# ICRISAT finds ways to enhance soil carbon by 300%

Results of a modelling study by ICRISAT from 2020 to 2022 reveal that the right combination of fertilizer, biochar and irrigation can potentially increase soil carbon by as much as 300% over 30 years in 13 districts of Odisha and Maharashtra, contributing to global efforts to combat climate change.

A new gaming app is under development to incentivize farmers to adopt climate-smart agriculture.

The findings can support policymakers, government, and civil society to implement strategies that incentivize farmers to manage their soils in ways to sequester more carbon.

Soil carbon is critical for crop yield and climate adaptation or mitigation measures which are heavily depleted by both intensive agriculture and the indiscriminate use of chemicals which leads to an increase in carbon emissions.

Dr ML Jat, Global Research Program Director, Resilient Farm and Food Systems said that given the projected climate change scenario, we need to re-design our food systems for resource optimization targeted at net zero emissions during a two-day workshop held to share the findings with stakeholders.

**From left to right:** Dr Victor Afarisefa, Research Program Director, Enabling Systems Transformation, ICRISAT, Umang Agarwal, Head, Carbon and Grow Mandi, Grow Indigo Pvt Ltd., Dr ML Jat, Research Program Director, Resilient Farm and Food Systems, ICRISAT, Jonas Bartholomay, Program Director, GIZ India and YS Saharawat, Country Director, IFDC, New Delhi during the workshop.

The German Agency for International Cooperation (GIZ) funded the research and sanctioned a project to conduct a detailed and rigorous assessment of agricultural management practices for their potential to sequester carbon.

As part of the project, ICRISAT scientists evaluated improved management practices such as biochar, need-based fertilizer and irrigation and assessed agricultural management practices for their potential to sequester carbon.

## Study methodology

The modelling study was conducted in five districts of Maharashtra (Jalna, Dhule, Ahmednagar, Amravati and Yavatmal) and eight districts of Odisha (Angul, Bolangir, Deogarh, Dhenkenal, Kalahandi, Kendujhar, Nuapada and Sundegarh). These districts have a predominantly semi-arid climate with annual rainfall between 600 mm and 1,100 mm.

Data such as crop yield, weather, soil types and crop management practices were collected from different sources. ICRISAT scientists made projections for carbon sequestration and yields for both States and conducted long-term experiments.

Important crops such as cotton, sorghum, soybean, chickpea, pigeonpea and millet were studied in the region. In addition, soil sampling and the analysis of long-term experiments on improved vs

traditional farmer practices and tillage and residue management practices were also conducted.

## Findings and the way forward

The modelling study found that biochar increased carbon value in the soil by 130-300% over 30 years with little difference in yield. Whereas, optimal fertilizers increased the carbon as well as yield by up to 30%. The carbon sequestration increased by more than 300% in combination with fertilizer, biochar, and irrigation.

"Profile sampling of long-term experiments found that carbon sequestration increased by 100 kg ha per year with the improved practices of landform management, fertilizers and crop varieties over 45 years.

"It is enhanced by 300 kg ha per year with residue over nine years (Aditi et al. 2021)," said Dr Girish Chander, co-lead of the project who studied the carbon sequestration.

Scientists observed a significant increase in soil carbon with improved nutrients, crop/variety, landform, minimum tillage and residue addition under the climate change scenario till 2100.

## Game app

A game app titled 'Mrida' was officially launched to promote behavioral change among farmers.

To facilitate behavioral change towards climate-smart agriculture, the team of scientists along with partner Vasudhaika Software Private Limited (Kalgudi) also developed a gaming app which imparts education.

"Apart from English, the app will be released in Marathi and Odiya to reach a larger population of farmers in the two states," said Dr Melesse Mequanint, co-lead (economics, game app and capacity building). The game app was officially launched during the workshop.