

論文の内容の要旨

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論文題目 An Economic Analysis of the Effects of Small-Scale Pond Irrigation on Farm Income and Rural Development in Southern Provinces of Lao PDR

(ラオス南部における小規模溜池灌漑の農家所得と農村開発に及ぼす効果の経済分析)

This dissertation aims to gain an understanding of impacts of small-scale pond irrigation on rural poor farm households and poverty reduction linkages in lowland rice-based farming systems in rural southern areas of Lao PDR. Recently, Lao Government is trying to develop a rice policy for the country. One of the aspirations of the country is becoming a rice exporter (as the country has already attained self-sufficiency level). To achieve this goal, the Government of Lao PDR has been investing in intensify production support including irrigation for rice farmers during the dry season. However, construction of large irrigation scheme requires high investment and management. Laos has abundant sources of water during wet season but most of this will be gone as run-off water. A number of ponds or reservoirs are already used by farmers but their use and management are still an issue. To our knowledge, there is no empirical research examining the impacts of homestead ponds on production, farm income and poverty linkages of the rural households in lowland rice-based farming systems in Lao PDR. Therefore, this dissertation intends to contribute to the empirical study of impact of small-scale pond irrigation on farm households and poverty linkages in Southern parts of Laos. The dissertation first used most of information obtained through a household survey conducted in the four districts during August to September, 2012. In total 23 villages were selected to conduct a field survey, in 4 districts which are namely Outhoumphone, Champhone, Phonthong and Sukhuma districts due to their intensity of individual farm ponds in southern Laos

To achieve its objectives, the first research of this dissertation assesses the economic impact of farmstead pond irrigation on the decomposition of farm household income under rice-based farming systems, the comparative analysis of two groups from farm household survey 2012 (188 pond farms and 34 no-pond farms) is used to describe the potential benefits of pond irrigation for the farmers' annual incomes. The empirical models of crop annual incomes (mainly soybean, vegetable and total crops) and models for per capita incomes are developed to investigate the impacts and linkages. The results from our research show that there are significant differences in household income from famers with a pond and that without a

pond. The premise is that resource water can be developed on many homesteads by construction of ponds: this can support more sustainable production systems, higher productivity and income, and greater well being of the family.

However, the impact of pond irrigation on household income for poor farmers in the southern also could be referred to the increase in agricultural commercialization due to water availability for enhancing production in both dry and wet season for pond farms. This increase in production encourages poor farmers to participate in market by selling their products to local traders appointed at their village. The empirical study on the extent of pond irrigation and informal contact of sales for the poor farmers, has provided some evidences of the impact of small scale irrigation on market participation of poor pond farmers in Southern Laos. This contact of sales created between the farmers and local traders affects significantly the smallholders' household income. In general, this kind of market arrangement is informal in many places of rural areas of Laos, where farmers are isolated from the infrastructure development. Only local small traders are their mean of market access and facilitate to sell out their farm outputs.

Finally, Based on these results, it is important to continue a research on the questions of what effectiveness of pond construction projects and what is the best choice of resource allocation in term of cropping land and water land on farmstead in the context of Southern Laos. Research on economic model of pond irrigation was studied. The empirical results show that small, medium and large ponds are profitable with positive NPVs, IRRs and BCRs. However, these economic indices are not so high as the potential benefits of ponds are not currently optimized. Overall, small and medium ponds show better profits than do large ponds (in term of BCR). By applying the BN model for pond modeling in different climatic scenarios and farming management styles, the simulation results show that the optimum size of the pond which appears to be around 0.07-0.09 of the farm area. However, it is important to note that the optimum pond size for the individual indicators (income, irrigation water or number of dry week) is not the same. Hence, here is a choice that the farmer should make: for his farm and the household, which indicator is the most important? Simulation can help oversee the consequences but the farmer should make the choice. The value of this optimum pond size (pond model) is strongly related to the farming practice and not so much dependent on the relative pond size or rainfall.

The results of this dissertation provide the first source of evidence about the multiple-uses and benefits of ponds for agricultural production in Laos. Data strongly indicate the utility of ponds, suggesting the need for further research on methods to optimize their use in the Lao context. Additionally, an evidenced-based case arises for Government and development agencies in Laos to use the farm pond model within community development projects.

For policy recommendations: it needs to have an approach for rural development should integrate small-scale pond model to help the poor farmers having water availability for production. Appropriate knowledge should be provided to rural farmers in order to make pond irrigation farms contribute to food security and nutrition issues in rural areas where the malnutrition is still discussed. The infrastructure development such as road could help to encourage rural poor farmers to participate to the market and

intensify their production. The Government should help rural farmers to have access to input markets and credit. As we have seen, irrigation equipment and mechanization of farm are determinants of farm commercialization. The improvement of institutional capacity of the public agencies is needed to provide better agricultural and forestry extension services. This would help to improve agricultural productivity and market participation by providing appropriate techniques of production and access to market information.

For further research, as we have seen that an individual on-farm pond irrigation is beneficial to farm household. However, research on pond ratio should be also scaled-up to village or community level in order to see the impact on food security and poverty reduction at regional level. The question 'how to manage water for high water use efficiency, remains a key constraint for an effective pond irrigation management for rural poor farmers in Laos. To deal with this question, it can be addressed with BoNam by looking at the water use efficiency indicator. The value of this indicator is strongly related to the farming practice and not so much dependent on the relative pond size or rainfall. This could be one issue for researcher, scientist and development agencies to reconsider in order to help rural poor farmers to improve their knowledge on pond irrigation management.