National Institute of Technology Rourkela

Synopsis Seminar

Seminar Title	: Risk Assessment in Crop Insurance using Remote Sensing Data: A Comparison of Probability Distributions
Speaker	: Upelina Bina Murmu (Rollno : 520sm1006)
Supervisor	: Dushyant Ashok Mahadik
Venue	: SM302
Date and Time	: 22 Aug 2025 (15:00)
Abstract	: Accurate crop yield distribution modelling is essential for actuarial pricing of crop insurance, with mis-specification leading to distorted premiums, adverse selection, and programme instability (Makki & Somwaru, 2001 Woodard et al., 2012 Luciano & Rochet, 2022). In India, such inefficiencies have been linked to low participation among marginal farmers despite higher uptake by wealthier landowners (Rajeev & Nagendran, 2019). Most studies rely solely on historical yield data, often neglecting agrometeorological variables that could enhance predictive accuracy. Remote sensing, particularly vegetation indices, offers considerable potential for risk assessment its integration into yield distribution modelling remains limited. This study develops a hybrid framework incorporating remotely sensed vegetation indices and meteorological variables into probabilistic yield estimation. The objectives are to (a) assess the predictive capability of these variables for wheat yield risk in Northern India (b) identify the most suitable statistical distribution for yield modelling and (c) enable midseason yield forecasting for premium calculation. Classical linear regression quantifies relationships between yield and three satellite-derived vegetation indices, generating predictions for 16 wheat-growing districts. Both parametric and non-parametric approaches are applied. Building on Goodwin and Ker (1998) and Ker and Goodwin (2000), bandwidth methods are systematically evaluated, and Bayesian midseason forecasting is integrated to dynamically update predictions and quantify uncertainty (Gelman et al., 2013). Findings show that incorporating remote sensing variables improves explanatory and predictive capacity, with performance varying across indices. NDVI offers moderate predictive power combining LAI with temperature yields stronger results and FAPAR alone performs best. Economically, Kernel Density Estimation produces smaller discrepancies between predicted and actual losses than parametric methods. The study found sensitivity to bandwidth choice highlighting the importance of informed modeller judgement. Premium comparisons reveal that traditional methods may underestimate risk, whereas Bayesian approaches capture uncertainty more effectively. This study enhances the accuracy and timeliness of yield forecasting. The approach strengthens the scientific basis for insurance design while supporting scalable, adaptive, and data-responsive products for data-scarce and climate-vulnerable regions.