

# Investigating the impact of contour bunding technology in two agroecologies of southern Mali

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# Introduction

Land and water management practices like contour bunding have been implemented by farmers for some time in southern Mali. Farmers use these practices to improve yield performance and increase household income. Datasets on the social, livelihood, and economic benefits of contour bunding technology (CBT) will help to make firm conclusions and recommendations regarding CBT applications in different agroecologies of southern Mali. As part of Africa RISING activities, a survey on CBT was conducted in Africa RISING intervention villages (Bougouni and Koutiala) to facilitate decisions regarding the use and scaling of CBT.

## Objective

The main objective of the survey was to evaluate the impact of contour bunding technology (CBT) using the agricultural sustainable intensification (SI) domains in two agroecologies of southern Mali.

## Interview procedure

Four SI domains: Productivity, social, economic, and human plus demographic information of each household were used for the interview. There are nine Africa RISING intervention villages and, based on the number of contour bunding (CB) users, it was decided to interview three male farmers and who female farmers who use CB. The survey questionnaire was guided by a gender scientist from the International Institute of Tropical Agriculture (IITA), Dr Gundula Fisher, the Africa RISING gender expert. The sampling procedure and survey questions are attached in Annex 1. Where there were less than five CB users in a village, the data was completed in the next nearby village. Survey time started at 9 am with variable ending times depending on several factors like the time required to visit the CB plots, availability of female farmers for questions as they were engaged in household activities, number of persons interviewed, and lack of focus by farmers in responding to questions.

Each interview took nearly 10 to 20 minutes depending on the ability of the responder to understand and precisely respond to the survey questions. Sometimes farmers provided detailed information and sometimes it was difficult to get precise information, for example, estimates of production before CB implementation started.

The interviews took place in a technology park, town hall compound, in the house of the chief of the village, or near the house of a local Africa RISING project representative. Exceptionally some female farmers were interviewed in their homes or near their farms.

The interviewer and member of the household invited for interview were located 20–30 meters from other interview groups to get a non-biased and independent answer for each question raised (Plate I). Farmers who had farms nearby were grouped together to facilitate the farm visit; when one group field visit was done, they were dropped at the meeting place and another group was carried to their farms.

The interview team went with representatives of the Africa RISING project in each village to visit the CB plots accompanied by farmers.



**Plate Ia.** Interview with Oumon Samaké, a farmer in Flola village, Bougouni District. Photo credit: Karamoko Traore/ICRISAT.



**Plate Ib.** Interview with Dramane Dembélé, a farmer in N'Golonianasso Koutiala. Photo credit: Karamoko Traore/ICRISAT.



# Progress and observations

## Bougouni District

Table 1. Bougouni interview summary.

District	Villages	Planned		Target achieved		CB non-cultivated or destroyed	Conflict	Number of CBs visited
		M	F	M	F			
Bougouni	Madina	3	2	2	1	1	1	3
	Flola	3	2	6	3	1	0	6
	Dieba	3	2	2	2	0	0	4
	Sibirila	3	2	3	2	4	0	2
Total		12	8	12	8	6 (30%)	1 (5%)	15 (75%)

In Madina, there are four beneficiaries of CBT but only three were available for interview as one had died, so the family was not able to be reached for interview. Two male and one female farmer were interviewed, and all three CB plots were visited. The main observation concerning CB plots in Madina was destruction in one farm because the owner had emigrated to Algeria. Consequently, the farm could not be cultivated because of runoff (Plate IIa).

In Malian culture, land doesn't belong to a female. Females cultivate their husband's land or borrow land from others (brothers or relatives). In Madina village, a female named Sata Doumbia asked her husband's family for a plot of land and they gave her an abandoned plot, which had not been ploughed for a long time and was not productive as there had been heavy runoff on the plot. She contacted the representative of Africa RISING in the village to have CB in the plot, information she had obtained from a technology park visit. Once the CB had been constructed, water started to drain properly, and the land established well. Observing this situation, her husband's brother took back the land and put it under family ownership. Now the two brothers have their own families and she has a new farm from her husband and requested for CBT in the field (Plate IIb).



**Plate IIa.** Uncultivated farm. Photo credit: Karamoko Traore/ICRISAT.





**Plate IIb.** A new farm owned by a female farmer in Madina village, Bougouni District. Photo credit: Karamoko Traore/ICRISAT.

Nine farmers were interviewed in Flola to complete the gap observed in Madina village. Six male and three female farmers were interviewed but unfortunately only one female was available for the CB plot visit as the others were busy with housework and farm activities (Plate III). Among these female farmers, two were heads of the household and the third was a spouse. It was noticed that in Flola there are two types of land: wetland used for rice and dryland used for crops. In the dryland there are many streams due to rainfall and the slope. Farmers took care of CB to minimize their farms from the impact of runoff. In Flola village, the interview team was warmly welcomed, and CBT was perceived by farmers as an important land management practice.



**Plate IIIa.** A cotton field in a CB plot. Photo credit: Karamoko Traore/ICRISAT.



**Plate IIIa.** Production of cotton from a CB plot (b). Photo credit: Karamoko Traore/ICRISAT.

The number of CB users varied from one village to another. Four farmers were interviewed in Dieba (two male and two female farmers). Of the two female farmers, one is head of household and the other is a spouse. The spouse represented her husband who had traveled to the neighboring village for a funeral ceremony. After the interview, the two male farmers took us for a CB plot visit. In Dieba village, three of the contour bunds were reinforced with *Andropogon gayanus* grass which made the CB durable and avoided structural damage due

to erosion. The other CB was reinforced with *Gliricidia sepium*. That farm was rocky and gravelly where runoff was high with reduced infiltration. According to the farmer, he could not even get soil for contour bunding, so he used stones and trees to support contour bunds. The trees are now well grown, and the area is arable (Plate IV).



**Plate IVa.** Enhancement of CB with *Andropogon gayanus*. Photo credit: Karamoko Traore/ICRISAT.



**Plate IVb.** Enhancement of CB with *Gliricidia sepium*. Photo credit: Karamoko Traore/ICRISAT.

In Sibirila, five farmers (three male and two female farmers) were interviewed. Four farmers were interviewed in the town and one of the female farmers, who is the head of household, was interviewed over the phone because she had moved to another village. Two male farmers accompanied us to the CB field for the visit. Apart from one CB plot, the rest had disappeared, so the field visit ended. We realized that farmers regretted the loss of their CB as they hadn't taken care of their CB plots.



**Plate Va.** Farm with CB. Photo credit: Karamoko Traore/ICRISAT.



**Plate Vb.** CB disappearing in the farm. Photo credit: Karamoko Traore/ICRISAT.



## Koutiala District

Table 2. Koutiala interview summary.

District	Villages	Planned		Target achieved		CB non-cultivated or destroyed	Conflict	Number of CB visited
		M	F	M	F			
Koutiala	M'pessoba	3	2	3	3	0	0	4
	Nampossela	3	2	2	2	1	0	4
	Zanzoni	3	2	3	2	1	1	5
	Sirakele	3	2	3	2	2	1	5
	Ngolonianasso	3	2	3	2	1	0	5
Sum		15	10	14	11	5 (20%)	1 (8%)	23 (92%)

In M'pessoba, six farmers (three male and three female farmers) were interviewed. Two farms were not visited because of poor road access. Three persons were interviewed in the town hall compound, one in her house, and the other two in their farms. One of the farmers used to feed his livestock with the *Andropogon gayanus* planted on the CB at the beginning of the rainy season. A female named Mariam Dembélé has a CB farm that was converted to the main farm of the larger family as the family observed increased cereal production after CB was introduced (Plate VI). It was difficult to enter that farm because the millet grew very well during the interview time. Even the two other farmers accompanying the team (Karim Coulibaly and Chaka Diallo) were very happy to visit the CB farm of Mariam Dembélé.



**Plate VIa.** Mariam's CB farm converted to family main farm. Photo credit: Karamoko Traore/ICRISAT.



**Plate VIb.** Mix cropping of *Hibiscus sabdariffa* with millet. Photo credit: Karamoko Traore/ICRISAT.

Nampossela farmers met at a representative location where the interview took place. One man's farm was cultivated by a female farmer because the owner's uncle and his father died within one week at the beginning of the rainy season. A female borrowed that land and then cultivated a small area. During the interview, a farmer named Tiangwa Koné refused for his wife to answer the questions on his behalf; he said, "she cannot give the impact CBT brought into the family and changed our life". His farm was remarkable in agronomic performance and the visiting team from ICRISAT were very happy. As reported by the farmer, in previous years before the CB, the runoff took all his crops until the villagers came to visit his farm. This farm is known as lowland with heavy runoff. That wasteland has become the main crop land for the family. He was the first person to be present in the meeting area and was very happy to see the Africa RISING team again. He used *Andropogon gayanus* grass on the CB to give it strength and production wise he was able to harvest 1.2 t/ha of millet (Plate VII).



**Plate VIIa.** Millet farm with *Andropogon gayanus* grass on CB plot. Photo credit: Karamoko Traore/ICRISAT.



**Plate VIIb.** One heap (1.2 t/ha) of millet production from that CB field. Photo credit: Karamoko Traore/ICRISAT.

In Zanzoni, all CB owners were male farmers; two allowed their spouses to respond to the survey questioner. This village was made up of big families where family members numbered almost one hundred people. There was a conflict in one family between the CB owner and his uncle. During CB construction they were one big family, he chose a waste land for CB with low nutrient content and where runoff was high. After putting CB in the farm, the family members witnessed an improvement in the value of the land, and this became a source of conflict. Presently the household has separated, and the uncle has taken over the CB land.



**Plate VIIIa.** Conflict between a CB farmer and his uncle. Photo credit: Karamoko Traore/ICRISAT.



**Plate VIIIb.** Uncultivated farm (b). Photo credit: Karamoko Traore/ICRISAT.

In Sirakélé village the interview was conducted in two different places; those close to the town hall (two farmers) and the other three farmers 4 km from the town hall. This village is too scattered. One CB farm was not cultivated due to the late start of the rainy season and another was used as a sorghum variety trial with the ICRISAT sorghum program.



**Plate IXa.** Sorghum production from CB farm.  
Photo credit: Karamoko Traore/ICRISAT.



**Plate IXb.** Farm with sorghum trial with cowpea.  
Photo credit: Karamoko Traore/ICRISAT.

In Ngolonianasso, one of the CB farms was converted into unsuitable land because of the high rate of runoff, which the constructed CB couldn't accommodate; as a result the farm was abandoned by the owner. One CB user lost his farm because the owner took back the farm after observing the improved quality of land as a result of CB implementation.



**Plate Xa.** Converted farm into nonarable land.  
Photo credit: Karamoko Traore/ICRISAT.



**Plate Xb.** Higher yield cotton on a CB farm. Photo credit: Karamoko Traore/ICRISAT.

# Constraints

These are some constraints that the interviewers faced:

- Availability of female farmers as they were engaged in home activities like cooking and being busy in harvesting.
- Poor farm access to visit the constructed CBs. Some roads are only accessible by cart.

## Conclusion

The survey mission helped to understand CB implementation and how communities perceived the technology. If properly done and given due care, CB can improve the status of farm land by reducing erosion and increasing soil fertility. However, the practice became a source of conflict among the land owners and landless farmers. Some of the wasted, unused land became more productive after the introduction of CB and the owners of the land decided to do the farming activities themselves by evicting the users of the land. Those farmers who witnessed increased productivity after the introduction of CB were unable to expand CB application because of lack of consistent information on the technology and method of application. It is important to continue creating awareness in rural communities on improved management of land and probably landless farmers need to be engaged in non-farming activities.



# Annexes

## Annex 1: Survey questionnaire and sampling procedure

Questionnaire Number...N°..... District.....

Village/Community.....Lat ..... Long.....

Date of Interview...../11/2018

Time of Interview..... Name of the Interviewer.....

### Demographic information

1. Sex M  F

2. Age of respondent:

3. Education: No formal education  Primary  Secondary  Tertiary

4. How many wives do you have?

5. Are they living together? Yes  No

6. What is the household Size for each?

7. What is your position in the household?

Head  Spouse  Adolescent Child  Relative

8. What is your rank among spouse?

First  Second  Third  Fourth  Others.....

9. What is the total area for land under cultivation?

1ha  1-2ha  2-3ha.  3-4ha  4-5ha  5-6ha  6-8ha

> 8ha

10. Do you have other income apart from agriculture?

Yes  No

### Economic and Social Domain

1. Who contributed labor to constructing the contour bunds for the first time?

Adult men in the household  Adult women in the household

Female youth in the household  Male youth in the household

Female temporary laborer (paid labor)  How much?

Male temporary laborer (paid labor)  How much?

2. Who in the household contributed most labor to constructing the contour bunds for the first time?

Adult women (unpaid labor)  Adult men (unpaid labor)   
 Female children (unpaid labor)  Male children (unpaid labor)

3. Were draught animals used to construct the contour bunds?

Yes  No

If yes, who in the household owns the draught animals?

Head  Spouse  Joint Ownership  Rented  how much?

4. Who maintains (labor) the structure of the contour bunds on a regular basis?

Adult women in the household  Adult men in the household   
 Female children in the household  Male children in the household   
 Female temporary laborer (paid labor)  how much?  
 Male temporary laborer (paid labor)  how much?

5. Who in your household decided to use contour bunding?

Self  Spouse  Joint decision (self and spouse)  Youth   
 Other.....

6. For what crop/s do you use contour bunding?

Sorghum  Millet  Maize  Cotton  Groundnut   
 Others.....

7. What crops cultivated with contour bunds do you perceive to get more income?

Crop	Who in the household controls the income from this crop?				
	Self	Spouse	Joint	Youth men	Youth women
1.					
2.					
3.					
4.					
5.					

## Human Condition

1. Please follow the answer from Q#7 from the Economic and Social domain. Insert only those crops that are cultivated under contour bunding.

	Who in the household decides how much of this crop's produce is consumed or sold?				
Crop	Self	Spouse	Joint	Youth men	Youth women
Sorghum					
Millet					
Maize					
Cotton					
Groundnut					

2. For which of the following crops has the share for home consumption increased? (Insert only those crops where there is an increase).

Crop	<b>Before</b> introducing contour bunding: Availability of crop for consumption after harvest in months	<b>After</b> introducing contour bunding: Availability of crop for consumption after harvest in months
Sorghum		
Millet		
Maize		
Cotton		
Groundnut		