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Cambridge India Network for Translational Research in Nitrogen

SUCCESS STORY OF ADOPTION OF PAU-LEAF COLOUR CHART IN VILLAGE BASSIAN: CINTRIN INITIATIVE



The climate change turbulences and pollution of water courses caused by the escape of reactive nitrogen (N) from the soil-plant system to the atmosphere is of serious concern for researchers and policy makers, and indeed the whole of society. The Biotechnology and Biological Sciences Research (BBSRC), UK and Department of Biotechnology (DBT), India funded Indo-UK Virtual Joint Centres on agricultural nitrogen are focusing on ways to reduce the use of nitrogen fertilizer in various field crops. Among the available N management technologies, PAU-Leaf Colour Chart is a breakthrough technology providing a decision support system for sustaining high yields with optimum N dose in field crops with a one time investment of about £1.

PAU-LCC: A BREAKTHROUGH TECHNOLOGY FOR DEFINING SITE-SPECIFIC OPTIMUM N DOSE IN FIELD CROPS

Farmers in India usually make fertilizer N topdressing decisions based on leaf colour. However, they don't understand the interpretation of colour, and generally go for excessive fertilizer N applications to keep their crop lush green in comparison to the neighbouring farmers' fields. Fertilizer N applications over and above the crop requirement do not increase grain yield. Conversely, increased succulence, over growth and dark green colour results in increased incidence of insect pests, and the crop becomes prone to lodging. A large proportion of the applied N escapes from soil-plant systems to the atmosphere and underground water courses causing environmental damage.



There was a need to understand leaf colour science to help guide farmers to manage fertilizer N according to the need of the crop. The International Rice Research Institute (IRRI), initiated the research on using leaf colour as an index of nitrogen supply to plants and developed a leaf colour chart for rice. The Punjab Agricultural University (PAU) systematically carried forward the study of spectral properties of major field crops (rice, wheat, maize and cotton) using optical sensors and chlorophyll meters and ultimately developed the PAU-Leaf Colour Chart (PAU-LCC) as a versatile and economical gadget for farmers. The PAU-LCC, that measures leaf colour variations of 5 SPAD (Soil Plant Analysis Development Meter) units at a cost of about £1 and provides N recommendations in major field crops, is a breakthrough development in the application of nitrogen science. The PAU-LCC technology is a farmer friendly technology as farmers already use leaf colour as an index for deciding N topdressings although they are unaware of the relevance of leaf colour thresholds. Now it is the duty of the science institutions and government agencies to educate farmers to adopt PAU-LCC technology. The development of digital app to make need based N recommendations as per PAU-LCC will further encourage the adoption of technology.

CINTRIN with the active support of Atam Pargas Social Welfare Council, a NGO, took an initiative for this purpose at the village of Bassian, Ludhiana in the Punjab state of India. The success story of adoption of PAU-LCC in the village is highly inspiring. Sixty farmers were educated to adopt PAU-LCC in rice during 2017, ninety farmers came forward to follow PAU-LCC in wheat during 2017-18 and the entire village adopted PAU-LCC in rice during 2018. The use of PAU-LCC led to the production of an equivalent grain yield with an average saving of 80 kg N per hectare in rice during 2017 and 55 kg N per hectare in wheat during 2017-18 in comparison with farmers' usual practice.

The adoption of PAU-LCC on-farm can provide an immediate solution to mitigate the global environmental pollution being caused by excessive fertilizer N use in agriculture. The National Institute of Agriculture Botany (NIAB), Cambridge, UK is keen to explore the transfer of PAU-LCC technology to UK farm crops.

Dr Tina Barsby OBE
Chief Executive, NIAB

BENEFITS OF PAU-LEAF COLOUR CHART

For Farmers

- Nitrogen fertilizer saving
- Reduced insect pest incidence
- Reduced insecticides/pesticides consumption
- Reduces lodging losses
- Reduced cost of production
- High yields
- High profits

For General Public

- Less air and water pollution
- Better quality food grains because of reduced consumption of insecticides/pesticides
- Prevention of health hazards being caused by nitrate contamination in water and nitrous oxides emissions in air.

For Indian Government

- Saving of expenditure for huge subsidy on urea fertilizer
- Maintaining ecological balance and biodiversity



Dr. Varinderpal Singh, Senior Soil Scientist, PAU and developer of PAU-LCC working with PAU-Leaf Colour Chart in wheat fields

The economic benefits of PAU-Leaf Colour Chart

Assuming an average saving of only 30 kg nitrogen per hectare (although the average saving at the village of Bassian is more than double), the adoption of PAU-LCC in all the fields of rice, wheat, maize and cotton in the Indian Punjab alone could annually save 7.5 billion INR (2.5 billion of farmers and 5 billion of the Government). The adoption of the PAU-LCC technology at a global scale could save huge amounts of nitrogen.

The saving of expenditure on and the reduced consumption of insecticides/pesticides is a bonus.

The economics of the prevention of air and water pollution, saving ecosystem and biodiversity is priceless.