

Sustainable Development of Pig Farming Systems in Vietnam: Insights from the Production and Environmental Perspectives

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Thesis Summary

Increasing population combined with improvement in living standards have been inducing people worldwide to consume more meat. Pork is the most consumed meat in the world and is dominantly produced in Asia developing countries. To meet the increasing demand for pork, the structure of pig production these countries have changed to intensive farming with the decrease in the number of pig producers while increase in the farm size. In the trend of intensification, the participation of feed enterprises into Vietnam pig production through the forms of contract farming to large-scale pig producers has expanded the production size, created mutual benefits and introduced the advanced technologies in pig rearing. In Vietnam, pig farms have been officially classified by scale that are based on number of pigs; however, this classification does not reveal the development of farming systems. Therefore, this study develops new typology for pig farming systems: industrial farms (IFs) and traditional farms (TFs). By surveying 270 pig farms in Vietnam, we found that housing systems, feeding modes, and contract farming are the key points to distinguish IFs from TFs.

Vietnam pig production is unsustainable because of high production costs, overusing water resources and severe environmental pollution. This study attempts to provide an insight into sustainability of pig farming systems in Vietnam by comparing technical efficiency (TE), water use efficiency (WUE) and pollution levels (PLs) and propose recommendations to improve the sustainability of IFs and TFs. The main findings are summarized as follows.

First, results of data envelopment analysis (DEA) show that input costs of IFs and TFs could reduce 26.2% and 34.3%, respectively, without any decreases in the outputs. In addition, analysis on scale efficiency (SE) indicates that IFs operate nearer their optimal scales than TFs do. This finding suggests the potentials for TFs to increase their TE by adjusting their production scale in the long run. For short run solutions, using Tobit models, we analyze the TE's determinants under variable return to scale (VRS) within each farming system. Various determinants were investigated, of which land rent and ratio of manure treatment area to pigpen area substantially reduce TE of IFs, while farm-prepared feed significantly increases TE of TFs. These findings imply the need to research less-occupying manure treatment plants for IFs and lower feed price for TFs through promoting domestic production and self-made feed.

Second, this study measures the WUE of pig farms in Vietnam, a tropical Southeast Asian country. There, a large volume of water has been used for washing and cooling pigpens and

discharged to the environment in the form of wastewater, which causes water scarcity and pollution. This study compares the WUE of these farming systems, suggests which of the systems is most sustainable, and proposes solutions to improve the WUE of each system. By applying sub-vector DEA, the results show that the free use of groundwater resources causes a low average WUE of 52%. IFs (closed pigpens) have the highest WUE, followed by TFs and SIFs (open pigpens). This finding confirms the sustainability of IFs over other types of farming. Furthermore, using Tobit models, we analyze the determinants of the WUE within each farming system. The results show that shortening the fattening phase and decreasing the floor space allowance per pig increase the WUE of TFs and SIFs. In addition, decreasing the depth of the puddles in pigpens and the frequency with which these puddles are drained improve the WUE of IFs. These results suggest a need to revise the design of pigpens in order to reduce water use related to washing and cooling.

Third, almost all of IFs have farming contracts to agribusiness firms, while TFs do not. This paper provides an insight into the environmental impacts of livestock contract farming in Vietnam by investigating manure management and pollution levels of IFs under contract farming (CF) and TFs (non-contract farming (NCF)) in Vietnam. By applying logit model, we found that commercial pigpen type of CF reduces the probability of manure separation, while larger garden area and knowledge of composting increase it. By analyzing the wastewater samples collected from the farms and employing nearest neighbor matching technique, this paper indicated that CF reduces the pollutants' concentrations in effluents. Using OLS regression models, we found out that manure separation contributes to a reduction in nutrient matters, while biogas plant or combination of biogas plant and stabilization ponds help to diminish organic matters. The study results suggest that the government should regulate the minimum required land area for installation of the combined manure treatment plants (MTPs). Additionally, to recycle manure and improve nutrient matters in effluent, advanced technologies for separating solid manure are extremely necessary for CF producers. Furthermore, we recommend the government to build mechanisms to compel the agribusiness firms engaging in their liability for the environmental side effects caused by their CF producers.