Utilization of Rice Husk and Rice Straw in Cambodia

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Map of Cambodia and General Information

- Total area: 181,035km²
- Location: SEA and bordered with Vietnam, Thailand and Laos
- Total population: 14.7 millions (51 % are women)
- Population by Urban - Rural residence
  - Urban=3 millions
  - Rural= 11 millions
Agricultural situation in Cambodia

- Agriculture contribute 29% of national GDP in 2010
- Migration from rural area to cities that cause to labor shortage
- The rice straw and rice husk are burned out
- Agricultural mechanization need to introduce into crop production in Cambodia

Rice Production & Surplus

2011: Milled Rice: 2.7 million tons,  Paddy Rice: 4.3 million tons

Source: MAFF-2012
Case Studies on utilization of Rice Husk and Rice Straw in Cambodia

- Case study by DAEng on Biochar Application in crop production

- Case study by DONBSCO and DAEng on Straw Management

Case study by DAEng on Biochar Application in crop production
The organizational chart of Dept of Agricultural Engineering (DAEng)

Department’s leaders
- Office of Adm. & Personnel
- Office of Planning, Accounting and Int. Cooperation
- Office of Training & Community Development
- Office of Pre Harvest Tech.
- Office of Engineering & ALR
- Office of Post Harvest Tech.
- Provincial Office of Agricultural Engineering
- 8 offices at central level
- 2 offices at Takeo and Battambang provinces

Goal:
The DAEng is committed toward contributing to poverty reduction ensuring food security and adapting to climate change.

What is Biochar?

- **Biochar** is a solid material obtained from the carbonization of biomass

- **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.
What we can convert agricultural wasted products into a soil improvement in Cambodia

- KUNTAN Biochar: Japanese device for making biochar
- Its capacity: 50kg of rice husk can get 18-20 kg biochar
- Burning: 4hr
- Cooling: 2hr

The used and effect of the KUNTAN making

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- Burning: 4hr
- Cooling: 2hr
Biochar testing at Dept of Ag Engineering (DAEng)

- **Testing plots**
  1. Plain soil
  2. Soil + NPK
  3. Soil + Biochar
  4. Soil + Biochar+NPK

- **Result**
  The soil + Biochar+NPK has a good result as soil + NPK

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Biochar testing at Dept of Agri. Engineering (DAEng) (Radish)

- **Testing plots**
  1. Biochar 100% 20.5 kg
  2. Biochar 50% + NPK 50% 20.8 kg
  3. Biochar 50% + Manure 50% 22.1 kg
  4. NPK 100% 17.1 kg
  5. Plain soil 15.6 kg

- **Result**
  The Biochar 50% + Manure and Biochar 50% + NPK 50% has a good result as NPK 100%
Biochar testing at Dept of Ag Engineering (DAEng) (Chinese Cabbage)

- **Testing plots**
  1. Biochar (100%) 1.8kg
  2. Biochar (50%) + NPK (50%) 2.05kg
  3. Manure (100%) 1.25kg
  4. NPK (100%) 1.1kg
  5. Plain Soil 1.0kg

Biocar (100%) = 2 kg/m^2
NPK (100%) = 0.02 kg/m^2
Manure (100%) = 2.5 kg/m^2

- **Result**
  The Biochar (50%) + NPK (50%) has a good result as Soil + NPK (100%)

Biochar rice field trial at Kbal Po Agri. Devt. Center, Takeo

- **Testing plots**
  1. Biochar (100%) 1.6t/ha
  2. Biochar (100%) + NPK (25%) 2.0t/ha
  3. Biochar (100%) + NPK (50%) 2.9t/ha
  4. NPK (100%) 2.6t/ha

Biochar (100%) = 3 t/ha
NPK (100%) = 250 kg/ha

- **Result**
  The Biochar (100%) + NPK (50%) has a good result as NPK (100%)
The Biochar field demo at some provinces by DAEng

Using rice husk for sustainable development in rural Cambodia

- Benefit 1: High-quality milled rice
- Benefit 2: Electricity supply
- Benefit 3: Biochar as soil improvement
  - Improving farm soil
  - Raising crop/rice production
Case study by DONBSCO and DAEng on Straw Management

In Cambodian Rice Fields

- Long stubble because of hand cutting, fast speed of combine and because of grazing stubble by cows/water buffalos
- Stubble infected with plant diseases
- Stubble regrow and built green sprouts
- „Green Bridge“
Stubble particularly with regrowth (ratoon) as a basis of harmful diseases and pest for rice.

**Target:**

- Interrupt the „Green Bridge“ and reduce inoculum
- by early chopping straw and stubble (as shorter as better)
- by shallow incorporating with a rotavator tiller or 7 disk plow
- Decomposition will support soil organisms and fertility
Plant nutrients in straw of a yield of 3,2 t/ha

- Nitrogen: 21 kg/ha
- Phosphor: 6 kg/ha
- Potassium: 58 kg/ha
Plant nutrients in 100 kg of straw or stubble

- Nitrogen : 0.4-0.6 %
- Phosphor : 0.1 %
- Potassium : 1.5 %
- Carbon: 40 %
- How many N P K do we incorporate the rice straw or stubble into the soil?

Incorporate the rice straw into the soil

We observe that:

- The rice panicle is so long
- The number of rice plant per hill increase
- The fertility of soil improve and the use of chemical fertilizer reduce
- The rice yield increase 0.4t/ha.
Conclusion

In 2010, Cambodia had produced 8.25 million tons of paddies and consequently 1.66 million tons of rice husk were also produced (around 20% of paddy weight is husk).

After case studies and experiment of biochar application on crop production, we observe that biochar can improve the soil quality, absorb water and store nutrient for the plants, and reduce irrigation and chemical fertilizer requirements. So by this way, we can reduce the cost of agricultural production.

Thank you for your attention