様　式　Ｃ－１９、Ｆ－１９－１、Ｚ－１９　（共通）

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研究課題名（和文）Using social networks to identify seed farmers for agricultural technology diffusion: A randomized controlled trial in Vietnam

研究課題名（英文）Using social networks to identify seed farmers for agricultural technology diffusion: A randomized controlled trial in Vietnam

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研究成果の概要（和文）：この研究プロジェクトは、開発途上国の農民ネットワーク内での新しい農業技術の採用と普及に重視しています。しかし、２０２１年度には研究地のCovid-19の深刻な状況により、厳しい社会的距離政策が取られたため、提案したRCTを実施することができませんでした。２０２２年になり、社会的距離の緩和に伴い、研究デザインを調整しました。科学的情報提供が農家の技術導入に与える影響を調べるRCTのベースライン、フォローアップ、エンドラインの３つの調査を完了した。
さらに、Covid-19の状況に合わせて、二次データを活用した研究にも取り組んでおり、その成果を国際的な査読付きジャーナルに論文として投稿しています。

研究成果の学術的意義や社会的意義
This reseach project contributes evidence about how scientific information affects the adoption of agricultural technology amongst farmers in developing countries. This empirical evidence would be valuable for policy-makers in designing information campaigns that improves the technology diffusion.

研究成果の概要（英文）：This research project focuses on the adoption and diffusion of new agricultural technology within farmer networks in developing countries. However, due to the strict social-distancing policies induced by severe Covid-19 situation at the study site, I could not conduct the proposed RCT in FY2021. In FY2022, after the social distancing was partly relaxed, I flexibly adjusted the research design to fit the post-Covid period. Specifically, I completed three surveys - baseline, follow-up, and endline - of a RCT to investigate the impact of scientific information provision on technology adoption of farmers. This RCT is still closely related to the proposed research topics about technology adoption and farmers' network. The original dataset is undergoing analyses to obtain preliminary results.
Adapting to the Covid-19 situation, I also diversified my research activities to incorporate studies using secondary data, which resulted in publications in international peer-reviewed journals.

研究分野：Development Economics

キーワード：technology adoption　technology diffusion　farmers　social network　RCT　Vietnam

様　式　Ｃ－１９、Ｆ－１９－１、Ｚ－１９（共通）

１．研究開始当初の背景（Research background）

In FY2021, due to the unexpected social distancing policies at the study site in Vietnam and strict abroad travel restrictions induced by the Covid-19 pandemic, the original research proposal about identifying effective seeds for technology diffusion could not progress. In FY2022, while maintaining the focus on technology adoption amongst small-scale farmers, I adjusted the research design to adapt to the post-Covid situation. The ***central research question*** of the revised research design is to evaluate t**he impacts of farm-specific information provision on the adoption of pro-environmental technology**. This section elaborates research background and academic gaps of the revised research question.

With the environmental consequences of the excessive use of chemical fertilizer becoming apparent in Asia, a growing body of literature investigates how to encourage the application of organic fertilizer. Besides price subsidy – a traditional economic incentive, recent studies examine the effects of information provision, which is considered a cost-effective method to change farmers' behavior. Despite the large number, most studies rely on observed data and consequently can only conclude the association between information provision and the adoption of organic fertilizer. Experimental evidence of causal impacts is scarce with Vu et al., *World Development* 2022 being one of the few examples.

In addition, the types of information investigated in the previous literature are limited to opinions and experience sharing from peer farmers. Alike chemical fertilizer, the correct application of organic fertilizer requires scientific information about the soil characteristics of the farm. However, **whether the provision of such scientific and farm-specific information can change the fertilizer application behavior of smallholder farmers** remains a significant ***academic gap***. While a few studies such as Ayalew et al., *JDE* 2022 and Harou et al., *JDE* 2022 show mixed findings for chemical fertilizer application in Africa, no studies have been conducted in the context of organic fertilizer application.

２．研究の目的（Research objective）

To address the above academic gap, through an RCT with the application of organic fertilizer among green tea farmers in Vietnam, the ***purpose of this research*** is to evaluate the **direct and spillover effects of farm-specific information on technology adoption**.

Regarding the ***scientific significance***, this research contributes new empirical evidence to the literature that investigates how to use information provision to improve the adoption of new technology amongst small-scale farmers in developing countries. Additional findings of the **spillover effects** – how information and adoption behaviors spread from one farmer to the others – would also enable further research on effective methods for injecting information into a population of farmers.

The originality of this study lies in the case study of the organic fertilizer application in Vietnam. Studies on agricultural technology diffusion mainly focus on technologies that boost crop yield in Africa. In **Asian countries**, such as **Vietnam**, due to the intensive use of agrochemicals, environmental sustainability presents a more serious challenge to agricultural development. However, there are very few studies about the **adoption of pro-environmental technology**. This research gives original evidence about how to use farm-specific information to increase the application of organic fertilizer – an environmentally friendly farm input.

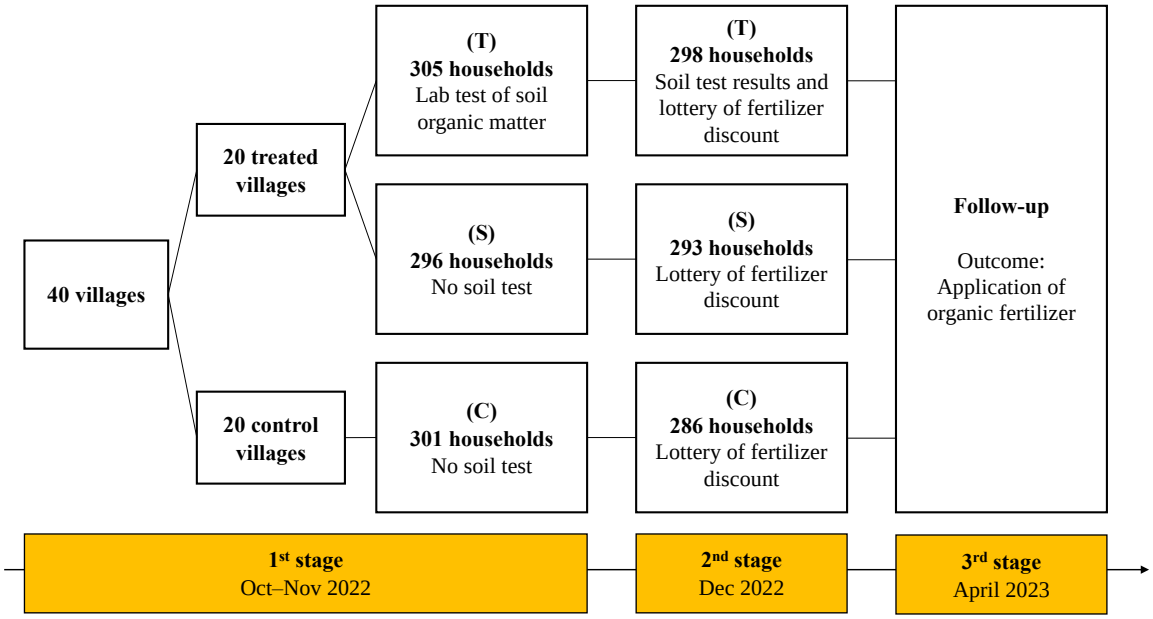
３．研究の方法（Research methods）

To achieve the research objective, I conducted an RCT with green tea farmers in 40 villages in Thai Nguyen – a central area for green tea cultivation in northern Vietnam in FY2022. This research project directly extends Vu et al., 2020 that examines the effect of experience-sharing on the adoption of organic fertilizer in Thai Nguyen. Compared to Vu et al., 2020, this project also extends the study site to cover four major tea-producing districts in Thai Nguyen. Within these four districts, 20 communes with the largest tea-growing area were selected proportionately based on the district-level tea cultivation area. In each commune, two non-neighboring villages with large tea cultivation were selected, resulting in a sample of 40 villages. As shown in Figure 1, these 40 villages were randomly assigned to treatment and control groups. Following a random sampling based on the household lists, about 30 households were selected in each treated village, while about 15 households were selected in each control village.

In the **1st stage,** from October to November 2022, I conducted a **baseline survey** with 902 randomly selected households to collect information about household-level demographics and tea production. The households were randomly assigned to three groups. Group T consisted of 305 households from 20 treated villages (about 15 households from each village) that were randomly selected to take the **soil samples** from their largest tea-farm plot. The soil samples of each plot were analyzed to measure the organic matter (OM) content contained. This farm-specific OM content was the key foundation to recommending suitable application of organic fertilizer for the T households in the 2nd stage. Group S contained 296 households which were from the 20 treated villages (about 15 households from each village) but which were not given the lab test of soil sample. Group C was 301 households in the 20 control villages (about 15 households from each village).

[1. Research Objectives, Research Method, etc. (continued from the previous page)]

Figure 1: Design and timeline of the RCT



In the **2nd stage** in December 2022, the investigators visited the households in the baseline survey to distribute the **recommendation for the application of organic fertilizer**. Due to the absence of household representatives, 877 of 902 were revisited. Households in group T were provided with farm-specific OM test results and consequent recommendations. Households in groups S and C were only provided with a government blanket recommendation. Importantly, an approximately 23.5-percent **price subsidy** was randomized at the household level for the purchase of an organic fertilizer product developed by the collaboration partner with this project. Upon the households' order, the fertilizer was shipped to the village within 2-3 days. This **purchase right after the provision of the farm-specific information** was an immediate outcome for the impact evaluation.

In the **3rd stage** in April 2023**,** a follow-up survey was conducted to measure the impacts of the farm-specific information provision indicated by ***the application of organic fertilizer***. In addition to the direct effects of the information provision by comparing the outcome between group T and group C, the spillover effect could be quantified by comparing group S and group C.

４．研究成果（Research achievements）

As mentioned in the background. the progress of the research project was delayed significantly due to the strict social distancing policies in FY2021. The RCT was just completed at the end of April 2023. The original data from the RCT are undergoing analyses to obtain preliminary results about the impact of farm-specific information on the application of organic fertilizer. Publication of the research results is expected in FY2023.

Adapting to the situation induced by the Covid-19 outbreak, I reallocated a part of the research fund to research projects that utilize secondary data – e.g., secondary household surveys and satellite images. In addition, I also collaborated with other researchers in research projects related to the diffusion of new technology and financial products within farmers' networks. The detailed research achievements are as follows.

- **Publications in peer-review journals**
  1. **Duc Tran,** Vu Ha Thu, Daisaku Goto **(**2022). Agricultural land consolidation, labor allocation and land productivity: A case study of plot exchange policy in Vietnam. *Economic Analysis and Policy* (Q1, IF: 4.444). Vol., 73, 455 – 473.
  2. Binaya Chalise, Shinji Kaneko, **Duc Tran** (2022). Blessing of the moon: cultural beliefs, birth timing and child health in Nepal. Culture, Health & Sexuality.

- **Presentations at international academic conferences**
  1. Gaku Ito, **Duc Tran**, Yuichiro Yoshida (Presenter: **Duc Tran**). Uncovering the Legacies of Chemical Warfare: Evidence from the Vietnam War. The 62nd Annual Meeting of the Western Regional Science Association (WRSA), Big Island, Hawaii, February 15-18, 2023.
  2. Ha Thu Vu, **Duc Tran,** Shoji Masahiro, Munenobu Ikegaki, Daisaku Goto (Presenter: Ha Thu Vu).. Long-term Diret and Spillover Effects of Subsidies on Crop Insurance Adoption in Vietnam. The 62nd Annual Meeting of the Western Regional Science Association (WRSA), Big Island, Hawaii, February 15-18, 2023

- **Invited presentations at seminars**
  1. Gaku Ito, **Duc Tran**, Yuichiro Yoshida (Presenter: **Duc Tran**). Unpacking the Legacies of Chemical Warfare: Evidence from the Vietnam War. Social Science Japan Data Archive (SSJDA) Seminars, Institute of Social Sciences, Tokyo University. March 14, 2022
  2. Ha Thu Vu, Duc Tran, Shoji Masahiro, Munenobu Ikegaki, Daisaku Goto (Presenter: Ha Thu Vu).. Long-term Diret and Spillover Effects of Subsidies on Crop Insurance Adoption in Vietnam. Asian Economic Development Seminar, Kyoto University. February 10, 2023.

- **Participation at academic event hosted by JSPS.**
  1. The 13th HOPE meeting with Nobel Laureates. Virtual Meeting, March 7-11, 2022. Award: Best Team Presentation.

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Harou, Aurélie P., Malgosia Madajewicz, Hope Michelson, Cheryl A. Palm, Nyambilila Amuri, Christopher Magomba, Johnson M. Semoka, Kevin Tschirhart, and Ray Weil. 2022. "The joint effects of information and financing constraints on technology adoption: Evidence from a field experiment in rural Tanzania." *Journal of Development Economics*, 155.

Vu, Ha Thu, Duc Tran, Daisaku Goto, and Keisuke Kawata. 2020. "Does experience sharing affect farmers' pro-environmental behavior? A randomized controlled trial in Vietnam." *World Development*, 136.

５．主な発表論文等

〔雑誌論文〕　計2件（うち査読付論文　2件／うち国際共著　2件／うちオープンアクセス　0件）

１．著者名 Duc Tran, Vu Ha Thu, Daisaku Goto	４．巻 73
２．論文標題 Agricultural land consolidation, labor allocation and land productivity: A case study of plot exchange policy in Vietnam	５．発行年 2022年
３．雑誌名 Economic Analysis and Policy	６．最初と最後の頁 455-473
掲載論文のDOI（デジタルオブジェクト識別子） 10.1016/j.eap.2021.11.017	査読の有無 有
オープンアクセス オープンアクセスではない、又はオープンアクセスが困難	国際共著 該当する

１．著者名 Binaya Chalise, Shinji Kaneko, Duc Tran	４．巻 NA
２．論文標題 Blessing of the moon: cultural beliefs, birth timing and child health in Nepal	５．発行年 2022年
３．雑誌名 Culture, Health & Sexuality	６．最初と最後の頁 1-13
掲載論文のDOI（デジタルオブジェクト識別子） 10.1080/13691058.2022.2111466	査読の有無 有
オープンアクセス オープンアクセスではない、又はオープンアクセスが困難	国際共著 該当する

〔学会発表〕　計4件（うち招待講演　2件／うち国際学会　1件）

１．発表者名 Duc Tran
２．発表標題 Unpacking the legacies of chemical warfare: Evidence from the Vietnam War
３．学会等名 SSJDA Seminar, Center for Social Research and Data Archives, Institute of Social Science, The University of Tokyo（招待講演）
４．発表年 2022年

１．発表者名 Duc Tran
２．発表標題 Uncovering the Legacies of Chemical Warfare: Evidence from the Vietnam War
３．学会等名 Western Regional Science Association（国際学会）
４．発表年 2023年

１．発表者名 Vu Ha Thu
２．発表標題 Long-term Diret and Spillover Effects of Subsidies on Crop Insurance Adoption in Vietnam
３．学会等名 Western Regional Science Association
４．発表年 2023年

１．発表者名 Vu Ha Thu
２．発表標題 Subsidy for all? Spillover effect of subsidy on crop insurance adoption in Vietnam
３．学会等名 JADE/GRIPS Development Seminar（招待講演）
４．発表年 2023年

〔図書〕　計0件

〔産業財産権〕

〔その他〕

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６．研究組織

	氏名 （ローマ字氏名） （研究者番号）	所属研究機関・部局・職 （機関番号）	備考

７．科研費を使用して開催した国際研究集会

〔国際研究集会〕　計1件

国際研究集会	開催年
The 13th HOPE Meeting with Nobel Laureates	2022年～2022年

８．本研究に関連して実施した国際共同研究の実施状況

共同研究相手国	相手方研究機関