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A UTILITY-BASED EQUILIBRIUM FRAMEWORK FOR WEATHER INDEX INSURANCE

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Climate change and extreme weather events pose significant risks to farmers' livelihoods, increasing the need for effective risk management tools. Weather Index Insurance (WII) has emerged as a cost-effective solution, offering timely payouts based on predefined weather indices. By facilitating quicker recovery from crop losses and reducing loan default risks, WII enhances financial stability for farmers, particularly in rural areas vulnerable to climate-related disruptions. Despite the numerous advantages of WII, its uptake among farmers remains low due to high premiums and unreliable compensation. This study proposes a utility-based equilibrium model that analyses the supply, demand, and risk preferences of farmers and insurers. The model is based on mean-variance utility theory and assumes non-homogeneous farmers, whose revenues and benefit payouts follow a normal distribution. A simulation is conducted using 100 synthetic farmers, grouped by weather index exposure and assigned varying risk aversion coefficients, to explore how insurance demand responds to risk preferences and the introduction of premium subsidies. The market equilibrium is determined by farmers who purchase a positive amount of insurance, balancing aggregate demand with supply. Demand for WII increases with higher farmer risk aversion and is also influenced by the insurer's risk preferences; lower risk aversion on the insurer's side leads to greater willingness to supply, increasing overall demand. The inclusion of premium subsidies further shows that individual farmer demand is shaped not only by personal characteristics but also by the behaviour of other farmers in the market. The model assumes non-homogeneous farmers with normally distributed revenues and benefit payments, which future studies are encouraged to relax.

Keywords: Equilibrium model, Premium subsidies, Risk aversion coefficient, Weather index insurance