



IFAD-Project Implementation Unit
Program Management Unit (PMU)
Ministry of Agriculture



SMALLHOLDER TREE CROP REVITALIZATION SUPPORT PROJECT (STCRSP)

IFAD/MOA Project Implementation Unit (PIU), Program Management Unit

Sao Tome and Principe Cross Learning Report: MARCH - APRIL 2014

PART II

REPORT OF TECHNICAL MISSION IN LIBERIA

TABLE OF CONTENTS

I. ACKNOWLEDGEMENTS	3
II. INTRODUCTION	4
III- DEMONSTRATION SITES	5
3.1. DRASTIC PRUNING.....	6
3.1.1 PLOTS IN FLOWERING STAGE.....	6
3.1.2 DRY PLOTS.....	6
3.1.3 PLOTS WITH EXCESSIVE HUMIDITY.....	6
3.1.4 PLOTS WITH LOW DENSITY	6
3.1.5 PLOTS WITH HIGH DENSITY	6
IV- CUTTING TECHNIQUES	6
4.1 APPLICATION OF COPPER SULPHATE.....	7
4.2 BANANA TREES.....	8
4.2.1 CONSERVATION OF SOIL MOISTURE.....	9
4.2.2 FOOD SAFETY AND SOURCE OF INCOME	9
V- PESTS	9
5.1. PARASITES	9
5.2 TERMITES.....	10
5.3. CAUSES.....	11
5.4. PREVENTION AND TREATMENT.....	11
VI- REGULAR SHADING	12
VII- DISEASES	13
7.1. BLACK POTS.....	13
7.2. FERTILIZERS DOSAGE TO FIGHT BLACK POTS.....	14
VIII- PRUNING MATERIALS	14
IX- BUD GRAFTING	15
X- MATERIALS TO USE IN BUD GRAFTING	16
10.1. PLASTIC.....	17
10.2. ALCOHOL.....	17
10.3. COTTON	17
10.4. SCISSORS	17
10.5. KNIFE.....	17
XI- SELECTION OF COCOA TREE	17
XII- BUD WOOD	18
XIII- TYPES OF BUD GRAFTINGS	18
13.1. BUD GRAFTING IN THE SHOOT	18
13.2. BUD GRAFTING THE STEM	19
13.3. BUD GRAFTING ON TOP OF EDGE OF STEM	19
13.4. BUD GRAFTING (SPLIT)	20
XIV- NURSERY	20
14.1 COVERAGE.....	20
14.2. SEEDLINGS DISPLAY.....	21
14.3 SANITATION	22
XV- STUFFING	22
XVI- CLEANING AROUND THE COCOA TREE	23
XVII- MANAGEMENT	23
XVIII- RECOMMENDATIONS	24
XIX- CONCLUSIONS	25
XX- ATTACHMENTS	26,27,28

I. ACKNOWLEDGMENTS

First of all, we would like to thank the Program Management Unit (PMU) and IFAD for the opportunity given to us to visit the Republic of Liberia and mostly to share our experience as farmers with our fellow Liberians farmers.

Secondly, we extend our thanks and appreciation to those who we had the opportunity to meet and work during our stay in this wonderful country, such as Ministry of Agriculture, City Mayoress, representatives of the cooperatives, farmers and individuals who direct or indirectly made this mission possible as well as our staying comfortable.

It is widely known that this mission came as a result of a trip made by a Liberian delegation to Sao Tome and Principe in July 2013, where Liberian officials had the opportunity to observe and share their experiences with all involved in the process of cocoa production in different districts and counties of Sao Tome and Principe.

Said that, we feel honored and appreciate all the efforts put in place by the Project Coordinator and FIDA to bring us to Liberia to share with local farmers our experience and knowledge during Liberia visit.

We also thank the working people on the field for their fully commitment during this long journey , especially Capacity Building Officers and different Tree Crops Officers, who made great efforts to give us all the possible conditions to achieve our goals and expectations on the field.

We would like to say to our fellow Liberians that we are also committed to the effort and struggle made by this country to overcome the challenges presented by this program, in as much we are able to provide technical support and information to help the work on the field to success.

We the team of Sao Tome and Principe hope that this mission will help Liberians farmers to achieve their expectations and ambitions regarding the cocoa business.

Tecnhicians from Sao Tome and Principe:

Aureliano Mendes Pires

Antonio d'Apresentação

Paulo jorge Lima da Conceição

II. INTRODUCTION

According to the program, plots were selected in each district making a total of 14 plots divided into 7 Districts such as: Salayea, Zozor, Voinjama, Quardu Gboni, Vahun, Kolahun and Foya. The cooperatives in each of these districts selected two plots with surface of 1ha each, in which the technical demonstrations were done only in Salayea, Zozor, Quardu Gboni and Voinjama Districts due to the suspected existence of Ebola Virus in Foya, Kolahun and Foya. Despite this situation, working teams from Foya, Kolahun and Vahun participated in the Voinjama and Quardu Gboni Districts.

Globally, the plots had four main characteristics which were: dry plots, humid plots, and plots with low and high density. It was observed that plots were in a state of abandonment due to civil war that lasted nearly twenty years.

In the beginning of the demonstration, it was noticed that skepticism came from the farms owners but with technical information and demonstration in the field, a higher level of confidence, motivation came from them. We would like to point out that team presented in the field (farmers, cooperatives members, crop tree officers) also contributed to enrich this activity with their wide background knowledge which helped us to move faster. Because of this, we noticed that this technical mission also served as additional knowledge to the one already acquired by locals farmers, because many of them have been in the cocoa business for long time or some are descendants of cocoa farmers.

During our work we were guided by tree crop officers, technicians and representatives of the project, the Ministry of Agriculture, who worked as a liaison between the team of Sao Tome and Principe and farmers.

In respect of the methodology, we decided to split the working group in two, one group worked with the technician Aureliano Antonio Pires and another with Antonio d'Apresentação in order to get the work done easily.

III. DEMONSTRATION SITES

3.1 DRASTIC PRUNING



Basically the drastic pruning is applied when farms are in a state of complete abandonment like it was in the demonstration sites. In these plots, we encountered a large number of big trees, bindweeds and old cocoa trees which have caused over-shading and blocking the penetration of the light and fluidity of air in the farms, fact that has caused numerous pests and diseases. On the other hand, this situation has also caused the appearance of many plants in a spot, some cases up to seven (7) plants at a spot.

We also found plots with different kind of characteristics; (i) plots in flowering stage, (ii) dry plots, (iii) plots with excessive humidity, (iv) plots with low density and (v) plots with strong density. And in each of these plots, we applied the specific techniques that match with those characteristics.

3.1.1 Plots in flowering stage: On these plots, we essentially chose to cut the vertical branches and leave the horizontal branches which are capital for production of better capsules; however, we kept cutting large trees as well as bindweeds. This method is justified by the need to keep the plants in flowering stage to bear and provide bud woods, because cocoa tree in this stage provide excellent bud woods.

3.1.2 Dry plots: On these plots there is already a high level sun light which causes the death of young and adults cacao trees. In this case, we chose not to eliminate all the large trees in order not to worsen the situation, besides; these plots are the ones which suffer the most from pests.

3.1.3 Plots with excessive humidity: These plots are the ones containing higher level of shading caused by a large concentration of big trees connected to each other by bindweeds making a kind of ceiling on the plot, in this case we eliminated most of the big trees in order of the appropriate level of shading.

3.1.4 Plot with low density: Besides the conventional pruning, we also prepared the spaces to be filled with branches we cut from the cocoa trees in the gaps between cocoa trees in order to identify future spaces to be filled with grafted seedlings.

3.1.5 Plots with high density: we noticed that in a space of 3 meters there were up to 8 cocoa trees, in this case we eliminated most of them and kept the cocoa tree with shoot from the root having the best characteristics.

IV. CUTTING TECHNIQUES



Firstly, this procedure consist of cutting of cacao trees slide with height of fifty centimeters (50cm), but before cutting, the first hit should be done down side and then second hit should be done up side to prevent

the tree from splitting and finally apply the copper sulphate, so that the insects and water cannot penetrate into the stem and cause the contamination of the root and consequently infect the plants to be grafted.

4.1 Application of copper sulphate



The application of copper sulphate should be done shortly after any cut made in the cocoa tree. But, before preparing the farmer should take into account the dosage of the solution to avoid its vanishing after application in case it rains. The dosage is done by adding one kilo of copper sulphate (1kg) with one liter (1l) of water.

4.2 Banana Trees (in absence of copper sulphate)



In the absence of copper sulphate, the farmer can use the liquid from banana trees (shoots or in state of decaying). But, for this procedure to be practical, the farmer should have banana tree as cover crop in the farm, especially between cocoa trees. By the way, the usage of banana as cover crop is important because of:

- 4.2.1 **Conservation of soil moisture:** Banana tree is an excellent crop for the conservation of soil moisture, because it helps cocoa trees in dry season to maintain the necessary level of soil moisture to obtain water during this season.
- 4.2.2 **Food safety and source of income:** This crop can also be used as food and, on the other hand, it may serve as a source of income because it allows the farmers in the absence of cocoa production to have extra income to meet daily financial needs.

V. PESTS

5.1 Parasites



This type of parasites affects mostly the plots located in areas with excess humidity which is caused by the irregular or saturated shading. These parasites do not cause the death of the cocoa trees but, it does not allow the cocoa trees flourish easily. To eliminate this kind of pests the farmer must regulate the shading (by cutting whatever is necessary), do pruning and then remove with hands or, use a brush to remove parasites by making sure to not hurt the cocoa tree with brush in order to avoid possible contamination of the cocoa tree.

5.2 Termites



5.3 Causes

Termites affect mostly dry plots (hot zones). The main reason for appearance of this pest is the existence of branches and dead trees in the state of decaying in the farmer without appropriate treatment.





5.4 Prevention and treatment

- a) Avoid having branches and dead trees in state of decaying in the farms;
- b) Regulate de-shading to avoid the excess of light to not cause the death of cocoa trees;
- c) Eliminate the termites lodgings in the soil as well as in the stem of the cocoa trees;
- d) Clean the space around the cocoa trees.

VI. REGULAR SHADING





Regular shading can be defined as vegetation that favors the penetration of the appropriate level of light, which can avoid the excess humidity and also avoid the shortage of water in the soil. Regular shading is indeed important for the maintenance of the plot especially in dry season, because it contributes to the creation of a stable condition for the survival of the cocoa tree during the dry season.

VII. DISEASE

7.1 Black pot





This pathology is characterized by burning the growing capsules causing the decreasing of the production in some cases up to 70%. The black pot is caused by a fungus named *Tiphodoro* which develops in the extremely humid plots. This is a disease with no cure but can be prevented by using the application of calcium hydroxide and copper sulphate.



Calcium Hydroxide



Copper Sulphate

7.2 Fertilizers dosage to fight black pots

- a) Add two kilos (2 kg) of copper sulphate with one kilo (1 kg) of calcium hydroxide with two hundred liters (200 l) of water, apply both in the first and second application in hot areas (areas with shortage of water and lack of soil moisture and shading).
- b) For plots located in humid zones (areas with excessive shading, moisture soil with existence of water) we use the same dosage in the first application, **but** in the second application add three kilos (3 kg) of copper sulfate with one kilo and half (1.5 kg) of calcium hydroxide for two hundred liters (200 l) of water.

Obs: (The timeframe between first and second application is 21 days).

VIII. PRUNING MATERIALS



For pruning we used materials, such as: power saws, handsaws, however, for drastically pruning, it is advisable to use a small power saws model STHIL MS 260 or STHIL MS 280. It is strongly advised for usage of power saw model STHIL HT 131 (long blade) to cut the branches in the high cocoa trees to replace the usage of ladder so that the farmer can work more easily, and for small cocoa trees it is advisable to use handsaw or power saw model STHIL MS 260.

IX. BUD GRAFTING

Bud grafting is a technique used to modernize the cacao production, and its goal is to replace the old trees for new ones, replace or mix cocoa varieties. This technique is done by using bud woods collected from the trees that are good producers and resistant to pests and diseases. Moreover, this technique also allows having cacao trees with maximum height of two meters (2m) which facilitates the process of harvesting and pruning and ensures a stable production cycle.



X. MATERIALS TO USE IN BUD GRAFTING



The proper usage of these materials ensures the success of the bud grafting.

10.1 Plastic : The plastic must be transparent to facilitate the farmer to observe the new shoot and protect it from the rain water.

10.2 Alcohol: This is to disinfect the materials (scissors and knives) before any cut, but it should have a percentage of 96% to be effective.

10.3 Cotton: The cotton serves primarily together with alcohol to disinfect the materials and clean them before doing any cutting.

10.4 Scissors: The scissors are used to collect bud wood and do small pruning in the new plant.

10.5 Knife: The knife is essentially used to prepare bud wood to graft in the stem.

XI. SELECTION OF COCOA TREE



The selection of cocoa tree to collect bud woods plays an important role because, it is through this process that the farmer will have the possibility to transfer the genetic code from the good cocoa tree (resistant to pests and diseases) to a new generation of cocoa tree. This process can be carried out on plots to be revitalized or any other farm on which the farmer thinks it is convenient, *provided that there is technical confirmation that the cocoa tree to be selected is a good producer and resistant to pests and diseases.* Regarding the way of selection, the farmer after certifying the quality of the tree to be selected, should code with tags those good trees as a means of identification to provide bud wood for bud grafting.

XII. BUD WOOD



Bud wood is collected from selected cocoa trees which are (good producers and resistant to pests and diseases). It should be collected early morning or late in the afternoon. This is justified by the fact that between late morning and afternoon the sun is still hot which may affect the quality of the nutrients into the branches to be used for grafting. It is possible to collect bud woods to be used 24 hours later, as long as they are kept in the cooler covered with wet towel to keep them fresh. On the other hand, the best way to certify a good bud wood is by checking if the up side of the branch is brown and down side is green.

XIII. TYPES OF BUD GRAFTING

13.1 Bud grafting in the shoot

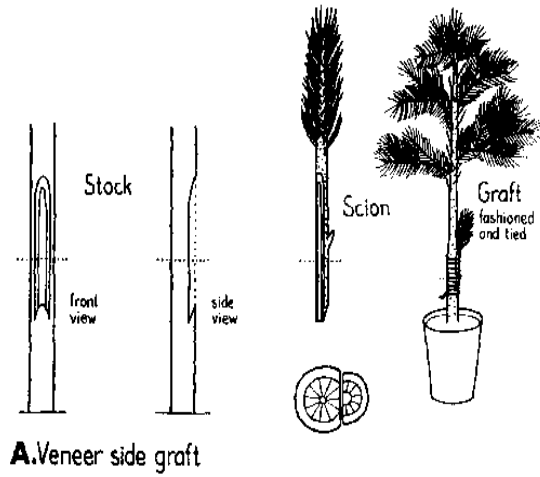
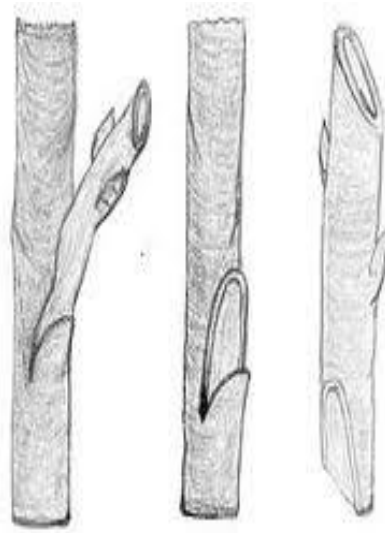


This type of bud grafting is done in the shoot that comes straight from the root, when it is thick as a pencil, and it starts bearing at the age of 18 months, in that moment the big stem can be removed.

13.2 Bud grafting in the stem (Veener)

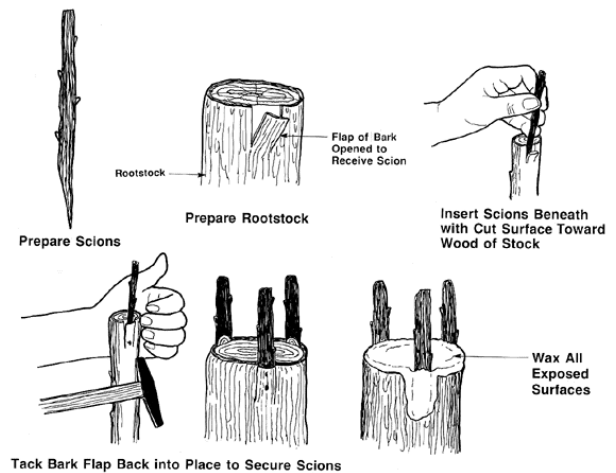
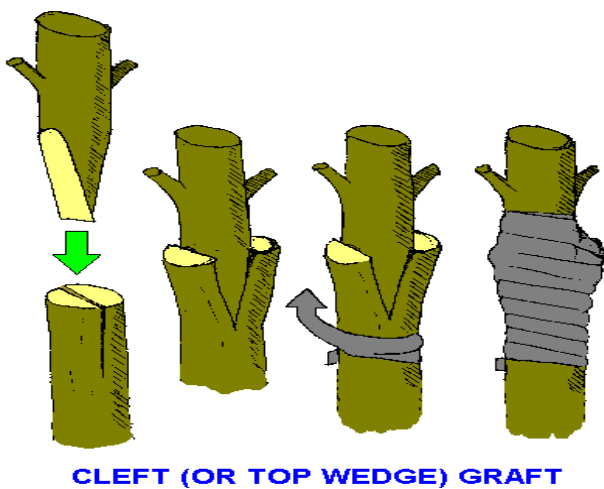


Fig. 3. A Veneer Graft



This type of bud grafting aims to profit stem at adult age to give rise to a new plant according to the variety grafted, and the production time is slightly faster than the grafting done in the shoot.

13.3 Bud grafting in Top edge of the stem (Cleft or Top Wedge)



This type of bud grafting stops automatically the genetic characteristic of the stem which serves only to catch water and nutrients from the soil to the new shoot and it starts bearing at age of 18 months.

13.4 Bud grafting (Split)



This type of bud grafting is very similar to *bud grafting in top edge of the stem*, the only difference is the fact that the stem used in top edge is bigger. The cocoa tree resulting from this type starts bearing at age of 18 months when the stem come straight from the root and if it is isolated it starts bearing at age of 30 months.

XIV. NURSERY



14.1 Coverage: This type of coverage hinders the process of photosynthesis because it does not facilitate penetration of sun light. Besides, the material used as cover is a material that by its nature lodges insects which may attack the seedlings.



14.2 Display of seedlings: We noticed that the way seedlings are displayed may cause the saturation of the nursery. It is advisable to have at least 150 seedlings per block (photo below) with a space of two (2 cm) centimeters between seedlings and fifty centimeters (50cm) between blocks to facilitate the circulation of the air, irrigation and sanitation.





14.3 Sanitation: relating to phytosanitary treatment, the application of organic fertilizers, insecticide (DIPPEL) and fungicide (copper sulphate) should be done fortnightly in the nursery.

XV. STUFFING



This technique serves to ensure soil moisture during the dry season and it is applied **essentially to new cocoa trees** and should be done in the last month of the rainy season. The application is done by using the rest **of banana trees, cocoa shell, sawdust and grasses** which become organic fertilizers.



XVI. CLEANING AROUND THE TREE



This technique should be done *during* the rainy season and, consists of cleaning up the space around the new and adults cocoa trees with objective of preventing attacks from insects like termites and also facilitate the application of fertilizers.

XVII. MANAGEMENT

COMMUNITIES				ASSOCIATIONS																			
N°	DATE	RECEIPT	FARMER	NAME	SEX	ADDRESS	GW	BW	N/C	DET	DET	DET	DET	DET	DET	DET	DET	DET	DET	DET	DET	DET	



Regarding the management, firstly we talked about the urgent need to create a database such as: (i) list of communities (ii) list of farmers' name per community (iii) number and surface of farm per farmer and

community (iv) creation of forms to monitor production per community (v) creation of forms to monitor the payments to farmers. We also mentioned the need for construction of transformation infrastructures (dryers and fermentation boxes) in the communities as well as technical assistance to farmers. The team also mentioned the implementation of attractive prices in order to stimulate the farmers to produce more and direct their production to the official circuit. In the end it was decided that each team should create their own form to monitor the production as well as the payment to farmers according to the reality of each cooperative.

XVIII. RECOMENDATIONS

Based on what we have been observing in the field for two weeks, The following point are recommended:

1. Creation of list of targeting group containing the number of farmers, farm surface, farm code per district, so that the project can easily direct all the necessary supports.
2. Purchase of the appropriate pruning material such as power saw 028 with short and long blade, hand saw, paintbrush, copper sulphate and ladder (in absence of power saw model STHIL HT 131).
3. Better interactivity between tree crops officers and farmers, where the tree crops must take lead in the practical than been more instructional, so that the farmers can learn and follow their examples.
4. Provide continuous technical training for trees crops officers and make sure they share the information with farmers in the field.
5. Continuous visit to the demonstration sites by the project officials and technicians to ensure that engagement are being respected.
6. Introduction of banana trees between the cocoa trees with a spacing of 6 meters, to help the soil keep fresh and humid as much as possible, especially during the dry season.
7. Cleaning the space around the cocoa tree during the rainy season and then place the cocoa shell around the new plants to preserve the humidity of the soil.
8. Filling of the gap filling with grafted plants from the nursery.
9. Selection and codification of the cocoa tree that are good producers and disease resistant for further collecting of the bud wood for bud grafting.
10. Launching of a large bud grafting campaign in the shoots and in the non productive cocoa trees during the rainy season, followed by the specialized technicians to ensure as much as possible the success of the bud grafting, due to the lack of experience of the local technicians.
11. Creation of a commercial center in different district for commercialization of materials and fertilizers, if possible partially financed by the government or project in order to stimulate production and productivity.
12. Classification of producers by category (A, B and C) in order to facilitate the granting of aid by the state or project based on the farmers commitment.
13. Pruning in the next twelve (12) months of the cocoa trees grafted this month.
14. Applying of copper sulphate in the grafted plants after removing the plastic to avoid fungus named *lasoplotia*.
15. First phase of sulphatation campaign beginning from May 15th to May 17th and second phase from July 7th to July 10th 2014.

XIX. CONCLUSIONS

Given the urgency to revitalize the plots, it becomes necessary to have the demonstration sites as top priority in this process, because we strongly believe that, these demonstration sites can become the strongest convincing point at project disposal for farmers to be a part of the revitalization program.

The failure of this program may boost the current supported notion of many farmers that, more cocoa tree means more production, a theory that cannot stand based on new production techniques applied in Sao Tome and Principe which we shared in the field with farmers.

We also understand that the success of the revitalization program depends almost exclusively on the success of the demonstration sites. Besides we lived an experience in Vahun district that a farm owner said that we will never touch his farm, because he thinks that pruning a cocoa tree may destroy his plot. So, this calls our attention to the fact that, the success of demonstration sites is capital to change the mentality of more conservative farmers.

Given this fact, it is urgent to put in place the technical, financial, logistical and administrative conditions at working people disposal to carry out this program successfully.

On the other hand, is also urgent need to have closer monitoring and collaboration among the different actors engaged in field through the sharing of technical information, technical training and cross learning so that everybody can overcome the possible challenges more easily.

Finally, despite the current constraints, we strongly believe that Liberia can return to its potential terms of cocoa production in quantity and quality to the level practiced before the civil war, but this goal can only be achieved with continued effort and commitment from all involved in this process.

XX. ATTACHEMENTS

Form to monitor the harvest

CECAB-STP COOPERATIVA DE EXPORTAÇÃO DE CACAU BIOLÓGICO 10

DIREÇÃO EXECUTIVA

FICHA DE SEGUIMENTO DE QUEBRAS

ASSOCIAÇÃO: _____ ANO: _____

Nº de quebras	Cacau em Goma (Kgs)	Data	Cacau Seco (Kgs)	Porcentagem	Data	Observação
1ª Quebra						
2ª Quebra						
3ª Quebra						
4ª Quebra						
5ª Quebra						
6ª Quebra						
7ª Quebra						
8ª Quebra						
9ª Quebra						
10ª Quebra						
11ª Quebra						
12ª Quebra						
13ª Quebra						
14ª Quebra						
15ª Quebra						
16ª Quebra						
17ª Quebra						
18ª Quebra						
19ª Quebra						
20ª Quebra						

Form to monitor the payment to farmers

CECAB/STP(COOPERATIVA DE EXPORTAÇÃO DE CACAU BIOLÓGICO) 1

FOLHA DE PAGAMENTO CACAU SECO Nº _____

COMUNIDADE: _____

DATA DE QUEBRA: _____/_____/_____

DATA DE PAGAMENTO: _____/_____/_____

RESPONSÁVEL: _____

A- Coeficiente de transformação: _____%

B- Valor unitário de cacau seco na comunidade: _____,00

Nº	Nome do Agricultor	1	2	3	4	Valor a total a receber (STD) Coluna3 - Coluna4	Assinatura do Agricultor
		Quant. Cac. Goma(kg)	Quant. Ca. Seco(kg) Coluna1xA	Valor do Cacau Seco (STD) Coluna 2xB	Valor recebido Cacau Goma(STD)		
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							

