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SUMMARY OF DOCTORAL THESIS

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Title:

Effect of Agricultural Extension Program on Smallholders' Farm Productivity, Efficiency and Women Farmers' Empowerment: A Case Study in North West Ethiopia
(小規模農場の生産性・効率性および女性農業者の能力向上に対する農業普及プログラムの効果―エチオピア北西部における事例研究―)

Ethiopia's economy is heavily reliant on the agriculture sector. The sector is yet characterized by low productivity, dominated by smallholders who are subsistence, small-scale and resource poor. To improve the performance of the sector the Government of Ethiopia (GoE) launched various policies and strategies including the National Extension Intervention Program (NEIP) strategy, known as the Participatory Demonstration, Training and Extension System (PADETES) in 1995. PADETES aims at improving income and supply of food via agricultural production and productivity, increasing industrial and export crops, ensuring rehabilitation and conservation of natural resources, and empowering farmers, especially female farmers in agricultural development. However, there has been little attention and rigorous analysis on the impact of agricultural extension interventions. The few impact studies available showed mixed results and mainly the success of the program was literally judged by the number of farmers taking part or full of the packages and/or farm inputs.

The objectives of this study were to analyze the effect of agricultural extension program-PADETES on smallholders' farm productivity, efficiency and women farmers' empowerment in North West Ethiopia. This study used cross-sectional data obtained from three case study rural villages consisting of 300 farm house holds, comprising extension program participant and no-participant, including 1112 plot level data for the productivity analysis and 576 plots for efficiency analysis. Even though the overall effect of agricultural extension program cannot be known for certain because of the lack of reasonably accurate baseline data for comparison, this study employed a bench mark ordinary least square method, Heckman treatment effect model and propensity score matching methods to control unobserved variability and potential endogeniety.

The different model estimations indicate the positive effect of agricultural extension on farm productivity. However, the positive effect in productivity is marginal (6%). Different factors had positively influence farm productivity, such as age, plot size, soil quality, slope of the plot, use of improved seed, amount of chemical fertilizer, and application of compost, ploughing frequency, intensity of labour and oxen power. Although the result indicated a positive effect of agricultural extension on farm productivity, the study found existence of selection bias which tends to target relatively wealthier farm households and those affiliated to *kebele* administration which is a non- agricultural activity. The participation could have increased farm productivity by up to 20 percent had it not been to the serious selection bias observed during program placement.

On the other hand, the econometric results based on the stochastic frontier production function indicated that substantial inefficiency is observed in extension participant's production. The participants and non-participants can, respectively, increase *teff* production by an average of about 28 percent and 29 percent through full technical efficiency improvements. This implied that, participation in agricultural extension program has had no positive significant influence on the technical efficiency of *teff* production. Moreover, both groups of farms have considerable overall technical inefficiencies suggesting the existence of immense potentials for enhancing production through improvements in efficiency with available technology and resources. This study provided evidence of the positive role of livestock ownership, credit and improved seed (though not overemphasized due to shortcomings in seed quality and timeliness of delivery) in enhancing efficiency of *teff* production.

The results from the gender division of labour in agricultural production revealed that female heads spent about 50 percent more time for domestic and farm activities compared to male heads. Female heads play a key role in both crop and livestock production and management activities in the study area. However, in spite of women's significant role in crop and livestock production, only 15.8 percent of female heads are users of the extension service whereas male heads account for the lion share (70.7 percent). Despite of the Ethiopian government advocacy that strongly promotes gender equality in all sphere of life, this study indicated the existence of male dominated extension service. The quota system imposed on extension workers that led them to target resource-rich farmers combined with women's poor access to resources are the most important factors for the denial of women's client-ship in extension services.

The results of this study provide a valuable policy insight in which improving access to diversified technology choices, quality agricultural inputs and well-defined advisory service are critically necessary for extension participants on top of expanding the program to less resourceful farmers by avoiding any entry barriers in the future. For the generation and adaptation of improved, diversified and quality agricultural inputs establishing and strengthening the research-extension linkage is very crucial. In addition, policies and strategies that improve technical skill and farm management capacity of farmers, access to demand driven livestock extension service, credit and availability of quality improved seed could help to raise the technical efficiency of smallholder farmers. To reduce the gender gap in agricultural extension service, it is essential to promote female farmers' participation in agricultural extension activities by providing gender-responsive training to extension workers in particular and the community at large. Further, improving the criteria used for performance evaluation of agricultural extension workers and targeting mechanisms need attention to minimize the effect of quantitative targeting that may conflict with program objectives. In addition, capturing the differences between male and female in terms of productive assets should be boldly underlined to design gender responsive services.

Furthermore, to get the expected outcome in terms of farm productivity, efficient utilization of available technologies and resources as well as to maintain the reliability and responsiveness of the extension program, refinements in the extension approach should be explored. Such refinements would need to disentangle the system away from politics, top-down, supply-driven, package approaches to limited crops, to more dynamic, responsive, impartial and competitive service provision. However, without such changes, the agricultural extension system in Ethiopia will become extraneous to the needs of smallholders production systems.