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Assessing the effect of organic fertilisers on the climate change mitigation of local Katokkon chili in Indonesia

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INTRODUCTION

- The climate crisis is one of major threats to food security in Indonesia
- Most of agricultural lands is managed by smallholder farmers with low adaptive capacities, climate related shocks cause low productivity or crop failures
- Chili *(Capsicum spp.)* plays a key role in smallholder farmers' livelihoods being a daily food with high economic value
- Especially in Toraja, the local variety Katokkon chili is such a high market demand cash crop
- One adaptation effort to restore farm productivity is improving soil quality and soil organic carbon through the application of biochar (B) and compost (C)

Fig 1. The Process of Making Roasted Husk as the Main Material of Biochar in Study Area

OBJECTIVE

To find the best combination of organic fertilizer using compost and biochar in the cultivation of katokkon chili and the synergy of compost and biochar on improving soil quality

METHODOLOGY

Data Collection: take place in Tana Toraja, Indonesia for 3 months (Juli-September 2024) and involved all population organic katokkon chili farmers as respondent (survey)
Research design: Split-plot design with four replications. Main plot (L) is katokkon varieties (Limbong Sangpolo (L1) and Leatung (L2)) and subplot (R) is biochar-compost R0 (100% C), R1 (80% C, 20% B), R2 (60% C, 40% B), R3 (40% C, 60% B), R4 (20% C, 80% B), and R5 (100% B)
Data Analysis: Tuckey HSD (95% confidence) and soil laboratory analysis
Research Parameters: Plant height, stem diameter, flowering time and productive branch

RESULTS

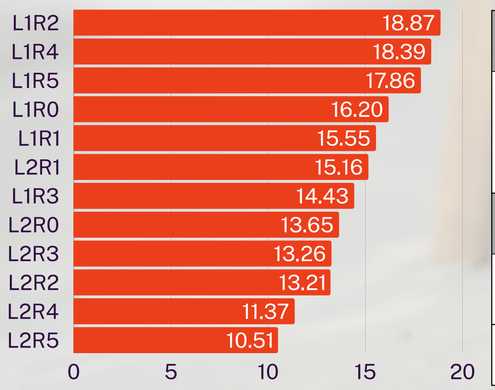
Compost and biochar application significantly affected the vegetative phase, particularly in terms of plant height (60% C and 40% B) and stem diameter (20% C and 80% B)

During the generative phase, no statistically significant were observed between the treatments with regard to flowering time or the number of productive branches. Still, the combination of 60% C and 40% B still produced the highest average number of productive branches

Soil organic carbon increased from 1.04% to 1.17%. The concentration of potassium (K), which supports plant height, increased from 0.19 cmol(+) kg^{-1} to 0.21 cmol(+) kg^{-1}

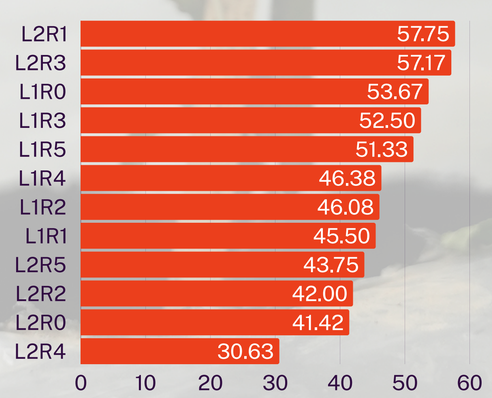
ANALYSIS

Plant height (cm)



ANOVA		
L×R	F	F5%
	10.45	2.78
Tuckey HSD		
Sd	Tuckey HSD 5%	Tuckey HSD
1.48	5.1	7.55

Flowering time (DAP)

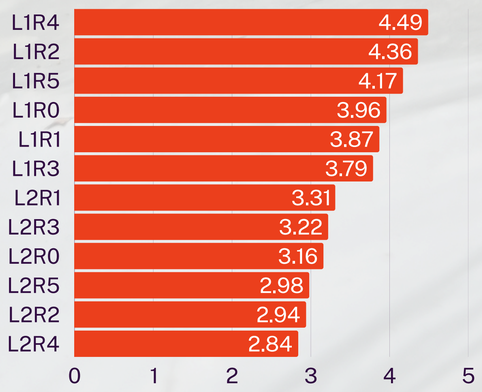


ANOVA		
L×R	F	F5%
	0.65	2.78
Tuckey HSD		
not significant		

Soil assesment

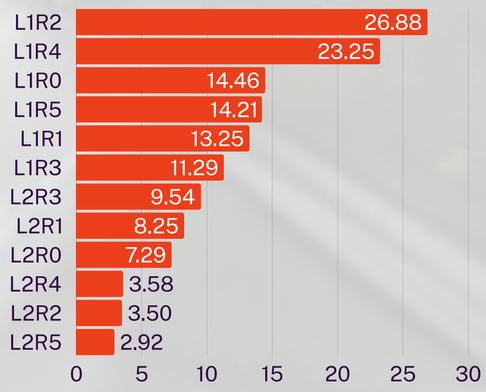
Chemical Properties	Value	Criteria	Test results	
			Before	After
C-Organic	>5.00	Very high	1.04%	1.17%
	3,01-5,00	High		
	2,01-3,00	Better		
	1,00-2,00	Low		
	<1.00	Very low		
K20 HCl 25% (mg/100g)	>60	Very high	0.19cmol (+) kg-1	0.21cmol (+) kg-1
	41-60	High		
	21-40	Better		
	10-20	Low		
	<10	Very low		

Stem diameter (cm)



ANOVA		
L×R	F	F5%
	33.27	2.78
Tuckey HSD		
Sd	Tuckey HSD 5%	Tuckey HSD
0.25	5.1	1.28

Productive branch (unit)



ANOVA		
L×R	F	F5%
	2.5	2.78
Tuckey HSD		
not significant		

CONCLUSION

The Limbong Sangpolo katokkon variety with a 60:40 compost:biochar composition (L1R2) or an 80:20 compost:biochar composition (L1R4) is most effective for vegetative growth. The highest average number of productive branches was found in the 60:40 compost:biochar combination (L1R2). Soil organic carbon and potassium could be improved.
This confirms that biochar applications has a climate change mitigating effect as carbon storage to reducing CO2 emissions. Biochar production needs to be further developed in a farmer-friendly, cost-effective and environmentally sound manner. While soil quality slightly improved, no significant change can be achieved in just one season. Organic farming required longer-term observations to assess the overall impact.
Studies led by farmers also confirm that the Limbong Sangpolo variety of katokkon chilli grows better than the Leatung variety. This phenomenon has also been documented in previous studies. The development of biochar is also a priority for our institution in the future. This is being done as a form of climate change mitigation, particularly in the study area.

Brot für die Welt

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