

# Internship Report

By Moritz Reckling (Reg. No. 841022682110)

Submitted to: Prof. Dr. Ken Giller, Plant Production Systems, Wageningen University

Wageningen, 13-01-2011

## Introduction

This report highlights my research work in Rwanda during my internship with CIAT-TSBF from the 1<sup>st</sup> of September until the 31<sup>st</sup> of December in 2010. This report builds on my first report and is rather short and my thesis, which I start to work on now, will be detailed. Action points which need to be followed up are highlighted with an arrow.

Before I describe the data collection procedure I would like to come back to the sampling of households (compare 1<sup>st</sup> report), since we had much discussion on this and I see it relevant for further work in Rwanda.

## The Rwandan Household Typology 'Ubudehe'

For the sampling in the southern study area Bugesera, I followed the same approach as I used in Burera (North) using the government typology. This typology is called 'Ubudehe' which also proved very useful in Bugesera.

'Ubudehe' (local collective action) is an initiative by the Rwandan Common Development Fund (CDF), to empower citizens to participate in poverty reduction and to strengthen decentralisation. On the village level, a committee decides on qualitative criteria for different wealth classes and in a village meeting, each household will be classified into these. The classes are the same for the whole country, but the criteria are always different (compare Table 1, an example from my two study regions).

Table 1: Ubudehe classes in Burera (Gafuka cell) and Bugesera (Gicaca cell)

Class	Type	Burera (Gafuka cell)		Bugesera (Gicaca cell)	
		Number of households	Farm size (ha)	Number of households	Farm size (ha)
1	Vulnerable	10	0	20	0
2	Very-poor	161	< 0.1	190	< 0.5
3	Poor	495	0.1-0.3	1159	0.5-1
4	Well off	279	0.3-1	945	1-3
5	Rich	71	1-3	53	3-6
6	Very rich	2	> 3	0	-

In my characterisation work, we worked with Class 2-5 since 1 and 6 are not primary involved in farming and are hardly present. We developed a list of quantitative criteria for each Class based on the knowledge of the local agronomists and the sector and cell authorities. We used these criteria to verify if the Ubudehe is consistent across randomly selected households.

Compared to the typology by Tiftonell et al. 2010, the Rwandan typology has in addition a Class of vulnerable households (which are however not involved in farming) but besides that is very similar. However, since the criteria of the Ubedehe are not clearly documented, it is difficult to make the comparison. I will compare the criteria we have identified and tested in the field in the two sites with the one from Tiftonell et al. in detail in my thesis.

## Data Collection & Processing

After the sampling of the households (described in the first report and above), we collected the data in three steps (Figure 1). In the first step, I studied the general characteristics and history of the two sites and interviewed 12 households (3 from each class 2-5) in each site (24 in total) about the major household and farming characteristics.



Figure 1: Research procedure in three steps

In a second step, all fields were visited to ask the farmers on the field and crop characteristics, crop rotations and the major in- and outputs. Furthermore, land area was measured (GPS aided) and soil samples collected from all bean fields and the fields of the major other crops e.g. maize, cassava (Bugesera) and potatoes (Burera). In total 100 fields were studied and soil samples collected. These are already in the laboratories for analysis and the results will be ready in January. Besides, the quantity and quality of stakes used by farmers for climbing beans were studied in all bean fields. These seem to have a strong influence on biomass production (and with that also on the BNF) and the yield.

→ Follow up to get soil sample results in January

→ Payments for soil analysis are arranged through CIAT-TSBF (Lorraine Odhiambo)

In a third step, I collected biomass samples on all climbing bean fields in the Burera site (23 fields), taking two samples in each field (46 separate samples). At this stage, around 15 weeks after planting, plants had the highest biomass and pods were in different maturity stages (the influence of different planting dates will be considered for the biomass results). Pods and leaves were sampled separately and 3-6 reference plants collected and the botanical names noted (to ensure that they are not legumes). *Bidens pilosa* was the only species which has also been used as a reference plant by Ojiem et al. 2007. I dried all 140 samples in the laboratory at ISAR Musanze (facilities were provided at no costs) to analyse dry matter weight and prepare them for BNF analysis (including grinding). All samples are already in Nairobi and will be further treated in early January.

→ Biomass samples need to be prepared and send to UC Davis for 15N analysis, to have the results available in February

→ Preparation and BNF analysis of 140 samples need to be paid

During biomass collection in Burera, nodulation of 4-8 climbing bean plants was assessed in two sites per bean field. The current ranking scheme in the manual 'Rhizobia Strain Isolation and Characterisation Protocol' by Bala et al. 2010, seems to be developed for soy bean and didn't really work for beans, since the number of nodules were much higher and the division between 0-5 cm and below 5 cm didn't apply. Therefore, we altered the scheme (Table 2), still using 5 scores but considering the depth of 0-15 cm.

Table 2: Altered scoring scheme for nodules in climbing beans

Score	0	1	2	3	4	5
Number of nodules	0	<10	10-20	20-30	30-50	>50

Actual harvest data could not be collected in the study period and this is generally difficult in climbing beans since farmers harvest fresh and dry beans over a period of 2-3 weeks. Therefore, we equipped all farmers in Burera with simple scales to weigh the harvest of fresh and dry beans separately after each harvest. The local agronomist (of the N2Africa partner DRD) will facilitate this process by several visits and send me the final data.

→ Follow up to get actual yield results towards the end of January

The work on discussing possible niches for an increased bean cultivation was not as detailed as intended. I discussed possibilities for an increased cultivation in the individual interviews but didn't rank different options later on.

## Further Characterisation Work in Rwanda and DRC

Since my field work was a kind of test case for the characterisation work, I provided my experiences for the further work in Rwanda and DRC.

First of all I contributed to the updating of the characterisation protocols, to make them as applicable and clear as possible for further field work.

In the DRC (South Kivu), I gave a 3 days workshop for 15 students of the Catholic University of Bukavu (UCB) and CIAT partners on how to apply the characterisation protocols and to practise the tools. The focus was on working with the questionnaire and the characterisation of fields including GPS measurements. The harvesting of yield and biomass as well as the processing of the samples and the GPS data was only slightly practised but explained.



Trained students of UCB



Biomass harvesting



Counting of nodules

Figure 2: Students of UCB during training workshop in DRC, Bukavu

In Rwanda we discussed the characterisation protocols and tools together with the agronomists from ISAR who will do the further work in the two further mandate areas Kamonyi and Kayonza. This was essential, to have homogeneity in the data collection procedure. We selected the two additional sites according to the agro-ecological potential and market access to have contrasting features between all four sites in Rwanda.

- Characterisation work has been carried out by ISAR in Kamonyi and Kayonza
- The same team will also collect the biomass, nodulation and yield data in Bugesera

## First Results & General Remarks

The history of crops gives a good indication of the importance grain legumes have in the two study areas (compare Table 3). In Burera, farmers prefer crops short in duration, with high yields and good markets. Perennial crops, subsistence crops with poor markets and poor yields are decreased or abandoned. Whereas the pattern in Burera is clearly towards intensification, in Bugesera reasons are more variable and changes rather recent. Farmers mention reduced land availability, little market demand (soy beans) and harsh climatic and soil conditions as reasons to cultivate less beans and soy beans. Government policies to cultivate maize and beans in the swamps, replaced the cultivation of sweet potatoes. Sorghum cultivation is reduced, due to recent problems with striga weeds.

Table 3: Cropping history in the two study areas (grain legumes are highlighted in colour)

Burera (Gafuka cell)			Bugesera (Gicaca cell)		
Increasing crops	Decreasing crops	Abandoned crops	Increasing crops	Decreasing crops	Abandoned crops
Climb. beans	Bananas	Wheat	Cassava	Sw. potatoes	Sw. potatoes
Maize	Sw. Potatoes	Garden peas	Maize	Soy bean	Soy bean
Irish potatoes		Finger miller	Beer bananas	Cocoyam	Cocoyam
Sorghum		Coffee	Beans	Sorghum	Sorghum
Vegetables			Groundnut	Beans	
			Coffee		

The availability and quality of stakes have a strong influence on the productivity of climbing beans. Their availability and good quality were often mentioned as major constraint to increase productivity in Burera and as a reason not to cultivate climbing beans in Bugesera.

The typology is useful in my opinion to distinguish between farmers with different positions in the social environment of villages, with different access to land, markets, inputs and credit. Richer farmers often have leading positions, hire or buy land with credit, get subsidised fertilisers and improved seeds and knowledge from NGO's. However, if the typology can also describe variations in biomass, BNF or yield data needs to be tested but I expect much variation within one Type which could be higher than between the Types.

The characterisation work in general was very interesting and besides collecting the necessary data, it promoted a close contact with the farmers, helping to understand their farming practises better. However, it is a challenge on the one hand to be open for the individual situation of each farmer and on the other, to ensure a consistent high quality of the collected data.

The collected biomass data from farmers' fields will be very useful for the comparisons with the results of the N2Africa experimental trials. I expect higher yields in the farmers fields due to a more narrow spacing, a higher number of seed per hole and stake and an earlier planting (in a wet soil).

It could be useful for the further planning of trial setups to compare new technologies with the existing farmers practises. For this and other activities, a higher involvement of farmers and national researchers is needed in the beginning of the planning.