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Article

Special research on well-being and earning of rice farmers in Laos: Survey of Official Development Assistant (ODA) projects and economic analysis

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Abstract: Farmers in rural areas can only earn revenue from rice farming which rice farming supports their better lives. Agricultural knowledge is a potential incentive for promoting well-being. This paper was survey research, there were two sections: 1) the author utilized an econometric approach to analyze the earnings of farmers from 10 provinces from 2017–2021; there were 1120 farmers involved in the survey; 2) the author used an economic evaluation approach to analyze effectiveness and efficiency of ODA by using data from 1110 farmers in 2018; 1205 farmers in 2019; and 1330 farmers in 2020. ODA is Instrumental Variables (IV) in the mincer model, ODA promotes agricultural knowledge for farmers, and of course, agricultural knowledge promotes revenue for farmers. The 2SLS and maximum likelihood are essential for the quartic function of mincer. Evaluation approaches from OECD/DAC and PCAP/JICA were utilized to compare the results of well-being indicators called basic human needs (BHN). According to the results of this study, the earnings of farmers who joined ODA projects were higher than the earnings of farmers who did not join ODA projects. The result of the economic evaluation approach found 'ineffectiveness'; on the other hand, the author could find the efficiency of ODA projects. Finally, the recommendation is that the government policy on BHN should be consistently linked to the ODA program made by both the government and donors. Certainly, BHN policy for farmers who are minorities is necessary such as providing rice fields to be utilized for free, this will lead to chances for farmers to enhance their well-being from rice production.

Keywords: basic human needs; economic analysis; ledge of agriculture; (2E) effectiveness-efficiency

JEL Classification: C36; I25; R1

1. Introduction

Lao People's Democratic Republic (Lao PDR) is well known for the origin of glutinous or sticky rice to Muto et al. [1], 'Laos has a long history of seasonal changes, Lao PDR or Laos has a tropical humid climate caused by a period of monsoons, the annual rainfall in the wet season from May to October covers 90%, while some months during the dry season between November and April may have no rainfall', see Eric and Ponnarong [2]. Rice is a very famous product exported to overseas markets. Laos' agricultural production is the basis for both Lao people's income and national revenue. Regarding the geographical areas of Laos, 'rice is primarily produced in the country's lowland', see Eric and Ponnarong [2]. Many of the leading provinces for rice production are located along the main river (Mekong River) composed of Vientiane, Khammouan, Bolikhamxai, Savannakhet, Salavan, and Champasack. Rice production and other agricultural products have substantially strengthened economic development in the past forty years after independence in

1975. ‘Rice production is the main farming activity in Laos, it is accounted for over 80% of the total agriculture products cultivated from the farming area’ by Bestari et al. [3]. Annually Laos has received funds from developed countries and international organizations such as GIZ, JICA, and OECD through implementing rice plantations.

Rice is important for rural people in terms of income and food security while they are having difficulties accessing food, income, and well-being. The problem of this study demonstrated that the poverty rate in rural areas of Laos was above 20%. The Lao Statistics Bureau (Read more: The Lao Statistics Bureau [4]. Where are the poor in Lao PDR? Small area estimation: Province and district level results. https://laosis.lsb.gov.la/tblInfo/TblInfoList.do) [4] reported that in 2019, in northern areas, Bokeo province had a poverty headcount rate of 21.42%, Odomxay had (28.59%), Luangprabang had the lowest rate (20.69%), and Huaphan had the highest rate (29.11%); in southern areas, Salavan had the highest rate (31.17%), Savannakhet had (29.50%), and Attapue had the lowest rate (26.75%). Based on these data, poverty remained in many areas. To improve the well-being of people, reduce poverty, and increase income, one way is to promote agricultural activity in local communities. Thus, since early 2015, the Lao government has started to introduce technical promotion projects to assist agricultural farmers in rice production and their earnings as well as well-being. This study has two purposes to examine such as 1) to investigate how the effectiveness and efficiency of agricultural projects support farmers, and 2) to examine how the income of farmers impacts their livelihood and well-being.

The government regulates the value chain for rice such as setting price floors. In the meantime, merchandizers are seeking to export rice products to both domestic and overseas markets Food and Agriculture Organization [5]. Small farmers have been emphasizing green and sustainable growing techniques by the Ministry of Agriculture and Forestry in Laos [6], the government has forced rice products to export to 5 million metric tons from the current export of 1 million metric tons by 2025. Certainly, increasing irrigation to improve rice production and other seed varieties is very essential to meet Laos’ national development goal.

It is essential to improve rice production with new tools such as using cheap and good quality fertilizer to increase the production and value of rice for the Lao people. Irrigation provides water for farmers not just for growing rice but for fisheries consumption as well. ‘Village farming is generally conceived as a basic unit of social life in a spontaneous community’ (See also, Etsusaka [7].) for enhancing their quality of life. Currently, despite the rainfed paddy fields, the paddy fields are also characterized by irrigation paddy fields which have been funded by ODA donors. In recent years, paddies have been irrigated by systematically pumping irrigation which has been introduced to Lao farmers, this induces a high quantity of rice products for consumption and export.

In current development, another interesting phenomenon is that Lao farmers have been struggling to give up their farming activities due to the cost of production increasing and the loss of land due to many developmental projects, many farmers are now moving to cities to find work instead of doing rice farming, this situation probably affects rice cultivation in the future, and reduce the fundamental food for Lao people, markets, economy and so forth.

The distribution of agricultural land in Lao PDR is reasonably satisfactory for farmers in the current condition. There is not much difference in the quality of paddy fields between provinces by Onphandala [8]. However, 'the average rice farms are small added' by Eric and Ponnarong [2], 'averaging only around 1–2 hectares' production can vary significantly between years, but the adaptation of higher yield varieties depends on an increased irrigated acreage. There is no irrigated acreage in the highland area which limits the highland rice farmers to grow crops per year from April to November, while some lowland rice farmers have been able to cultivate rice two times a year with irrigated farms near a river. Planting time is in June and July, farmers will cultivate rice products from October to December.

Laos is socialist in the LDCs with a weak economy and has a low income per capita compared to some neighboring countries in the pre-and post-period of education reform in 1996. Laos remained inequality in well-being in many areas, even the portfolios such as FDI, ODA, and Government expenses have played important roles in promoting the Lao economy since 1986, in NSEDP [9].

Table 1 shows the opposite trend movement between ODA disbursement and well-being indicators from the macro-economic perspective such as employment and income. Every 5 years during 2001–2020, ODA from OECD countries had been increasingly disbursed to Laos, otherwise, the employment and income of Lao people had been sharply decreased.

Table 1. Trend of ODA disbursement and macro-economic indicators.

NSEDP phases	ODA disbursement in average (US million)	The employment rate in average (percentage)	The income per capita in average (percentage)
2001–2005 (5th NSEDP)	232.98	4.6	78.43
2006–2010 (6th NSEDP)	374.21	6.23	77.90
2011–2015 (7th NSEDP)	430.29	6.17	77.25
2016–2020 (8th NSEDP)	523.84	3.63	76.51

Source: OECD [10] and World Bank [11]. Data from 2001–2020.

Table 2 shows basic human need indicators (BHN) of farmers such as assets, food and drink, life satisfaction on health, elderly people care, and basic education. These BHN indicators in **Table 2** indicate that between the years 2020, 2015, and 2010; farmers had a higher degree of tension such as accessing clean food and drink is more difficult, buying new assets is not available due to insufficient income, having healthier is impossible, to access for elderly care is also difficult and to have basic education is not widely opened in local areas. These issues are explained by the percentage change of each BHN indicator in **Table 2** from the year 2010 to 2015, and the year 2015 to 2020.

Despite the diminishing return on the well-being of rice farmers, the ODA disbursement has increasingly added funds to the Lao economy, which leads the author to strive to understand this issue. Certainly, the author sets the research question and research objective as given below:

1) Research question:

Is there any efficiency and effectiveness of ODA projects in the field of rice farming? on promoting the income and well-being of rice farmers.

2) Research objectives:

Find out the outcome of income and well-being indicators of farmers, while they partnered with ODA projects.

Table 2. Trend of ODA disbursement and well-being or BHN[a] indicators.

Year	OECD (ODA) US$ million	Rice farmers	BHN indicators					
			Assets	Clean water	Food	Life satisfaction (health)	Elder people care	Basic education
2010	389.21	4309	47% of interviewees answered that rice farming revenue did not increase the assets of their families.	65% of interviewees answered that they could not access irrigation water.	29% of interviewees answered that they could not access food security.	23% of interviewees answered that they do not have good health conditions.	56% of interviewees answered that they do not have good care for their old age.	66% of interviewees answered that they could not access to good education (at least vocational).
2015	471.09	5720	53% of interviewees answered that rice farming revenue did not increase the assets of their families.	62% of interviewees answered that they could not access irrigation water.	31% of interviewees answered that they could not access food security.	26% of interviewees answered that they do not have good health conditions.	59% of interviewees answered that they do not have good care for their old age.	72% of interviewees answered that they could not access to good education.
2020	529.08	6982	58% of interviewees answered that rice farming revenue did not increase the assets of their families.	76% of interviewees answered that they could not access irrigation water.	36% of interviewees answered that they could not access food security.	28% of interviewees answered that they do not have good health conditions.	64% of interviewees answered that they do not have good care for their old age.	75% of interviewees answered that they could not access to good education.

Source: Author's data collection from every 5 years: 2010. 2015 and 2020 from rice farmers in Laos.
[a] The right of human for Basic Human Need is necessary, access to clean water, food, sanitation, and satisfaction in life, these are required for our humankinds, read attachment: https://www.epw.in/tags/basic-human-need-index.

2. Literature review

A scale of return is a key factor in determining the demand for knowledge because knowledge becomes a factor that induces income by Onphundala [8]; concepts of knowledge and farm efficiency through the worker effect, and choice of production technique were well defined in Schultz [12] and Welch [13]. The agricultural sector in Laos plays a vital role in promoting products from agriculture, building capacity for farmers, and providing knowledge on rice farming to farmers. Good quality of rice and high yield are affected by knowledge and technique of growing rice, the volume of rice production is much grower compared with previous years.

Jamison and Lau [14] 'surveyed the worldwide literature on education and small farming production in countries of Asia, Africa, and South America and produced 37 datasets, authors revealed that the educational level of households 20 educational levels can enhance modern farm operating and used 14 levels in the same way for rice production', they showed that 'the positive correlation between education attainment and farm efficiency is 31 out of 37 studies; education was positive in the modern agricultural economy'. Similarly, other studies have also

found a positive effect of education on enhancing the efficiency of farming, but the effect was quite small.

Table 3. ODA works as a distributional channel for promoting well-being.

Distribution channel	**Developmental sector**	**Indicators promote development**		
1. Private Investment	Industry			
2. FDI	Agriculture			
3. ODA	Service	Job/Employment	Income	Wellbeing
4. Government budget	Education (knowledge)			
	Tourism, etc.			
This research's purpose	**Developmental sector**	**Indicators promote development**		
3. ODA	Knowledge of rice farming	Job/Employment	Income	Wellbeing

Source: OECD [10] and JICA/PCAP has 5 criteria [15].

However, in **Tables 3** and **4**, knowledge is an important dominator for income earnings in market economies, which means people have better knowledge, the income earning and well-being will be received afterward people get employment, however, ODA performs the role of strengthening the knowledge. Studies from centrally planned economies have shown that low rates of returns on income earning occurred in good education, many researchers carried out their analysis by utilizing the capital earning model using OLS and Maximum Likelihood to estimate the impact of education on income for example by Wei et al. [16] and Xie and Hanman [17]; the result of education promotes income was low in planned economies in the early stage of transition, for instance, in Vietnam by Moock et al [18], in Slovenia by Orazem and Vodopivec [19], and in Czech Republic and Slovakia by Chase [20].

Table 4. ODA works as a distributional channel for rice farming and well-being.

ODA	**Developmental sector**		**Indicators promote development**		
	Program for knowledge/education	**Participants**	**Employment**	**Income**	
JICA[a]	Workshop/training projects for agricultural plantation	Agriculturist of Laos	Join a training program for capacity building on agricultural farming	Salary/wage	Wellbeing
EU[b]	Training projects for enhancing knowledge of sustainable plantation	Farmers in Laos	Have good knowledge from workshops and practice growing rice on their rice farms	Revenue/income from selling rice products	
OECD[c]	Training programs for agricultural production (the purpose of the program is to reduce the gender gap)	Investors and farmers	Investor runs investment in rice farming, joins with local farmers to grow rice and sell rice production		

Source: OECD [10] and JICA/PCAP has 5 criteria [15].

[a] JICA provided training project on building capacity for agriculturist in Laos on producing organic agriculture product OA with OA standard in the internal control system ICS. Website of JICA for OA is available at https://www.jica.go.jp/project/english/laos/026/materials/c8h0vm0000f8rwvm-att/leaflet.pdf.

[b] EU leaded by some countries such as France, Switzerland, Germany, Luxembourg disbursed funds on promoting farmers for sustainable farming, Lao farmers enable their benefits from sustainable farming production. https://international-partnerships.ec.europa.eu/system/files/2021-12/mip-2021-c2021-9087-laos-annex_en.pdf.

[c] OECD program on enhancing female participation in agricultural farming in Laos, the rate of women participation in the agricultural farming was 70% which is the highest rate in ASEAN and followed by Myanmar 45% and Vietnam41%. https://asean.org/wp-content/uploads/2021/07/Background-Report-Strengthening-Womens-Entrepreneurship-in-Agriculture-1.pdf.

Abadzi [21] 'analyzed systemic problems in education in several countries: Africa, Asia, and South America, the study revealed inefficacy of educational practices under the instability of socio-economic development, many more students had no intense to attend class'. However, some papers showed a decreasing rate of absence, which improved the quality of education and income. Another research paper by Eric and Ponnarong [2] 'explored the link between educational quality and economic growth, according to their analysis, policies that aim to improve educational systems in developing nations have significant economic returns'. Many authors found that long-term improvement in education will substantially increase GDP compared to countries that make no changes. Additionally, a report [22] showed that 'quality of education can provide an employment opportunity, good livelihood, and economic growth, of course, the report provided broad policies that help people acquire skills and increase knowledge'. In this study, asserting the knowledge of agriculture for promoting the earning of rice farmers will be an important factor in revealing snapshots of farmers' livelihood and well-being.

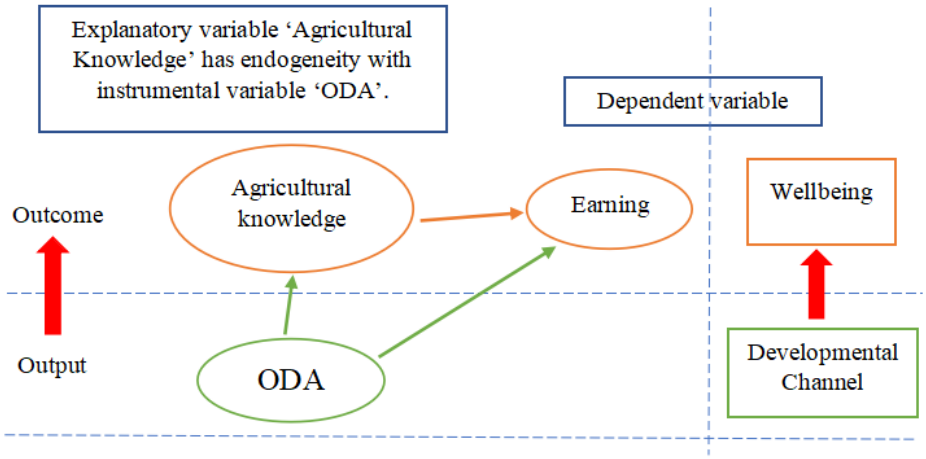


Figure 1. Flow of ODA as an instrumental variable for promoting agricultural knowledge and income.

This paper focuses on how agricultural knowledge promotes income earning of rice farmers (assume that people with agricultural knowledge, will have better opportunities to earn income), The Mincer model will be deployed in the analysis; in **Figure 1** the flow chart of ODA projects impact on income earning for farmers, namely, ODA projects promote agricultural knowledge for farmers and after the stage of rice plantation and production, farmers be able to gain their incomes from selling those rice production, in consequences, farmers will make expenses or purchase things to serve their lives for their wellbeing.

Another scenario is that measuring the effectiveness and efficiency of ODA in promoting well-being is privileged by adopting evaluation approaches from OEDC/DAC [23] and PCAP/JICA [15] in **Table 5**. Finally, the study also revealed possible policies that can bolster local areas' development with the participation of ODA.

Table 5. Economic evaluation criteria created by organizations.

Criteria	Main checking points on economic evaluation	
	OECD/DAC	**PCAP/JICA**
Effectiveness	1) To what extent were the objectives achieved/are likely to be achieved? 2) What were the major factors influencing the achievement or non-achievement of the objectives?	The output and objectives of the project are coherent and estimate the results of the project achievement by looking at the real implementation of the project compared with the designed activities in the project in the beginning phase.
Efficiency	1) Are Activities cost-efficient? 2) Objectives achieved on time? 3) Project implemented most efficiently compared to alternatives?	Output and input management of the project are well progressive, estimate budget used in the project's activities, estimate utilizing inputs such as natural resource and human resource.

Source: OECD/DAC has 6 evaluation criteria [23] and JICA/PCAP has 5 criteria [15].

3. Methodology and data

To find a concrete result of ODA impacts on the income and well-being of rice farmers, the author utilized two approaches to estimate the connection between ODA and other indicators like income and well-being. Focusing on the 'efficiency and effectiveness' of ODA is necessary. Thus, to carry out the estimation of the efficiency and the effectiveness of ODA project impacts on income and well-being; the first estimation used the evaluation approach; and the second estimation used the econometric approach by relying on the Mincer [24] equation.

3.1. Economic evaluation

The survey was conducted to find out whether is there any efficiency and effectiveness of ODA projects in promoting the well-being of rice farmers. In this analysis, there were farmers between 1000–1350 people who had been interviewed by the survey team in 2018, 2019, and 2020 (3 years). Evaluation approaches from OECD/DAC [23] and PCAP/JICA [15] were used as the typical model for the author in this research, the author relies on the evaluation criteria from OECD and JICA to formulate some evaluation indicators in **Table 6** in this study. Indicators of well-being or BHN indicators such as agricultural knowledge, employment opportunity,

Table 6. Economic evaluation estimation for this research.

Criteria	Main checking points on economic evaluation and BHN indicators		
	OECD/DAC	**PCAP/JICA**	**This research**
Effectiveness	1) To what extent were the objectives achieved/are likely to be achieved? 2) What were the major factors influencing the achievement or non-achievement of the objectives?	Are the outputs and objectives of the project coherent? estimate the project achievement by looking at the real implementation of the project and the designed activities in the pre-project.	1) Does the ODA project support rice farmers with new knowledge for rice farming/employment opportunities? 2) Does the ODA project improve your well-being? Such as having many more assets, better life expectancy for elderly care, health, food, and drink.
Efficiency	1) Are activities cost-efficient? 2) Objectives achieved on time? 3) Project implemented most efficiently compared to alternatives?	Are output and input management of the project well-progressive? estimate the budget used in the whole project's activities and estimate inputs such as natural resources and human resources.	1) Does the ODA project help cost minimization on rice farming? 2) Does the ODA project reduce the gap in life between you and other farmers?

Source: OECD/DAC has 6 evaluation criteria [23] and JICA/PCAP has 5 evaluation criteria [15].

assets of farmers, nutrition of farmers from clean water and food, life safeguard on health; life expectancy on elderly people care, cost minimization on rice production, and gap reduction among ethnicities are entirely used in the analysis, based on Robin Loveridge et al. [25].

1) Analysis factors in the economic evaluation approach, developed by the author:

$$\sum_{i=1}^{n}(X_{it}+Y_{it})=\sum_{i_{x=1}}^{n_x}X_{it}+\sum_{i_{y=1}}^{n_x}Y_{it} \quad (1)$$

Replace E for the summation

$$E(X_i+Y_i)_t=E(X_i)_t+E(Y_i)_t \quad (2)$$

$$E(X_i)_t=E(X_i+Y_i)_t-E(Y_i)_t \quad (3)$$

Vice versa:

$$E(Y_i)_t=E(X_i+Y_i)_t-E(X_i)_t \quad (4)$$

let, $E(X_i + Y_i)$ is the total number of farmers from rice farming who were interviewed as to 'well-being indicators', and 't' refers to the year.

Then, the extent:

$E(X_{ia})$ is a farmer who answered 'agree' to the ODA projects to increase well-being.

$E(Y_{id})$ is farmers who answered 'disagree' for the ODA projects increase well-being.

Next, Find the percentage mean of $\%\bar{E}(X_{ia})_t=\frac{E(X_{ia})_t}{E(X_i+Y_i)_t}\times 100\%$

And the percentage of mean $\%\bar{E}(Y_{id})_t=\frac{E(Y_{id})_t}{E(X_i+Y_i)_t}\times 100\%$

2) Interpretation of factors:

- Single factor:

$\bar{E}(X_{ia})$ > 0.5 or 50%, there is efficiency or effectiveness, means $\bar{E}(X_{ia}) > \bar{E}(Y_{id})$

$\bar{E}(Y_{id})$ > 0.5 or 50%, there is inefficiency or ineffectiveness, means $\bar{E}(Y_{id}) > \bar{E}(X_{ia})$

- The single factor with time determinant (n–k):

't' represents the year, while k is the determinant of year lag $|k|$ = 0, 1, 2, 3, …, K

If mean $E(X_{ia})$ has ~ $E(X_{ia})_{t-0} > E(X_{ia})_{t-1} > E(X_{ia})_{t-2} \ldots > E(X_{ia})_{t-k}$

Or in any case, ~ $E(X_{ia})_{t-0} < E(X_{ia})_{t-1} < E(X_{ia})_{t-2} \ldots < E(X_{ia})_{t-k}$

~ $E(X_{ia})_{t-0} > E(X_{ia})_{t-1} < E(X_{ia})_{t-2} \ldots < E(X_{ia})_{t-k}$

~ $E(X_{ia})_{t-0} > E(X_{ia})_{t-1} > E(X_{ia})_{t-2} \ldots < E(X_{ia})_{t-k}$

~ $E(X_{ia})_{t-0} < E(X_{ia})_{t-1} > E(X_{ia})_{t-2} \ldots > E(X_{ia})_{t-k}$

But if 2/3 of $\bar{E}(X_{ia})$ is greater than 0.5 or 50%.

Accepts, that there is effectiveness/efficiency.

If mean $E(Y_{id})$ has ~ $E(Y_{id})_{t-0} > E(Y_{id})_{t-1} > E(Y_{id})_{t-2} \ldots > E(Y_{id})_{t-k}$

Or in any case, ~ $E(Y_{id})_{t-0} < E(Y_{id})_{t-1} < E(Y_{id})_{t-2} \ldots < E(Y_{id})_{t-k}$

~ $E(Y_{id})_{t-0} > E(Y_{id})_{t-1} < E(Y_{id})_{t-2} \ldots < E(Y_{id})_{t-k}$

~ $E(Y_{id})_{t-0} > E(Y_{id})_{t-1} > E(Y_{id})_{t-2} \ldots < E(Y_{id})_{t-k}$

~ $E(Y_{id})_{t-0} < E(Y_{id})_{t-1} > E(Y_{id})_{t-2} \ldots > E(Y_{id})_{t-k}$

But if 2/3 of $\bar{E}(Y_{id})$ is greater than 0.5 or 50%.

Accepts, that there is ineffectiveness/inefficiency.

3) Data

The survey was conducted in 2018, 2019, and 2020 in many provinces in Laos, namely, there are 5 provinces from the northern part: 'Phongsaly, Bokeo, Odomxay, Huaphan, Luangprabang', and 6 provinces from the middle and southern part: 'Attapue, Champasack, Saravan, Xekong, Bolikhamxay, and Vientiane Capital', totally there are 11 provinces in the survey, there were 1120 farmers in 2018, 1,205 farmers in 2019 and 1330 farmers in 2020 involved in the interview of the survey team. These provinces are areas where ODA projects in the field of rice farming have been implementing the agricultural framework made by the Lao government and donors.

3.2. Empirical approach (econometrics)

1) The model specification is based on Mincer [24].

$$\ln Y_i = \beta_0 + \beta_1 S_i + \beta_2 EX_i + \beta_3 EX_i^2 + \mu_i \quad (5)$$

mincer mentioned the variables such as Y_i represents income from the monthly earnings of the individual, S_i is the total years of school attendance of the individual (between basic school to vocation), EX_i is the total years of working experience of the individual i represents the individual; μ_i is residual. Potential experience $EX_i^2 = (\text{Age} - \text{Education year} - 6)^2$, 6 is the beginning year for the individual to start his or her primary school.

In Equation (6) the author extents:

Y_i presents the income earnings of the individual farmer.

S_i is the level of agricultural knowledge of individual farmer, there are four levels of agricultural knowledge for farmers: 1) No knowledge of agriculture or rice farming, 2) Basic knowledge of agriculture, 3) Good knowledge of agriculture, 4) Better skill of agriculture, 5) Depth knowledge on rice farming, 6) Advanced knowledge of agriculture, 7–9) Professional rice farmer.

EX_i is the total years of working experience of individual farmers.

The potential experience EX_i^2 is $(\text{Age} - S - a)^2$, Age is the total age of the individual farmer, *S* is total years of school attendance of individual farmer, a is the beginning year of the individual farmer to start his or her vocational school in between the age of 12 to 18 years old ($12 \leq a \leq 18$).

Then, let the fitted income-earning model be:

$$\ln Y_i = \beta_0 + \beta_1 S_{\text{agricultural knowledge (i)}} + \beta_2 EX_i + \beta_3 EX_i^2 + \mu_i \quad (6)$$

In Equation (6), to solve the quadratic function of Mincer, the author considered Instrumental Variable (IV) Technique by using 2SLS estimation and Maximum Likelihood Estimation.

2) Data

The research was conducted in many provinces in Laos, namely, 11 provinces including Phongsaly, Bokeo, Odomxay, Huaphan, Luangprabang, Attapue, Champasack, Saravan, Xekong, Bolikhamxay and Vientiane Capital. The data in this analysis was surveyed in 2017–2021 by totally interviewing 1120 rice farmers.

4. Results

This paper investigated ODA and agricultural knowledge in association with income earnings and the well-being of rice farmers. The study revealed some interesting results as explained below:

4.1. Economic evaluation analysis

1) Effectiveness

Table 7 shows the number of farmers involved in the interview of the survey team, in 2018 1110 farmers responded to the interview as well as in 2019 there were 1205 farmers, and 1330 farmers in 2020 participated in the interview; Interestingly, the result revealed that ODA projects do not make any effect on promoting the wellbeing of farmers, such a result is based on observing BHN indicators include: agricultural knowledge of farmers, employment opportunity of farmers, assets of farmers, food and drink, elderly care, and life satisfaction on health; there was over fifty percent of farmers replied that ODA projects cannot promote the wellbeing of farmers in terms of effectiveness, for instance in 2018 the percentage of mean $E(Y_{id})$ of life satisfaction on health was 55%, in 2019 $E(Y_{id})$ was 50% and in 2020 $E(Y_{id})$ was 51%, these percentages of mean $E(Y_{id})$s are relevant to rise the ineffective level of ODA projects. Overall, the percentage of mean $E(Y_{id})$ of every HBN indicator in **Table 7**, from 2018 to 2020, was greater than the percentage of mean $E(X_{ia})$; of course, in the symbolic interpretation is '$E(Y_{id}) > E(X_{ia})$'.

Table 7. Result of effectiveness, based on the designed evaluation criteria.

Year	Rice farmers	BHN indicators for rice farmers' wellbeing													
		Knowledge of agriculture		Job/employment opportunity		Assets		Water access		Food security		Life satisfaction (health)		Elderly people caring	
		$E(Y_{id})$	$E(X_{ia})$	$E(Y_{id})$	$E(X_{ia})$	$E(Y_{id})$	$E(X_{ia})$	$E(Y_{id})$	$E(X_{ia})$	$E(Y_{id})$	$E(X_{ia})$	$E(Y_{id})$	$E(X_{ia})$	$E(Y_{id})$	$E(X_{ia})$
2018	1120	41%	59%	54%	46%	62%	38%	51%	49%	61%	39%	55%	45%	61%	39%
2019	1205	56%	44%	53%	47%	62%	38%	51%	49%	48%	52%	50%	50%	52%	48%
2020	1330	57%	43%	53%	47%	62%	38%	52%	48%	49%	51%	51%	49%	53%	47%

Source: Author's calculation and evaluation.

2) Efficiency criteria

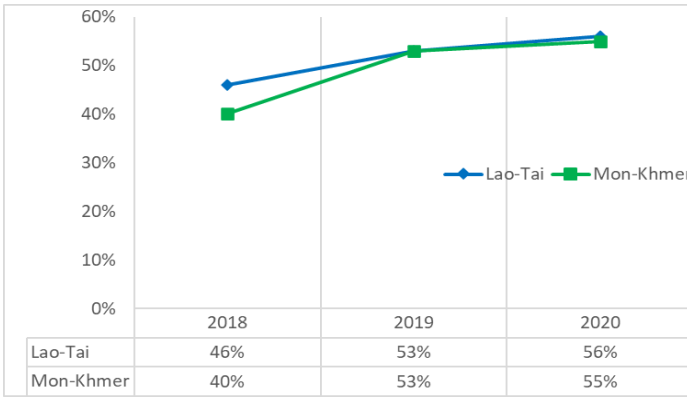
Table 8 shows the results of farmers joining the interviewing of the survey team, the interpretation is similar to the detail in **Table 7**. In **Table 8**, there are two BHN indicators: cost minimization for rice production and gap reduction among ethnic groups, these indicators are used for estimating the efficiency of ODA projects. The result revealed that ODA projects can assist farmers in minimizing the cost of rice production due to the reason of ODA projects provide bio-fertilizer for free to rice farmers, farmers do not pay any cost for purchasing this material, simultaneously, ODA projects can reduce the gap among ethnics in local communities because facilities provided by Lao government and ODA projects such as roads, sanitation and welfares, these facilities are undoubtedly accessible by farmers, even some farmers are from minor tribes in the community. In **Table 8**, the percentage of mean $E(X_{ia})$ of cost minimization was 65% in 2018, 54% in 2019, and

63% in 2020, these percentages of $E(X_{ia})$s are greater than the percentages of mean $E(Y_{id})$; likewise, farmers said, ODA projects were efficient in terms of cost minimization and gap reduction among ethnics, the symbolic interpretation is $E(X_{ia}) > E(Y_{id})$, and there are 2/3 of $E(X_{id})$ from the result.

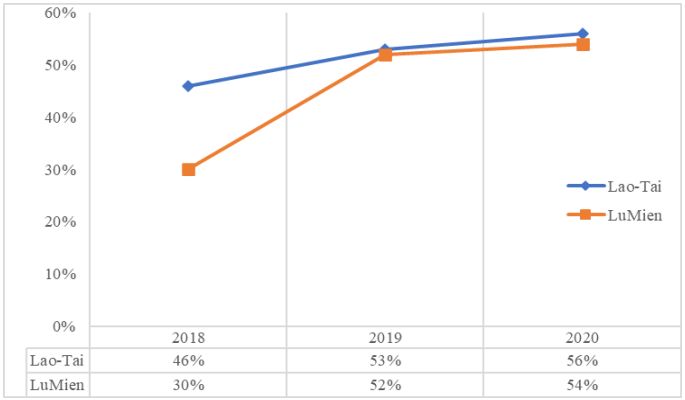
Table 8. Result of efficiency, based on designed evaluation criteria.

Year	Rice farmers	BHN Indicators for rice farmers' Wellbeing			
		Cost minimization for rice production		Gap reduction among ethnics	
		$E(Y_{id})$	$E(X_{ia})$	$E(Y_{id})$	$E(X_{ia})$
2018	1120	35%	65%	62%	37%
2019	1205	46%	54%	49%	51%
2020	1330	47%	53%	49%	51%

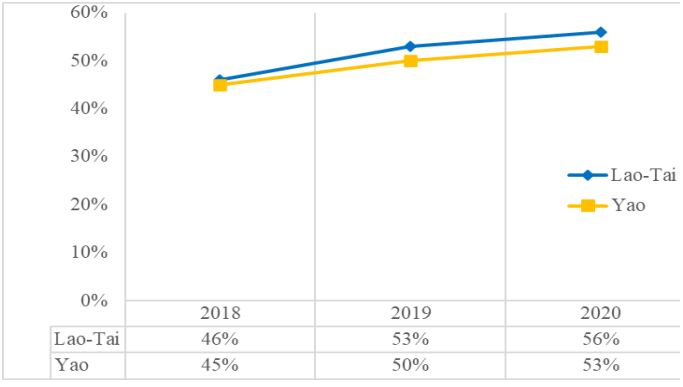
Source: Author's calculation and evaluation.



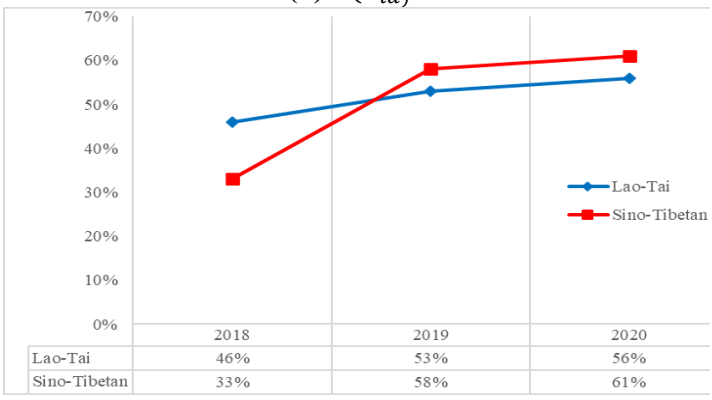
(a) $\bar{E}(X_{ia})$



(b) $\bar{E}(X_{ia})$



(c) $\bar{E}(X_{ia})$



(d) $\bar{E}(X_{ia})$

Figure 2. Comparison of the gap reduction among minor ethnics and major ethnics 'Lao-Tai'.

Figure 2, this figure shows the percentage of mean $E(X_{ia})$ on the gap reduction between minor ethnics of Lao people including LuMien, Mon-Khmer, Sino-Tibetan, and Yao, and the major ethnic of Lao people called Lao-Tai, gap reduction among minor ethnics and major ethnic had been substantially diminished during 2018–2020, for instance in **Figure 2a**, in 2018 the minor ethnic called LuMien had 30% of the percentage of mean $E(X_{ia})$ which compare with Lao-Tai had 46% of the percentage of mean $E(X_{ia})$, this means that the gap among Lao-Tai and LuMien was very different, but in 2019 and 2020 the gap was reduced to almost the same percentage

of mean $E(X_{ia})$, of course, in 2019 the percentage of mean $E(X_{ia})$ of Lao-Tai was 53% and LuMien was 52%, and in 2020 $E(X_{ia})$ of Lao-Tai was 56% and $E(X_{ia})$ of LuMien was 54%. Despite the percentage changes in **Figure 2**, farmers from minor ethnics said, they have more chances to use facilities provided by the Lao government and ODA projects such as good roads, expandable markets, better sanitation, and more satisfying welfare; these are facilities comfort the activity for rice plantation and production to farmers.

4.2. Econometric analysis

Table 9 shows the result of ODA impacts on agricultural knowledge, and then agricultural knowledge impacts on the income of farmers, simultaneously, the experience of farmers also impacts on income of farmers, these results are interpreted by relying on the Mincer [24] model. Firstly, ODA is used as an instrumental variable or endogenous variable of the agricultural knowledge which rice farmers gained this agricultural knowledge from ODA projects through workshops and training in the article related to agriculture and rice farming. Secondly, according to the procedure of rice production, farmers used agricultural knowledge for their rice farming activities, in consequence, after selling rice production most farmers will have income and eventually farmers will purchase things for their lives, this circumstance will reflect the quality of life or wellbeing for farmers. In **Table 9** the author used the variable called agricultural knowledge 'Tertedu' in Equation (6), the result from 2SLS and MLE estimation showed that there was a positive relationship between Tertedu and income of farmers, the coefficient of Tertedu is 0.063, this means increase 1 level of agricultural knowledge will increase 6.3% in the income of rice farmers; the interpretation is the same for the variable 'Jobexp' which is the experience of farmers, the coefficient of Jobexp is 0.0247, this means increase 1 year for the experience of farmers will increase 2.47% in the income earning of rice farmers, but not for potential experience 'Jobexp2'.

Table 10 interprets the result of the income earning of rice farmers who partnered with ODA and rice farmers who did not partner with ODA. The coefficient of Tertedu of rice farmers partnered with ODA was 0.0143 and the coefficient of Tertedu without ODA was 0.0132, which means farmers partnered with ODA projects can earn income 'LnYi' higher than farmers who did not partner with ODA projects, for instance, increases 1 level of agricultural knowledge to farmers will increase 1.43% in income earning for farmers with ODA projects and 1.32% in income earning for farmers without ODA projects; also, for the experience of rice farmers 'Jobexp', the author interpreted that increases the 1-year experience of farmers who partnered with ODA projects will increase 0.73% in income earning, as well as the income of farmers who did not partner with ODA projects, will also increase 0.89% in income earning. Even though the coefficient value of Jobexp for rice farmers without ODA is higher than the coefficient value of rice farmers partnered with ODA, however, both coefficients have a positive relationship with the income earning of rice farmers. but not for potential experience 'Jobexp2'.

Table 9. Impact of ODA, region, and gender on education and income.

2SLS Estimation				
Variables	**Tertedu**	**Jobexp**	**Jobexp2**	**Cons**
Logincome	0.063708	0.0247152	−0.0003365	2.596943
	(12.83)	(11.37)	(−7.66)	(89.73)
R-square: 0.3602				
Observations: 1120				
Instrument variables: ProgODA, Region, Gender				
Test for endogeneity: (*P* = 0.0132), Tertedu is endogenous variables with instrument variables				
First stage least square testing of IV: (*P* = 0.0000), *R*-square: 0.5826, Adjust *R*-square: 0.5807				
Test for the validity of IV model: (*P* = 0.9684), accept the null hypothesis, this IV model is valid				
Maximum Likelihood Estimation				
Variables	**Tertedu**	**Jobexp**	**Jobexp2**	**Cons**
Logincome	0.0637088	0.0247152	−0.0003365	2.59694
	(12.83)	(11.37)	(−7.66)	(89.73)
R-square: 0.3602				
Observations: 1120				

Source: Author's Calculation in 2022 by applying the Instrumental variables (IV) with 2SLS estimation and MLE estimation.

Table 10. Impact of ODA on promoting education and income

	MLE			
Variables	**With ODA**	***P***	**Without ODA**	***P***
Tertedu	0.0142875	(0.0000)	0.0131978	(0.013)
	(8.53)		(2.50)	
Jobexp	0.0073123		0.0089813	
	(6.09)		(7.09)	
Jobexp2	−0.0001029		−0.0001197	
	(−4.61)		(−5.18)	
Cons	1.012901		0.9758029	
	(63.67)		(41.65)	
R-square:	0.30292915		0.26467609	
Observations:	653		467	
Instrument variables: Region, Gender, With ODA or Without ODA				
All coefficients are related by the significance at the 5% level.				

Source: Author's calculation in 2022 by applying the Instrumental variables with MLE estimation on Mincer's income function.

5. Discussion

Laos has become a country for rice farming due to the availability of geographical areas and rivers. Rice plantation makes revenue for the local farmers, enhancing their well-being after selling rice crops, and contributing to the Gross Domestic Product (GDP). In developing countries with natural resources and wide nature-based land fields for rice plantations, this condition can grow the locality's

economy and livelihood of residents in Schultz [12]. However, it is particularly vulnerable to narrative economic improvement, not a broad incentive to grow the economy in the least developed country by Abadzi [21]. As a result, the agricultural sector of Laos has experienced a complete halt, the trade for rice was expected to continue to grow throughout 2021–2030 due to ongoing rice projects supported by the Lao government in research of Sethboonsarng [26]. However, a weak capacity of rice production in Laos will lead the local economic activities to result in a decrease in income earning for local farmers, unemployment issues will further hinder economic performance and overall GDP markets in the study of the Food and Agriculture Organization [5].

6. Conclusion and recommendations

6.1. Summary

The economic evaluation approach has two criteria such as effectiveness and efficiency, the result of the effectiveness revealed that ODA projects for rice farming do not show any effectiveness in promoting the BHN of farmers, this meant evaluating some BHN indicators include: agricultural knowledge, employment opportunity, assets of farmers, clean food and drink, life satisfaction on health, and elderly people care, these indicators did not show any outstanding participation of ODA projects on promoting the BHN of rice farmers; each BHN indicator had the percentage of mean $E(X_{ia})$ smaller than the percentage of mean $E(Y_{id})$. On the other hand, the result of the evaluation on efficiency found that ODA projects are 'efficient' for promoting cost minimization on rice plantation and production as well as promoting the gap reduction among ethnics in local areas, the cost minimization and gap reduction among ethnics have the percentage of mean $E(X_{ia})$ greater than the percentage of mean $E(Y_{id})$, likewise, there are also 2/3 of the percentages of mean $E(X_{ia})$s are higher than 50%. Despite the results, farmers from minor ethnics said, they have better chances to access some facilities provided by the Lao government and ODA projects such as good roads to rice farms, and expandable markets for selling rice products, these are facilities comfort the rice plantation, and production for farmers in minor ethnics. Thus, in terms of efficiency, ODA projects play a vital role in cost minimization and gap reduction for farmers. On the other hand, in terms of effectiveness, ODA projects do not work effectively in promoting villagers' well-being via BHN indicators.

According to the result of the econometric approach by relying on the Mincer model, the study found that farmers who partnered with ODA can earn income higher than rice farmers who did not partner with ODA projects in **Table 10**. Certainly, agricultural knowledge of rice farmers 'Tertedu' in **Table 9** will support the income earning of rice farmers 'LnYi'. Simultaneously, the experience of rice farmers 'Jobexp' is also a factor in promoting the income earning of rice farmers 'LnYi' in Equation (6) of this survey analysis.

6.2. Recommendation

6.2.1. Policy

Even though minimizing the cost of rice production can be efficiently done by the participation of ODA projects, the policy required for lower input prices is vitally needed for rice farmers.

In the study, of course, ODA can reduce the gap among ethnics, however, the government policy on providing free utilizing facilities such as new roads to rice farms, sanitation, and health care without fee, are important facilities to all local farmers and recently such facilities are still required in their local communities.

6.2.2. Further study

ADB evaluation approach paid much attention to the ex-post evaluation of ODA projects. Thus, the next study will grapple with to use of the ADB evaluation approach in the phase of ex-ante evaluation of ODA projects.

Female opportunity to access well-being is more difficult than males, well-being estimated by observing female participation in rice production is also challenging.

Informed consent: Participants in the survey were beneficiaries who had been informed of ethical consent by the beginning time of interviewing and in the questionnaire made by the author. Participants were informed they could withdraw from the survey if they wanted, and their data could be deleted without any personal information captured and identified.

Conflict of interest: The author declares no conflict of interest.

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