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The result of the Project demonstration Plot

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1. SUMMARY

This paper is prepared to compile the result of COVAMS project's demonstration plot in soil erosion control technology for 2009-2010 planting season. The main focus of the demonstration was on the effectiveness of contour ridging and Swale against soil erosion. Besides, the project tried to study how much of impact would be observed with the erosion control measures in maize harvest. The demonstration showed significant result in both points.

To analyze above points, the project settled one demonstration plot each in Chuma and Chiwalo village. Each plot was demarcated into two with 500m^2 each; one is without erosion control measures (hereinafter "not conserved garden") and the other is practiced with soil erosion control measures (hereinafter "conserved garden").

The rain falls in the 2009 – 2010 planting season was less than the one of normal year. The total volume of the rain fall was 662mm and 718mm at Chuma and Chiwalo respectively from November 2009 to April 2010, at the same time; its distribution was very erratic, especially the farmers experienced dry spell in November after they had planted maize. Most of the farmers felt it was not favorable weather conditions for maize growing.

The results from the two demonstration plots in soil erosion control have shown the absolute effect to protect the soil of the gardens from the erosion. There was no occurrence of erosion observed at Chiwalo demonstration plot at the conserved garden while 0.67m^3 of erosion was observed at the not conserved garden. Chuma demonstration plot had almost the same tendency.

The mean volume of the erosion from the both demonstration plots became 0.49m^3/500m^2. When extend this volume to entire conserved area, which was around 300ha, of 2009 in the target villages, it becomes approximately 3,000m^3 if not conserved. In short, it can be said that 3,000m^3 of soil was protected in 2009 under COVAMS.

On the other hand, a significant difference in the yield of maize between the conserved and not conserved gardens was observed. The yields of the conserved gardens were 3.6 fold and 1.36 fold of the not conserved garden at Chiwalo and Chuma respectively.

2. PURPOSE OF THE PROJECT DEMONSTRATION PLOT

COVAMS project is promoting to practice some of the soil erosion control technologies such as contour ridging, box ridges, soil structure improvement, hedge raw and swale (refer to COVAMS working paper No. 2,) in order to prevent soil erosion from gardens. However, the project has not had any data in the effectiveness of these soil erosion control technologies. Hence the project decided to establish a demonstration plot with the following purposes;

① To confirm the effectiveness against soil erosion of the recommending technologies
② To see the impact of the technologies in maize growing and its yield
③ To share the result of the demonstration plot with the farmers
④ To have site visit for the COVAMS concerned officers

As described above, the purposes of the demonstration look more on research purpose. Despite such intentions, the project hesitates to call the demonstration plot as research plot because the method for collection of the data on the mentioned points would not be in accordance with proper research procedures. Hence the result of the demonstration will be utilized as reference to know the tendency of the effects of the soil erosion control technologies.

In addition to the study purposes, the demonstration plot will be utilized as it sounds like. However, the project will not be able to invite all the farmers of the target villages due to the cost for inviting them. Hence the intention for the demonstration purpose will be focused on officer's level or other organizations which show their interest. Even though the intention is not really for the farmers, the project never close the door of demonstration plot for any visitors.

3. DESIGN OF THE DEMONSTRATION PLOTS

The project demonstration plots were settled at Chiwalo village of STA Kapeni and Chuma village of TA Kuntaja. The lands where the demonstration plots were allocated were leased from respective village heads, and the project did not request any geographical conditions. Therefore, the geographical condition of the demonstration plots are quit diversified.

The size of the plot in both villages was 1,000m^2. The plot was demarcated into two plots with 500m^2 each; one was practiced with soil erosion control measures and the

other was practiced with usual way as the farmers do. The outlines of the plots were shown at figure 1 and 2.

Figure 1 : Chiwalo demonstration plot

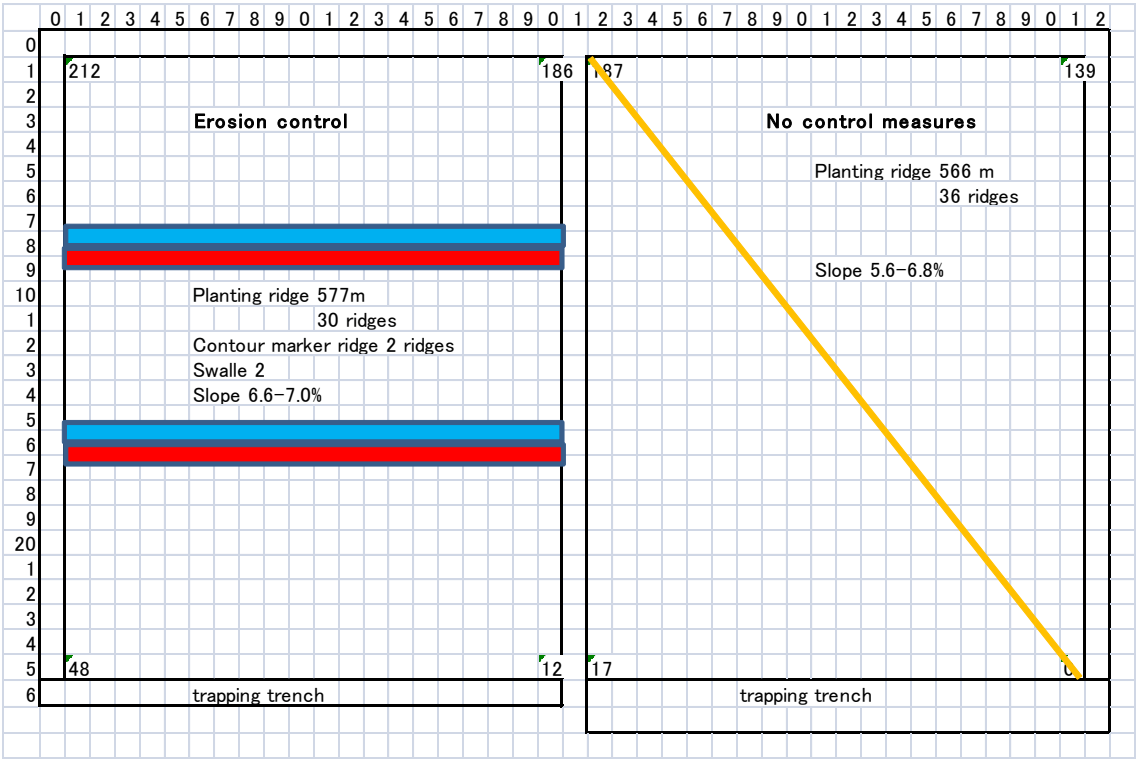
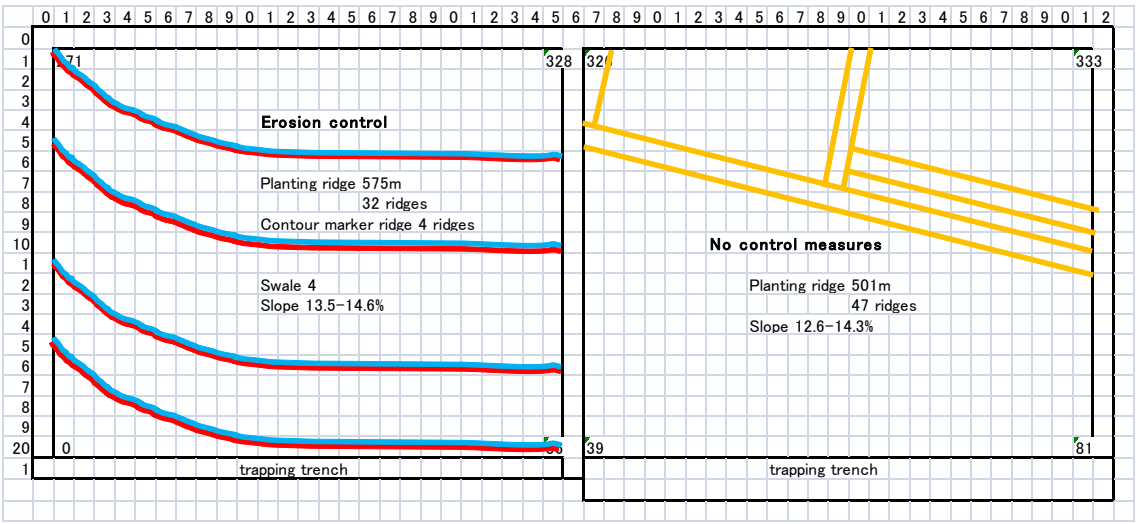


Figure 2 : Chuma Demonstration plot



The lines in the plots show their directions of ridges. “Erosion control” means the conserved garden. The direction of the slope is against the ridges of the erosion control

plots. The percentage of the slope of each plot is shown in the figures, but the one in Chuma's "No control measure" is complicated. The down side of the plot does not follow the same percentage but become more gradual. Therefore, the ridges of the plot were similar situation as the one of "conserved garden" plot.

Trapping trenches were set at the bottom of each plot in order to collect all the eroded soil from the garden. To avoid inclusion of eroded soil from outside of the garden, banks were constructed around the plots.

4. THE RESULT OF SOIL EROSION

4.1 RAIN PATTERN AND VOLUME DURING THE OBSERVATION PERIOD

The rain pattern and volume during the 2009 planting season was shown at figure 3.

Figure 3: Rain pattern and volume

Village	Month	Nov. 2009			Dec. 2009			Jan. 2010			Feb. 2010		
	Period (days)	1 ~ 10	10 ~ 20	20 ~ 30	1 ~ 10	10 ~ 20	20 ~ 30	1 ~ 10	10~ 20	20 ~ 30	1 ~ 10	10 ~ 20	20 ~ 30
Chiwalo	Days	0	2	6	5	3	6	1	3	4	7	3	8
	Volume	0	23	40.5	34.5	8.5	119	5	15	99	48	61	72
Chuma	Days	0	2	5	1	0	5	0	3	5	7	4	8
	Volume	0	20	27	36	0	71	0	47	106	41	58	106

Mar. 2010			Apr. 2010			Total
1 ~ 10	10 ~ 20	20 ~ 30	1 ~ 10	10 ~ 20	20 ~ 30	
2	2	6	4	2	2	63
20	43	46	53	25	6	718.5mm
1	1	2	3	2	1	50
8	35	10	56	38	3	662mm

The areas normally receive approximately 800mm of rain falls in the same period (2001, Final report for the master plan study on watershed rehabilitation in Middle Shire in Malawi). Hence, it was only around 80% to 90% of rain falls in this season, and number of rainy days was one third of the total days in the period. The maximum volume of rain falls in a day was 48mm and 42mm in Chiwalo and Chuma respectively. The number of

days which recorded 30mm or more of rain falls in a day was 7days in both villages.

4.2 OBSERVATION AND RESULT OF EROSION

During the planting season, it was observed that the plots with soil erosion control measures held soil intact inside the box ridges while the other plots were observed some erosion.

The volume of eroded soil was measured, combining collecting soil from the trapping trenches of each plot and calculation. The collection was done on March 25 and March 26 in Chiwalo and Chuma respectively. Hence, the volume of eroded soil was measured after having rain falls of 634.5mm and 565mm in Chiwalo and Chuma respectively.

Figure 4 shows the result of erosion.

Figure 4: Volume of eroded soil at each plot

Village	Erosion control plot	No control measures plot
Chiwalo	0	$0.67m^3$
Chuma	$0.04m^3$	$0.31m^3$

As they were observed during the planting season, the plot with erosion control measures had no or very little erosion was occurred while the other plots had quite lots of soil was eroded. When they are converted into hector, the volume of erosion became $13m^3$ /ha and $6m^3$ /ha in Chiwalo and Chuma respectively.

5. THE RESULT OF MAIZE YIELDS

Many farmers who practiced erosion control technologies in 2008 planting season said that the yield of maize was increased. To confirm the impact of putting erosion control measures in maize yield, the project tried to grow maize in the demonstration plots, and compared the yields between conserved gardens and not conserved gardens. As a result of the maize growing, the project confirmed the tendency of increased yields in both conserved plots compared to the one of not conserved plots. It was 3.6 fold and 1.36 fold of the yield from not conserved garden at Chiwalo and Chuma demonstration plot respectively.

As above mentioned, the weather condition was considered as not favorable one during the planting season. Actually, the total quantities of the rain falls during the planting

period were 634.5mm and 565mm at Chiwalo and Chuma respectively. Additionally, rain pattern was so erratic.

Because of this little rain, the growth of maize was disturbed by termites at Chiwalo demonstration plots. According to the owner of the land, the harvest of maize used to be not good from the same land. It was probably because of termites. However, it was observed that the growth of maize was better at the conserved garden than the other side. Samples were taken from the same dimension of spots for both conserved and not conserved plots, instead of choosing three lines at not conserved garden due to difficulty to identify the lines at that time. The estimation of yields of the plots were 24.7kg and 90.5kg per $500m^2$ from the not conserved garden and conserved garden respectively, which were figured out from the sample survey.

On the other hand, Chuma demonstration plot had no disturbance like the one of Chiwalo. As a result, the yields of the two plots were better than that of Chiwalo's and estimated 150.7kg and 205.7kg per $500m^2$ from the not conserved garden and conserved garden respectively with the same sample survey method.

The difference between the two plots was smaller than that of Chiwalo's. This was because of the geographical conditions of the not conserved garden as described in the design of the demonstration plots. Besides, having a tree inside the conserved garden affected the growth of the maize around the tree by shading the area, and the place was taken as one of the sample taking spots since it was designed so.

An observation was made that the size of cobs at the higher portion of not conserved garden was obviously smaller than the one of lower portion of the garden.

The field management in this maize growing in the demonstration plots and the method of sample taking were summarized in annex 1.

6. CONCLUSION

6.1 EFFECTIVENESS OF THE SOIL EROSION CONTROL TECHNOLOGIES

It can be concluded that the technologies introduced to the target villagers as soil erosion control measures were absolutely effective to prevent erosion, although the maximum rain falls in a day during the surveying period was in a range of 42 to 48mm

and less number of rainy days.

Some erosion might occur if it had more rain falls e.g. more than 50mm in a day. However, the potential of the technologies to hold the soil intact can be higher when the soil structure is improved since the owners of the lands seem not to put any effort to improve soil physical structure so far. In short, the technologies will still be effective even if the amount of rain falls goes up.

The project encourages planting Vetiver grass along the contour marker ridges. But the fact was that the there was very limited function with Vetiver grass against soil erosion since it was observed that contour ridging and swale were enough to prevent erosion. It may function as an erosion control measure when no construction of swale is done.

The amplitude of gardens which were practiced soil erosion control measures by the target villagers in 2009 was estimated 300ha. When the average of quantity of eroded soil from both of not conserved gardens is applied to this area, it gives an estimation of amount of protected soil by the farmers in the target villages in 2009. The estimation becomes about 3,000m^3.

6.2 IMPACT IN MAIZE HARVEST OF THE EROSION CONTROL TECHNOLOGIES

It was also confirmed that the technologies of soil erosion control affect the yield of maize positively. The impact in the maize yield was quite significant. It also revealed that about 600mm of rain falls was enough to grow maize effectively with efficient water harvest even under such erratic rain pattern.

The impact found at the demonstration gardens of the project was actually almost minimal, compared to the one of many farmers who put the erosion control measures under COVAMS. They said that despite such weather condition, the increase reached up to 25 fold of last year's harvest which was under sufficient rain falls.

The technologies helped to hold moisture of the soil for longer period. This function of the technologies may be able to reduce the attack by termites as it was observed at Chiwalo's demonstration plots, although it was not confirmed adequately.

It can be concluded that the impact in the increased maize harvest encourages the farmers to practice soil erosion control measures.

Annex 1

Summary of field management

Demonstration plot : Maize yield 2009 / 2010

Field management period : From : November 25, 2009 to March 16, 2010 (112days)

Item \ Village	Chuma : Slope 12.6~14.6%		Chimalo : Slope 5.6~ 7.8%		Remarks
	Control	Conserved	Control	Conserved	
Quantity of seeds	960g	920g	850g	1000g	not accurate
No. of hills	668	2300	707~750	2300	
Germination	12/1	12/1	12/1	12/1	
Fertilizer	12/3	11/25	11/25	11/25	application
Basal dresing	8.5kg (6.3g)	11.5kg	11kg	11.5kg	5g/cap
Top dressing	15kg (CAN)	15kg (CAN)	14kg (Urea)	14kg (Urea)	
	1/11	1/11	1/8	1/8	application
	7.3g /hill	6.5g/hill	6.3g/hill	6g/hill	Chimalo attacked
Weeds scraping	11/26.	11/26.	12/2.	12/2.	by termites
	12/3	12/14	12/17	12/17	
Yield	22kg	25kg	3kg	11kg	9 samples taken
	3lines x 3m	3lines x3m	2.25m x 3m	3 lines x3m	/ plot
	90cm apart	75cm apart		75cm apart	
	2.7x3x9=	2.25x3x9=	2.25x3x9=	2.25x3x9=	
	72.9㎡	60.75㎡	60.75㎡	60.75㎡	Total sample area
	150.7kg	205.7kg	24.7kg	90.5kg	Per 500㎡
Moisture Unknown	3.014kg	4.114kg	494kg	1.810kg	Per 10000㎡ (ha)