

## 論文の内容の要旨

### 論文題目

Impact Evaluation of Agricultural Training upon Information Diffusion and Technology Adoption:  
Evidence from a Randomized Field Experiment in Indonesia  
(農業研修が情報の伝播と技術の普及にもたらす影響評価：  
インドネシアにおけるランダム実験をケースとして)

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Technology has long been seen as a major contributor to economic development, but permeating technology in the developing nations has been a continuous challenge. Majority of livelihood in the developing nations depend on agriculture and live in the rural area. Formal educational institutions are deemed lacking to push technology to the end user, and informal institutions can offset this lack in the rural area where majority of the people live. This dissertation tries to address the missing links between the role of formal extension services in the form of institutionalized training and informal social network in the form of rural network with peers and neighbors upon information dissemination and technology adoption.

The primary objective of this dissertation is to provide experimental evidence that exposing randomly selected farmers to institutionalized agricultural training can elevate agricultural knowledge as well as promote technology adoption due to the strengthened social network resulting from the training experience. To serve the purpose, social experiment is carried out with different training environments that can generate different learning experience. These experiences can hypothetically be reflected in the diffusion and adoption behavior. The study context of Indonesian rural households and the details of the experiment have been explained while three empirical studies stemmed from the experiments have been explored. Building on a 3-years panel dataset, I examine how the interplay between formal extension services and informal rural social network can better explain the technology transfer and adoption in the rural area.

Agricultural information are transferred through social interactions, so ties to agricultural informants and network structures within farmers' local neighborhood determine farmers' ability for information gathering mechanism. The role of various network ties is examined, including friendship network and advice network, upon farmers' knowledge gathering ability during formal training. Although the numbers of ties are important for knowledge gathering process, they do not necessarily result in better quality of information acquired, as friendship network in fact hurts productivity. Further examination explores how farmers' position in their local network structures

influences their information processing skill. Farmers who occupy a central position in their network structures in their local neighborhood are found to perform better in learning outcomes, indicating that one's position in their local network determines their ability in facilitating problem-solving activities in an unknown environment outside their locale.

Agricultural training in general helps disseminate agricultural technology but training carried out in most remote place is found to drive adoption due to significantly strengthened social network. Training is administered in varying locations (in farmers' hometown and in remote locations comprise intra-island and inter-island locations) to investigate the effect of both locations and social learning on agricultural technology diffusion and adoption. Identical training content is given regardless of location. Training, regardless of location, is found to improve farmers' knowledge regarding agricultural technology, but only training held in an inter-island location significantly spurs the adoption of water-conservation techniques. Farmers trained in an inter-island location tend to communicate more frequently with their peers and experts upon returning from training, which induces their propensity to adopt the technology. Farmers' centrality properties are found to have influenced their knowledge gathering ability especially for the complex agricultural training. This part concludes that training spillover from participants to non-participants is detected, resulting in the diffusion of agricultural techniques even though it has yet to propel adoption for the non-participants.

Institutionalized agricultural training also has a profound impact in stabilizing farm income of training participants who belong to below-median farm income category. Agroforestry has long been regarded as a means for income smoothing for poorer household. After the training, training participants in general reduce plant diversification as they may find it inconsistent with their farm management strategy. However, relative to the non-poor, poorer farmers tend to diversify more or keep their number of crops. Training participants in general are also well-informed regarding the economic and environmental benefits of agroforestry, with poorer farmers being more aware on its economic merits and richer farmers being more informed on its environmental benefits. Upon returning from the training, the poor is also found to increase the depth and size of social network with their agricultural informants. Training spillover is also significantly stronger for the poorer participants compared to their richer counterparts. Impact evaluation assessments also show that crop diversification is negatively associated with income vulnerabilities, indicating the program's relevance for poverty eradication strategy.

This whole dissertation provides evidence: that at the beginning, formal institutions be it agricultural training such as the one studied in this research or institutionalized extension services, play important roles to raise awareness regarding agricultural practices. Nevertheless, for a faster dissemination strategy, informal social network may help hasten the information diffusion amongst farmers. As new technologies need encouragements from many parties in order to be fully embraced by the society, informal rural network can serve as the primary enforcer for technology adoption.

Deeper analysis also show that not only training has helped farmers to broaden their knowledge and advance their farming practices, it is also found to have developed farmers' capacity both at personal-level and community-level. Upon returning from the training, trained farmers are observed to become more enthusiastic in information gathering, as well as play active part in their community as indicated by the stronger network centrality measures.

Overall, this dissertation found that formal institutions, in the form of institutionalized training, and informal institutions in the form of rural social network equally complement and play an important role for technology advancement in the rural area. Training serves as an effective measure to disseminate agricultural information, and rural social network helps to push technology adoption due to the increased social learning effects. Future agricultural training should put more emphasis on knowledge facilitation which enabling information diffusion process amongst participants and consider the potential spillover to non-training participants upon the completion of the training. Future agricultural extension policy should extend the approach to consider the interplay between formal institutions such as extension systems and informal institutions such as rural social network for better development outcomes.