portal for the Climate-smart tree sourcing in East Africa project

Publications

- A PHD thesis and two journal papers on the method of extracting spatial patterns and the detection of change trend of wetland and other landcover such as rangeland and tree cover
- Report and two journal papers on the vulnerability and resilience of grassland, wetlands and tree cover to climate change.
- Climate-smart agriculture: Propoganda or paradigm shift?

Output: 2.1.1

Summary: Publications:

- Do we expect formation of growth rings on species with reverse phenology?
- the Roles of tree in increasing the adaptive capacity of smallholder farmers
- Determinants of tree-related adaptation strategies to extreme weather events among smallholder farmers in the Philippines
- Determining roles of trees and agroforestry for reducing household vulnerability to climate extremes in northern upland and coastal Vietnam (in preparation)

Output: 3.1.1

Summary: MONGOLIA:

The planned workshops have been held with the project partners and key stakeholders. Both the Climate Change Coordination Office of the Ministry of Green Development and the Policy and Planning Department of the Ministry of Industry and Agriculture indicated their strong interest in supporting and participating in the research activities. Based on the recommendation from the partners, the research is focusing on one sheep breed in the eastern aimags of Mongolia, with surveys

of limited sample size and geographical scope and further analysis to extrapolate the results to a wider geographical scale. The results will be shared with national stakeholders and used to support their discussions on development of a livestock sector NAMA.

Output: 3.1.2

Summary: SOUTH EAST ASIA:

The 'Talking toolkit' which is a collection of participatory tools for talking about adaptation with farmers and others has been produced and is available on the web and in printed form has been taken-up by the National Agricultural University and both staff and students have been trained. It is being used by a variety of students in their field research.

KENYA:

Piloting of pyrolysis kiln to generate liquid fuel and biochar in W. Kenya. Cornell is still keen to raise the funds necessary to pilot this. Up to now they have not been successful

Publication: Report on rural commercial energy users including transporters to estimate the potential demand for liquid fuel in rural communities, where biomass could be sourced and converted into energy through pyrolysis

Capacity/Publication: PhD thesis "Smallholder Use of Biomass in Western Kenya and Implications for Supply of Biomass for Energy Production" + papers finished. Defense in April 2015

Output: 3.3.1

Summary: EAST AFRICA (MICCA PROJECT)

Capacity:

- Creation of a series of materials that assisted the development of a mother and child nursery system in the Kolero area. The key material was a nursery persons logbook that enabled persons to keep track of their activities and plan for future activities.
- Eleven satellite nurseries received technical support in terms of materials and knowledge backstopping. In total estimated 116,172 seedlings were distributed to farmers from these satellite nurseries and the central nursery at CSL. The central nursery at the CSL continue to serve as a hub for trainings, demonstration as well as a source of information/material supply source.
- Training of farmers in Kolero, Tanzania

Reports:

- MICCA final report
- Science to support climate-smart agricultural development
- Assessment of carbon stock in the farming systems of Kaptumo and Yala

ON-GOING

peer reviewed publications:

- The development of a mother and child nursery system in the Kolero area
- 'Is conservation agriculture 'climate-smart' for maize farmers in the highlands of Tanzania?' (The paper is being revised for resubmission to Nutrient Cycling in Agroecosystems)
- 'Does fallow address deforestation in the Uluguru Mountains, Tanzania?' (This paper is in final stages of internal review and nearly ready to be submitted)

Output: 3.3.2

Summary: ON-GOING:

Data:

- Database on CSA practices and technologies (the Compendium)

Publications:

- The SAMPLES protocol is nearly complete
- Climate-smart agriculture: Propoganda or paradigm shift? (based on the data collection (the Compendium) which has been delayed)

Output: 4.1.2

Summary: INDIA:

Publications:

- 'Enriching livestock wealth through enhanced fodder production and supply systems'
- 'Enabling smallholders to improve their livelihoods and benefit from carbon finance'

On-going:

Publications:

- Assessment of agriculture based CDM applications success and failures in India (The documentation is complete and the paper is in the final review stage.)
- Monograph on the guidelines for scaling up climate smart agriculture (CSA)
- publication on gendered aspects of VACA in the region, China. The research field work has been done, and gender-disaggregated data has been collected and analyzed, and the research results have been presented at several international conferences. A journal article in English and a book chapter in Chinese are in the process for submission.

Output: 4.2.1

Summary: Capacity:

- (Kenya) 2 project staff participate in the training " Livelihoods and market"
- (Burkina Faso, Sierra Leone, Mali) Manual for field measurement regarding measurement of aboveground biomass and fuel wood stocks
- (Burkina Faso, Sierra Leone, Mali) 1 scientist, 1 senior technician, 7 villagers/farmers trained trained on carbon measuring and monitoring tools

Data:

- (Burkina Faso and Sierra Leone) Land health data collection based on LDSF

- (Burkina Faso and Sierra Leone) Gathering of satellite and ancillary data from BIODIV study sites

Methods:

- Drought Analysis (methodology based upon a suite of recently available advanced remote sensing products to ascertain its use in data-sparse areas, i.e. areas with few weather stations, such as the Asian Highlands.)
- Field measurement guidelines for biodiversity measurement (Manual)

Models:

- Hydrological Modeling of Climate Change Impacts on Terrestrial Ecosystems
- Bioclimatic Modeling of Climate Change Impacts on Terrestrial Ecosystems

Report:

- (Kenya) In-depth description of community-led value-chain analysis in Western Kenya

Communication products:

- (Kenya) Video "Making agroforestry work for smallholder farmers in Western Kenya"

Publication:

- Opportunities and applications of dendrochronology

ON-GOING

Data;

- Soil sample processing in the BIODIV sites in West Africa
- Airborne LiDAR for estimating canopy gap fraction and leaf area index of tropical montane forests (in the BIODIV sites)

Reports:

- ICRAF Corporate carbon footprint assessment 2013
- Impact of land change on aboveground tree carbon stocks in the Taita Hills, Kenya
- Predicting soil organic carbon content in the Taita Hills, Kenya, using LiDAR-data

Publications:

- Assessing carbon footprints of International Organizations
- Impact of land change on carbon stocks in Burkina Faso/Sierra Leone

Output: 4.3.1

Summary: On-going:

Data:

- Agro-climatic and socioeconomic drivers of land use/cover change. The data has been ingested, processed, and stored on ICRAF's Landscapes Portal

Publication:

- Assessment of Earth Observation Based Long-term Global Vegetation Records for Agroecosystems (under review)

Output: 4.3.3

Summary: Data:

- Datasets that are able to analyze the effect of agroforestry on crop production and yield. Two datasets are from Malawi covering the 2011-12 season and 2012-13 seasons.

On-going:

Model:

- Agroforestry models for foresight analysis

Publication:

- gender analysis of agroforestry and maize yields in Malawi

3. Communications.

Media Campaigns:

<http://ccaafs.cgiar.org/blog/these-are-some-long-term-impacts-agriculture-tv-show-can-have#.VN2kyWjLdcS>

<http://www.businessdailyafrica.com/Corporate-News/Dairy-farmers-embrace-technology-to-boost-output/-/539550/2092848/-/view/printVersion/-/5arrc/-/index.html>

<http://www.voanews.com/content/indian-farmers-fighting-pollution-one-tree-at-a-time/1740297.html>

Media and blog

more than 30 media outlets reported and blogged about the Award

http://www.worldagroforestrycentre.org/newsroom/media_coverage/centre-scientist-wins-african-climate-award

<http://pressoffice.mg.co.za/witsuniversity/PressRelease.php?StoryID=248615>

media interview about the dendro lab

<http://www.coastweek.com/3741-kenya-04.htm>

Blogs:

<http://blog.worldagroforestry.org/index.php/2015/01/19/farmers-and-researchers-disagree-on-deliberately/>

<http://dialogues.cgiar.org/blog/smallholder-farmers-secret-weapon/>

<http://blog.worldagroforestry.org/index.php/2015/02/11/catch-the-climate-change-moment/>

<http://blog.worldagroforestry.org/index.php/2014/09/10/which-agroforest-for-which-farm-under-changing-climates/>

What do farmers really know about climate change?

<http://blog.worldagroforestry.org/index.php/2014/03/27/what-do-farmers-really-know-about-climate-change/>

Stronger, resilient islands in the Philippines

<http://blog.worldagroforestry.org/index.php/2015/01/30/stronger-resilient-islands-in-the-philippines/>

http://worldagroforestry.org/research/climate_change/projects/dendrochronology-lab

<http://treesofchange.org/wca2009/newsroom/highlights/tree-rings-link-climate-and-carbon-africa>

Websites:

National Agroforestry Policy of India. <http://agricoop.nic.in/dacdivision/agroforest14.pdf>

Report of the project, "Enabling small holders to improve their livelihoods and benefit from Carbon finance": <http://www.naip.icar.org.in/documents/10184/77209/c1naip-CarbonFinance.pdf/30878cd8-20bf-46cb-874f-22cdb1d9bd96>

Social Media Campaigns:

<http://ccafs.cgiar.org/blog/these-are-some-long-term-impacts-agriculture-tv-show-can-have#.VN2kyWjLdcS>

<http://www.businessdailyafrica.com/Corporate-News/Dairy-farmers-embrace-technology-to-boost-output/-/539550/2092848/-/view/printVersion/-/5arrc/-/index.html>

<http://www.voanews.com/content/indian-farmers-fighting-pollution-one-tree-at-a-time/1740297.html>

Media and blog

more than 30 media outlets reported and blogged about the Award

http://www.worldagroforestrycentre.org/newsroom/media_coverage/centre-scientist-wins-african-climate-award

<http://pressoffice.mg.co.za/witsuniversity/PressRelease.php?StoryID=248615>

media interview about the dendro lab

<http://www.coastweek.com/3741-kenya-04.htm>

Newsletters:

NA

Events:

"Stakeholders' workshop on water governance and climate change adaptation" on Nov. 26, 2014 in Kunming.

Expert and training workshops on the identification of a methodology for LEK and CC perceptions (Lima April 2014/Pucallpa May 2014)

Videos and other Multimedia:

Video on "Making agroforestry work for smallholder farmers in Western Kenya.

Presentation of How to videos on rainwater harvesting and conservation agriculture with trees to over 60 training participants

Video "Agroforestry and Climate Change Adaptation in Baoshan, Yunnan, China"

Video "Water Governance and climate change in Lijiang, Yunnan, China"

Other Communications and Outreach:

Gebrekirostos A (2014) Stable carbon and oxygen isotopes in tree rings reveal drought events and possible ground water fluctuations in sub-Saharan Africa (Scotland Aviemore 6-10 may 2014) <http://www.st-andrews.ac.uk/~rjsw/TRACE2014/TRACE2014proceedings-abstracts.pdf> this presentation is based on exploring source water

Gebrekirostos A (2014) Trees as historians Award acceptance presentation, in Pretoria, South Africa
A p r i l 2 0 1 4
<http://africanclimate.net/sites/default/files/news/D%20A%20pretoria%20Climate%20award%20ac>

[Gebrekirostos](#) A (2014) Advances in tropical dendrochronology and its application in climate change and agroforestry research World agroforestry congress New Delhi ,India

Gebrekirostos A (2014) Detecting climate variability and its impacts from tree rings in sub-Saharan Africa Paper presented at World Dendro, The 9th International Conference on Dendrochronology January 13 – 17, 2014, Melbourne, Australia <http://ab.xlibx.com/1history/13551-17-th-accepted-abstracts-the-international-conference-dendrochronol.php>

4. Case studies.

Case Study #1

Title: Assessing, improving and scaling up the agroforestry models for biofuels and food production in Karnataka State, India

Author: ICRAF

Type: Policy engagement; Participatory action research ; Food security;



Project Description:

As part of the Programme for the Development of Alternative Biofuel Crops, this pilot is supporting ongoing efforts to improve and scale up a promising biofuel initiative being implemented in Karnataka.

In a nutshell, this initiative has been spearheaded by UASB and KSBDB in Karnataka, and has already attracted significant attention nationally, with other states such as Maharashtra starting to develop similar models. Essentially, smallholder farmers in energy-deprived villages are provided with quality plant material and technical assistance for growing native or locally-adapted bioenergy trees, such as pongamia (*Millettia pinnata*), simarouba (*Simarouba glauca*), mahua (*Madhuca longifolia*), neem (*Azadirachta indica*) and other species in the borders and bunds of their plots, in addition to communal marginal lands. These agroforestry systems improve food security and alleviate energy poverty, since all their products are consumed locally – the SVO, biodiesel and biogas are used for running tractors, irrigation pumps and for cooking via adapted stoves, while the biofertilizer derived

from the seedcake improves the productivity of traditional crops. ICRAF has been conducting studies to evaluate this model and its potential for improvement. Preliminary data suggest that the efforts undertaken in Karnataka have a positive impact on the livelihoods of the poorest, and that the model implemented in the state can be scaled up, subject to some adjustments.

To fully realize this potential, several gaps still need to be addressed through further investments in germplasm collection, nursery techniques, technologies for oil expelling and processing, value addition at village level, and others. Furthermore, the model needs to transition into financially sustainable and bankable proposals, allowing for reduction of public subsidies. ICRAF is already working with the Government of Karnataka and other partners towards achieving these objectives, while facilitating the scaling up of the model into Maharashtra and other states.

Introduction / objectives:

- Assess the biofuel initiative spearheaded by the government of Karnataka State, evaluating its environmental, social and economic impact, as well as identifying its gaps;
- Provide technical support to Karnataka State towards improving its successful model for local energy provision and consumption by smallholder farmers through the use of local bioenergy trees;
- Support the graduation of this model from subsistence-based into a bankable model, strengthening value chain linkages between the poor producers and the up-taking markets, thus ensuring its economic sustainability;
- Scale up and adapt the Karnataka model to other states, starting by Maharashtra.

Project Results:

Three studies have been finalized, contributing to a better understanding of the benefits and challenges of the biofuel initiative undertaken by the Karnataka State, as well as the opportunities for scaling it up to other states, and how the Programme can improve its impact on rural development. Three other studies have been initiated and are expected to be concluded in 2015.

Three sub-agreements were signed with the University of Agricultural Sciences of Bangalore, the JNKVV University and the PDKV Akola university. R&D activities have started on the ground in the first quarter of 2014, and they are filling in gaps related to germplasm collection, nursery techniques, technologies for oil expelling and processing, value addition at village level, and others.

A MoU was signed with the Karnataka State Biofuel Development Board (KSBDB). Following suggestions emerging from one of the studies mentioned above, as well as from the Seering Committee meeting, the Programme is currently assisting KSBDB in its efforts to develop a bankable proposal for the biofuels value chain in Karnataka.

Partners:

Karnataka State Biofuel Development Board (KSBDB)
University of Agricultural Sciences Bangalore (UASB), Karnataka State
JNKVV University, Karnataka State

PDKV Akola University, Maharashtra State

Links / sources for further information:

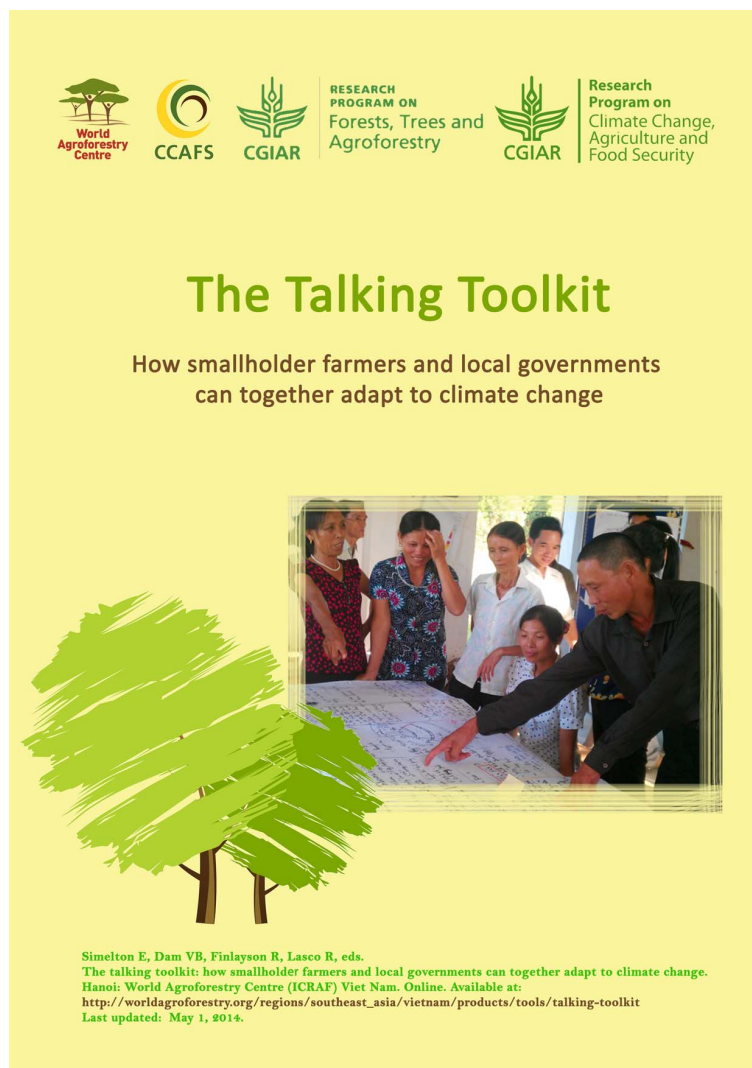
<http://worldagroforestry.org/research/alternative-biofuel-crops>

Case Study #2

Title: The Talking Toolkit: How smallholding farmers and local governments can together adapt to climate change

Author: Simelton E, Dam VB, Finlayson R, Lasco R

Type: Capacity enhancement; Participatory action research ;



Project Description:

The Talking Toolkit is a collection of exercises, which called 'tools', which designed to draw information from farmers for people who work with farmers: development workers, agricultural organizations and government policy-makers. There were also a series of Toolkit training for partners, researcher institutes, universities and NGOs

Introduction / objectives:

This toolkit was created to help everyone better understand the exposure of farmers to climate change, what impact it might have on them and food production, and how they can adapt. It is for anyone involved in a research or development project related to climate change and want to learn how

to use proven research methods to get the information needed in order to achieve the project's objectives.

Project Results:

By November 2014, the Talking Toolkit, which is freely available online has been viewed and/or downloaded 5000 times. The Toolkit-training in 2014 was attended by a total 91 people (31M/40F university lecturers, 6M/16F university students). The toolkit or elements of it, have been used by research institutes, universities, development NGOs. We also had a Toolkit training in 2012 for our partners (extension and farmers' association), and in 2013 for NGOs.

1 The Talking Toolkit seemed to have filled a gap among practitioners at the time. There was a huge demand for participatory tools focusing on local/farmers' knowledge and specifically on agriculture impacts, and training both from extension, universities and development NGOs – which could be addressed thanks to some additional funding from CCAFS SEA. The toolkit has also been used by international research institutes and universities in Europe, the US and Africa.

2. The Toolkit helped us design a more appropriate questionnaire with real examples of climatic hazards. Therefore the project led to a better understanding on the role of trees and agroforestry as a climate-smart approach in Vietnam. Agroforestry is not well studied except from production and few had looked at agroforestry from a climate impact perspective. Thanks to the project we could raise this issue to CCAFS and one of the project sites was elected as CCAFS climate smart village. That is promising for promoting resilient agroforestry systems in Vietnam.

Partners:

This project was funded by the CGIAR research programs on Forests, Trees and Agroforestry and Climate Change, Agriculture and Food Security. We also thank the Ministry of Natural Resources and Environment in Viet Nam for their support. We are grateful, too, for the collaboration of the departments of Agriculture and Rural Development in Yen Bai and Ha Tinh provinces, the Farmers' Union in Ha Tinh, as well as villagers, local leaders and extension workers in Luc Yen and Ky Anh districts.

Links / sources for further information:

Assessment of the ICRAF Climate Change Activities 2009-14

By Martin Whiteside

January 2015

Case Study #3

Title: Malawi's Agroforestry Food Security Programme

Author: Godfrey Kundhlande, Bruce Sosola, Aston Mulwafu

Type: Innovative non-research partnerships; Food security;

Project Description:

The purpose of the AFSP was to use effective partnership to scale-up agroforestry innovations to increase food and nutrition security, income and to improve livelihoods of resource-constrained smallholder farmers in Malawi.

The AFSP to contribute towards climate-smart agriculture, i.e. agriculture that sustainably increases productivity (food security), resilience (climate change adaptation) and reduces greenhouse gas emissions (mitigation) in Malawi through the scaling-up of agroforestry innovations, namely: (1) Fertilizer trees and conservation agriculture to improve soil fertility and crop yields; (2) Fruit trees – to improve household nutrition, health and income; (3) Fodder trees – to improve milk yields for smallholder dairy farmers to enhance nutrition, health and income; and (4) Woodlots – for firewood and timber production.

Introduction / objectives:

1. Adapt and target fertilizer, fruit, fodder and timber trees to appropriate niches to help improve crop and livestock productivity and resilience to risks
2. Improve local and national tree germplasm supply and delivery systems to enable farmers to access high quality tree seed and seedlings timely
3. Strengthen the capacity of national and local institutions, NGOs and CBOs in scaling up agroforestry to achieve Evergreen and climate-smart agriculture in Malawi
4. Engage policy makers to formulate appropriate policies to mainstream agroforestry at national level
5. Demonstrate the potential contribution of agroforestry to food security and carbon sequestration under smallholder agriculture

Project Results:

- A total of 3,385 hectares are under conservation agriculture with fertilizer trees (CAWT) in all districts
- A total of 20,090 households are practising CAWT in their fields where the main crop maize is interplanted fertiliser trees such as tephrosia, gliricidia, pigeon peas or faidherbia as their fertilizer trees.
- On average, each household is practising CAWT system on 0.2 hectares of crop land
- 640 smallholder dairy farmers established tree fodder banks comprising 69,164 on an area covering the 92 hectares to help provide high quality inexpensive supplementary feed to their dairy cows.
- A total 1332 households (848 male and 484 female) raised fruit mother blocks of assorted fruits totaling 25,466 trees covering the total area of 66 hectares. At full production, these mother blocks can supply high quality germplasm to as many as 200,000 farmers.
- A total of 603 Lead farmers were trained by extension workers.
- 19,850 (8,736 male; 11,114 female) farmers attending the field days where they learned about and observed various agroforestry and conservation agriculture demonstrations

- 59 extension workers participated in the study tours from which they learnt from best bet practice sites for agroforestry and conservation agriculture

Partners:

The Agroforestry Food Security Programme (AFSP) II is being implemented by the World Agroforestry Centre (ICRAF), together with government departments - Department of Agricultural Extension Services (DAES) and Land Resources Conservation Department (LRCD), district councils in the districts where project activities are taking place; a farmers' association National Smallholder Farmers Association of Malawi (NASFAM); an international NGOs - Concern Universal and a local NGO - Catholic Development Commission of Malawi (CADECOM).

Case Study #4

Title: • Climate-smart tree sourcing in East Africa - collaboration between research and implementing agencies in East Africa

Author: Jens-Peter Barnekow Lillesø - University of Copenhagen/ICRAF Fellow

Type: Capacity enhancement; Policy engagement; Breakthrough science;

Project Description:

- The project will develop and test species and provenance specific recommendation domains, combining the expertise of national and international tree seed and research centres, high-resolution present and future climate data sets, newly developed high-resolution potential natural vegetation maps for East Africa (VECEA project), species distribution records and recently developed approaches for habitat distribution mapping.
- The project will develop a decision support tool as a collaboration between research and implementing agencies in East Africa
- Project will enable support agencies and projects to assist smallholders to access the best possible sources for use in smallholder agroforestry

Introduction / objectives:

- Objectives congruent with the CCAFS theory-of-change: (1) Improved technologies, practices and portfolios for climate-smart agriculture that meet the needs of farmers, including women and marginalised groups ; (2) Methods and approaches for equitable local adaptation planning and governance, including transformative options; (3) Innovative incentives and mechanisms for scaling up and out that address the needs of farmers, including women and marginalised groups

Project Results:

- Seed collected from 15 populations x circa 30 trees across the whole recommendation domain of the species in three countries
- Plants raised in three countries
- Design for breeding seed orchards (BSOs) prepared
- Plants ready for establishment in 3 replicated BSOs (one BSO in each of the three countries covering the environmental range of the species) in March 2015
- To come: BSOs established across the environments (cold/warm, moist/dry) recommendation domain of the species
- To come: Growth and health of individual trees across the environments of the recommendation domain analysed
- To come: Patterns of current growth compared to climate change scenarios for East Africa
- To come: Evidence based recommendations for use of seed across recommendation domain
- To come: Planting zone recommendations for BSO included in decision support tool
- To come: Information is utilised for climate smart seed sourcing in smallholder agroforestry
- Comment: It is important to stress that for most agroforestry trees the project objectives take time to reach due to the longer gestation time of woody species as compared to annual crops. Breeding Seed Orchards is a compromise between obtaining knowledge of how woody species are adapted to the

ranges of environments in their areas of distribution and producing seeds that are adapted to different planting zones (climate smart). So far it has not been possible to achieve this with modern molecular methods for untested species – which account for almost all African tree species

Partners:

World Agroforestry Centre, University of Copenhagen, National Tree Seed Centres in Kenya, Tanzania, Uganda

Links / sources for further information:

- Kindt, R., Groen, T., de Leeuw, J. and Lillesø, J-P.B. 2014. Distribution and ecology of trees in Eastern Africa drylands, pp. 24-34 in De Leeuw J, Njenga M, Wagner B, Iiyama M. (Eds.) 2014. Treesilience: An assessment of the resilience provided by trees in the drylands of Eastern Africa. Nairobi, Kenya. ICRAF
- Dawson IK, Carsan S, Franzel S, Kindt R, van Breugel P, Gaudal L, Lillesø J-PB, Orwa C, Jamnadass R. 2014. Agroforestry, livestock, fodder production and climate change adaptation and mitigation in East Africa: issues and options. ICRAF Working Paper No. 178. Nairobi, World Agroforestry Centre.
- Kindt, R., Lillesø, J-P.B., van Breugel, P., Bingham, M., Sebsebe Demissew, Dudley, C., Friis, I., Gachathi, F., Kalema, J., Mbago, F., Moshi, H.N., Mulumba, J.W., Namaganda, M., Ndangalasi, H.J., Ruffo, C.K., Minani, V., Jamnadass, R. and Gaudal. L. 2013. Correspondence in forest species composition between the Vegetation Map of Africa and higher resolution maps for seven African countries. *Applied Vegetation Science* 17: 162-171.
- Lillesø, J-P.B. and Gaudal, L. 2011. Sustainable germplasm distribution strategies. Dawson I, Harwood C, Jamnadass R, Beniest J. 2011. Agroforestry tree domestication: a primer. The World Agroforestry Centre, Nairobi, Kenya.
- www.vegetationmap4africa.org

Case Study #5

Title: Projected Climate Change and Impact on Bioclimatic Conditions for Terrestrial Ecosystems, and the Protected Area Network Within Yunnan Province, China

Author: Robert Zomer, Jianchu Xu, Mingcheng Wang

Type: Innovative non-research partnerships; Capacity enhancement; Policy engagement;

Project Description:

This study is part of and contributes to the Yunnan Environmental Protection Dept. (YEPD) “Biodiversity Strategy and Action Plan For Yunnan Province”. It presents the results of a quantitative geospatial analysis of projected climate change in Yunnan Province, People’s Republic of China (PRC) and its potential impacts on terrestrial ecosystems, biodiversity, and conservation efforts. The spatial analysis and modeling results presented are based on a statistically derived bioclimatic stratification of Yunnan Province, using gridded 1km resolution interpolated weather station data averaged from 1960-2000 as the baseline for current conditions. This bioclimatic stratification, and its reconstruction based upon projected future climate parameters, is used to predict and understand the impact of these projected future climate conditions on the spatial distribution of bioclimatic zones and strata, and by extension, ecosystems and biodiversity by the year 2050. All four of the IPCC AR5 future Resource Conservation Pathways (RCP), i.e. GHG emission scenarios, have been modeled, analyzed, and are presented in the various tables and figures, in order to give the range of projected climate parameters and impacts. Results of this geospatial analysis of climate change impacts are presented for the whole of Yunnan Province, for 15 of the 18 Priority Areas listed in the Yunnan Province Biodiversity Strategy Action Plan (BSAP), and for the protected area system of Yunnan. This analysis is intended to provide a basis for understanding the potential impacts of climate change on terrestrial ecosystems and biodiversity conservation across Yunnan, and provide a detailed overview for each BSAP Priority Area.

Introduction / objectives:

The over-riding necessity to recognize the now central role of a rapidly changing climate across Yunnan Province, and the need to incorporate and plan for adaptation within conservation planning, efforts and policy.

Project Results:

This study shows a quick and drastic change in the spatial distribution of bioclimatic conditions throughout Yunnan Province, and predict significant and increasing biophysical and biological perturbation for species and ecosystems in the near- to medium-term future under all scenarios. By the year 2050, rapid and significant changes in bioclimatic conditions can be expected across all bioclimatic zones, ecosystems, and within all the BASP Priority Areas and Protected Area within Yunnan Province. By the most conservative estimate, by 2070, and as early as 2049, much of Yunnan will be experiencing novel and unprecedented climatic condition.

Partners:

Yunnan Environment Protection Dept., China; Kunming Institute of Botany, Chinese Academy of

Science; Ecology Environmental Protection Research Center, Yunnan Institute of Environmental Science, China; Department of Science for Nature and Environmental Resources, University of Sassari, Italy.

5. Outcomes.

Outcome #1:

Bringing the National Agroforestry Policy of India forward

What is the outcome of the research (i.e. use of research results by non-research partners)?

In February, 2014, India became the first country to approve a National Agroforestry Policy, which was released by the President of India at the World Congress on Agroforestry, Delhi-2014. Government of India (GOI) has constituted an Inter-Ministerial Committee on Agroforestry, in which one of ICRAF's staff is a permanent member, to move the policy recommendations ahead. New grants to six states covering about 70,000 ha in agroforestry have been approved under National Mission on Sustainable Agriculture (NMSA).

What outputs produced in the three preceding years resulted in this outcome?

In 2013, the National Advisory Council (NAC), GoI established a multi-stakeholder working group which through a series of consultations and technical inputs from ICRAF as one of the leading members, developed the National Agroforestry Policy Draft, shared it with a larger clientele, incorporated their comments and finalized the document. (<http://www.indiaenvironmentportal.org.in/content/383958/recommendations-for-a-national-policy-on-agroforestry/>)

The National Agroforestry Policy was approved by the Cabinet of Indian Government and by both the houses of the Parliament. (<http://agricoop.nic.in/dacdivision/agroforest14.pdf>)

A National level Inter-Ministerial Committee on Agroforestry has been constituted, with ICRAF staff as a permanent member, to move the policy ahead.

Guidelines for High Quality Planting Material Production and Certification are under final review

Operational Guidelines of NMSA for XII Plan Period from Ministry of Agriculture (MoA) (http://agricoop.nic.in/dacdivision/Final_guidelines.pdf)

Two notifications to states issued; one to de-notify at least 20 tree species, and other to identify an agroforestry cluster, for freedom from felling, transit and utilization restrictions. (http://envfor.nic.in/sites/default/files/press-releases/Final_Report_of_HLC.pdf)

What partners helped in producing the outcome?

There is large number of stakeholders that relate to this initiative. The main ones are: The Ministry of Agriculture and its various departments including ICAR, Ministry of Forest and Environment, Ministry of Rural Development, Ministry of Tribal Affairs, Ministry of New and Renewable Energy, State Governments, and educational and research institutions. They contributed the technical information

from their specific research areas during the entire process of policy making

Who used the output?

National and state level policy makers, Ministries and their line departments, Agricultural Universities, Farmers, Nursery growers, NGOs and Civic Societies, Financial Institutions and Industry are some of the major users of the outputs

How was the output used?

For providing an official home for Agroforestry under rules of business allocation of GOI, authorizing IMC to accelerate the application of policy recommendations, Governments and programs complying with the notifications and incorporating tree component in the farming schemes, and farmers confidence building through the notifications and guidelines.

What is the evidence for this outcome? Specifically, what kind of study was conducted to show the connection between the research and the outcome? Who conducted it?

Policy document, Notifications, Guidelines on the net

(<http://www.indiaenvironmentportal.org.in/content/383958/recommendations-for-a-national-policy-on-agroforestry/>)

(<http://agricoop.nic.in/dacdivision/agroforest14.pdf>)

(http://agricoop.nic.in/dacdivision/Final_guidelines.pdf)

(http://envfor.nic.in/sites/default/files/press-releases/Final_Report_of_HLC.pdf)

No specific study has been done on the linkages between research and outcome, as it is too early and too much of an expectation so soon. It will be taken up at an appropriate time.

7. Outcome indicators.

Outcome Indicator:

New knowledge on how alternative policy and program options impact agriculture and food security under climate change incorporated into strategy development by at least 3 national agencies, and 3 key international and regional agencies

Achievements:

In February, 2014, India became the first country to approve a National Agroforestry Policy, which was released by the President of India at the World Congress on Agroforestry, Delhi-2014. Government of India has constituted an Inter-Ministerial Committee on Agroforestry, in which one of ICRAF's staff is a permanent member, to move the policy recommendations ahead.

Evidence:

New grants to six states covering about 70,000 ha in agroforestry have been approved under National Mission on Sustainable Agriculture (NMSA).

Policy document, Notifications, Guidelines on the net

(<http://www.indiaenvironmentportal.org.in/content/383958/recommendations-for-a-national-policy-on-agroforestry/>)

(<http://agricoop.nic.in/dacdivision/agroforest14.pdf>)

(http://agricoop.nic.in/dacdivision/Final_guidelines.pdf)

(http://envfor.nic.in/sites/default/files/press-releases/Final_Report_of_HLC.pdf)

8. Leveraged funds.

There is no Leverage funds

9. Publications.