Estimating the Impact of the Lors Thmey Farm Business Advisor Model

EVIDENCE FROM A QUASI-EXPERIMENTAL STUDY IN CAMBODIA

Evaluation Brief, January 2018

While the agricultural sector has played a vital role in expanding economic growth and improving livelihoods for rural farmers in Cambodia over the past decade, many challenges remain, particularly to smallholder farmers. Recognizing the market limitations on vulnerable smallholder farmers, World Vision has collaborated with iDE and the social enterprise that iDE founded, Lors Thmey, to expand and refine Lors Thmey's Farm Business Advisor (FBA) model to develop input supply chains through microfranchising. In this program, FBAs—who are experienced farmers themselves—provide access to both quality inputs and training on best practices within communities in an effort to increase agricultural productivity through the adoption of more advanced technologies and techniques. The ultimate purpose of the FBA model is to increase agricultural yields and income for vulnerable farmers and their families.

iDE World Vision

CAUSAL DESIGN

1.0 INTRODUCTION

Over the past decade, the agricultural sector has played a vital role in expanding economic growth and improving livelihoods for rural farmers in Cambodia. According to an analysis conducted by the World Bank's Agricultural Global Practice,[1] significant growth in Cambodia's agricultural economy transformed local markets and increased demand for more diversified and higher value crops. Expansion of farmlands and increases to production efficiency resulted in agricultural value added—or value of gross production minus intermediate farm inputs—to increase 5.3 percent from 2004 to 2012, while average agricultural wages tripled from 2005 to 2013. Given that the Cambodian Ministry of Agriculture, Forestry, and Fisheries (MAFF) estimates that the majority of the country's rural population, or roughly 80 percent of the total population, relies on agricultural activities as a major source of income,[2] it is not surprising that this agricultural growth corresponded to a large reduction in poverty rates across the country. According to World Bank estimates, *"Cambodia's poverty headcount declined from 53 percent in 2004 to 18 percent in 2012, lifting four million people out of poverty. More than 60 percent of poverty reduction was a result of positive developments in the agriculture sector."*[3]

While these positive gains have greatly improved the lives of many rural families in Cambodia, many challenges remain, particularly to smallholder farmers.[4] Agricultural growth has exhibited signs of slowing, dropping to less than 2 percent in 2013, and the factors that led to the accelerated rates (i.e., farmland expansion, mechanization of labor) are seeing diminished returns in the face of additional challenges, such as climate change and reduced global rice prices. Low activity in agro-processing and national market chains also reduce smallholder farmers' ability to capitalize on production, leaving them reliant on demand for raw, unprocessed goods.

iDE and World Vision have a long history supporting vulnerable communities in Cambodia and have recognized the market limitations imposed on vulnerable smallholder farmers, such as lack of access to reliable pricing information, poor vegetable market demand forecasting, reduced access to agricultural technologies, and limited ability to engage local markets. All together these and other issues promote socioeconomic inequity through inefficiency. iDE and the social enterprise that iDE founded Lors Thmey have collaborated with World Vision to expand and refine Lors Thmey's Farm Business Advisor (FBA) model to develop input supply chains through microfranchising. In this program, FBAs—who are experienced farmers themselves—provide access to both quality inputs and training on best practices within communities in an effort to increase agricultural productivity through the adoption of more advanced technologies and techniques. The ultimate purpose of the FBA model is to increase agricultural yields and income for vulnerable farmers and their families.

IMPACT OF THE FBA MODEL ON ACCESSIBILITY, ADOPTION, AND INCOME

- Did FBA activities improve the use of **agricultural inputs and practices**?
- Did FBA activities improve **agricultural productivity**?
- Did FBA activities improve **household income**?

IMPACT OF THE FBA MODEL ON CHILD HEALTH AND WELL-BEING

- Did FBA activity lead to a change in **child health and well-being outcomes**?

1 Eliste, Paavo; Zorya, Sergiy. 2015. *Cambodian Agriculture in Transition: Opportunities and Risks.* Washington, D.C.: World Bank Group.
2 Ministry of Agriculture, Forests, and Fisheries - Cambodia. *Agricultural Sector Strategic Development Plan 2014-2018.* May 2015
3 World Bank. 2017. *Cambodian Agriculture in Transition: Opportunities and Risks.* Washington, D.C.: World Bank Group. http://www.worldbank.org/en/country/cambodia/publication/cambodian-agriculture-in-transition-opportunities-and-risks
4 Classification for "smallholder" varies based on the agricultural context for each region. In the case of this study, smallholder is defined broadly to refer to households that primarily produce for local markets or personal subsistence and not at national scale.

2.0 EVALUATION DESIGN

Based on these key research questions, a propensity score matching[5] (PSM) approach was used to create a counterfactual to estimate the impact of the FBA program and understand the range of benefits that farmers in Lors Thmey villages and households could potentially experience. This is preferable to a direct comparison between a treatment and comparison group because of the high likelihood that farmers that did purchase inputs and receive advice from Lors Thmey were different from non-Lors Thmey farmers along a range of outcomes that could potentially make them more productive and successful farmers to begin with.

DATA SOURCES

The evaluation of the Lors Thmey program leverages household data collected as a part of the Government of Cambodia's own evaluation of PADEE (Project for Agricultural Development and Economic Empowerment). The use of this data minimized the cost implications of the study while allowing for retrospective analysis. The information collected was combined with separate internal data comprised of Lors Thmey administrative sales and training records that were used to identify communities where the FBA program was active and what range of activities were being most utilized by program beneficiaries. Additionally, the research team conducted a series of key informant interviews (KII) and focus group discussions (FGD) across the five provinces within the evaluation to better understand the context surrounding the Lors Thmey FBA program and their target clients. The information gleaned from the KIIs and the FGDs helps to ensure proper interpretation of quantitative survey data and enhances the research team's ability to give meaningful recommendations in the final analysis.

2.1 Estimation Strategy

Utilizing propensity score matching, the research estimated the potential impact of the Lors Thmey program by estimating multiple models. In addition to the analysis that modeled the propensity score using a probit model, the research also employed a series of weighted regression models that incorporated a number of controls such as community level fixed effects and access to financial products and institutions. Where possible, models that controlled for baseline levels of outcomes were utilized to account for varied levels in baseline conditions among treatment and comparison households. A deeper explanation of the quantitative models used in this evaluation and their construction is addressed in the full impact evaluation report.

5 In this analysis, treatment is measured through recorded Lors Thmey activities at the village level and through self-reported interaction with FBA agents. The probability of receiving treatment is calculated through a number of potential explanatory variables that are likely to be associated with individuals that participate in the Lors Thmey program. This probability is then collapsed into a 'propensity score' which is then used in analysis.

TREATMENT ASSIGNMENT

The treatment assignment variables utilized in the analysis sought to measure impact at the household and village level and were created from two primary of sources: data gleaned from the PADEE household survey and internal administrative data from Lors Thmey's sales and transaction records. The use of multiple treatment variables is helpful for understanding how Lors Thmey may have impacted the ways in which rural farmers engaged Lors Thmey and benefited from its products and activities. For instance, by comparing various levels of program intensity to the general treatment group, the research explored how different farmer profiles utilized the benefits of the program. Moreover, household level treatment helped the researchers understand what direct impact an average household engaging in Lors Thmey might have experienced as opposed to looking at benefits averaged across a wider community.

OUTCOMES OF INTEREST

Based on the key research questions that defined the analysis, the impact evaluation focused on a specific set of outcome indicators that were tied to the Lors Thmey's program theory of change. **Farmer behavior** centered around changes to livelihood practice and behavior, particularly as they related to resources spent on the farm. **Farmer productivity** revolved around differences in actual farm productivity, output and agricultural efficiency, specifically on the subset of crops that were the focus of Lors Thmey training and demonstration efforts. **Agricultural revenue**, and more broadly, household income, was also examined to understand whether or not changes observed in agricultural productivity and other labor activities resulted in quantifiable changes to household revenue. Finally, the analysis explored whether or not there was any associated link between Lors Thmey and changes in **child well-being** among children in treatment households.

3.0 RESULTS

Impact Evaluation

The findings of the report show evidence that Lors Thmey provides benefits to households through two primary channels. Following the program theory of change, participation in the program resulted in increases in the purchase and adoption of Lors Thmey products and practices. This was observed both in areas where Lors Thmey activity was more heavily present as well as in areas where activity was reduced, albeit to a lesser degree. Productivity changes were most prevalent for the subsets of produce specifically aligned with Lors Thmey technologies and were not observed across all vegetables as an aggregate. For farmers in areas where Lors Thmey was less active, vegetable producing activity was less observed, however, the incidence of time dedicated to nonfarm income was substantially higher. As a result, changes to household income showed two distinct pathways. In the first, particularly where Lors Thmey was most active, the analysis observed statistically significant increases to target vegetable income. In the second pathway, where Lors Thmey was more broadly active, farmers were able to dedicate more time to nonfarm activities, which resulted in statistically significant increases on nonfarm and total income.

Finally, the changes in income should be contextualized by larger economic trends that showed an average decline in income earned across all households within the sample over the timeframe of the program. However, the decline experienced by treatment areas was, on average, lower than the decline experienced in comparison households. Therefore, the Lors Thmey program should be viewed within a wider context of effectively helping to mitigate economic decline while maintaining the viability of vegetable production as a contributor to a household's income stream.

IMPACT OF THE FBA MODEL ON ACCESSIBILITY, ADOPTION, AND INCOME

• Did FBA activities improve the use of **agricultural inputs and practices**?

As a general observation, farmers in Lors Thmey areas behaved differently from those in comparison groups. Higher levels of take-up of advanced products and technologies were evident from the data analyzed. However, differences in the types of groups benefiting and changing most, lends some key insights into how this plays out in the wider context. For instance, changes in take-up and adoption, were most strongly felt in high intensity areas, suggesting that in places where Lors Thmey had it strongest foothold, the model was able to change farmer behavior and increase use of more advanced agricultural technologies (Table 1). At the household level, farmers who specified interaction with an FBA more recently (at endline) were more likely to adopt some kind of advanced product or technology **(Table 2).**

TABLE 1. Treatment Effects Table: FBA Advanced Agricultural Products (Village Level)

TREATMENT ARM	STATISTICAL MODEL (UNITS: COUNT OF TYPES OF PRODUCTS)						
	1	2	2A	2B	3	3A	3B
Village Treatment	0.0527***	0.0637***	0.0637**	-0.0271	0.0502***	0.0502*	-0.0269
	(0.0185)	(0.0148)	(0.0278)	(0.0197)	(0.0138)	(0.0291)	(0.0200)
High Intensity	0.0833***	0.109***	0.109**	0.0667	0.0823***	0.0823*	0.0662
	(0.0233)	(0.0228)	(0.0428)	(0.0701)	(0.0199)	(0.0438)	(0.0705)
Low Intensity	0.0406***	0.0249*	0.0249	-0.0330*	0.0190	0.0190	-0.0325*
	(0.0128)	(0.0149)	(0.0252)	(0.0188)	(0.0139)	(0.0242)	(0.0192)

*** p<0.01, ** p<0.05, * p<0.1

TABLE 2. Treatment Effects Table: FBA Advanced Agricultural Products (Household Level)

TREATMENT ARM	STATISTICAL MODEL (UNITS: COUNT OF TYPES OF PRODUCTS)						
	1	2	2A	2B	3	3A	3B
HH Level – Endline	0.127***	0.129***	0.129***	0.145***	0.113***	0.113***	0.146***
	(0.0348)	(0.0312)	(0.0376)	(0.0318)	(0.0292)	(0.0333)	(0.0320)
HH Level – Full	0.0368*	0.0348*	0.0348	0.0377*	0.0198	0.0198	0.0382*
	(0.0208)	(0.0183)	(0.0217)	(0.0208)	(0.0176)	(0.0203)	(0.0208)

*** p<0.01, ** p<0.05, * p<0.1

However, farmers in low intensity areas showed low levels of take-up but demonstrated much higher levels of days worked outside the farm **(Table 3).** For households less reliant on vegetable income overall, this may not be entirely surprising. Qualitative findings suggest that for some farmers, the benefits to productivity and efficiency most translated to the increase of time saved and spent off farm. For these households, the benefit to increased farming technology and efficiency would not necessarily be isolated to production, but could also expand to a facilitation in the ability to leave the farm to engage in other productive labor.

TABLE 3. Treatment Effects Table: Nonfarm Days Worked (Village Level)

TREATMENT ARM	STATISTICAL MODEL (UNITS: DAYS)									
	1	2	2A	2B	3	3A	3B	4	4A	4B
Village Treatment	45.40	29.49	29.49	86.11***	44.95	44.95	88.49***	30.93	30.93	88.48***
	(29.18)	(23.11)	(29.59)	(32.78)	(31.57)	(37.37)	(32.15)	(22.91)	(30.67)	(31.85)
High Intensity	29.29	18.18	18.18	186.0**	50.38	50.38	185.0**	22.44	22.44	179.4**
	(39.93)	(26.75)	(34.35)	(74.62)	(39.10)	(45.72)	(73.67)	(25.88)	(34.75)	(72.57)
Low Intensity	40.41*	40.29*	40.29	72.39**	49.89*	49.89	71.63**	39.81*	39.81	72.63**
	(23.24)	(21.04)	(28.93)	(34.32)	(25.77)	(33.08)	(33.67)	(20.88)	(28.97)	(33.50)

*** p<0.01, ** p<0.05, * p<0.1

- Did FBA activities improve **agricultural productivity**?
- Did FBA activities improve **household income?**

When examining how the Lors Thmey affected overall levels of farm productivity, the story, on average centers more around substitution than overall increases to production. This is demonstrated by statistically significant increases in target vegetable output **(Table 4)**, but no demonstrated differences across all vegetable aggregation. That is not to say that Lors Thmey, when fully applied does not result in dramatic changes to household farming output. Qualitative findings such as those highlighted in the most significant change stories show how transformative these shifts may be for individual families. Across the wider spectrum of households, however, Lors Thmey is more associated with a shift in the types of crops being produced. Insofar as this shift results in a more strategic and reliable means of responding to market demand for goods, this has the potential for encouraging diversification and shielding farmers against price volatility due to oversupply.

TABLE 4. Treatment Effects Table: Target Vegetable Yield (Village Level)

TREATMENT ARM	STATISTICAL MODEL (UNITS: Kg)						
	1	2	2A	2B	3	3A	3B
Village Treatment	20.08**	27.18***	27.18***	34.29*	19.08**	19.08	34.12*
	(9.350)	(7.796)	(10.000)	(17.67)	(9.616)	(11.66)	(17.72)
High Intensity	29.91	30.51**	30.51**	78.52	18.08	18.08	78.50
	(21.89)	(12.36)	(12.58)	(84.66)	(15.25)	(14.19)	(85.11)
Low Intensity	30.71***	20.88***	20.88**	25.09	15.28*	15.28	24.85
	(11.20)	(7.194)	(8.690)	(15.39)	(8.454)	(9.216)	(15.16)

*** p<0.01, ** p<0.05, * p<0.1

These factors around changes in behavior and productivity ultimately contribute to changes observed in the composition of household income. As expected, farmers in high intensity Lors Thmey areas that were shown to adopt more Lors Thmey products and practices and produce more target vegetables saw higher levels in income from those vegetables within the last year. Lors Thmey villages generated, on average, approximately 24,917 KHR ($15.17 PPP converted US Dollars) more in annual agricultural income versus the comparison group **(Table 5).**

TABLE 5. Treatment Effects Table: Target Vegetable Income (Village Level)

TREATMENT ARM	STATISTICAL MODEL (UNITS: RIEL)									
	1	2	2A	2B	3	3A	3B	4	4A	4B
Village Treatment	26,472***	28,821***	28,821***	32,551**	23,217**	23,217**	32,003*	24,917***	24,917**	28,975*
	(7,771)	(6,857)	(8,161)	(16,531)	(8,060)	(9,314)	(16,537)	(6,010)	(6,788)	(14,880)
High Intensity	30,883**	33,264***	33,264***	61,287	23,634*	23,634*	61,242	30,609***	30,609**	52,696
	(13,504)	(10,502)	(12,277)	(67,843)	(12,100)	(12,193)	(68,203)	(9,897)	(11,623)	(62,313)
Low Intensity	30,736***	21,241***	21,241***	25,626	17,787**	17,787**	24,942	18,014***	18,014**	22,303
	(10,948)	(7,226)	(7,673)	(15,833)	(8,265)	(8,170)	(15,629)	(6,387)	(6,861)	(13,755)

*** p<0.01, ** p<0.05, * p<0.1

What may be more surprising is the degree to which nonfarm and subsequently, total income gains are observed in the treatment areas and by the household level treatment groups. On average, overall nonfarm income gains for the treatment group approached 1,059,000 KHR ($644.95 PPP converted US Dollars) **(Table 6)**. The associated analysis suggested that this would correspond to a 30 percent marginal increase in total income. These gains in nonfarm income almost entirely comprise the difference in total income experienced between treatment and comparison groups.

TABLE 6. Treatment Effects Table: Nonfarm Income (Household Level)

TREATMENT ARM	STATISTICAL MODEL (UNITS: RIEL)									
	1	2	2A	2B	3	3A	3B	4	4A	4B
HH Level – Endline	1.272e+06*	942,212	942,212	389,668	882,369	882,369	363,099	885,524	885,524	379,389
	(729,658)	(583,476)	(669,591)	(554,105)	(618,534)	(728,044)	(547,367)	(564,680)	(659,858)	(547,277)
HH Level – Full	1.326e+06***	1.125e+06**	1.125e+06**	803,468	959,539*	959,539*	665,462	1.059e+06**	1.059e+06*	682,071
	(492,248)	(520,062)	(523,876)	(567,062)	(514,655)	(501,491)	(556,921)	(509,023)	(531,922)	(552,099)

*** p<0.01 p<0.05, * p<0

The primary takeaway from these income figures is that Lors Thmey has a potential role to play in two separate channels of income growth. By creating the foundation for behavior change that improves productivity, income gains are likely to be experienced both from increased markets earnings from target vegetables and through the creation of time to participate in other incomes sources in other income sources by reducing the total time necessary to generate the same income. The magnitude and degree to which each strategy is viable will depend on a number of outside factors linked to matters both internal and external to the program itself. Internally, as work and investment is made to bolster local vegetable markets, market earnings from vegetables could expand further by taking full of improvements to the wider market. Externally, growth in nonfarm income will be dependent on the ability for outside sectors, such as manufacturing, to offer economically desirable alternatives to farming. This may, however, be dependent on the ability for villages to achieve some level of agricultural production or subsistence. In either case, the evidence supports the notion that Lors Thmey contributes to the larger effort of cultivating livelihoods and improving the economic prospects of communities in Cambodia.

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Subpopulation Findings

Additional analyses were also done for key interest subgroups within the sample population. Female-headed households, like the general population, saw positive results compared to female-headed households in the comparison group, but not when compared to male-headed households in the comparison group. The same is not true for ID Poor households. While female-headed households in treatment saw significant positive increases across the board compared to female-headed households in the comparison group; ID Poor households within treatment villages saw very little impact from the program. This suggests that they are not buying from FBAs and that these households see little spillover effects from the Lors Thmey.

IMPACT OF THE FBA MODEL ON CHILD HEALTH AND WELL-BEING

• Did FBA activity lead to a change in **child health and well-being outcomes**?

The Lors Thmey FBA program showed limited evidence of increasing factors related to child health and well-being. Improvements to the general well-being of household members, particularly children, is centered on the assumption that increases to household revenue and income are spent on children's health and well-being. The quantitative analysis showed that, for the most part, basic material needs—comprised of access to a blanket, mattress, and clothing— for virtually all children in the sample were being met regardless of a given family's economic situation and that Lors Thmey villages were no better or worse off compared to non Lors Thmey areas.

There is some indication the Lors Thmey is associated with improved schooling outcomes. Households in Lors Thmey areas show that, on average, a higher proportion of school age children in each household are enrolled and attending school. This finding was not robust across the models used, however, so special care should be taken in interpreting the results.

There is however some evidence to believe that this question underestimates the potential impact of Lors Thmey on schooling and attendance. Qualitative interviews indicated that overall levels of total enrollment among rural children is generally high. What is not captured is the potential reduction in overall attendance of students throughout a given school year. As such, a student that is pulled out of class temporarily in order to assist with a harvest period and returns afterward would still be categorized as currently enrolled and attending according to the survey. This highlights the needs to refine exploration of impacts on child benefits, but also highlights the possibility that the findings in the study are likely to be conservative measures.

Conclusion

The findings of the report show evidence that the Lors Thmey FBA program continues to have a positive impact on farming productivity and income generation. Villages increased purchase of Lors Thmey products and adopted their practices both in areas where Lors Thmey activity was more heavily present as well as in areas where activity was more limited. The study also observed that farmers in areas where Lors Thmey was most active saw increases in vegetable income, whereas villagers in less active Lors Thmey saw more substantial income increases through nonfarm activities. This latter finding is likely due to increases in time saved and effort reduced due to improvements to agricultural productivity. In all cases, changes to farmer agricultural outputs is most prominent with crops directly associated with Lors Thmey technologies and techniques and not observed across all vegetable types. These parallel channels for income generation highlight the potential ability for the Lors Thmey FBA program to contribute to increased well-being among farmers and their households. Taken together, the positive results add to the body of evidence that show the potential that market-based models have for providing economically sustainable and viable solutions for addressing the needs of vulnerable communities.