

THE SUMMARY OF DOCTORAL THESIS

High Yielding Variety Adoption, Technical Efficiency and Poverty Reduction for Rural Rice Farming Households under Rainfed Ecosystem: An Example of Eastern India

4013S3038

Wei Wu

Chief Advisor: Prof. Nabeshima Kaoru

Keywords: HYV adoption, technical efficiency, rural poverty reduction, eastern India

This Ph.D. dissertation covers the regional development in eastern India where the study area— Giridih and Purulia— is located, by focusing on the patterns of agricultural development under rainfed ecosystem and poverty reduction among surveyed rural households. The dataset analyzed is drawn from a panel household survey, collected jointly by the International Rice Research Institute and Indian Statistical Institute in Kolkata during the Kharif seasons in the time period between 1998-1999 and 2004-2006. The study area has been recognized as one of the poorest regions in the country and has drawn upon the long-term interests of development economists.

The agricultural development is investigated from the aspects of farmers' decision making regarding high-yielding variety (HYV) rice adoption, and the technical efficiency of sampled rice farms and plots during the survey periods. In addition, the relationship between agricultural and non-agricultural development is discussed to understand the roles they played in rural poverty reduction. The study provides needed empirical evidence at both plot- and farm-level, allowing for gaps in the existing literature to be filled as well as highlighting the important areas for policy intervention. The three main research areas addressed in this dissertation are:

1. Since rice plays a significant role in the agricultural development of the study area, the use of HYVs plays a key role in increasing rice productivity, enabling food security, and reducing hunger. Therefore, the first part of the study explores the factors that influenced the probability of adopting HYVs by small-scale rice farming households over time.

Applying McFadden's choice model (1974), the empirical results argue that potential high yield served as the main driver for sampled farmers to adopt HYVs, since yield is significant for explaining the farmer's choice. The 'subsistence pressure' is found for these farming households, thus cultivating a higher yielding rice variety becomes essential for their livelihood. The study also identifies the important roles played by education, landholding size, labor availability, the share of production sold in the market, and share of non-agricultural income in affecting farmer's decision of HYV adoption. In addition, the agroecological factors—land types and irrigation availability—also significantly influenced and constrained farmer's adoption choice. To meet their maximum utilities, policymakers should facilitate the farmers to cultivate properly and scientifically, and to lessen the environmental constraints for rice productivity growth.

2. Aiming to improve the agricultural productivity of surveyed small-scale rice farmers and, thus, the income earning from agriculture that would eventually contribute to the living standard improvement, the second part of the study addresses the issue by estimating the degree of technical efficiency at farm-level, and plot-level separated for traditional varieties (TVs) and HYVs. Additionally, at a farm-level, the output growth decomposition analysis has been conducted, where the main driving force for production growth during the survey period is identified.

Applying stochastic frontier analysis (Aigner et al., 1977), the unknown production structure of sampled farmers has been estimated using the translog production function with a single time-trend presentation of the technical change. The farm-level estimation finds that the sampled rice farms were operated relatively close to the production frontier. Only a small

proportion faced the severe issue of technical inefficiency. The estimations at plot-level argue for lower technical efficiency scores for both TV and HYV plots when compared with the farm-level estimation, and the mean technical efficiency of HYV plots was higher than that of TV plots. The farm-specific reasons for technical inefficiency include the effects of the age of household heads, the highest education attainment of household members, the size of landholding, the share of non-agricultural income, the share of plots in lower land types, and the share of plots being irrigated. Another non-neglected factor is the external environment, particularly the sufficiency of rainfall. The study also finds the technical change was the main contributor to the growth of rice production over time. Therefore, how to facilitate the farmers to better implement the adopted new technologies and improve their efficiency of utilizing the technologies are open for discussion by policymakers and researchers.

3. The last part of the study provides empirical evidence to the debate as to whether agricultural development is complementary or a substitute for non-agricultural development and poverty reduction. The roles that agricultural development played in non-agricultural development and in poverty reduction are identified. In addition, the contribution made by the non-agricultural sector is addressed and the specific pathways through which the surveyed households had escaped poverty are highlighted.

The mobility tables and corresponding transition matrix tables are constructed to present the income mobility patterns, focusing on the main income sources households relied upon. To understand the impact that agricultural development had on each type of household income, a set of fixed-effects estimations of yield effects has been examined from the perspective of the relationship between changes in yields and changes in the outcome measures. The finding supports the premise that growth in agricultural productivity and in the non-agricultural sector had a substitute relationship. However, in districts with a more developed non-agricultural sector (such as Giridih), the relationship tended to be more complementary; this supports the findings of the previous studies, suggesting that solely focusing on improving agricultural income, without ensuring a successful non-agricultural sector, was ineffective (Foster & Rosenzweig, 2004). Therefore, it is crucial for policymakers to pay attention to the development of non-agricultural sectors as the source of household income expansion and rural poverty reduction in the area.

References

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