

Biochar Production Technology in Cambodia and its Application on Agricultural Crops

Presentation by

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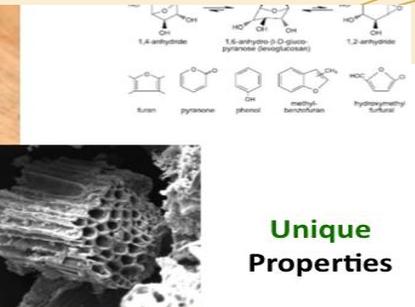
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Live together & Grow together

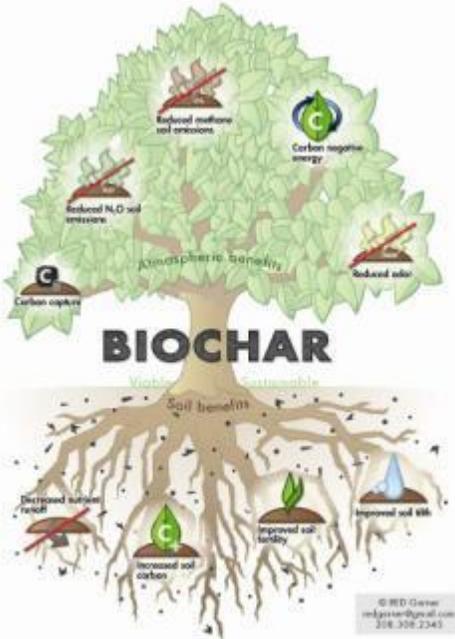


I. What is Biochar?



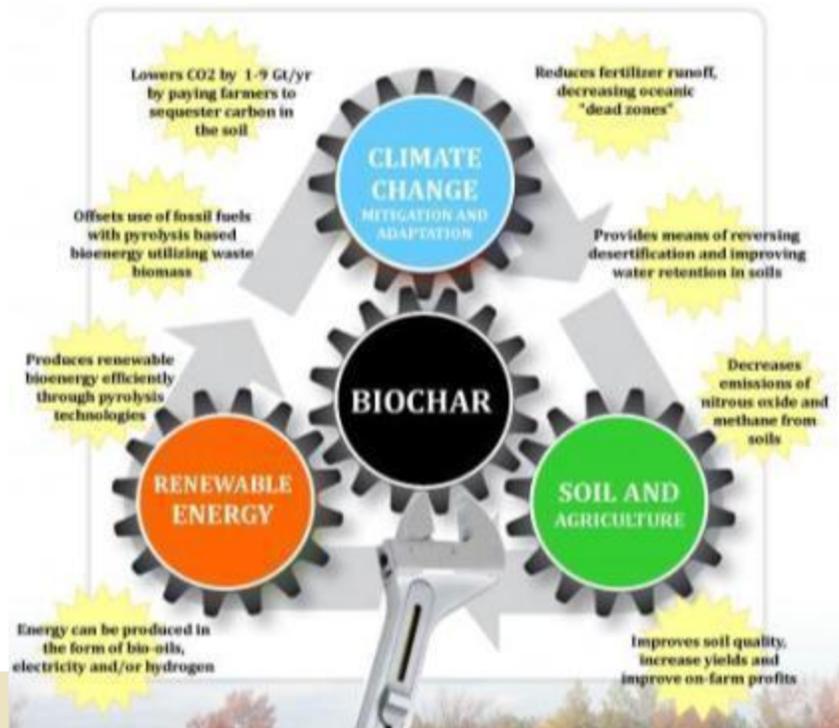
Unique Properties

- Biochar is a 2,000 year-old practice that converts agricultural waste into a soil enhancer that can hold carbon, increase food security and discourage deforestation.
- Biochar can be an important tool to increase food security and cropland diversity in areas with severely depleted soils, scarce organic resources, and inadequate water and chemical fertilizer supplies.
- Biochar is a powerfully simple tool to Combat Climate Change.



**Dr. Tim Flannery,
Professor, Mcquarie University
Australia**

“Biochar may represent the single most important initiative for humanity’s environmental future...”



Without Biochar

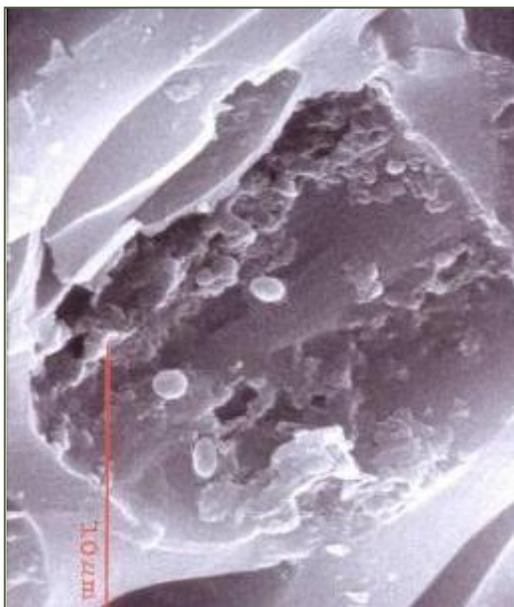


With Biochar



Biochar can contribute as following:

- 1. Enhance productivity of farmland;**
- 2. Achieve environmental friendly agriculture, organic agriculture;**
- 3. Sustainable carbon sequestration;**
- 4. Rural promotion (Carbon minus project);**
- 5. Environmental-friendly education.**



II. How to use Biochar?

**Agricultural
Uses**

Soil Reformer

**Soils for Seed-Beds
and Flower Pots**

**Industrial
Uses**

High Water Retention

Softening Soil

Replenishing Silica

Reforming Acid Soil

**Protecting Against
Disease**

Paddy

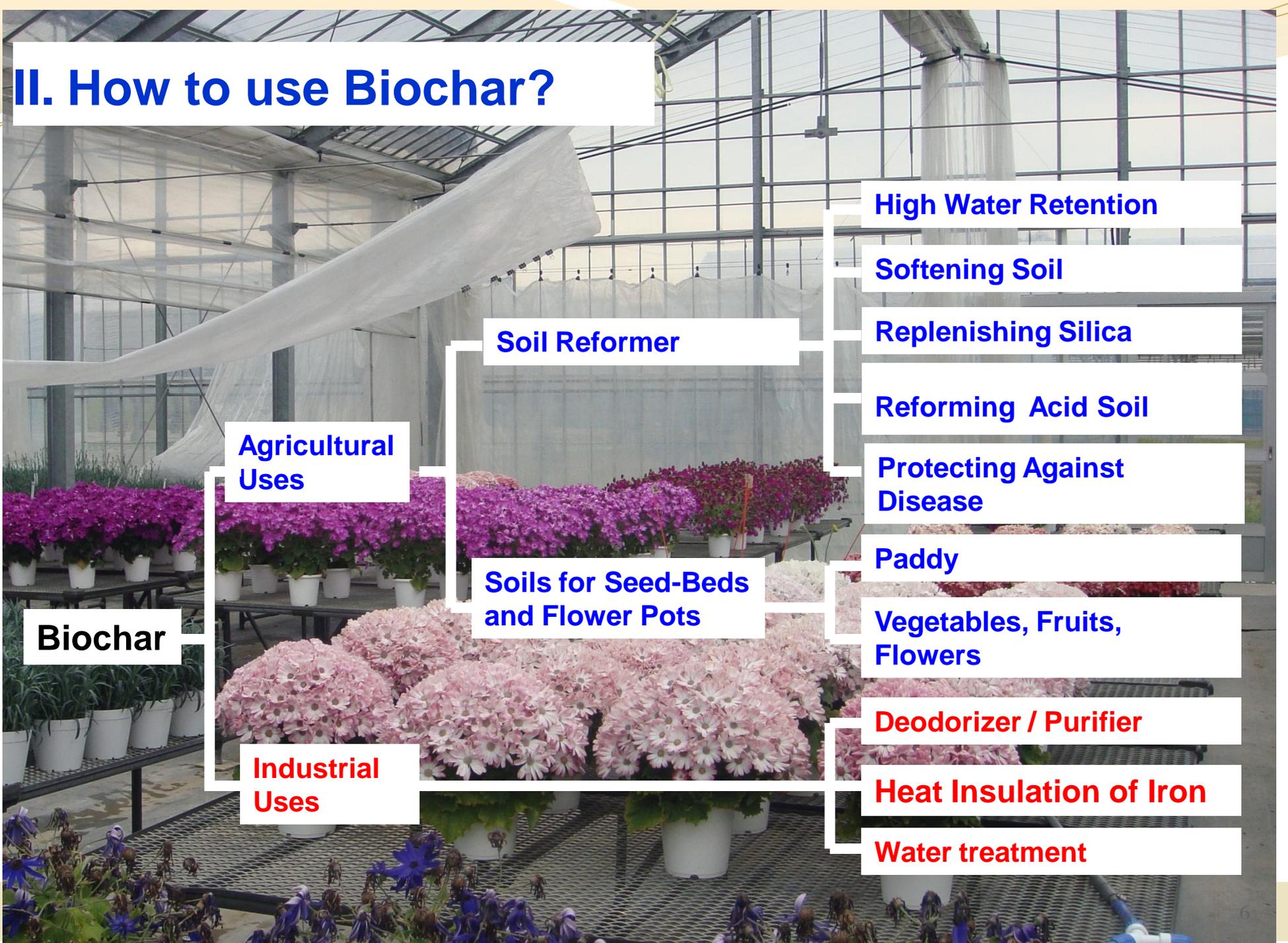
**Vegetables, Fruits,
Flowers**

Deodorizer / Purifier

Heat Insulation of Iron

Water treatment

Biochar



III. Biochar Congress in Beijing, PRC



This Biochar Congress organized in Beijing from 17 to 19 Sept 2012

What we can convert agricultural wasted products into **energy** and **soil improvement** in Cambodia ?



The agricultural wasted products are rice husks, corn cobs, wood chips, coconut shells, cane sugar residues, peanut shells, etc.



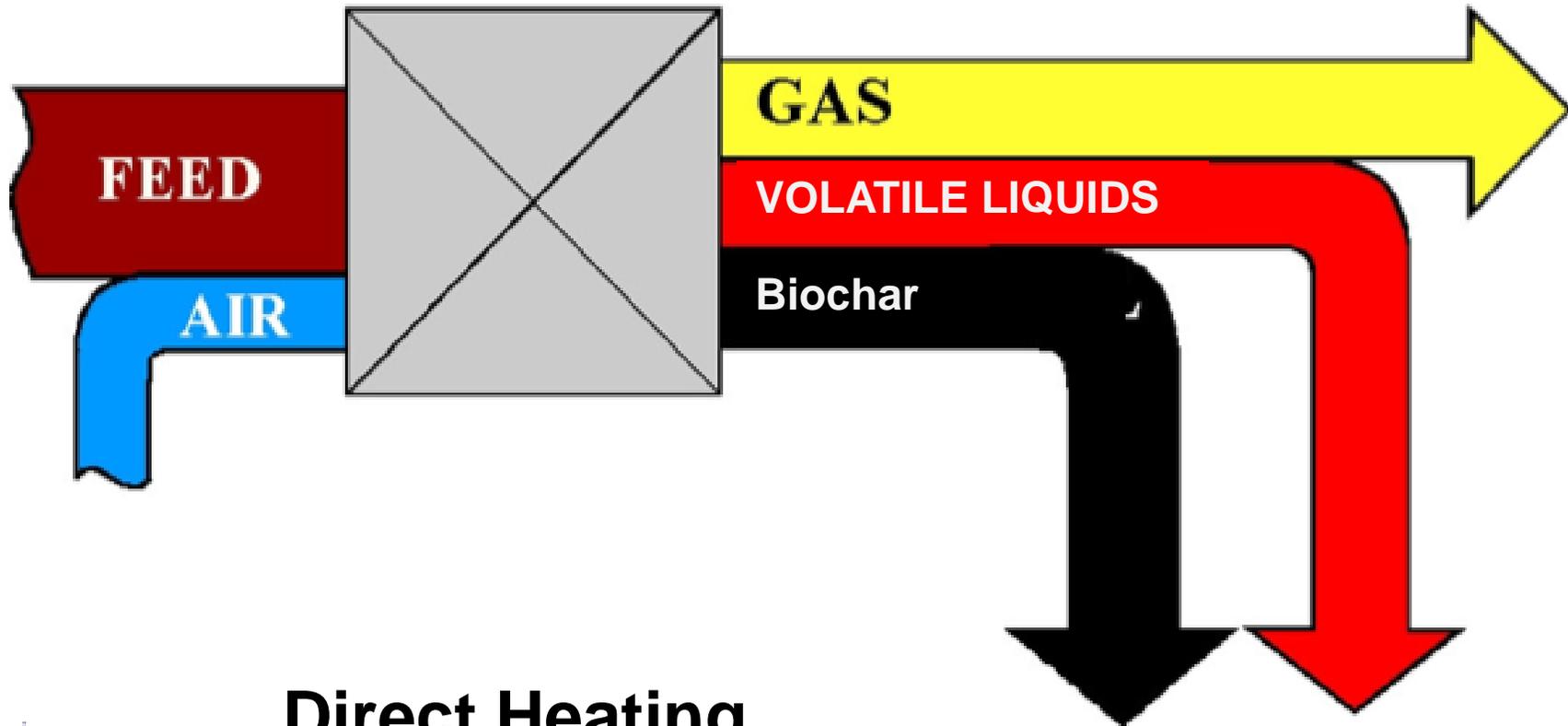
What we can convert paddy stubble into **energy** and **soil improvement** in Cambodia ?



IV. Biochar production equipment

- Biochar is produced in a range of kilns with vary greatly in performance, size, cost, durability and production scales; from small household-level kilns, to village-wide and industrial-size systems.
- The most common are at three scales:
 - ✓ Small-scale: Improved Cookstoves (ICS) produce biochar as a by-product of cooking, either with a twin or single chamber design and an inner chimney. These typically produce up to 1kg per run.
 - ✓ Medium-scale: Oil-drum kilns, of various designs (100-200 liter capacity), typically produce 7-15 kg of biochar per run.
 - ✓ Large-scale: Retorts are high-capacity static brick and metal units producing up to 400kg biochar per run (over 48hrs)

V. Biochar – Direct method of heating



Direct Heating

VI. Different types of simple Biochar kilns



M1

M2

M3

M4

VII. Design of Chiveak Tyung Biochar kiln

Chiveak Tyung biochar (CVT) kiln – a top-lit updraft steel char kiln. This kiln was designed and fabricated by the Department of Ag Engineering



VIII. Design of mobile Biochar kiln



- ❖ The mobile biochar kiln was designed and fabricated by Dept. of Agricultural Engineering.
- ❖ It was designed to mobilize the biochar kiln to rice fields and use stubble straw from rice fields to produce biochar for soil amendment.

IX. Biochar trial at Dept of Agricultural Engineering



T1- biochar 100% (3kg/m²)

T2- biochar 50% (1.5kg/m²) & NPK 50% (0,01g/m²)

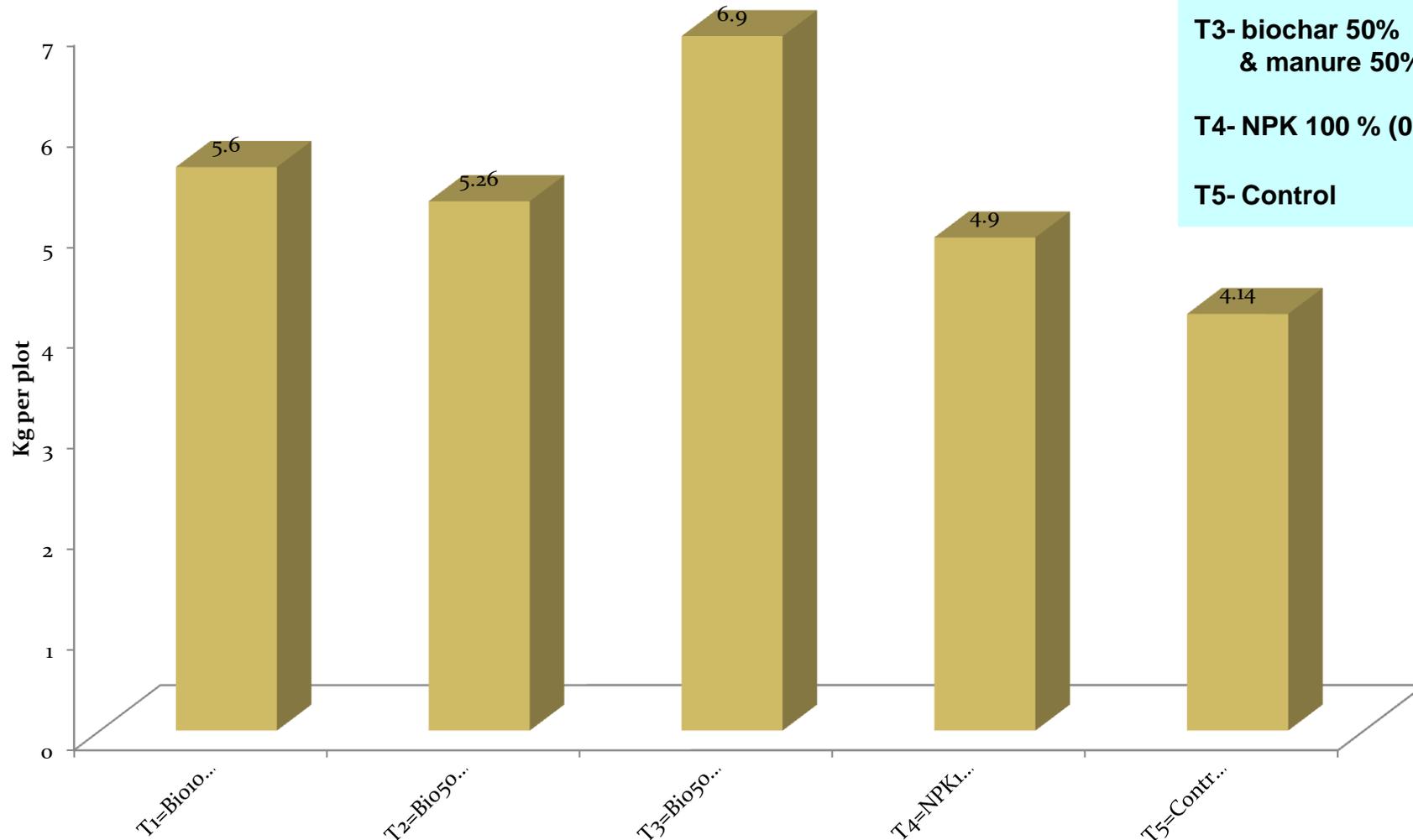
T3- biochar 50% (1.5kg/m²) & manure 50% (1.5kg/m²)

T4- NPK 100 % (0,02g/m²)

T5- Control

Result of biochar trial on Chinese cabbage

Crop yield



T1- biochar 100% (3kg/m²)

T2- biochar 50% (1.5kg/m²)
& NPK 50% (0,01g/m²)

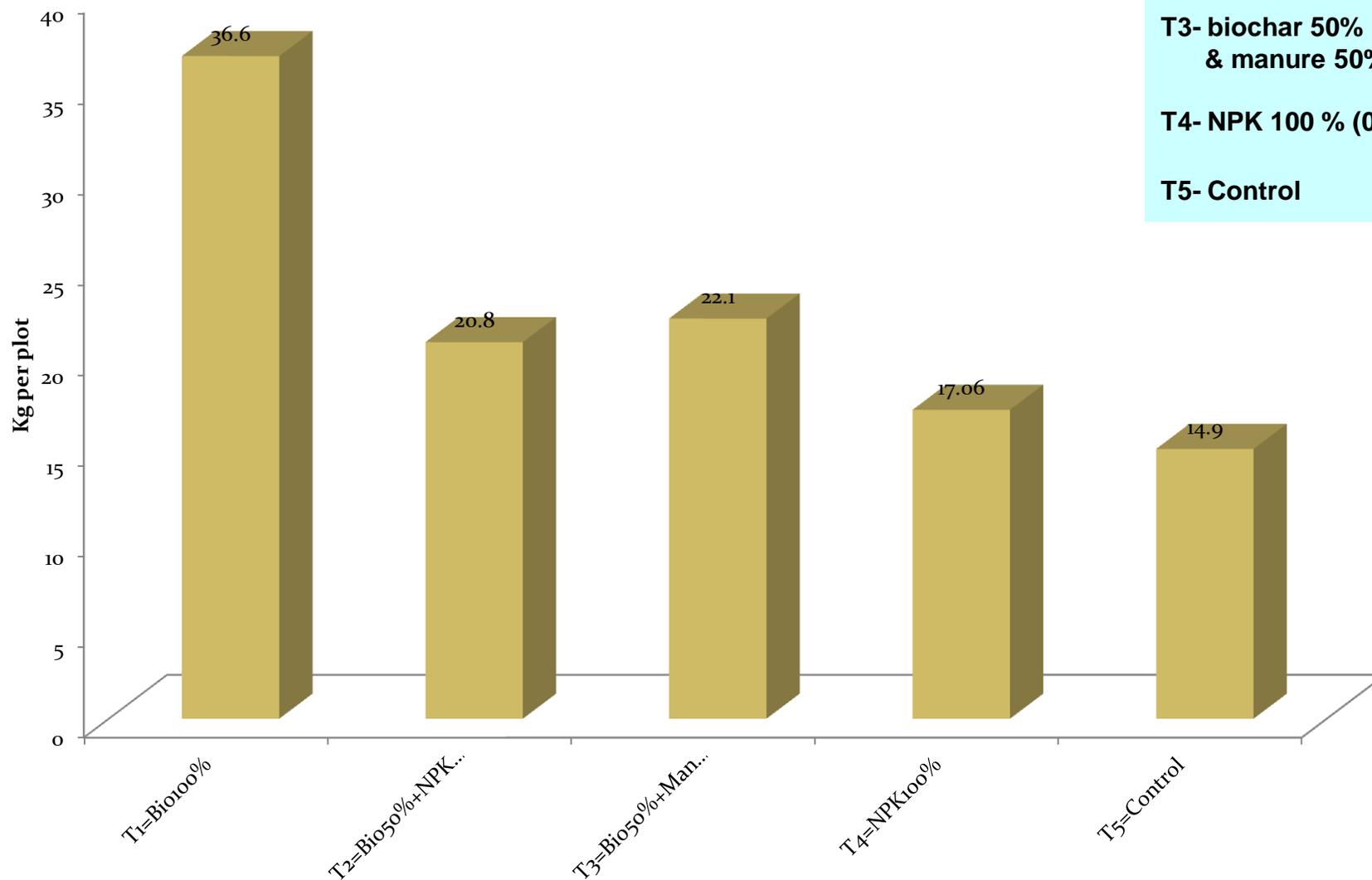
T3- biochar 50% (1.5kg/m²)
& manure 50% (1.5kg/m²)

T4- NPK 100 % (0,02g/m²)

T5- Control

Result of biochar trial on radish

Crop yield



T1- biochar 100% (3kg/m²)

T2- biochar 50% (1.5kg/m²)
& NPK 50% (0,01g/m²)

T3- biochar 50% (1.5kg/m²)
& manure 50% (1.5kg/m²)

T4- NPK 100 % (0,02g/m²)

T5- Control

Result of biochar trial on salad

T1- biochar 100%

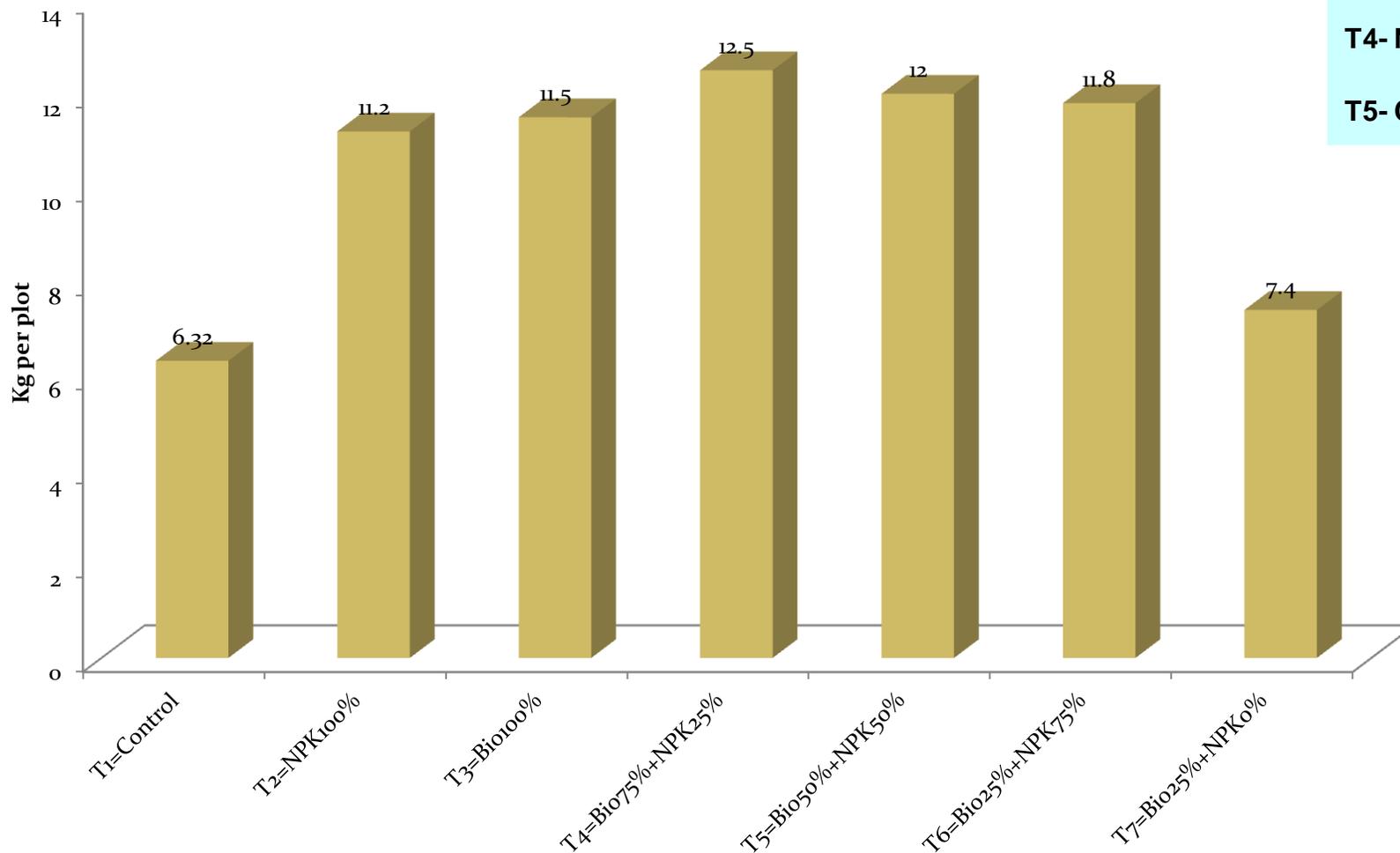
T2- biochar 50%
& NPK 50%

T3- biochar 50%
& manure 50%

T4- NPK 100 %

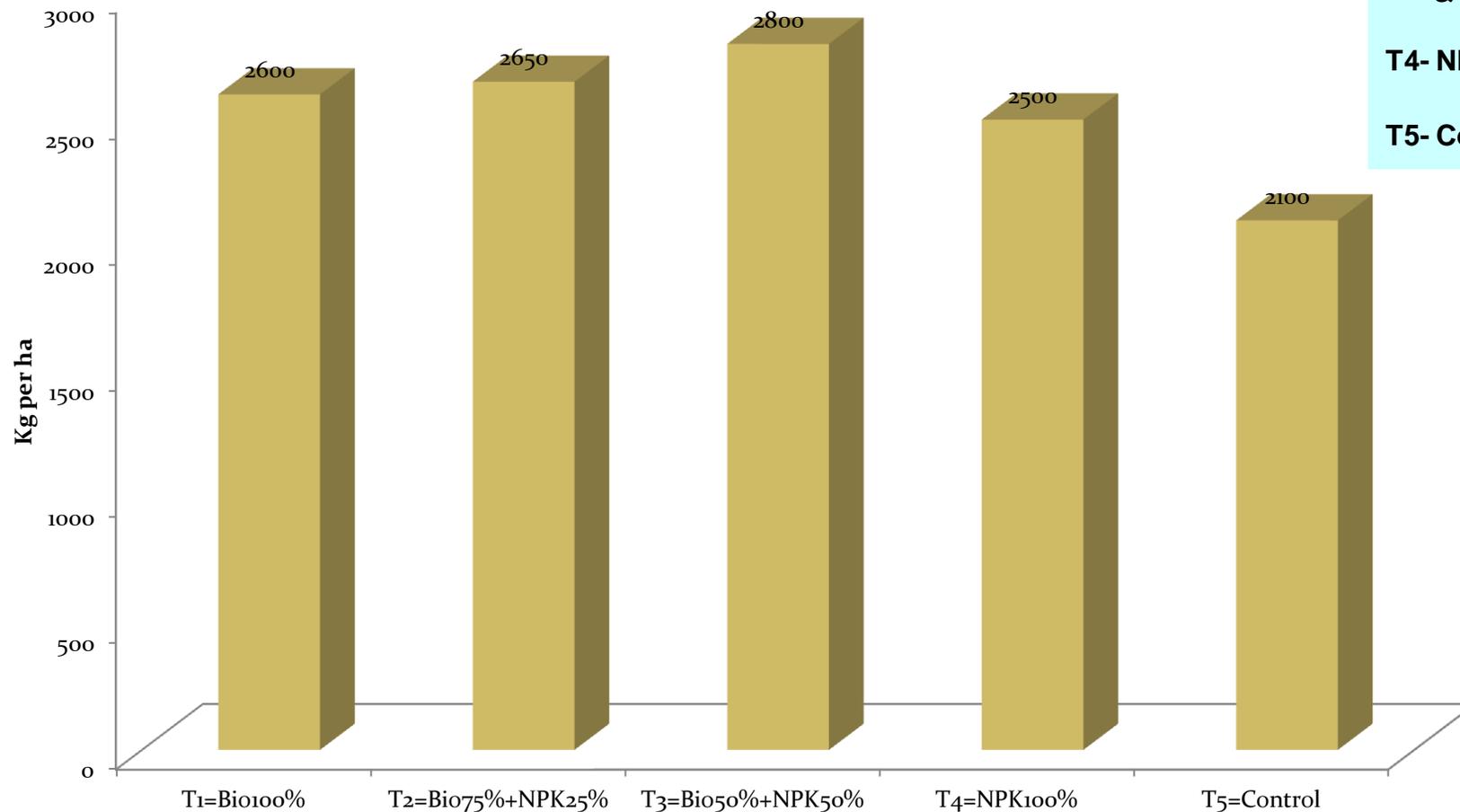
T5- Control

Crop yield



Result of biochar trial on paddy

Rice yield



T1- biochar 100%

T2- biochar 50%
& NPK 50%

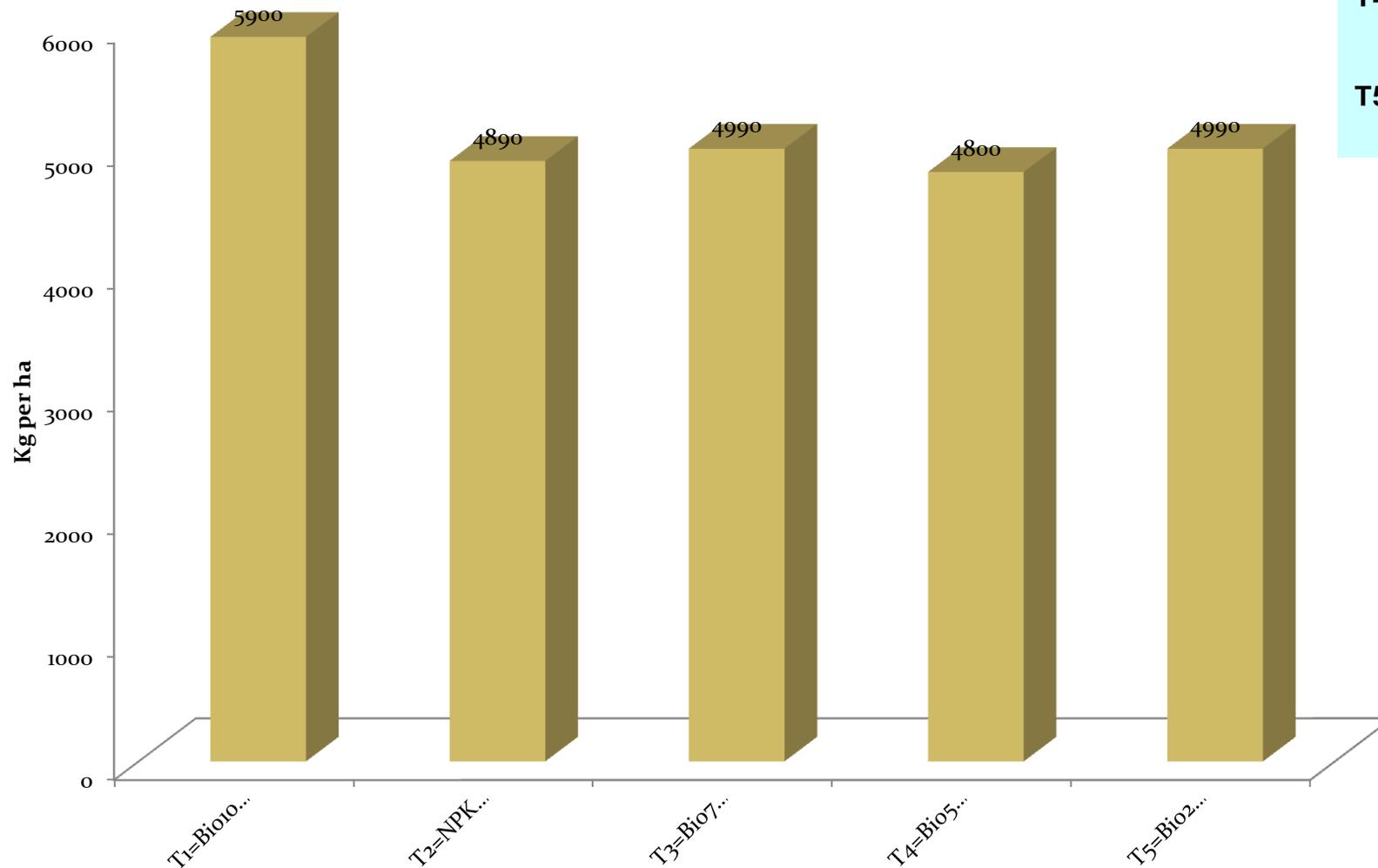
T3- biochar 50%
& manure 50%

T4- NPK 100 %

T5- Control

Result of biochar trial on maize

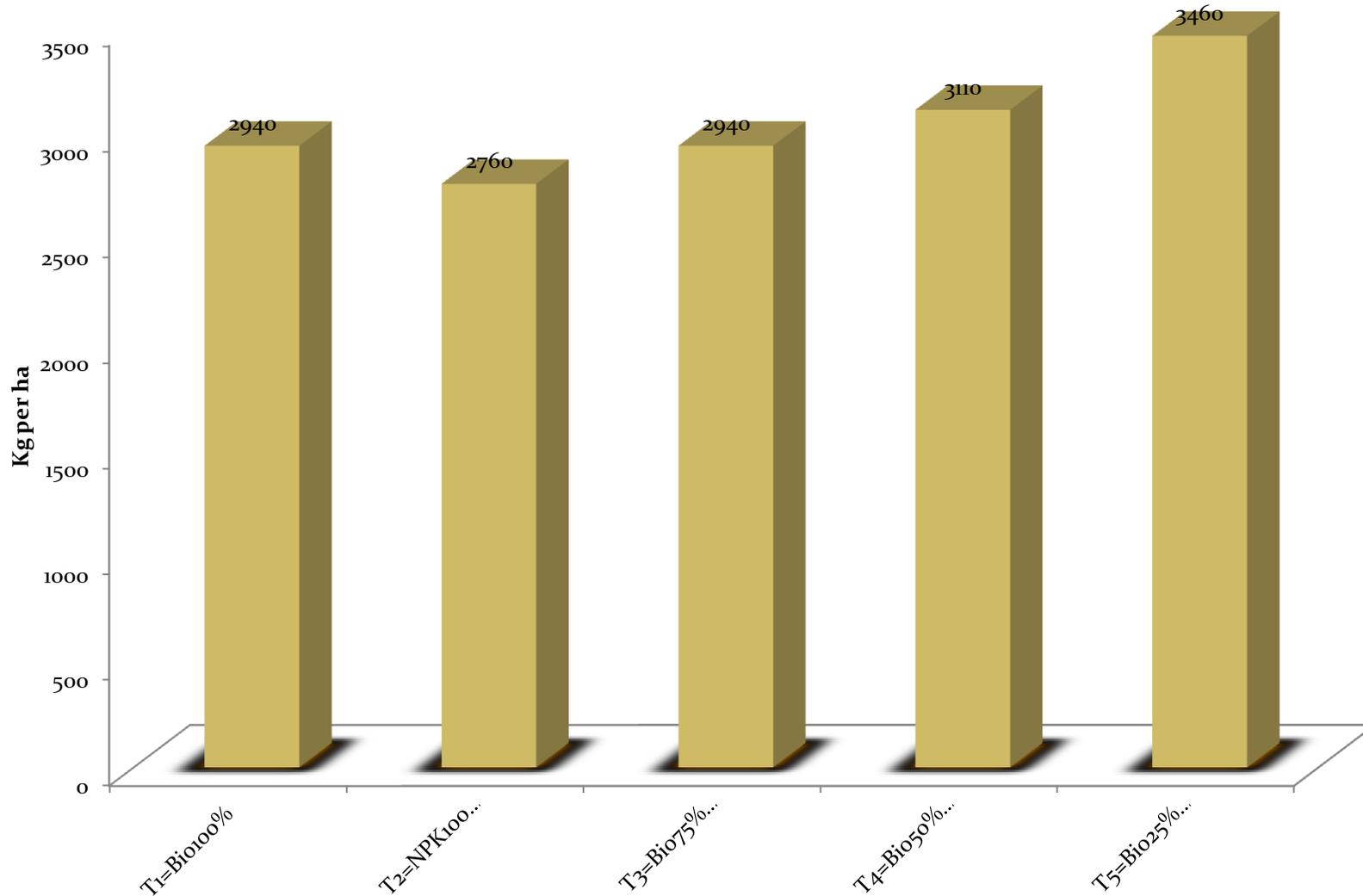
Maize yield(kg/ha)



- T1- biochar 100%
- T2- NPK 100 %
- T3- biochar 75% & manure 25%
- T4- biochar 50% & NPK 50%
- T5- biochar 25% & NPK 75%

Result of biochar trial on soybean

Soybean yield (kg/ha)



X. Biochar application on farm land



X. Biochar application on farm land – cont'd



DMC (Direct seeding Mulch based Cropping systems) and Biochar



XI. Conclusion

- Agricultural residues in Cambodia such as rice husk, rice straw, corn cob, sugarcane baggasses, etc. are limited to use for power generation and soil amendment;
- Biochar can be produced from agricultural residues and considered as a positive solution to increase food security, scarce organic resources, and inadequate water and chemical fertilizer supplies;
- Biochar can contribute to reduce CO₂ emission in the atmosphere and keep environmental friendly agriculture;
- Biochar kiln can be produced in different methods and materials; and
- The research and development of biochar kiln should be adapted with local condition in order to make sure the user could afford to buy it.

XII. Future plan on biochar production & application

- Awareness raising with relevant stakeholders including Agricultural Educational Institutions;
- Better information sharing and extension of the technology through national and regional workshops on the benefits of biochar;
- In close cooperation with development partners and private sector on biochar making device and application; and
- Introduce biochar application with various crops through biochar training workshop and field demonstration to farmers and relevant stakeholders.

Thank you.

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