

Research Article

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How does willingness and ability to pay of palm oil smallholders affect their willingness to participate in Indonesian sustainable palm oil certification? Empirical evidence from North Sumatra

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Abstract: A sample survey of palm oil smallholders was used to examine the amount of Willingness and Ability to Pay (WATP) and the factors that determine WATP as well as the impact of WATP on the willingness to participate of smallholders in Indonesian Sustainable Palm Oil (ISPO) certification scheme. Results reveal that the average amount of WATP accounted only half of the certification cost, implying that partial assistance is needed to support the smallholders through government subsidy. The study shows that WATP significantly affects the willingness to participate, and smallholders with higher WATP are more likely willing to participate in ISPO. Both WATP and willingness to participate are significantly determined by social norms (farmers collective impression) and awareness of the consequences of unsustainable farming practices. This result indicates the necessity to improve a positive impression on ISPO and increase awareness of the importance of following the sustainability principles of palm oil farming to increase the smallholders' WATP, and at the same time their willingness to participate in ISPO program. It is suggested for the government to intensify the campaign of the program to a wider range of smallholders to increase their knowledge and awareness of the certification program.

Keywords: smallholder, ISPO certification, WATP, willingness to participate

1 Introduction

Indonesia's palm oil sustainability index is considered low or less sustainable (Papilo et al. 2018). This problem, coupled with demands from importing countries that desire environmentally friendly palm oil products, increases the urgency of Indonesia to produce palm oil sustainably (Khatun et al. 2017). The Roundtable on Sustainable Palm Oil (RSPO) emerges as a guarantee that the certified products are produced without damaging the environment or harming the surrounding community. However, in this case, the most disadvantaged parties, according to Schoneveld et al. (2019), are smallholders, especially independent farmers. Findings from Oosterveer et al. (2014) suggested that independent smallholders cannot participate in RSPO certification due to the absence of attachment of farmers to other organizations or parties such as NGOs that can guide certification requirements (Brandi et al. 2015).

The Indonesian government then formed the Indonesian Sustainable Palm Oil (ISPO) to create a national sustainable certification scheme that is more suitable for the conditions of palm oil farmers in Indonesia. The regulation is consisted of mandatory guidelines for all plantations in producing palm oil to obtain an ISPO certificate based on the standardized assessment (Apriyanto et al. 2019). ISPO certification by the government is used as a kind of guarantee letter that must be owned by every palm oil producer as written in the Minister of Agriculture Regulation No. 11/2015, which was later strengthened by Presidential Regulation No. 44/2020. Even so, smallholders still face difficulties in adhering to the ISPO version of the sustainability standard (Hutabarat et al. 2019). Limited knowledge and lack of skills can be the main reasons. Until 2017, less than 1% of smallholder plantations had been certified by ISPO and RSPO. Meanwhile, smallholder plantations control more than 40% of Indonesia's palm oil plantation area. Suhada et al. (2018) pointed out that this emphasizes the importance of the sustainability of smallholder plantations for the future of Indonesian palm oil in the global market.

A comprehensive assessment of how smallholders perceive the certification scheme will significantly assist

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responsible regulators. Willingness and ability to pay (WATP) and willingness to participate by farmers in this study were selected as variables showing the perspective of smallholders toward ISPO, which is mandatory not only for private plantations and state-owned plantations but also for smallholder plantations. In connection with the willingness of farmers to join programs made by the government, Schoneveld *et al.* (2019) recommended the need for the presence of the government to provide counseling for small farmers to get proper information about what smallholders need the most. Therefore, the objectives of this study are as follows: (1) to estimate the farmer's WATP, (2) to identify the determinants of WATP, and (3) to analyze the influence of WATP and other factors on willingness to participate in the ISPO certification program.

Information related to WATP was obtained using the Contingent Valuation Method (CVM) through interviews with palm oil farmers. Descriptive analysis was used to determine the amount of WATP. The determinants of WATP were analyzed using the Tobit model regression analysis, while the probit model was employed to analyze the effect of WATP and behavioral factors on the willingness of farmers to participate in ISPO.

2 Literature review

The CVM is used to measure the monetary value of environmental objects that have no market value, such as environmental damage (Mutandwa *et al.* 2019). According to Whitehead and Haab (2013), CVM is included in the scope of welfare economics. In addition, Kojima and Ishikawa (2017) described CVM as a Marginal Rate of Substitution, where consumers are willing to sacrifice one of their goods to get other goods with similar utility. CVM acts as a tool to actualize sustainable agricultural practices. Emas (2015) attested the close relationship between the environment and the economy, which plays a vital role as the basis for sustainable development. This principle is essential to be used as the foundation for sustainable palm oil development. Meijaard *et al.* (2018) revealed that apart from the contribution of palm oil as the second largest foreign exchange contributor to the national economy, palm oil also creates enormous job opportunities. The economic growth generated by the palm oil commodity will be ideal if it considers environmental aspects in its management. Therefore, sustainable certification is needed

by those who take role in palm oil from upstream to downstream.

In terms of agricultural certification, Azhar *et al.* (2018) explained that the ideal certification refers to certification that technically and financially adopts universal standards, which is capable of reducing the burden of small-scale producers but still firmly represent Sustainable Development Goals. This makes it clear that in order to create a better certification scheme, the constraints faced by smallholders must be taken into account. McGurk *et al.* (2020) using the CVM conducted a study to predict factors that influence the willingness to participate and willingness to accept of farmers toward agri-environmental programs conducted by the government. The factors that influence willingness to participate were analyzed using the probit regression model, as in the study of Abdullah *et al.* (2019).

WATP measurement is used by following a study conducted by Danyliv *et al.* (2014). Factors that affect WATP were analyzed using Tobit following the study by Meijaard *et al.* (2018). Meanwhile, the theory of planned behavior found by Fishbein and Ajzen (2010) was applied to discuss the influence of attitudes, subjective norms, behavior control, and farmer intentions in complying with certification sustainability standards. The findings of Si *et al.* (2020) in the form of a modified model of planned behavior proved that awareness of the consequences significantly affects intention. This variable will be employed as one of the predictors in this article. Previous studies on willingness to pay (WTP) have demonstrated particular problems with the response of protest. Some studies have decided to discard the protest response, but recently, researchers have found that the protest response is considered important and its removal is likely to bias the results of the analysis (Chen and Qi 2018).

Several things that can be considered to improve the ability of farmers to comply with certification requirements can be seen from the study of Giuliani *et al.* (2017), which proved that the positive correlation between certification and environmental consequences could be strengthened if farmers sell their crops through cooperatives. Also, the presence of a premium price for smallholders is also considered important as a motivation boost for palm oil producers to join and remain in the certification scheme (Furumo *et al.* 2020). Therefore, Tey *et al.* (2020) recommended technical and financial assistance as well as favorable regulations to produce a more inclusive scheme (Hidayat *et al.* 2015).

3 Methods

3.1 Conceptual framework

There have been a number of studies conducted to measure WTP and willingness to participate using the CVM, among others by Amegnaglo et al. (2017), McGurk et al. (2020), Abdullah et al. (2019), and Chen and Qi (2018) who researched on the CVM to analyze the WTP of farmers against a program. The advantages of the CVM as an approach to calculating WTP provide an opportunity to estimate a person's preference for ecological, environmental services (He et al. 2018). However, instead of applying WTP as used in other current literature, this study uses the concept of WATP to measure the stated preference of farmers toward ISPO certification program. WATP was previously used by Danyliv et al. (2014) to observe the ability and WTP of the hospitalized patients toward a certain medication. It is believed that the stated preference of smallholders is more suitably measured by WATP than WTP because of the presence of economic constraints that they should not only be looked over their WTP but also the ability to pay for the certification cost. Afterward, they should declare whether they are willing to participate in the ISPO certification or not. Therefore, the implication of WATP toward willingness to participate in certification can be predicted through further analysis in this study. This shall be one of the scientific advancements that this article provides compared to other literature.

Concerning the sustainability of palm oil plantations, one of the efforts to produce sustainable palm oil is through a certification scheme, which requires all parties involved in the palm oil marketing chain to be certified. Some of the world's sustainable certification schemes for agricultural commodities are the RSPO, International Sustainable and Carbon Certificate, Universal Trade Zone (UTZ), Global GAP, and Rainforest Alliance. This certification is a prerequisite for making local products traded in the global market. To set certification standards in Indonesia, the government decided to create a national sustainable certification scheme known as ISPO (Hutabarat et al. 2019).

ISPO is targeted to palm oil plantation producer, including state-owned, private, and smallholder plantations. State-owned and private palm oil plantations generally face almost no difficulty meeting standards, in contrast to smallholders. The overly complex problems faced by smallholders still need to be added to the burden of ISPO certification obligations that make the performance

of smallholders in ISPO insufficient (Hidayat et al. 2018). The main obstacle in this matter is whether the farmers are willing to participate in the government program because the willingness to participate will be determined by the willingness and ability of the farmers to pay (WATP). To strengthen the national certification scheme, the use of the CVM to calculate WATP and willingness to participate, as well as the factors that influence them both, can be used as input for the government in designing certification schemes that holistically suit the conditions of palm oil smallholders (Saadun et al. 2018).

3.2 Study area

North Sumatra is the province with the second-largest palm oil plantation in Indonesia. Padang Lawas itself is known as a suitable location for palm oil development. This location does not have peatlands like other areas which are very risky for planting palm oil. Besides, in many cases, palm oil plantations owned by smallholders in Padang Lawas were initially planted rubber or rice fields. Therefore, deforestation by burning forest land is rarely found in Padang Lawas. In this area of palm oil plantations, smallholders are categorized into two types, independent and managed. There were differences between independent and managed smallholders when observed based on their characteristics. Independent farmers are local residents who live in Padang Lawas. Meanwhile, managed farmers are centered in one particular area, where there lived transmigrants from Java Island who had moved permanently onto this location since 1990. In addition, managed farmers involve in farmer groups and cooperatives that aim to provide financial management support for these farmers. The determination of the location in this study was carried out purposively on the recommendations given by the Padang Lawas Regency Agriculture Office. The location of the study area in Padang Lawas Regency is depicted in Figure 1.

3.3 Sampling and sample size

The sampling frame consisted of both independent and managed smallholders, and the distribution is summarized in Table 1. At least four sub-districts were purposively selected to be the location of this study, namely, Barumon, Lubuk Barumon, Barumon Selatan, and Hutaraja Tinggi. On one hand, most of the farmers in Padang Lawas are independent farmers who do not receive assistance in

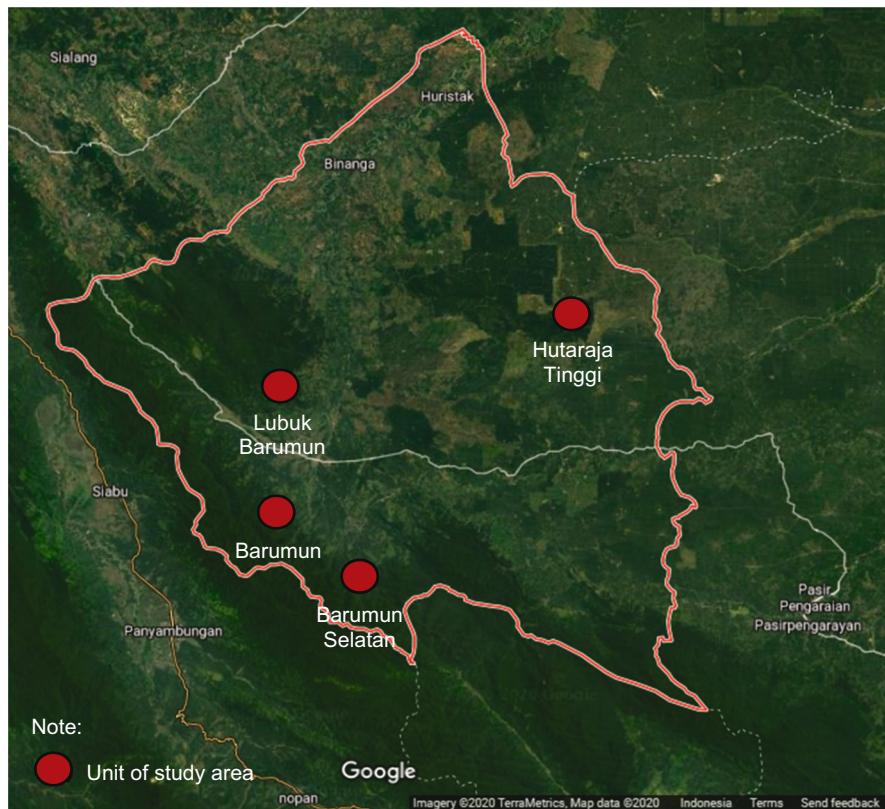


Figure 1: Study areas. Source: Google Maps.

agricultural practices or the sale of crops or involved in farmer groups. Independent plantations are plantations managed by the community themselves without the involvement of other parties (Puruhito *et al.* 2019). In some respondents, on the other hand, independent plantations are inherited from their parents, or the result of buying their palm oil plantations for investment. In this study, independent smallholders who selected as respondents are spread across the four study areas and collected through the snowball sampling method.

As mentioned, independent smallholders have a different historical background from managed farmers.

Table 1: Distribution of independent and managed smallholders by study area

Districts	Independent (sample size)	Managed (sample size)
Barumun	3	0
Lubuk Barumun	46	0
Barumun Selatan	21	0
Hutaraja Tinggi	5	75
Total	75	75

Since their placement in this area, the transmigrants were given a house with a yard and two hectares of palm oil plantations to start their livelihoods as palm oil farmers. In addition, the managed farmers previously had contracts with state-owned palm oil plantation companies (nucleus companies) that were responsible for absorbing the farmers' crops, as well as providing assistance in the form of training and coaching cultivation practices for farmers. The contract was then terminated due to the farmers' dependence on collector traders who offered higher prices than the core companies. However, until now managed farmers are still receiving intensive attention from the Padang Lawas Regency Agriculture Office. In each village, there is one combination of four farmer groups and one cooperative. A total of 150 farmers out of 985 populations of palm oil farmers in Padang Lawas District were interviewed in this study (Table 1).

3.4 Method of data collection

To collect data, face-to-face interviews were conducted using a structured questionnaire, and then the answers will be tested using validity and reliability tests to ensure

the validity of the data. Questions posed to farmers included socioeconomic characteristics, demographics, behavioral factors, WATP, and willingness to participate. The amount of WATP is measured from the bidding game process with an amount of money ranging from 30% to more than 50% of the cost of certification for palm oil plantations, using the results of research by Hutabarat et al. (2018) as a reference for the cost of certification of palm oil. Both behavioral factors and willingness to participate are estimated using a five-level Likert scale (1, strongly disagree; 2, disagree; 3, undecided; 4, agree; and 5, strongly agree) (Chen and Qi 2018). In addition, the willingness to participate is collected from open-ended questions which will be analyzed using the probit regression model.

With varying farming conditions, palm oil smallholders are required by the government to meet ISPO sustainability standards. To succeed the certification program established by the government, farmers' participation is needed. The level of farmer participation can be seen from the willingness of farmers to participate in the ISPO standard certification program. The level of farmer participation will increase the promotion of Indonesian palm oil in the eyes of global market, which has so far been thought that palm oil and its derivative products are not sustainable (Hidayat et al. 2015). Therefore, it is necessary to study the compatibility of farmers to ISPO standards through analysis of WATP and willingness to participate. Before being asked about WATP and willingness to participate, farmers were informed about the benefits and costs that will be received after the ISPO registration process along with the annual fee for smallholder plantations which will be used for annual audits and monitoring. That way, farmers can make the best decision whether they are willing to participate or not. In terms of the response of farmers' WTP, there are several cases where farmers refuse to mention the nominal WTP as a protest against government regulations regarding ISPO (Chen and Qi 2018).

3.5 Data analysis

WATP refers to the concept of WTP using the CVM. Identification of a person's perspective through WATP is very important to be confirmed as a monetary value of his preferences (Danyliv et al. 2014). In collecting WATP data, censored data cannot be avoided, considering that analysis using OLS regression can lead to biased results. Jeon and Lee (2020), Halstead et al. (1991), and Xu et al. (2014) applied Tobit regression for the analysis of contingent valuation studies in their study. The use of

Tobit regression in CVM studies is believed to provide unbiased results and consistent parameter estimates (Halstead et al. 1991; Tobin 1958). The Tobit regression equation used is as follows:

$$WATP_i = \begin{cases} X_i' \beta + e_i & \text{if } WATP_i > 0 \\ 0 & \text{otherwise,} \end{cases} \quad (1)$$

where WATP is the amount of money that farmers are willing and able to pay for the cost of ISPO certification with X_i' as the WATP predictor. In addition, e_i is a normally distributed error. WATP is a continuous variable that contains censored data because there are farmers who refuse to convey the WATP value they have. The models used in the Tobit regression in this study include:

WATP ISPO

$$\begin{aligned} &= \beta_0 + \beta_{11}AGE + \beta_{12}EXPE + \beta_{13}ATTI \\ &+ \beta_{14}SN + \beta_{15}ATP + \beta_{16}INT + \beta_{17}AC + \beta_{18}INP \\ &+ \beta_{19}ONINC + \beta_{110}NONINC + \beta_{111}IND + \varepsilon_1. \end{aligned} \quad (2)$$

After being interviewed regarding their ability and WTP, farmers were then asked about their willingness to participate in the ISPO certification scheme. The question posed is in the form of an open-ended question, which generates a dichotomous variable. The willingness of farmers to participate was analyzed using probit regression with the equation (Adjabui 2018):

$$\begin{aligned} Z_i^* &= \alpha X_i + u_i \quad u \sim N(0, 1) \\ Z &= 1 \quad \text{if } Z^* > 0 \\ Z &= 0 \quad \text{if } Z^* \leq 0, \end{aligned} \quad (3)$$

where Z_i^* represents the latent variable which acts as the dependent variable. In this model, Z_i^* is influenced by variable X with α as the parameter vector and the error term u_i . The binary probe used in this model provides a dichotomous option as to whether the farmer wants to participate in ISPO or not. The probit model is empirically divided into two models, namely, the model of the influence of WATP and socioeconomic factors, as well as the influence of behavioral factors on farmers' decisions to participate. The forms of the equation include:

PWTP ISPOA

$$\begin{aligned} &= \beta_0 + \beta_{21}WATP + \beta_{22}AGE + \beta_{23}LAND \\ &+ \beta_{24}EDUC + \beta_{25}FAMM + \beta_{26}ONINC \\ &+ \beta_{27}NONINC + \beta_{28}IND + \varepsilon_2, \end{aligned} \quad (4)$$

where the ISPO PWTP refers to the willingness of farmers to choose to participate in ISPO. Hypothetically, this model includes predictors that are included in the socioeconomic factors of farmers such as WATP, age, land size, education, number of family members, and the independence

dummy. Meanwhile, other researchers added other predictors, such as awareness of environmental conditions, preferences, or beliefs (Wang *et al.* 2020). The awareness variable used in this study was also used in the study of Tan and Lin (2019) and Halkos and Jones (2012).

$$\text{PWTP ISPOB} = \beta_0 + \beta_{31}\text{ATTI} + \beta_{32}\text{SN} + \beta_{33}\text{ATP} + \beta_{34}\text{INT} + \beta_{35}\text{AC} + \varepsilon_3. \quad (5)$$

In addition, model (5) was used to investigate the influence of behavioral factors on the willingness of farmers to participate. This has been done before by Halkos and Jones (2012) and Rosenberger *et al.* (2012). Furthermore, Rosenberger *et al.* (2012) stated that the addition of attitude variables in analyzing WTP would bridge social psychology with economic valuation studies so that it can build a new approach that can inspire other studies.

3.6 Measurement of variables

Some of the variables used in the two regression models are listed in Table 2. These variables are used in the analysis using the equation models (2), (4), and (5). When compared, there are a large number of differences between

independent smallholders and smallholders. In terms of age, experience, and awareness of consequences, independent smallholders are lower than managed farmers. Some independent smallholders are young farmers who decide to work as palm oil farmers. Meanwhile, the majority of managed farmers in Padang Lawas are transmigrants who have lived and worked as palm oil farmers since they migrated to Sumatra Island. The long experience that smallholders have has resulted in good communication with extension workers and the Department of Agriculture, so that managed farmers have a higher awareness of the consequences of unsustainable palm oil practices in Indonesia.

The score of behavior variables such as attitudes, social norms, ability to perform, and independent smallholders' intentions was lower than that of managed farmers. However, non-farm income, on-farm income, and the growth of independent smallholders' assets proved to be greater than that of managed farmers. This can be attributed to the geographical location of independent smallholders who live closer to the city crowd. The bigger the job opportunity, the more people get a higher alternative income.

The farmers interviewed were dominated by men, both independent smallholders (85.33%) and managed (82.67%). Jobs that require much energy on plantations are more suitable for men than for women. In the majority

Table 2: Descriptions and variable descriptive statistics

Variable	Description	Independent (N = 75)		Managed (N = 75)		All (N = 150)	
		Mean	SD	Mean	SD	Mean	SD
PWTP	Willingness to participate 1 = yes 0 = no	0.61	0.49	0.79	0.41	0.99	0.12
WATP	Willingness and ability to pay (million IDR)	0.52	0.49	0.70	0.28	0.61	0.41
AGE	Farmers' age (years)	40.86	11.93	44.95	12.66	49.03	12.12
EXPE	Experience (years)	12.33	9.66	16.14	9.44	19.95	7.52
FAMM	Family member (people)	3.22	1.62	2.49	1.03	2.86	1.40
EDUC	Formal education background (years)	9.73	3.80	9.33	3.34	8.93	2.78
LAND	Land size (ha)	2.89	3.81	2.89	2.80	2.88	1.14
ATTI	Attitude toward sustainability indicators	44.51	3.58	49.91	6.75	55.32	4.44
SN	Farmers' cumulative impression	18.41	3.31	21.61	4.35	24.81	2.53
ATP	Ability to perform or perceived behavioral control	28.99	4.49	35.60	7.98	42.21	4.42
INT	Intention toward sustainability indicators	44.25	4.13	50.09	7.26	55.93	4.45
AC	Awareness of consequences	23.41	5.79	27.31	6.33	31.44	3.57
ONINC	On-farm income per year (million IDR)	52.05	76.39	48.65	58.02	45.25	30.32
NONINC	Non-farm income per year (million IDR)	20.98	44.05	20.38	31.41	19.79	6.80
IND	Dummy independent farmers 1 = independent 0 = managed	1.00	0.00	0.00	0.00	0.50	1.00
INP	Production input (million IDR)	12.03	29.94	7.94	9.18	9.98	22.17

of respondents, husbands work on plantations with the help of their wives in administrative stuffs or jobs that do not require much energy. Based on age, most of the palm oil farmers in Padang Lawas are still productive. Regarding age distribution of farmers, it is known that independent farmers are dominated by age less than 40 years. Meanwhile, the majority of managed farmers are more than 40 years old. Young farmers have the potential to achieve maximum farming yield. However, the level of education is a characteristic element that determines an individual's ability to absorb innovation and adopt new technology. Table 3 shows that independent smallholders are dominated by people with a senior high school educational background, whereas managed farmers are more likely to graduate from elementary school. However, due to their close relationship with the Padang Lawas Agricultural Office, smallholders are not left behind in terms of palm oil cultivation practices. This is due to the existence of a combination of farmer groups and cooperatives in each village.

Most of the independent smallholders (58%) and managed (89%) have experienced being palm oil farmers for more than 10 years. The managed smallholders have a

longer period of experience than independent because they have been managing palm oil plantations since moving to the area through the transmigration program. Independent smallholders are local residents who live near or even in one house with their extended family so that the household members of independent smallholders are larger (3–5 members) than managed farmers. Meanwhile, the number of managed farmer family members (50.67%) is mostly 1–2 members because only nuclear families participated in the transmigration program. Currently, some of their children have gone overseas to get a better education. Based on land area, independent (82.67%) and managed (97.33%) are small-scale producers according to the classification of Alwarritzi et al. (2016). Some independent smallholders decided for themselves to open palm oil plantations because of the benefits offered, while nearly 100% of managed smallholders cultivate 2-hectare size of palm oil provided by the government.

4 Results and discussion

4.1 Amount and determinants of WATP

The amount of WATP of farmers to pay for certification varies (Table 4 and Figure 2). In the research of Amegnaglo et al. (2017), the initial bid represents the minimum amount of WTP of farmers, while the final bid is the maximum amount of money that farmers are willing to pay. Based on Table 4, the number of initial bids from independent smallholders is higher than that of managed farmers. It should be noted that among the independent smallholder respondents, there are medium- and large-scale farmers who manage more than eight hectares of palm oil plantations. Farmers of this type have the ability to pay up to 100% of the cost of certification considering the large amount of income generated from the plantation.

Table 4: Smallholders' WATP toward ISPO

		Independent	Managed	All
WATP > 0 (million IDR)	Initial bid	0.50	0.40	0.40
	Final bid	1.25	1.25	1.25
	Average	0.52	0.70	0.61

Note: Data collected in Indonesian Rupiah (IDR) with exchange rate 1 USD = IDR 14,500.

Table 3: Socioeconomic characteristics of farmers in Padang Lawas Regency

Identity	Criteria	Smallholder	
		Independent (%)	Managed (%)
Gender	Male	85.33	82.67
	Female	14.67	17.33
Age (years)	23–32	0.31	0.15
	33–42	0.25	0.09
	43–52	0.29	0.32
	53–62	0.12	0.31
	63–72	0.04	0.09
	73–82	0.01	0.01
Education (years)	Uneducated	2.67	0
	Elementary school	33.33	37.33
	Junior high school	16.00	32.00
	Senior high school	34.67	28.00
	University	13.33	2.67
Experience (years)	1–9	41.33	10.67
	10–24	49.33	64.00
	>25	9.33	25.33
Family member	1–2 people	33.33	50.67
	3–5 people	44.00	48.00
	>5 people	22.67	1.33
Land size (ha)	Small (<5)	82.67	97.33
	Medium (6–8)	12.00	1.33
	Big (>8)	5.33	1.33

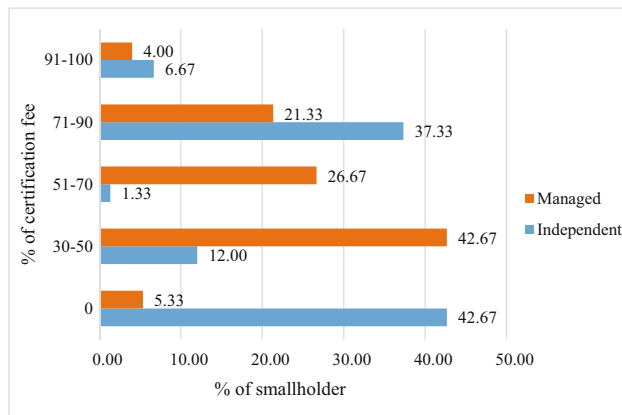


Figure 2: Distribution of farmer WATP in terms of percentage of certification costs.

The average WATP stated by farmers is 610,000 IDR, while in the research of Hutabarat *et al.* (2018), the cost of certification for palm oil plantations per hectare is IDR 1,247,000. By knowing the amount of WATP, the government can estimate the amount of subsidy that must be provided for farmers to support the ISPO certification program for all palm oil producers, especially smallholders. Since the average WATP of independent farmers is smaller than that of managed farmers, higher subsidy should be given to the independent farmers. Nevertheless, in terms of the generalizable finding or its ability to be applied in other research, this study will certainly contribute in that how the information of the amount of certification cost that the smallholders can afford can be used as the baseline for other comparable studies. This is mainly due to the limited number of current literature that provide information on ISPO certification cost. The exact and detailed amount of certification cost of ISPO can only be taken from a prior research conducted in different geographical sites. This shall be a limitation of this study to be of concern for the future line of research.

WATP measurement does not only estimate farmers' willingness but also farmers' ability to pay (Figure 2). Economic limitations are an understandable reason from the large percentage of farmers who claim WATP between 30 and 50% of the cost of certification. This happened to independent smallholders (12%) and managed (43%). The distribution ultimately represents the difference in the amount of subsidy needed by the independent and managed smallholders related to the cost of certification for palm oil plantations. For independent smallholders, 43% refuse to pay the certification fee, while for managed farmers, only 5% refuse to pay. This rejection is motivated not only by the limited ability to pay but also

the willingness of farmers to pay for something that benefits have not been identified. The obligation of farmers to certify their plantations should be followed by intense socialization to explain the benefits that will be obtained by farmers when their plantation area is certified. Thus, farmers know not only the cost of certification to pay but also the benefits they will receive.

One of the considerations for farmers in deciding the WATP value is the income from oil palm plantations. The comparison between the income and the cost of certification can also show how much the farmers ability to pay for the cost. Independent smallholders have a different average income from managed farmers. With an average income of IDR 17.31 million per hectare per year, the certification fee is 7% of the income of independent smallholders. Meanwhile, managed farmers with an average income of IDR 15.17 million per hectare have a percentage of certification fees of 8% of the farmer's income. The cost of certification will burden farmers who have low WATP. Thus, government support in the form of financial assistance to simplify the certification process is needed. In addition to cash assistance, applying a minimum price can increase the benefits received by farmers who participate in certification (Latynsky and Berger 2017).

After knowing the amount of farmers' WATP, the next step is to see the determining factors for farmers' WATP on the certification fee. Table 5 shows that several factors significantly affect the amount of WATP of farmers, including age, attitude, social norms, awareness of the consequences, and farm income. Age has a negative and significant effect, as expected (Halkos and Jones 2012). This shows that older farmers tend to reject the idea and have less ability to participate in ISPO. Attitude of the smallholders toward certification has significant and positive effects (at 10% of significance) on their WATP. This implies that a positive response of the smallholder on certification will increase the WATP and vice versa. The willingness of a farmer to pay the cost of ISPO certification requires courage and openness to the innovation programs offered by the government. In terms of social norms, Halkos and Jones (2012) proved that there is a significant and positive effect of social norms on the amount of money that is willing to be paid. This proves that palm oil farmers in Padang Lawas tend to follow the values held by those around them. There must have been a shadowing agreement among smallholders. Regarding income, Chen and Qi (2018) agreed that income has positively affected the number of WATPs in their study.

In addition, awareness of consequences is a variable that has a significant and positive effect on the number of

Table 5: Estimation result of Tobit model: the determinant of farmers' WATP toward ISPO

Variables	Coeff.	Sig.
Constant	-56.669*	0.061
Age	-6.298**	0.013
Experience	0.956	0.311
Attitude	31.850*	0.064
Social norm	9.028**	0.034
Ability to perform	-2.343	0.639
Intention	-27.318	0.134
Consequences awareness	11.860***	0.000
Input	-1.091	0.252
On-farm income	1.801*	0.084
Non-farm income	-0.103	0.259
Independence	-0.861	0.705

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$.

WATPs. Awareness of the consequences in this study refers to farmers' awareness of the consequences of the massive expansion of palm oil plantations in Indonesia by considering three aspects (Hidayat et al. 2018). These include economic, social, and environmental aspects which are simultaneously affected by unsustainable palm oil plantation management practices that have continued to occur in the last few decades. This problem is the main reason behind the claim of palm oil as a driver of the magnitude of deforestation and land fires in Indonesia in 2015 (Glauber and Gunawan 2015). The on-farm income positively affects the WATP of smallholders (at 10% of significance), implying that the bigger the on-farm income, the higher the WATP for certification of the smallholders.

4.2 Impact of WATP on willingness to participate in ISPO

Interviews were conducted to obtain information about the willingness to participate of farmers on each of the criteria included in the ISPO sustainability standard as conducted by Chen and Qi (2018) and Amegnaglo et al. (2017). The results are then ranked according to the highest score (Table 6). By comparing the scores of independent and managed smallholders, it can be said that managed farmers are always superior to independent smallholders. Managed smallholders have a greater commitment to planning to implement ISPO indicators. This also implies that higher incentive should be given to the managed farmers in relation to the implementation of the ISPO indicators. On the other hand, ISPO received many protests from independent smallholders. The low level of willingness to participate of farmers (64.33%) is due to limited farmer capital while hoping for the incentives provided by government in the form of a premium price or an amount of funding assistance that can reduce the burden of farmers (Hidayat et al. 2018). Moreover, the results of research by Hidayat et al. (2018) emphasized that incentives from the government seem to be beneficial and help farmers increase WATP because the ideal certification scheme should offer not only high costs but also great benefits for the sustainability of smallholder palm oil plantations. This finding is in accordance with previous studies (McGurk et al. 2020; Furumo et al. 2020).

Table 6, on the other hand, shows the obstacles faced by farmers, namely, the indicators that require operational reports on farming activities. The limited ability

Table 6: Willingness to participate of smallholders toward ISPO indicators

Indicators	Independent (%)	Managed (%)	All (%)
Compliance to palm oil cultivation techniques	70.67	88.53	79.73
Environmental license completion in accordance with the environmental management and monitoring regulation	77.87	78.93	78.40
Plantation legalities	65.07	88.27	76.67
Maintenance of disc	62.67	80.80	71.87
The government recommended high-quality seeds	46.93	86.13	67.20
A record number of fresh fruit bunches sold, name and location of buyers	59.47	67.73	63.60
Infrastructure development	26.22	97.78	62.00
Improvement of farmers' socioeconomic conditions and evaluation	37.33	82.22	59.56
Integrated pest management (IPM)	51.56	63.11	56.67
Farmers' organization	31.67	76.67	54.83
Farmers business development is based on the evaluation results of farmer groups and cooperatives	37.78	67.56	53.11
Report on the operations of plantation businesses, farmer groups, and cooperatives	42.93	54.13	48.27
Average	50.85	77.66	64.33

of farmers to meet these indicators can be resolved by prioritizing the implementation of guidance from outside parties such as related stakeholders and NGOs. According to Hidayat *et al.* (2015), this will bridge the gap between independent smallholders and managed, through farming organization. One of the requirements that must be met to certify palm oil plantations is the formation of organizations in the form of farmer groups, cooperatives, and the Internal Control System (Hutabarat *et al.* 2019). The low interest of farmers to participate in organization, especially independent smallholders who score low on the farmer group indicator (31.67%), will undoubtedly hinder the process of preparing farmers for certification.

The results of the analysis of the determinants of farmers' willingness to participate were obtained by applying two probit regression models. Based on model A in Table 7, it can be seen that WATP has a significant positive effect on farmers' decisions to participate in the certification scheme. Farmers with higher WATP tend to be willing to participate. This shows that farmers who can join ISPO are farmers who are willing and able to pay the cost of certification, although not fully because assistance is needed from the government in financing. These results confirm the findings of Al-Ghuraiz and Enshassi (2005) who noted the importance of one's ability and willingness to be involved in a program. In model A, it is also found that the variables of family members, non-farm income, and independence have a significant effect

Table 7: Estimation result of probit model: determinant of farmers' willingness to participate in ISPO

Variables	Socioeconomic (model A)		Behavior (model B)	
	Coeff.	Sig.	Coeff.	Sig.
Constant	-10.340*	0.089	-18.737***	0.005
WATP	6.428**	0.020		
Age	0.028	0.580		
Land size	0.363	0.158		
Education	0.150	0.343		
Family member	0.582*	0.071		
On-farm income	-2.00×10^{-8}	0.151		
Non-farm income	-2.72×10^{-8} *	0.073		
Independence	-1.921*	0.094		
Attitude			7.904	0.139
Social norms			1.881*	0.083
Ability to perform			1.016	0.452
Intention			-7.273	0.166
Consequences awareness			2.537***	0.000

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$.

Table 8: Farmers' awareness of the consequences of unsustainable oil palm cultivation practices

Classification	Objectives	Smallholder	
		Independent (%)	Managed (%)
Good	4	0	4.00
Bad	146	100.00	96.00

on farmers' willingness to participate. It is proven that managed smallholders are more likely to choose to participate than independent smallholders. This confirms what is shown in Figure 2, which also presents the large percentage of independent smallholders who refuse to pay for their involvement in ISPO.

Model B in Table 7 shows explicitly that there are behavioral variables that significantly determine willingness to participate. Rosenberger *et al.* (2012) previously emphasized that behavior variables are essential to assess given the farmer's perspective because they reflect the compatibility of standards with the real conditions of farmers. In line with the study of Halkos and Jones (2012), social norms provide a significant positive sign, which means that the validation of the people around farmers is closely related to the likelihood that farmers are willing to participate. In their research, Moon *et al.* (2005) and Halkos and Jones (2012) stated that the awareness factor has a positive and significant effect on respondents' participation. In line with these findings, awareness of the impacts of unsustainable development has a positive and significant effect at every level of significance. In other words, farmers who have higher awareness are more likely to choose to participate in ISPO certification.

Based on the analysis of the determinants of WATP and willingness to participate, awareness of the consequences is a factor that significantly influences both. Therefore, the awareness of farmers toward unsustainable palm oil cultivation practices is something that needs to be discussed. Table 8 shows that both independent and managed smallholders are aware of the dire consequences of unsustainable agricultural cultivation practices for social, economic, and environmental aspects. Inadequate knowledge should be overcome by socialization and guidance of farmers in order to have a better understanding of the importance of sustainable cultivation practices (Rosenberger *et al.* 2012).

One of the ISPO indicators contains the prohibition of burning land to open palm oil plantations. On the other hand, the majority of farmers in Padang Lawas do not burn, and even less feel the impact of the smoke

generated by land burning, as happened in areas with large peatlands around the Padang Lawas Regency. Likewise, the response of farmers to the socioeconomic aspects. Therefore, increasing farmers' awareness of the consequences of unsustainable palm oil development is expected to increase WATP and farmers' willingness to participate in ISPO certification.

5 Conclusion and recommendation

Based on the estimation of farmers' WATP, the average WATP is only half the cost of certification. These findings can be used as a guidance for the government in determining the amount of subsidies as a form of support for smallholders who are constrained by the cost of certification. The results of the analysis show that behavioral factors, particularly social norms, significantly determine the amount of money that farmers are willing to pay to participate in ISPO certification. For determining the WATP, farmers consider the assessment of their closest people first before determining the amount of WATP against the cost of certification.

The core finding of this study is the identification of WATP, which significantly affects the willingness to participate of smallholders. This finding confirms that smallholders with higher WATP inclined to be willing to participate in the certification scheme, even though the WATP does not still fully cover the certification cost. Awareness of the consequences of unsustainable development practices had a significant effect on WATP and farmers' willingness to participate. The study also confirms that the majority of farmers still have a weak awareness of the consequences. However, it is worth noting regarding the hope of smallholders to receive support in the form of government funding to reduce the burden of certification costs because it imposes an obligation on smallholders to certify palm oil plantations. In addition to funding assistance for certification costs, the government is also expected to be able to convey intensive socialization about ISPO certification, so that farmers can raise awareness of the consequences and obtain complete information regarding the benefits of ISPO certification. Regarding any further line of research, it is suggested to pursue the more comprehensive view on the ideal scheme of certification for the palm oil smallholders. The impact will even be higher if the research discuss not only the entire cost needed to be paid but also the amount of incentive that should be given by the certification program to the smallholders who want to

certify their plantation. When this study is applied in other geographical sites, different socioeconomic or behavioral factors affecting the willingness to participate or the amount of WATP for certification might be found. Therefore, comparative study is necessary to obtain a bigger picture of smallholders' perspective on the certification program participation.

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