



# IAEA

International Atomic Energy Agency

*Atoms for Peace*

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## ***Increasing crop production and addressing soil degradation in Mali***

### ***The challenge...***

Soil erosion and farming activities that extract nutrients from the soil have caused severe soil degradation in Mali. This imposes high costs on farmers, who must buy expensive, imported fertilizers to increase the performance of crops in these degraded soils. If the plants cannot use these fertilizers efficiently due to low levels of organic material in the soil, yields will be low, adding the cost of harvest losses to the cost of fertilization. Mali's rural population faces food insecurity and malnutrition, and better soil management and improved crops are vital.

### ***The project...***

A three-staged approach was taken to address low crop yield and soil degradation in Mali. The first step was to find a cereal crop with high water and nitrogen use efficiency. Then, to ensure the best possible nitrogen content in the soil, the best crop for natural nitrogen fixing was identified. Lastly, water management practices were assessed by studying the water content in the soil that resulted from different water management practices.

Isotopic techniques were used to identify the best high nitrogen use efficiency genotypes of sorghum, a cereal crop. This technique was also used to identify the best grain legume, cowpea, which has a high nitrogen fixing capability.

Neutron probes, instruments that measure the quantity of water in soil, were used to assess the effects of a selection of different water management practices, and to monitor changes in soil water storage in the plants' rooting zones.

### ***The impact...***

- Sorghum varieties with shorter stems, a shorter growing period, and higher yield were developed through plant breeding and induced mutation and are now available to farmers. Initial trials indicate that they outperform local cultivars and give an increase in yield of up to 25–35% in farmers' fields.
- Assessment of nitrogen fixing legumes in the cropping system showed that rotation between sorghum and cowpea offers low- or no-cost alternative nitrogen fertilization. Rotation also has a direct, positive impact on food security and malnutrition as cowpea has a high energy value.
- Plant mutation techniques were used to select cowpea cultivars with higher yield and greater resistance to drought and/or striga, a parasitic weed.
- The introduction of cowpea culture to local farmers increased sorghum production while at the same time enriching the diet of the local communities.
- Communities have been trained on how cowpea can be incorporated into the local diet, and on better preservation techniques so that it can be stored for longer.



*Harvesting sorghum in Mali.*