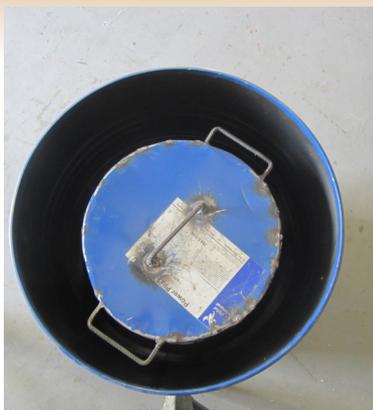


On-farm Biochar Production System



An on-farm biochar production facility at the ICBA station. Biochar is produced through recycling date palm feedstock collected from the experimental station.

Climate-smart agriculture practices



ICBA established an on-farm biochar production facility for technology transfer.



During biochar production temperature was controlled through a thermocouple.



Biochar produced through recycling date palm waste.

The United Arab Emirates (UAE) has sandy soil with very low water and nutrient holding capacities. In these conditions, date palm is considered one of the most resilient crops in the region. Over the years, with rising temperatures and scarce precipitation, there have been calls for new ways to conserve water, improve soil properties and prevent nutrient loss to achieve future food and nutrition security.

In the UAE there are about 40 million date palm trees. Each tree generates about 15 kilograms (kg) of waste biomass annually, totaling 600 million kg (0.6 million tonnes) of green waste. Converting date palm waste into biochar can reduce carbon dioxide (CO₂) and methane (CH₄) emissions generated by the natural decomposition or through burning of the waste. This 2,000-year-old practice was re-introduced into the agricultural system in the late 1900s. It processes agricultural waste into a soil enhancer that improves soil fertility, saves water, helps to mitigate greenhouse gas (GHG) emissions and fight global warming.

The International Center for Biosaline Agriculture (ICBA) has been working on developing, testing and using the biochar production system in its experimental fields in Dubai, UAE, since 2015. Research has been undertaken:

1. To evaluate the use of biochar in field trials for soil improvement and increasing crop production
2. To develop guidelines for sharing technology in order to optimize biochar application rates

What is biochar?

Biochar is a form of charcoal that can be used as a soil conditioner and as a means to sequester carbon. It is produced by the pyrolysis of biomass, i.e. by heating biomass in an oxygen-free or low-oxygen environment so that it does not (or only partially does) undergo combustion. Under this system, biochar can be produced from green wastes that can sequester carbon and improve soil quality. An advantage of this process is that it also produces gases that can be captured as bioenergy and fed back into the energy grid, making it a carbon negative process overall. Biochar is one of the most stable biologically produced carbon sources that can be added to soil.

How does it work?

Under the biochar production system at ICBA, dried date palm fronds were used as feedstock. The process consists of two cylindrical cores (drums), one external to produce heat, and the other internal where feedstock is placed to produce biochar through pyrolysis at 350 degrees Celsius (temperature monitored through a thermocouple) and biochar is crushed and passed through a 2-mm sieve for analysis and subsequent use. The entire process takes over 2 hours to transform 300 kg of date palm feedstock into 100 kg of biochar.

What are the benefits?

Biochar from on-farm production technology (using date palm feedstock) was used in both greenhouse (forage maize) and field (pearl millet) experiments at the ICBA research station. The results clearly showed that biochar use significantly improved plant growth and soil productivity. More detailed studies along with long-term field experiments will be conducted at ICBA to develop a more sophisticated pyrolytic process for large-scale production and use of biochar.

Benefits of biochar use:

- Improves nutrient availability and reduces cost of production
- Enhances water holding capacity of soil
- Eco-friendly compared to burning date palm wastes or land filling, thus contributing to climate change mitigation
- Increases soil carbon sequestration
- Stabilizes carbon in soil for decades to millennia
- Adsorbs metals and decontaminates water
- Adsorbs nutrients, thereby restricting their loss to sub-surface water bodies
- Improves and maintains structural stability of soil

International Center for Biosaline Agriculture - ICBA is an international, non-profit research-for-development organization that aims to strengthen agricultural productivity in marginal and saline environments through identifying, testing and facilitating access to sustainable solutions for food, nutrition and income security.

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