

## **Where do Smallholder Farmers get Their Information? An Exploration of the Sources of Agricultural Information in Northwest Cambodia**

Presley Nickens, Smith Center of International Sustainable Agriculture, University of Tennessee

David Adler, Smith Center of International Sustainable Agriculture, University of Tennessee

Jean Pierre Enriquez, Smith Center of International Sustainable Agriculture, University of Tenn.

Ricky Bates, Pennsylvania State University

Tom Gill, Smith Center of International Sustainable Agriculture, University of Tennessee

Sovanneary Huot, Pennsylvania State University

Lyda Hok, The Royal University of Agriculture

Srean Pao, The National University of Battambang

### **Abstract**

*A significant emphasis on scaling up food security efforts is needed to achieve Sustainable Development Goal 2 (Zero Hunger) by 2030. Scaling up sustainable intensification efforts for Cambodian smallholder farmers is key since they face greater exposure to the uncertainties of climate change, globalizing markets, and rural-to-urban migration. One way to increase the effectiveness of efforts and the scaling up of sustainable intensification technologies is through improving access to information about production and marketing technologies. This study aimed to identify sources of information about sustainable technologies available to smallholders and barriers that may be preventing adoption. Information was gathered from a household survey to document the sources of agricultural information for smallholders in Northwest Cambodia. This research suggests Cambodian smallholders are receiving agricultural extension services, however, the overall quality and effectiveness of these messages are unknown, since NGOs with competing foci are the primary provider of extension information. Smallholders face significant barriers that prevent the adoption of sustainable technologies and participation in markets, such as low price for goods, poor product quality, lack of time, and concerns for safety. Future endeavors to strengthen the price of goods and alleviate market-related challenges would likely result in increased smallholder income and food availability.*

**Keywords:** extension, sustainable intensification, agriculture information, smallholder, technology

## Introduction and Background

The decades-long trend of steady declines in global hunger has unfortunately come to an end. Beginning in 2015, the Food and Agriculture Organization of the United Nations (FAO) has documented continual upticks in hunger worldwide, as measured by prevalence of undernourishment. Approximately 690 million people suffered from food insecurity in 2019, approximately 8.9% of the world population. (FAO et al., 2020). Asia alone comprises half of this total with an estimated 381 million undernourished people in 2019. Fortunately, estimates by FAO show that we can reduce undernourishment if continued efforts are made to support smallholder farmers in Asia (WFP & FAO, 2022). However, a significant emphasis on scaling up food security efforts is needed to achieve Sustainable Development Goal 2 (Zero Hunger) by 2030 (Sakar et al., 2020). Despite producing nearly half of the world's food, smallholders have notoriously low yields, strong gendered divisions of labor, and limited financial resources resulting in chronic food insecurity (Tittonell, 2013). There is a pressing need to sustainably intensify food systems, while at the same time, improve environmental outcomes (Pretty et al., 2018). For this reason, smallholders in Southeast Asian countries are an entry point for the use of sustainable technologies and practices in the region. Smallholders face greater exposure to the uncertainties of a changing climate, globalizing markets, and rural-to-urban migration (Morton, 2007). Among smallholders, women and youth face specific barriers that require tailored interventions (Huot et al., 2023; Zulu et al., 2021). One way to increase the effectiveness of efforts and the scaling up of these technologies is through improving access to information about production and marketing. By providing farmers with the information they need to make informed decisions, agricultural information can help them increase their yields, reduce costs, and access markets for their products, ultimately leading to improved food security for themselves and their communities. Thus, the current study provides an example of the sources of agricultural information for smallholders in Northwest Cambodia.

## Conceptual Framework

*The Cambodian National Strategy for Food Security and Nutrition* emphasizes increased food availability and access through diversification of food systems. They recognize that farmers need accurate information about new technologies that could combat food insecurity (Royal Government of Cambodia, 2018). Sustainable intensification (SI) is a broad term that encompasses a variety of technologies that seek to increase the productivity of agricultural lands in order to reduce the need to expand land use and the utilization of environmentally harmful inputs, thus conserving land and reducing negative environmental externalities (Zurek et al., 2015; Pretty et al., 2018). SI is a promising vehicle to increase productivity for smallholder farmers in Cambodia and the wider Southeast Asia region (Petersen & Snapp, 2015). SI requires a systems-based approach where all aspects of the food system are considered across various

scales when analyzing the potential reconfiguration of any one part of the system (Loos et al., 2014). Knowledge and information flows are important aspects of the larger system. A SI approach considers multiple domains including human capacity and information access (Musumba, 2017). In order for farmers to adopt technologies they need access to information (Feder & Umali, 1993; Nikam et al., 2022; Mulwa et al., 2017). Feder and Umali (1993) report that risk and information availability are major factors influencing farmer adoption of new technologies. Barriers to the adoption of new technologies also include weak social networks, low-quality extension services, reliance on government support during crop failure, incidence of pests and diseases, resource constraints, inability to access markets, and the occurrence of climate shocks (Kassie et al., 2015; Shilomboleni & De Plaen, 2019; Westermann et al., 2019; Barret et al., 2010; Jack, 2013). Continual strides have been made over the past decades to reduce barriers to scaling adoption, particularly with the increase in digital tools and computer technologies (ICT). However, there is a need to document the changes to how farmers access information to better inform stakeholders working to further adoption. A thorough understanding of how farmers interact with and learn from these stakeholders is necessary to improve scaling efforts and reduce food insecurity.

Cambodia is currently undergoing rapid economic and social change, but despite strides in economic growth and poverty reduction, Cambodia remains a predominantly rural country with a weak educational system and strong dependence on agriculture (Ran et al., 2013). The Ministry of Agriculture, Forestry, and Fisheries (MAFF) established the Department of Agricultural Extension (DAE) in 1995 to strengthen extension services and meet farmers' needs. However, a variety of stakeholders engage in providing extension services including the private sector, NGOs, and donor organizations. The International Food Policy Research Institute (IFPRI)'s 2018 assessment of the extension system in Cambodia found that weak coordination between the government, extension service providers, and research institutes has resulted in an unreliable system unable to address the needs of farming communities (Ke & Babu, 2018). Only a small fraction of the large body of agricultural knowledge held in research institutions, universities, public offices, and libraries is available to farmers (Elly & Ephraem, 2013). Yet, steady flows of accurate information from educational and research systems to farmers could play a vital role in the adoption of SI technologies, including climate change mitigation strategies (Sani et al., 2015). In 2015, MAFF adopted a new agricultural extension policy focused on pluralistic advisory services to increase the involvement of the private sector and NGOs in extension services. However, it is probable that this pluralistic approach may reduce the overall effectiveness of extension services. A study of informal extension centers (several of which were NGOs) in Southeast Asia by Bicksler et al. (2022) stated that these centers varied in their demonstrations, focus, extension techniques, and institutional messages. A myriad of organizations are providing Cambodian smallholder farmers' primary source of agricultural information, in some cases there are conflicting messages, that may leave farmers confused about which messages to listen to or which practice to adopt.

Increased access to agricultural information can be extremely beneficial for smallholder farmers in Cambodia, resulting in informed decisions about their farming practices and increased yield. Improved yields, in turn, can lead to a rise in food security for the farmers and their families, as well as for the wider community. There are several, specific ways that agricultural information can assist smallholder farmers in Cambodia. Agricultural information can help farmers choose the right crops to grow based on factors such as soil type, climate, and market demand. Thus, maximizing yields and income. Farmers can also benefit from information about how to manage their farms more effectively, such as techniques for soil conservation, pest management, and water management. This can assist in cost reduction and greater productivity. Agricultural information can help farmers access markets for their crops, both locally and internationally, resulting in better prices for their products and greater overall income. Farmers can benefit from information about financial management, including budgeting, accounting, and access to credit. This can help them invest in their farms and increase their productivity over time. Overall, access to agricultural information can play a critical role in improving the food security of smallholder farmers in Cambodia.

From 2015 to 2019, the Women in Agriculture Network (WAgN) Cambodia project identified technologies, institutions, and policies that facilitate small-scale farmers using SI practices to improve their household nutrition and boost production to enter the local, regional, and international horticultural markets. WAgN employed a gender and ecologically sensitive lens to build a scientifically rigorous and comprehensive understanding of the nexus of gender and SI. This approach stressed the importance of markets and promoted efforts to move Cambodian agriculture towards a market-driven system (Gill et al., 2011). Project activities promoted gender equity and family nutrition by understanding and addressing barriers to women's participation in horticulture value chains as well as the adoption and use of SI application. The provided conceptual framework advances the literature by outlining the need to document smallholder access to information concerning sustainable technologies, thus leading to more informed stakeholders and improved scaling efforts to reduce food insecurity in Cambodia.

### **Purpose and Objectives**

The purpose of this research note is to determine the sources and types of extension information farmers received across various sectors of agriculture, providing a baseline from which to inform stakeholders involved in extension service provision or farmer adoption activities. This research note uses data from a household survey to document the sources of agricultural information for smallholders in Northwest Cambodia. The data was collected as part of an USAID research for development project under the Feed the Future Initiative that seeks to understand pathways for scaling up the adoption of SI technologies. We seek to know what sources of information farmers are relying on in different agricultural sectors, how this

information is perceived by farmers, and how effective the information is for decision-making. Our objectives are as follows:

1. Document the flow and sources of agricultural information provided through extension outreach that is available for smallholder farmers in Northwest Cambodia.
2. Identify smallholder barriers to crop production and market access.
3. Provide an overview of smallholder demographics and production practices.

### **Methods and Data**

WAgN engaged a broad cross-section of stakeholders in applied research, evaluation, and extension, forming important partnerships in the private and public sectors. As part of this project, a household survey was conducted in three provinces in Northwest Cambodia. Data were gathered from rural household surveys conducted in August 2016. The lead investigators collectively developed the survey instrument with questions covering a comprehensive range of topics, from household demographics, agricultural practices, sources of agricultural information, and barriers to production. Using a multistage randomized sampling strategy based on the Cambodia census, 400 households were selected using probability sampling from 3 provinces (Kampong Thom, Siem Reap, and Battambang). The survey instrument was given to one adult in each household (in the Khmer language using trained Khmer enumerators) and took on average 1 hour to complete. The data were recorded and entered into a data set by the Khmer enumerators. After adjusting for errors in the responses, a total of 394 smallholder surveys were used for analysis. Most questions were closed-ended, with some multiple choice that included an “other” option. Questions on barriers were identified by a multiple-choice list or an “other” option that collected the participant’s response. Household respondents were given a small gift for their participation. All research protocols were approved by the University of Tennessee Institutional Review Board (16-03351-XP). IBM SPSS Statistics (Version 24) was used to analyze the survey data. We present descriptive statistics of the data below, to serve as a baseline for which to compare.

### **Results**

The data were collected from a survey administered to 394 smallholders in Cambodia: 117 (29.7%) males and 277 females. The average age of respondents was 46 years old. The primary occupation of those surveyed was a farmer, comprising 86% of respondents. The remaining 14% surveyed were still knowledgeable in the household’s agricultural affairs or the farmer surveyed held another primary occupation. The highest education level reported most often was Primary School (49.7%), followed by no school (19%), and Secondary School (16.8%). The majority of farmers used fertilizer (92.4%), pesticides (64%), and broadcast seed by hand (97.3%). Area of land used for farming was one hectare or less for 43.7% of

respondents. When asked if rice production was enough for consumption for the entire year, 66.4% of respondents said yes (Table 1). However, 36% of respondents have borrowed money to buy food and 39.7% have borrowed rice from a neighbor.

**Table 1**  
Smallholder Production Practices and Resource Overview

Parameter	% or Mean
<b>Demographics</b>	
Female	70.3
Average Age	46.0
Farming is Main Occupation	86.0
<b>Education Attainment</b>	
No School	49.7
Primary	19.0
Secondary	16.8
<b>Farming Practices</b>	
Use Fertilizer	92.4
Use Pesticides	64.0
Use Mulch	8.9
Grows a Cash Crop	19.0
Farms on one Hectare or Less	43.7
Broadcasts Seed by Hand	97.3
Owns Animals	86.8
Average Cattle Owned	3.7
Average Buffalo Owned	4.9
Average Pigs Owned	4.8

**Table 1 (continued)**

## Smallholder Production Practices and Resource Overview

Parameter	% or Mean
Average Chickens Owned	8.8
Average Ducks Owned	13.1
Food Availability	
Rice production enough for the whole year	66.4
Borrowed money to buy food	36.0
Borrowed rice from a neighbor	39.7

n= 394

**Extension and Training**

In general, more than 44% of those surveyed received any type of extension information. More respondents received extension information for rice and vegetables. Males received more information about rice (27.4%) and females received more information about vegetables (27.8%). The lowest extension type of information presented to males was post-harvest management (3.4%) and the lowest for females was marketing (4%). The following results of production services came from the people who had received extension services (43 males and 131 females). Through all the extension types, the NGOs and the Department of Agriculture show the highest representation. NGO information is the dominant source of information for smallholders. To illustrate an example of their influence, about 87% of smallholders own animals (Table 1). NGOs provided 80% of animal extension information, while the Department of Agriculture provided roughly 2% of animal information. Extension information primarily covered the rice, vegetable, animal, and fish sectors. Respondents generally found extension services to be useful, with a success rate of 76.4 to 100% across the varying extension types (Table 1).

Another form of extension may be found in smallholder group membership. Llewellyn (2007) found local groups were perceived as a valuable source of relevant agronomic information for farmers and that farmers were more willing to pay for information from their local group. When Cambodian smallholders were asked if there was an agricultural, livestock, or fisheries producer's group in the respondents' community, 28.4% said yes. Membership groups allow producers to participate in an informal information exchange.

**Table 2**

Extension type representation (as a percent) through gender, source of information, and utility

Extension area	Male	Female	Total	Source of information*			Useful
				NGO	Ag Dep	Additional	
Rice	27.4	21.3	23.1	81.4	3.4	15.2	86.2
Vegetable	21.4	27.8	25.9	79.2	2.6	18.2	89.4
Animal	12.8	20.6	18.3	78.9	1.8	19.3	89.5
Fish	4.3	7.6	6.6	81	4.8	14.2	100.0
Crop rotation	5.1	10.8	9.1	93.3	0.0	6.7	93.3
Other area**	46.2	48.8	47.9	64.1	0.0	35.9	86.2

\*Additional sources of information include in person, TV, traders, neighbors, harvest programs, and self-study. \*\*Other areas include extension for: post-harvest management, storage, and marketing. n=394

### Barriers

Perceived barriers to increasing market access and participation for vegetable producers include low price (79.7%), vegetable quality (20.3%), lack of time (12.2%), and other barriers (28.1%) such as transportation, supply, and farm location. The majority of Cambodian smallholders (80.3% males, 79.4% females) cite low price as the main barrier to increased market participation for vegetable producers. The survey found 22.2% of males and 19.5% of females reported that their product quality was the second largest barrier preventing them from being more involved in Cambodian markets. Other reported barriers are related to the market and

its challenges, such as no marketing, market logistics, and a lack of middlemen to purchase the products. Water and equipment availability were specific concerns for farmers who reported technical barriers. This is primarily associated with resource availability, as farmers reported that they do not have enough land, water, and money to participate in vegetable markets.

Another barrier to crop production as a whole was safety. When asked if concern for personal safety affected their ability to participate in crop production, a total of 37.3% of respondents answered yes (38.6% females, 34.2% male). Reasons for concern primarily stemmed from human-related violence, natural disasters, or farming practices. Respondents were fearful of robbery, assault, road accidents, and being in an isolated area far from home. Other fears included injury by storms, snakes, machinery, or pesticide poisoning.

### **Conclusion**

This study provided baseline knowledge of the sources and types of extension information available to Cambodian farmers to help advance future studies examining sustainable intensification and barriers to technology adoption. As a result of this study, extension professionals can make more informed decisions on where to focus their efforts and disseminate additional information in areas where extension information is lacking. Additionally, extension professionals can develop materials to assist farmers to overcome the barriers presented in this study. Future research and efforts into streamlining extension messaging from multiple extension groups are needed to progress this specific research area forward. This research suggests Cambodian smallholders are receiving information from agricultural extension services; however, the overall quality and effectiveness of these messages are unknown. The data showed that NGOs were the primary provider of extension information for farmers, nevertheless, the broad diversity of institutional messages and foci (Bicksler et al., 2022) may reduce the impact of extension information. Further efforts to align NGOs with differing missions and values may contribute to more effective extension messaging and consequently, increased food security. Although extension messages are being communicated, significant barriers to Cambodian farmers may prevent the implementation of recommended extension practices. The data suggested that the top barrier to increased market participation for Cambodian smallholders was low price. Future endeavors to strengthen the price of goods, prevent foreign imports, and alleviate market-related challenges would likely result in increased smallholder income and food availability. Roughly 66% of Cambodian smallholders believed they produced enough rice for consumption, nevertheless, respondents reported that they had to borrow money for food or borrow rice. Future research should take this cultural difference concerning what is considered food into account. Variation in the type of food consumed is associated with adequate nutrition (Khoury et al., 2014). Greater access to rice, food to be consumed with rice, and livestock would increase food security in the country. Increased availability of these food sources may be

achieved through the implementation of sustainable technologies as a result of increased information access.

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