

AI/ML solutions for Climate Change – Food & Climate-smart Agriculture

According to the IPCC Climate Change 2022 Report, climate change is expected to cause global temperature increases, more frequent heat waves, and shifts in climatic zones. Droughts and floods will become more severe, affecting freshwater availability and quality. These consequences have far-reaching social and economic impacts, affecting billions of people.

Nuclear technologies can help countries adapt to climate change by efficiently using limited soil and water resources for crop growth. However, addressing complex global challenges in water, food, and agriculture requires more than human expertise alone. Combining information and communications technologies (ICTs) and Artificial Intelligence (AI) offers a promising solution to tackle the climate crisis. As AI techniques mature, there will be opportunities to apply them in nuclear techniques for agriculture, including soil property estimation and soil moisture mapping using data from various sources.

The [International Atomic Energy Agency \(IAEA\)](#), through its [Joint FAO/IAEA Centre of Nuclear Techniques in Food and Agriculture](#), has selected the following challenge for the AI/ML Solutions for Climate Change:

- *How can AI help map and monitor soil moisture using data collected from cosmic ray neutron sensors and gamma spectrometry techniques, in combination with satellite imagery?*

AI can revolutionize dynamic soil moisture mapping and monitoring by leveraging data from cosmic ray neutron sensors, gamma spectrometry techniques and satellite imagery, at different temporal and spatial resolutions (from real time to a weekly frequencies). By employing machine learning algorithms, AI can process and analyze these multi-source data sets, enabling accurate and real-time estimation of soil moisture content across vast areas. Cosmic ray neutron sensors provide valuable information about soil moisture at a footprint of 20-30 hectares while gamma spectrometry helps assess soil moisture and properties at a smaller footprint of less than a hectare. By integrating this data with satellite imagery, AI may offer comprehensive and up-to-date insights into soil moisture dynamics, benefiting agriculture, water resource management, drought prediction, and climate change adaptation efforts.