IMPROVING TECHNICS AND TECHNOLOGIES OF THE PRODUCTION OF CROPS AND FODDER PLANTS IN THE SUDANESE ZONE OF MALI: CASES OF KANI, NOUPINESSO AND MPESSOBA VILLAGES (SIKASSO REGION)

Presented
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General objective

To contribute to improve fodder plant and crop productivity using soil tillage and intercropping systems to maintain food and feed security at Kani and Noupinesso.

The specific objectives

i. **Assess the effect of CB technology on soil runoff and erosion,**

ii. **Determine soil moisture and water table dynamic under CB technology practice,**

iii. **Evaluate crops and fodder plants growth and yields with the application of CB technology,**

iv. **Evaluate the effect of micro-dosing system on farmer's income,**

v. **Determine the efficiency of intercropping system sorghum-soybean.**

Hypothesis

- **CB technology would reduce soil runoff and erosion ;**
- **It would increase infiltration rate, soil moisture indeed recharge water table;**
- **CB technology would significantly improve crop and tree yields;**
- **Micro-dosing technology would significantly increase crops yield and farmer's income;**
- **Leguminous crop would improve sorghum production.**

Materials and Methods

Photo 1: Field fitting out in CB technology

Materials and Methods (continu)

Photo 2: Making of ados

Materials and Methods (continu)

Photo 3: b) measurement of water table dynamic, a) tube protected using a padlock, Noumpinesso and kani, 2018

Materials and Methods (continu)

Photo 4: a) tube protected using a padlock, b) System of soil moisture measurement

Materials and Methods (continu)

Photo 5: Device of runoff and erosion measurement at Kani

Experimental Design

Two types of experiments in Split-plot design were conducted:

- **The first trial was a factorial combination of two tillage practices (Contour bonding CB technology and no contour bonding NCB or farmer's practices) and (four types of soil fertilization). The plot dimension was 4 x 3 m in four replications;**

- **The second trial also was a factorial combination of two tillage practices (CB and NCB) and (three farming systems). The plot dimension was 5 x 10 m in four replications.**

Vegetable material

Fodder plants (*Leucaena leucocephala* and *Gliricidia Sepium)*

Growth and development of fodder plants (height, diameter at base, diameter at 1.30 m, and crown radius) were determined each 15 days. We planted this plants in july 2017

Photo 6: Fodder plants in 2017

Photo 7: *Gliricidia sepium* on the ado at Madou Berthe's field 2018

Data collection

- **Runoff and erosion determination**
- **Soil moisture and water table evaluation**
- **Intercropping evaluation**
- **Growth of tree and crop parameters (height, diameter, tuft radius and biomass)**
- **Grain Yield**
- **Prevailing marketing price of grain yield and amendments**

Calculations

- **Land Equivalent Ratio (LER)**

(PerfCom, 2012)

$$\text{LER} = \frac{\text{Yield of intercropped cereal}}{\text{Yield of sorghum sole crop}} + \frac{\text{Yield of intercropped soybean}}{\text{Yield of soybean sole crop}}$$

- **Value cost ratio**

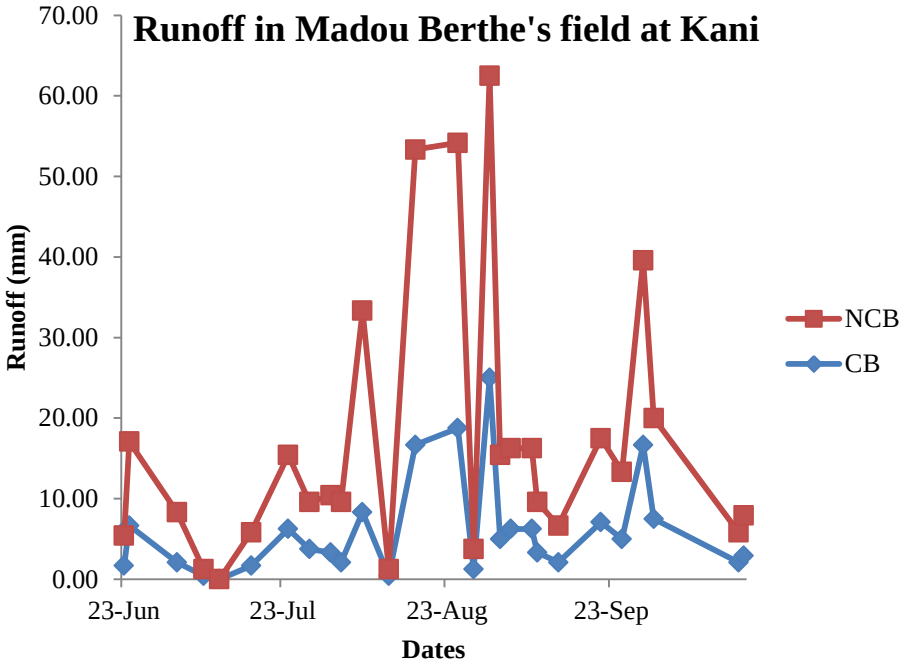
Nziguheba *et al.* (2010): $$\text{VCR} = \frac{Y - Yc}{X}$$

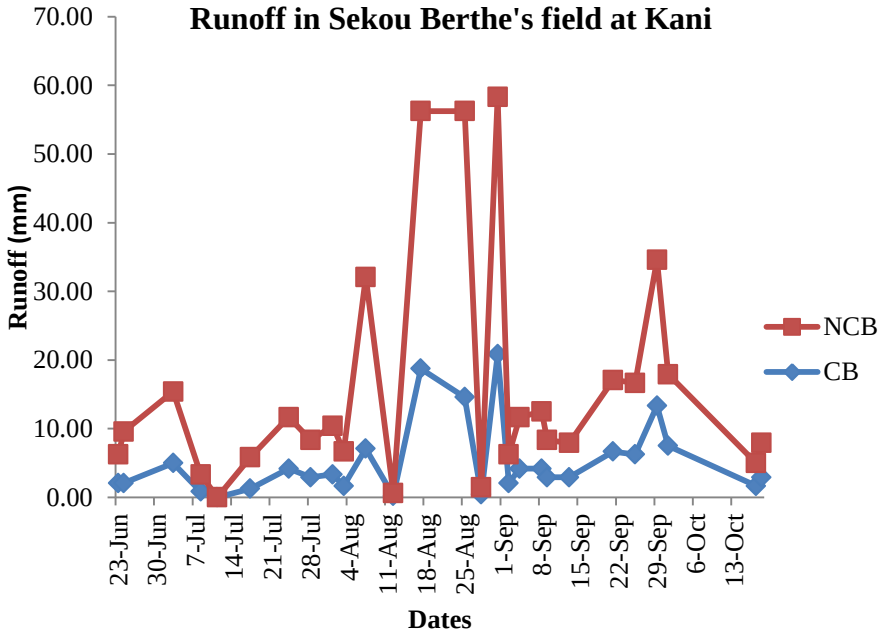
- **Statistical analysis:**

ANOVA using Genstat version 12

Means separation was done using l.s.d at 5%.

Results and Discussion





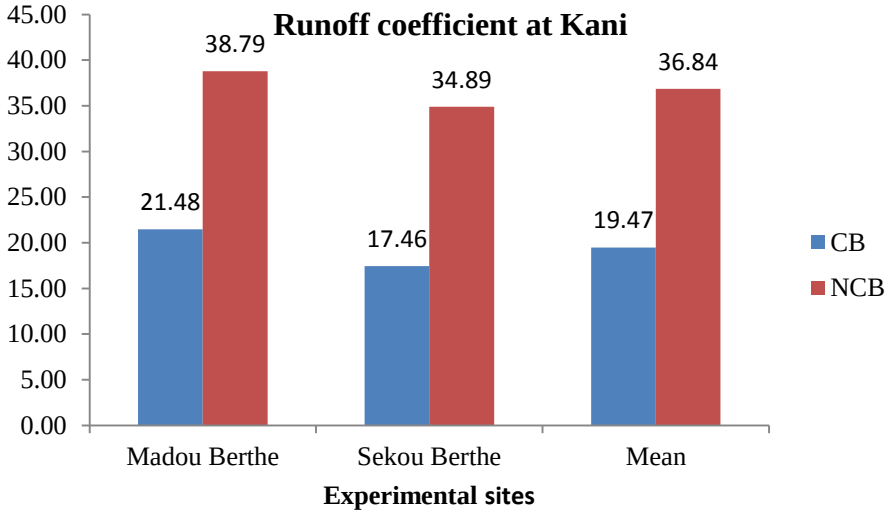


Figure 1: Effect of CB on runoff

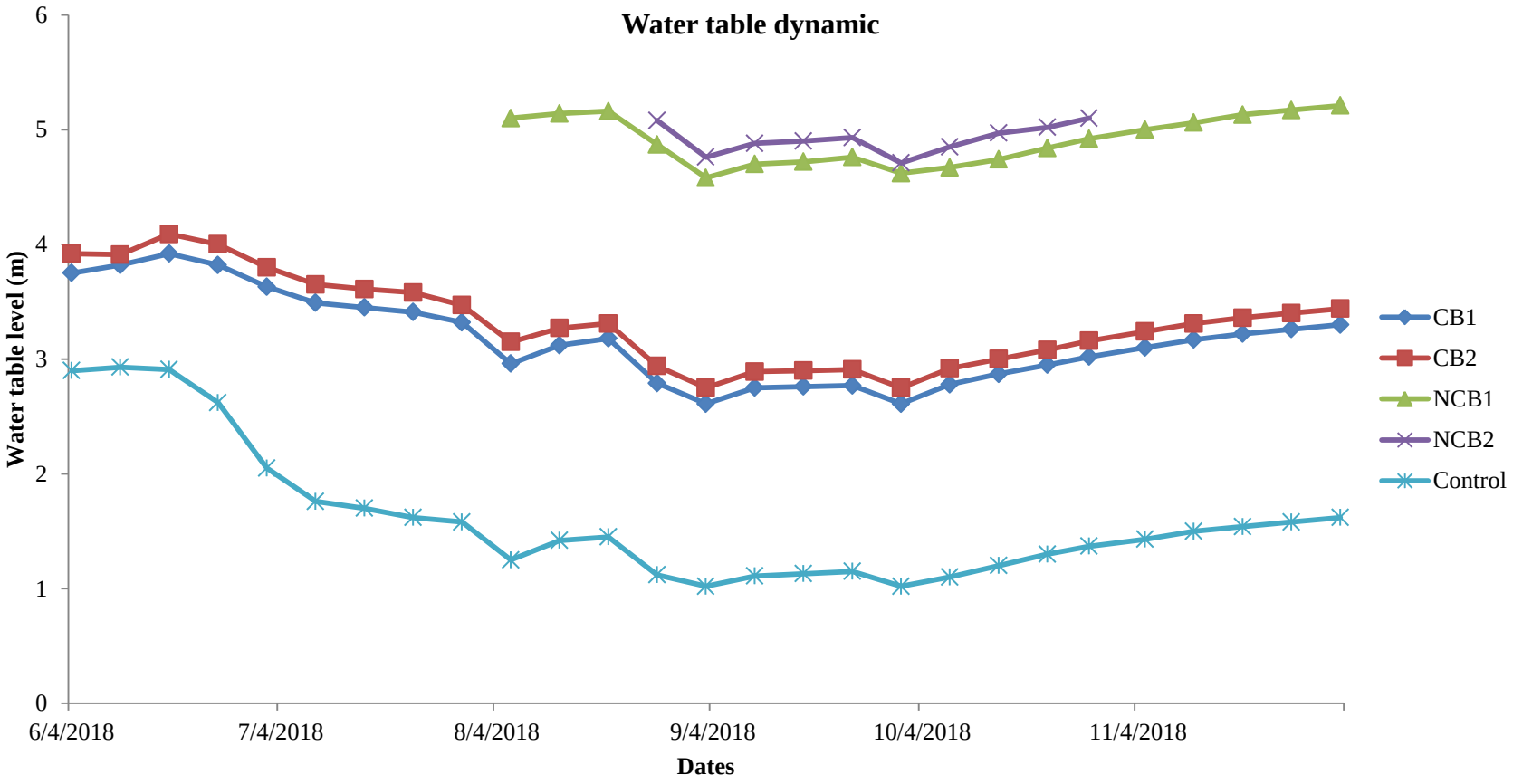
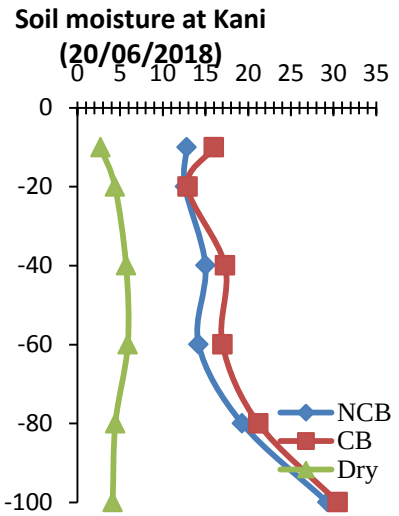
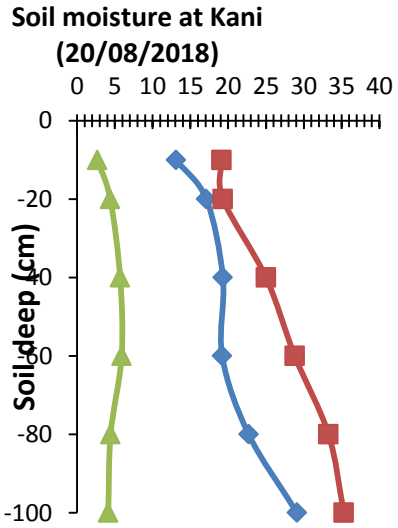
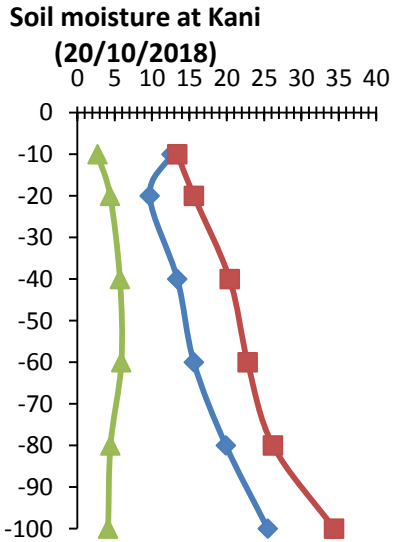


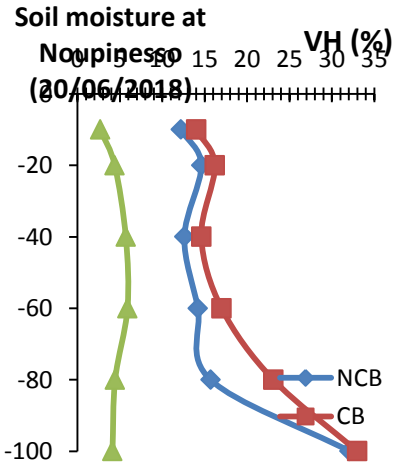
Figure 2: Effect of CB on water table dynamic at Noumpinesso

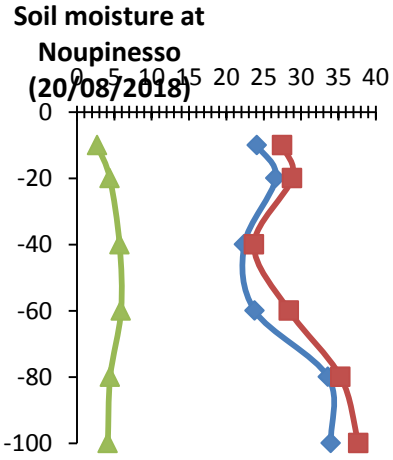
Figure 3: Soil moisture at Kani and Noupinesso

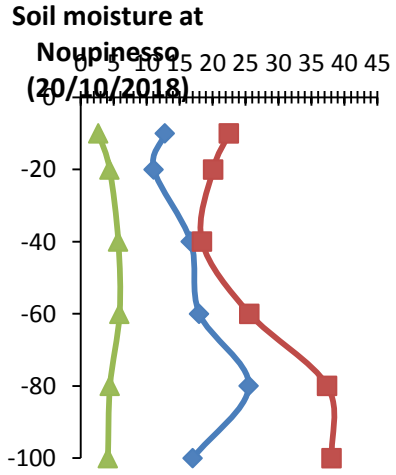












Kablan *et al.* (2008) 16 to 64 %

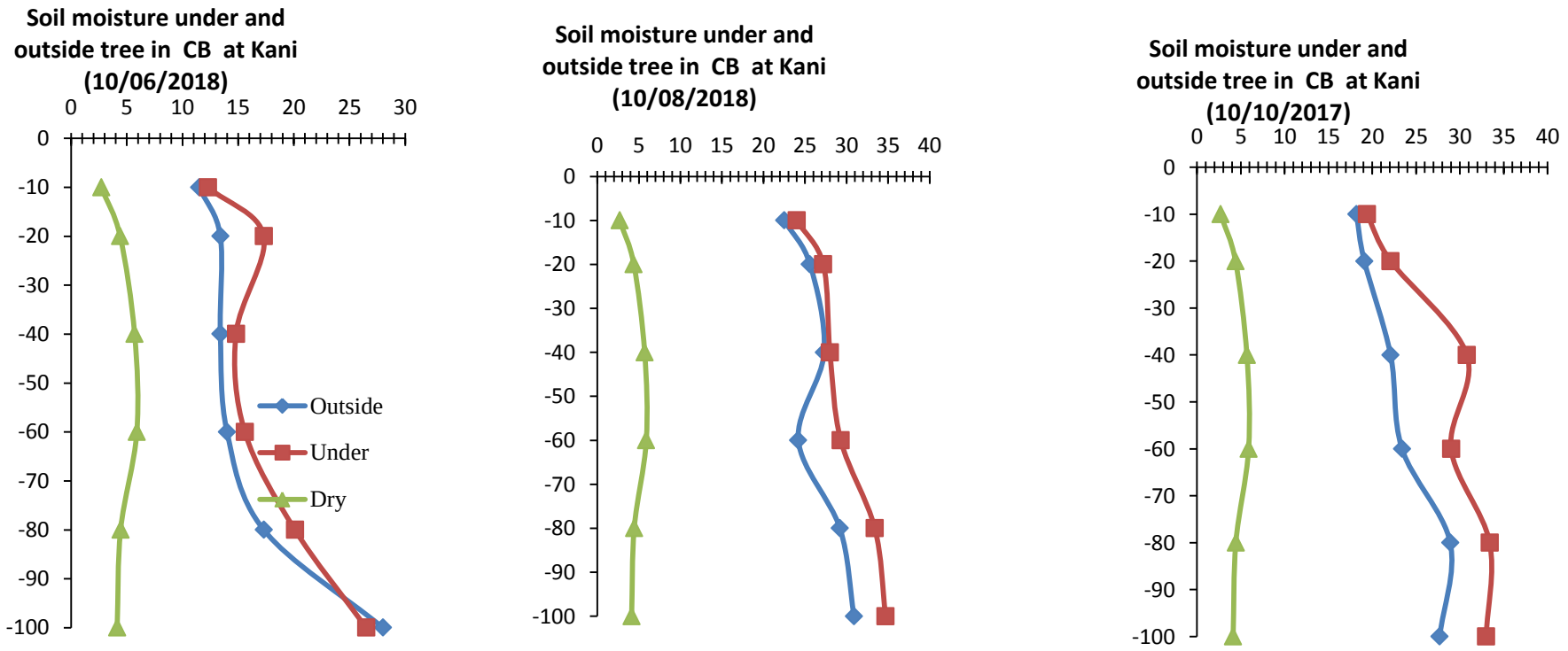


Figure 4: Soil moisture under and outside fodder plant in CB parcel at Kani

Table 1: Effect of CB and fertilizers on cotton yield

Duncan and Jayne (2016)

Muhammad *et al.* (2014)
2660 kg ha^{-1}
2523 kg ha^{-1}

	Cotton yield kg/ha					
	Soil fertilization					
FARMERS	**T1**	**T2**	**T3**	**T4**	**F.pr (0.05)**	**L.s.d**
Sékou Berthé	843.75	1031.25	1666.67	1760.42	<.001	150.095
Salif Berthé	895.83	1010.42	1625.00	1635.42	0.005	256.783
Barnabé Traoré	822.92	947.92	1593.75	1687.50	0.019	453.528
Bourama Dembélé	1000.00	1218.75	2302.08	2447.92	0.006	519.769
Remon Sanou	864.58	1083.33	1822.92	1927.08	0.016	514.100
Sita Berthé	760.42	968.75	1437.50	1520.83	0.019	380.870

	Soil conservation				
	CB	**NCB**	**F.pr (0.05)**	**L.s.d**	**CV(%)**
Sékou Berthé	1510.42	1140.62	0.002	106.133	3.6
Salif Berthé	1427.08	1156.25	0.018	181.573	6.2
Barnabé Traoré	1484.38	1041.67	0.022	320.693	11.3
Bourama Dembélé	1979.17	1505.21	0.026	367.532	9.4
Remon Sanou	1661.46	1187.50	0.025	363.524	11.3
Sita Berthé	1338.54	1005.21	0.029	269.316	10.2

Khlifi (2008)

Table 3: Value cost ratio (VCR)

Heerink (2005) VCR 2

(IDRC, 2014) 2,6 and 6,9

FARMERS	SOIL FERTILIZATION	VCR
Sekou Berthe	T2	3
	T3	5
	T4	3
Salif Berthe	T2	2
	T3	4
	T4	2
Barnabe Traore	T2	2
	T3	5
	T4	2
Bourama Dembele	T2	4
	T3	8
	T4	4
Remon Sanou	T2	4
	T3	6
	T4	3
Sita Berthe	T2	3
	T3	4
	T4	2

Table 4: Impact of CB and intercropping system on grain yield and Land Equivalent Ratio (LER) of sorghum

Saberi,2018
Bonetti R, 1991 (Saberi,2018)
24.01 % and 26.12 %

	Grain yield (kg/ha) Farming systems				
FARMERS	Sorghum sole crop	Sorghum-soybean	F.pr (0.05)	L.s.d	LER
Youssouf Berthé	1167.00	1958.00	0.148	2382.4	3
Oumar Berthé	1343.75	1864.58	0.305	3441.264	3
Tiéméko Berthé	1239.58	2250.00	0.072	1455.919	3
Boukary Berthé	1218.75	1968.75	0.07	1058.850	3
Amadi Bathily	1166.67	1552.08	0.215	1720.632	3
Mahamadou Bathily	1385.42	2072.92	0.019	264.713	3
Blaize Sanou	1281.25	1666.67	0.017	132.356	2
Basil Sanou	1333.33	1656.25	0.180	1191.207	3
Mpessoba	1098.96	2546.88	0.038	1085.322	4

	Soil conservation				
FARMERS	CB sorghum	NCB sorghum	F.pr (0.05)	L.s.d	CV(%)
Youssouf Berthé	1760.00	1365.00	0.282	2382.4	12.0
Oumar Berthé	2083.33	1125.00	0.175	3441.264	16.9
Tiéméko Berthé	2020.83	1468.75	0.130	1455.919	6.6
Boukary Berthé	1770.83	1416.67	0.147	1058.850	5.2
Amadi Bathily	1531.25	1187.50	0.239	1720.632	10.0
Mahamadou Bathily	1958.33	1500.00	0.029	264.713	1.2
Blaize Sanou	1604.17	1343.75	0.025	132.356	0.7
Basil Sanou	1656.25	1333.33	0.180	1191.207	6.3
Mpessoba	2045.83	1600.00	0.121	1085.322	4.7

Figure 5: Height of *Gliricidia sepium* in different fields at different dates of rain season at Kani and Noupinesso (Traore *et al.*, 2006)

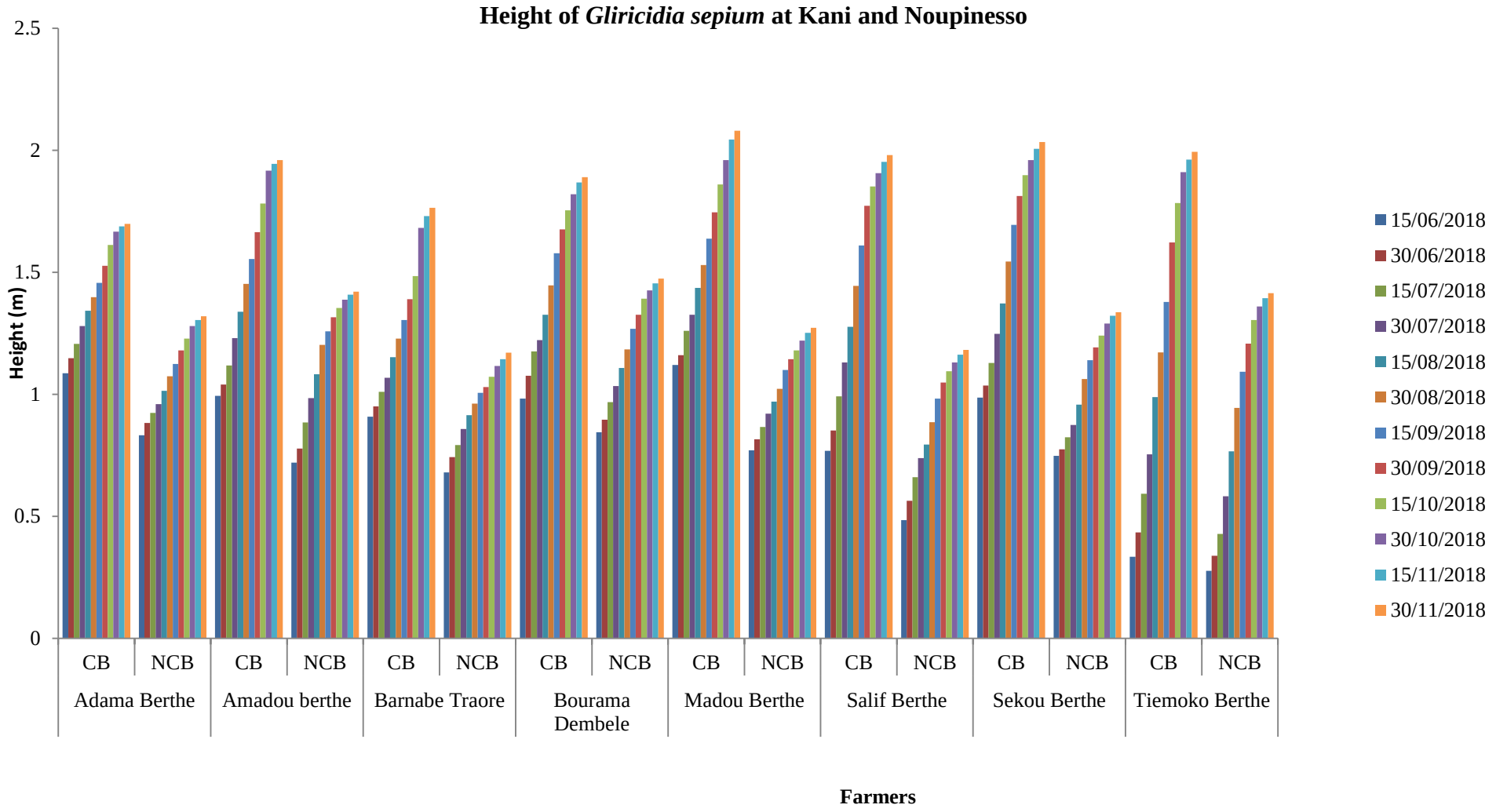
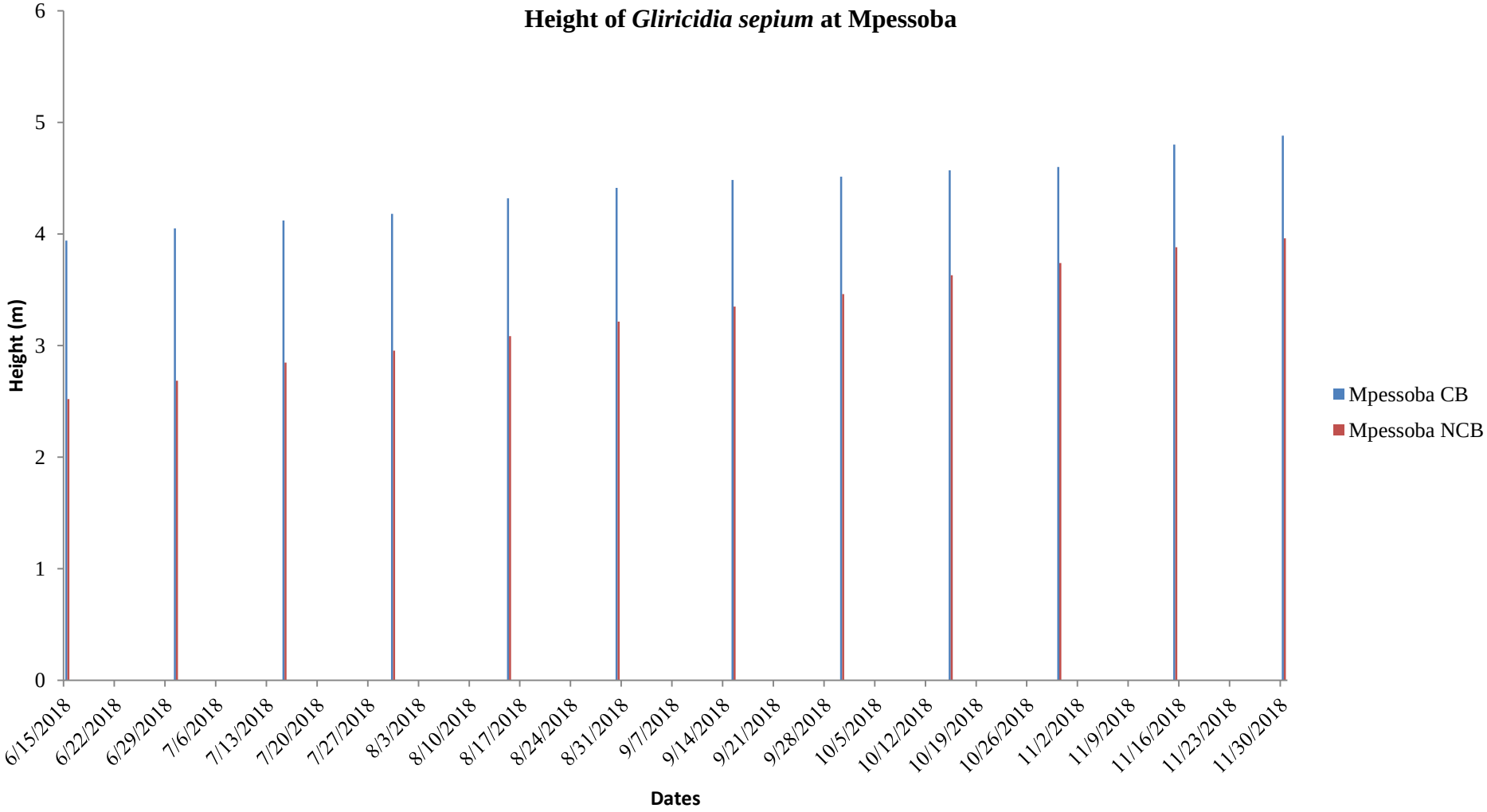


Figure 6: Height of *Gliricidia sepium* at different dates of rain season at in the Technology Park



THANK YOU

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