Structure for Progress Report

1. Name of IARC

CIAT (Centro Internacional de Agricultura Tropical)

2. Project Title

Carbon insetting in the dairy value chain

3. Funding type, GIZ Project Number and Contract Number

Contact #: 81170344
Project Processing #: 11.7860.7-001.00

4. Reporting Period

February 2014 – January 2015

5. Project Coordinator and Project Scientists

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6. Project Partners
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Heifer International, Nicaragua
Solidaridad Network

7. State of Project Implementation

Outputs
1. Prediction of climate impacts and adaptation needs of participating livestock producers, by
a. Quantifying exposure of livestock systems to progressive climate change and
b. Analyzing sensitivity and capacity of dairy smallholders to cope with climate changes.

An important part of this work has been implemented as part of two Master thesis "Climate-smart value chains by carbon insetting: An actor-oriented analysis of potential consequences on producer level, by the example of the dual-purpose livestock value chain in Nicaragua", conducted by Alexandra Köngeter at the university of Bonn and "Adding Value to Smallholder Forage-Based Dual-Purpose Cattle Value Chains in Nicaragua, in the context of Carbon Insetting" by Lisette Phelan of the University of Hohenheim. Output 1a is still in progress.

1.a. Quantifying exposure of livestock systems to progressive climate change
97.5% of smallholder farmers said that they had noticed a difference in the climate and weather patterns impacting on their farm over a period of time from 2005-2015. Observations regarding temperature, precipitation, heat, drought frequency, and the length of
both dry and rainy seasons were evenly distributed across all districts. Distributions for wind, however, differed significantly between districts sampled (chi-square p-value = 0.036).

	Perception of change
Temperature	Higher = 95%; Lower = 5%;
Precipitation	Higher = 37.5%; Lower = 57.5%; Constant = 5%
Wind	Higher = 20%; Lower = 45%; Constant = 35% *
Heat	97.5% higher; Constant = 2.5%
Drought frequency	Higher = 60%; Lower = 22.5%; Constant = 17.5%
Length of dry season	Shorter = 42.5%; Longer = 52.5%; Constant = 5%
Length of rainy season	Shorter = 57.5%; Longer = 32.5%; Constant = 10%

Perception of climate change impact on Muy Muy and Matiguás

1b. Analyzing sensitivity and capacity of dairy smallholders to cope with climate changes.

The production risks which smallholder farmers perceived as associated with climate change are indicated in the table below. In addition to asserting a decline in milk yield compared to a decade earlier, farmers also noted an impact on calving rate, age and interval, as well as cattle body weight.

Milk yield	Decreased = 57.5%; Increased = 7.5%; Constant = 35%
Calving rate	Decreased = 17.5%; Increased = 20%; Constant = 62.5%
Calving age	Decreased = 30%; Increased = 20%; Constant = 50%
Calving interval	Decreased = 17.5%; Increased = 20%; Constant = 62.5%
Body weight	Decreased = 22.5%; Increased = 15%; Constant = 62.5%

Production risks induced by climate change

Climate change was regarded by the majority of smallholder farmers as negatively impacting on productivity and efficiency of production, and 92.5% said they had used their cash savings to improve their production systems. 82.5% of farmers had looked to diversify production to overcome the impact of climate variability, for example, by adopting improved forages, or planting crops in dispersed areas to reduce yield variance.

Decided to take a loan	70%
Borrowed cash from neighbours	30%
Borrowed in-kind from neighbours	7.5%
Searched for off-farm employment	15%
Received remittances from absent household members	5%

Coping strategies used by smallholder farmers in the last two seasons

In addition to affecting production, 67.5% of smallholder farmers said that climate variability had also impacted on household welfare and that they had had to use cash savings to improve the health and education statuses of their spouse and/or children.

2. Assessment of greenhouse gas emissions, carbon stocks and carbon sequestration potential from livestock related practices. This will be achieved via an inventory of activities with high possibility of carbon credit certification, while simultaneously meeting producer adaptation and livelihood needs. The most viable carbon certification standards will also be identified.

The activities under this heading fit all in the LivestockPlus concept which is developed as part of CRP Livestock and Fish.

The following results have been developed according to the output number two, which had as main objective the assessment of the best livestock practices able to sequester carbon and reduce greenhouse gas emissions at farm level. An extensive literature review was conducted to collect information on previous work done on the study area. Based on this research, a simple and accessible methodology was selected, able to achieve the objective and to meet the livelihood needs of the producers (completed)

The baseline data collected by Heifer International as part of the project “Competitive beef and dairy through sustainable intensification and specialized market access”, allowed us to visualize and characterize the study area regarding aspects that influence greatly GHG emissions and carbon sequestration, such as land use, farm infrastructure, herd, animal composition among others. From this data, 30 farms of small and medium holders, where livestock is their main activity and income (completed).

Four systems were identified and selected to measure the data which allowed us to calculate the carbon stocks on livestock related practices. The systems were selected according to the relevance and presence on the farms, as well as potential on carbon sequestration: Improved pasture with trees, improves pasture without trees, natural pasture and secondary forest.

To calculate the carbon stock, the above ground biomass included trees, pasture and litter. A forest inventory was conducted to collect dimensional data of trees and apply allometric

equations according to the DBH, height, wood density, species and life zone. The Botanal methodology was applied on *Brachiaria brizantha* (Toledo) and *Brachiaria brizantha* (Marandu) for improved pastures and *Paspalum sp* for natural pasture to calculate the availability of forage biomass based on the frequency and botanical composition. On the other hand, below ground biomass, which included only soil carbon stocks, was assessed through secondary data (completed).

To calculate GHG emissions an indirect methodology was applied through a questionnaire structured by CATIE, adapted and modified by us was applied. The questioner had five different components: Human, social, natural, physical and financial capital (completed). Each of the components will allow us to calculate the CH_4, CO_2 and NO_2 emission at farm level. The emissions were considered within the activities that occur until the product leaves the farm. So far, the calculator that will be use to estimate the emissions has not be chosen (ongoing).

3. Assessment of the socio-economic implications of carbon efficient livestock practices. Cost-benefit analyses will be conducted to determine the most profitable and sustainable activities.

An important part of this work has been implemented as part of a Master thesis “Climate-smart value chains by carbon insetting: An actor-oriented analysis of potential consequences on producer level, by the example of the dual-purpose livestock value chain in Nicaragua”, conducted by Alexandra Köngeter at the University of Bonn.

In Matiguás, one of the two project sites, semi-structured interviews were conducted individually with 45 small, medium and large livestock farmers (stratification according to farm size). Topics included information about household characteristic and livelihood assets, access to productive resources, market access, perception about environmental change and adaptation strategies, trade-offs regarding potentially certified climate-smart practices and experiences with PES. Three participatory workshops with the different groups of livestock farmers and five semi-structured interviews with experts from local institutions concluded the field work.

Transcripts have been concluded, data analysis is ongoing. Qualitative content analysis with RQDA according to the procedure of thematic structuring proposed by MAYRING is currently in progress.

Further ongoing activities are the indicator-based typology of livestock producers in Matiguás and the governance structure of the dual-proposal beef and dairy value chain.
Differentiated by the three socio-economic groups, perception of environmental changes, especially climate change, adaptation strategies and tradeoffs implied in carbon efficient practices as well as socio-economic consequences of carbon insetting will conclude the work.
Participatory mapping shows the exposure to climate change from the actor’s perspective. Preliminary results suggest that the three types for livestock farmers differ in their perception regarding climate change exposure as well as referring to their coping and adaptation strategies. For example, smallholders are more likely to chose migration to remote areas, off-farm employment or rely on remittance whilst larger farmers tend to improve on-farm technology or seek a niche market.

Additionally, a study (mainly through a master thesis research by Lisette Phelan of the University of Hohenheim) was conducted on the feasibility of carbon insetting as an innovative climate change mitigation and adaptation strategy, enabling actors along the dual-purpose cattle value chain in Nicaragua to realize ‘quadruple-win’ outcomes (social, economic, environmental

and productivity benefits). The feasibility was evaluated to what extent a PES mechanism such as carbon insetting - where there is an explicit aim to generate social, economic, and environmental and productivity benefits - can contribute to an improved livelihood security and sustainability of smallholder farmers engaged in dual-purpose cattle production in Nicaragua. The results indicate that, due to the extensive nature of dual-purpose cattle production - and the use of natural forages in combination with improved grasses as feed, as opposed to concentrate feeds, Nicaragua, with a comparative advantage in terms of production costs, is highly competitive in export markets for both beef and dairy products. It is feasible to implement a PES mechanism which is explicitly designed to generate 'quadruple-win' benefits for the buyers and providers of an ecosystem service, such as carbon sequestration. However, successful PES scheme outcome is inherently contingent on the ecosystem service buyers' willingness to pay, as well as the underpinning motive to realize social, economic, and environmental and productivity gains through investment in ecosystem service provision.
In the value chain context, carbon insetting provides a platform for value chain actors – often regarded as having divergent and indeed, even conflicting interests – to collaborate in adapting to and mitigating climate change. Facilitating interaction between agro-food processing industry actors and smallholder farmers adds value to the value chain as a whole – improving commercial relationships which exist between actors, facilitating access to new markets, paving the way for products to be certified as low-carbon or carbon neutral, enhancing the traceability and quality of products and ultimately generating profits which can be shared and reinvested to improve the livelihood security and sustainability of smallholder farmers engaged in dual-purpose cattle production.

4. Empirical evaluation via case study at community and household level at a specific research (pilot) site in collaboration with the private sector and development institutions. The study will focus on trade-offs between adaptation, mitigation and livelihood benefits and on feasibility of attribution and monitoring systems. Results will be validated with farmers and private sector partners..

The representative farms have been selected (see output 2) and the empirical evaluation is ongoing.

5. Development of a Project Design Document (PDD) to implement a carbon insetting initiative. The PDD will be informed by outputs 1 to 4 and jointly developed by all stakeholders. This document will
   be used to raise interest and capital for large-scale dissemination of recommended practices for the dairy sector.

This output will be realized at the end of the project period.

6. Dissemination of carbon insetting potential in smallholder dairy value chains at policy level. This will be achieved by summarizing conclusions in a policy brief and sharing this brief at a workshop in the North (Germany).

This output will be realized at the end of the project period.

8. General Achievements and Problems encountered

Main barriers for smallholders to implement climate-smart practices are the lack of long-term training and information and financial limitations to do the required initial investments. Therefore,

migration to cheaper zones is one common strategy. Barriers for larger livestock producers to change agricultural practices are mainly the missing possibilities to access a high value market. Communication about positive experiences, such as by a pilot project, is needed to enhance a (cultural) change in agricultural practices.

Carbon insetting is expected to improve food security by sustainable practices, increase drought resilience, improve natural resources conservation and open new markets. Poor smallholders benefit as they are more vulnerable towards the effects of deforestation and climate change, facing more difficulties to access water resources and forages. Nevertheless, it might be difficult to include small producers in a carbon insetting market as they lack of organization and product quality according to international standards. There may be problems regarding the project's contribution to gender equality as livestock activities and decisions are carried out by male producers.

We have been able to create synergies with two closely related projects (FSP-Solidaridad, USAID Linkage project on sustainable grassland intensification). Making use of the farmers network of the FSP-Solidaridad project (mainly through the Cooperative Nicacentro in Matiguás) we have selected the representative farmers for measurements and the socio-economic survey, and in the final stage of this projects we will be able to disseminate results more easily. The US-Linkage project provides important biophysical data of grasses, legumes and trees, especially related to carbon content and nutritional value.

Highlight important achievements, methodological breakthroughs, experiences and major limitations of project implementation, unexpected side-effects of project activities (refer to assumptions); report on the use of results by other scientists, projects and beneficiaries; report on feedback from users regarding interim results and implications for NARS and AROs.

9. Conclusions for the following Reporting Period

State if the project plan is still relevant and if goal, purpose and outputs are still achievable. Point out issues which require adjustment of the work-plan, including comments from in-house peer reviews and/or validation of progress by peers. Draw conclusions for the further implementation of the project.

The project plan is still relevant, and we will be able to achieve the objectives and outputs, within the budget and time limits. The further implementation of the project will increase emphasis on outputs 1, 4, 5 and 6. We aim for still stronger synergies with the projects FSP-Solidaridad on enhancing the dual-purpose cattle value chain and USAID Linkage project on sustainable grassland intensification.

10. Publications, Papers and Reports

None

11. Summary

The project is well underway and we expect to reach our objectives and outputs within the budget and time limits. Up to present most work has been done related to outputs 2 (Assessment of greenhouse gas emissions, carbon stocks and carbon sequestration potential

from livestock related practices) and 3 (Assessment of the socio-economic implications of carbon efficient livestock practices).

As part of the Carbon Insetting project best-bet livestock-related practices suitable for carbon credit certification at the smallholder farm level are being identified, including assessments of carbon stocks and greenhouse gas emissions. Thirty farms were characterized in respect of land use, farm infrastructure, geography, and herd composition. Carbon stocks of grasses and trees were estimated in the four most representative grazing systems (natural pastures with or without trees, improved pastures with trees, improved pastures without trees), and secondary forest. Greenhouse gas emissions were estimated indirectly through a methodology based on an inventory of human, social, natural, physical and financial capital. The activities under this heading fit all in the LivestockPlus concept linked to the CRPs CCAFS and Livestock and Fish.

In contrast to mandatory carbon markets, on the voluntary carbon market there are no common certification standards, and there is therefore a strong need to assess potential biophysical, ecological and socio-economic implications of carbon insetting. As a part of the Carbon Insetting project we look at potential socio-economic consequences of the introduction of carbon insetting to the dual-purpose livestock value chain in Nicaragua. We characterized 45 livestock farmers and their vulnerability to shocks like climate change. Furthermore, farmers' perception of climate change is assessed, as well as adaptation strategies and trade-offs of potential climate-smart agricultural practices. Tools used in this study included semi-structured interviews and participatory workshops.

The feasibility study on carbon insetting as a Payment for Ecosystem Services (PES) mechanism concluded that the carbon insetting can contribute to an improved livelihood security and sustainability of smallholder farmers engaged in dual-purpose cattle production in Nicaragua. However, successful PES scheme outcome is inherently contingent on the ecosystem service buyers' willingness to pay, as well as the underpinning motive to realize social, economic, and environmental and productivity gains through investment in ecosystem service provision.

The results of these two outputs will feed into outputs 4, 5 and 6 during the remainder of the project (until February 2016).