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JAMTANI INDONESIA

RYCAM
RURAL YOUTH CLIMATE ACTION MOVEMENT

Regenerative Integrated Circular Aerohydroculture (RICA) within Bioeconomy for Flood and Climate-Resilient, Low-Emission Paddy Systems

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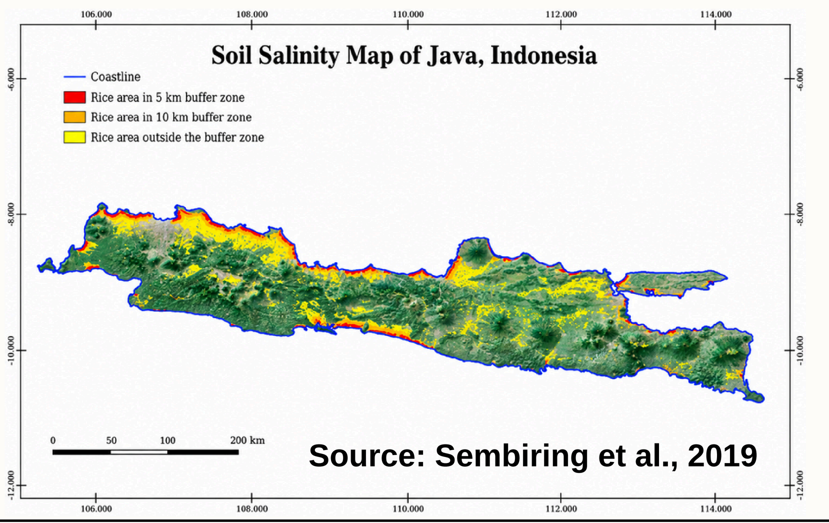
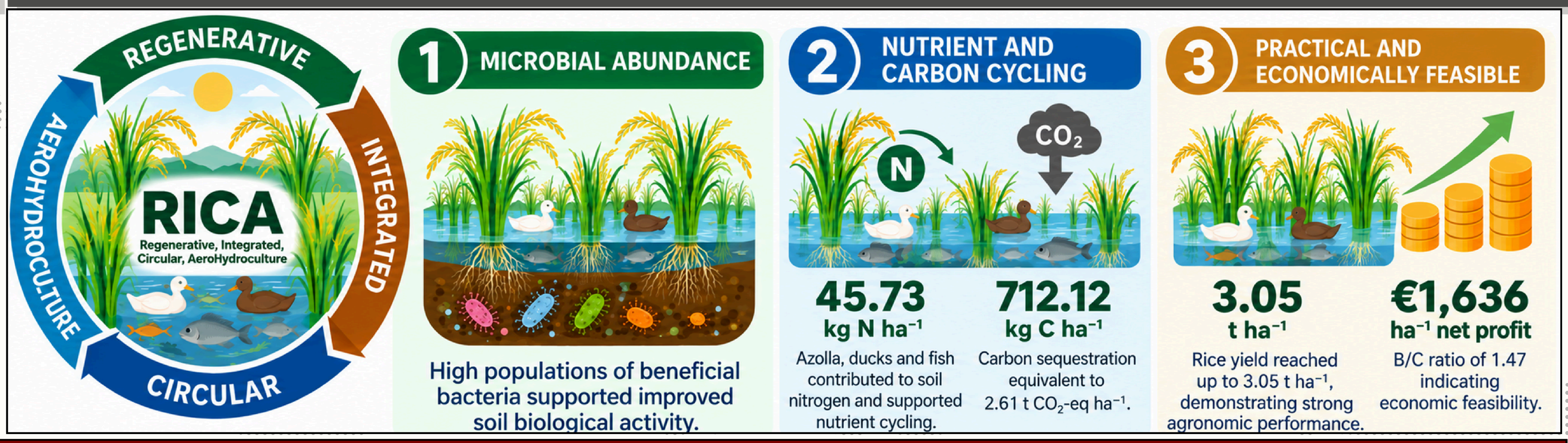
INTRODUCTION

Flooding, poor drainage, high Fe levels, uncertain planting seasons, low cropping intensity (~1 season year⁻¹), limited biomass utilization, and unstable environmental conditions constrain rice productivity and reduce farmer income in flood-prone areas of Pangandaran.



Source: Sembiring et al., 2019

KEY FINDINGS



OBJECTIVE

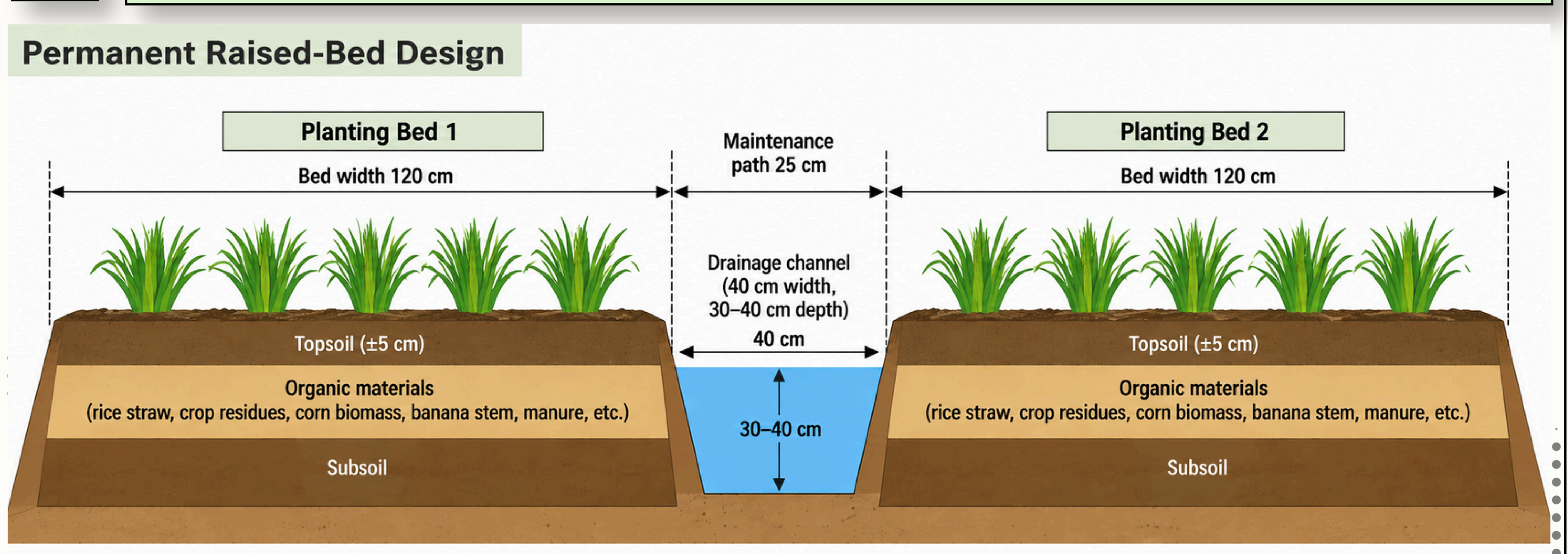
This study aims to evaluate the effectiveness of **Regenerative Integrated Circular Aerohydroculture (RICA)** as an integrated regenerative farming approach for improving soil health, enhancing microbial biodiversity, increasing nutrient-use efficiency and carbon sequestration, and sustaining rice productivity and resource resilience in flood-prone and climate-resilient paddy systems.

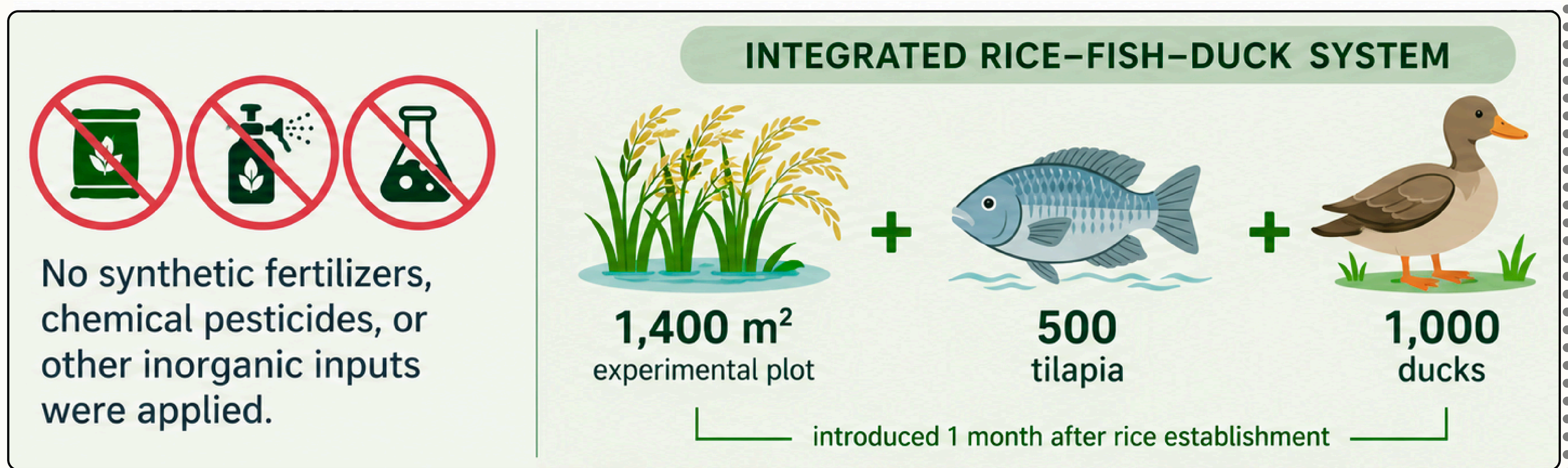
METHODOLOGY

1 EXPERIMENTAL SITE, PANGANDARAN, WEST JAVA, INDONESIA

Pangandaran, West Java, Indonesia — flood-prone lowland managed by JAMTANI, with seasonal flooding and poor drainage. Coordinates: 7°40′35.30″ S, 108°40′46.10″ E.

2 EXPERIMENTAL DESIGN OF RICA IN PERMANENT RICE FIELD





Demo-Plot Regenerative Integrated Circular Aerohydroculture (RICA):

- Green Bioinputs: Azolla: 500 g m⁻², BOB: 1 t ha⁻¹, GLAB: 40 L ha⁻¹ (foliar)
- Integrated Farming : Nile tilapia: 500 fingerlings, Mojosari ducks: 100
- Rice Varieties: Biosalin 2, Paketih, Cakrabuana, Mekongga, Inpari-34, Arumba, Baroma, Ngawos Mawar

3 CLIMATE BUSINESS FIELD SCHOOL

RESULT

1 SOIL HEALTH AND MICROBIAL ABUNDANCE

$$\mathrm{CFU/g} = \frac{\text{Number of colonies}}{\text{Inoculum volume (mL)} \times \text{Dilution factor}}$$

Microbial Group	Abundance (CFU g⁻¹)
Total bacteria	3.5×10^8
Fungi	4×10^4
N-fixing bacteria	5×10^6
P-solubilizing bacteria	5.8×10^8

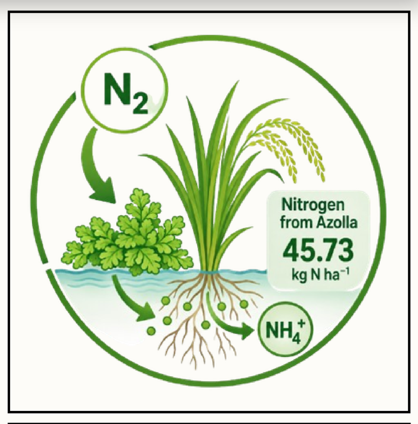
Fig. 1 Microbial Abundance from Soil in RICA System

2 NUTRIENT CYCLING

Nitrogen Contribution from Azolla

$$\text{N contribution (kg N ha}^{-1}) = \text{Azolla biomass (kg ha}^{-1}) \times \text{N content (\%)}$$

Azolla fixed atmospheric nitrogen and contributed 45.73 kg N ha⁻¹, supporting soil nutrient cycling and rice growth.

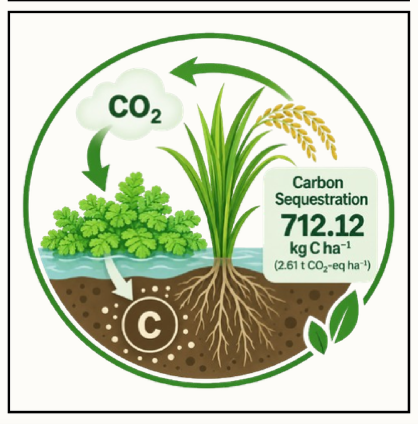


Azolla → N_2 Fixation → Soil N → Rice Growth

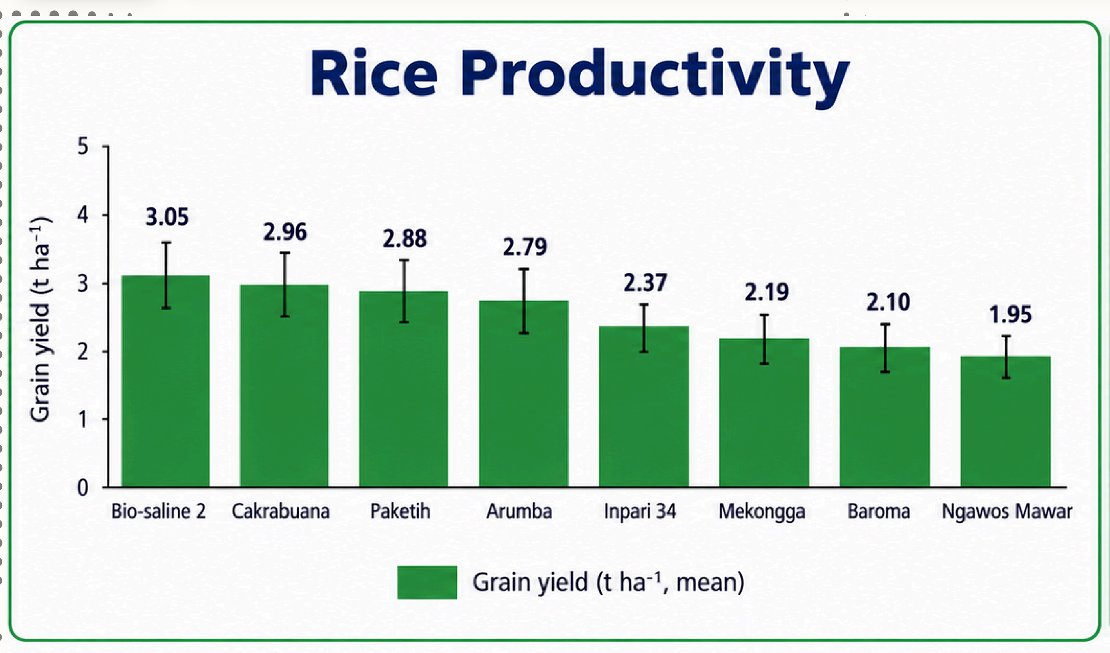
Carbon Sequestration

$$\text{Carbon sequestration (kg C ha}^{-1}) = C_{after} - C_{before}$$

Carbon sequestration reached 712.12 kg C ha⁻¹, convert into equivalent to 2.61 t CO_2-eq ha⁻¹ per rice farming cycle, supporting long-term carbon storage in the rice system.



3 RICA SYSTEM PRODUCTIVITY



System component	Revenue (€ ha⁻¹)	Cost (€ ha⁻¹)	Net profit (€ ha⁻¹)
Rice	€ 365	€ 150	€ 215
Nile tilapia	€ 149	€ 95	€ 54
Ducks	€ 4,577	€ 3,209	€ 1,367
TOTAL	€ 5,090	€ 3,454	€ 1,636
B/C ratio	1.47		

All economic values are in Euro (€) per hectare (ha⁻¹).

4 ECONOMIC PROFITABILITY

CONCLUSION

RICA improved soil fertility and carbon storage, achieving 3.57% SOC, 79.97 Mg C ha⁻¹ carbon stock, a 66.7% increase in soil N, rice yield up to 3.05 t ha⁻¹, and IDR 33.42 million net profit with a B:C ratio of 1.47.

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