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Article

The Influence of Good Agricultural Practice (GAP) on the Productivity and Well-Being of Malaysian Sustainable Palm Oil (MSPO)-Certified Independent Smallholders in Malaysia

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Abstract: Good agricultural practice (GAP) helps increase productivity by producing fresh fruit bunches (FFBs), and selling FFBs will increase Independent Smallholders' (ISH) income. However, although GAP promotes increased productivity, the effectiveness of GAP in delivering the well-being of the ISH in oil palm production areas remains to be determined. To that end, this study (i) measures the smallholder's well-being index, (ii) compares the well-being index by states in Malaysia, and (iii) maps the relationship between GAP implementation, productivity, and well-being. The study selected respondents using purposive sampling (PS). PS identifies and selects individuals with Malaysian Sustainable Palm Oil (MSPO) certification and knowledge and experience of GAP. As a result, the research interviewed 564 ISHs with MSPO certification from 162 Sustainable Palm Oil Clusters (SPOC). The study used Principal Components Analysis (PCA) and the Structural Equation Model (SEM) framework to achieve the objectives. The study found that the average ISH well-being index was 0.62, and ISHs in Sabah had the highest well-being, with 0.73 compared to other states. The study also found that GAP influences productivity and is positively and significantly related to well-being. Therefore, it indicates to ISHs and the government the importance of GAP implementation to increase ISHs' productivity and well-being.

Keywords: good agricultural practice; independent smallholder; Malaysian Sustainable Palm Oil; palm oil; well-being

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1. Introduction

The scientific name of palm oil from West African woods is Elaeis Guineesis. The name "Guineesis" denotes that the original specimen originated in Guinea, a country in West Africa. However, the world's oil palm industry is seen to be more developed in Southeast Asian regions such as Malaysia. The history of the oil palm industry in Malaysia began in 1848, when four seedlings of this plant were brought to and planted in the Bogor Botanical Garden, Indonesia. The first plant was used on the roadside as an ornamental plant in Deli, Sumatra, because it has a beautiful clump. In 1911, it was brought to Malaysia in Rantau Panjang, Kuala Selangor, with the same purpose. However, its economic potential was first realized by the government in the 1960s through the establishment of the Federal Land Development Authority (FELDA) to eradicate the people's poverty by cultivating oil palm and rubber plants. In the late 1970s and 1980s, Malaysia's oil palm industry was developed very widely and made oil palm the country's main commodity crop.

Now, Malaysia is the world's second-largest oil palm producer after Indonesia, followed by Thailand, Colombia, and Nigeria (Figure 1). Malaysia recorded production between 18 and 20 million tons per year, with a growth rate of around 2% in 2020–2022. Meanwhile, Indonesia's production has increased yearly, reaching 46 million tons in 2022. Indonesia's production growth rate is around 4% for the same period. The production growth rate in other countries also increased, although on a small scale. According to [1], the increase in palm oil production is due to the rapid demand for vegetable oil, widely used in foods, industrial applications, and bioenergy.

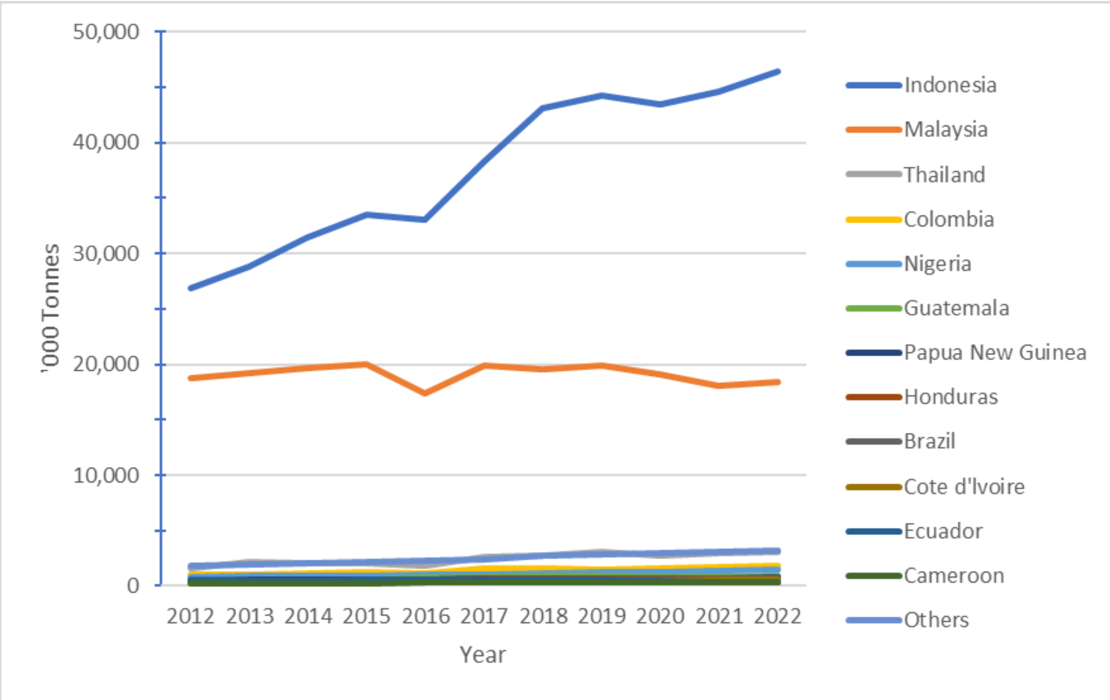

Figure 1. World's major producers of palm oil, 2012–2022. Source: Adapted from [2].

However, the development of the palm oil industry in this region has led to severe environmental issues. Because of the haze issue affecting most countries in Southeast Asia in the late 1990s, the world's oil palm industry has often received strong criticism from non-governmental organisations and environmental activists [3]. Among the other criticisms, the issue of afforestation on a large scale for the opening of oil palm plantations, which affects the environment and land ownership, is also often debated worldwide. The change in land use from forest areas to oil palm cultivation destroys biodiversity, causes soil erosion and the existence of crop residues, and reduces water and air quality [4–8]. In addition, palm oil-producing countries practice cutting and burning for land clearing and drainage in peatland areas [9]. This practice harms the ecological system and causes forest burning and carbon dioxide emissions, ultimately contributing to climate change [10,11]. As a result, some countries have launched anti-palm oil campaigns, such as the European Union, which restricts the import of palm oil to stop deforestation in Indonesia and Malaysia [12,13].

Another issue involving palm oil is global consumer awareness of the importance of sustainability for every product produced. For example, Ref. [14] found that consumers in the United Kingdom (UK) view products containing palm oil as having a negative impact on the environment and sustainable development in the production area. A similar consumer perception of the presence of palm oil in foodstuffs in Spain and Peru was found in [15]. Peruvian consumers believe that the selection of palm oil products is one of the worst compared to other vegetable oils when considering the environmental impact. Meanwhile, Spanish consumers consider the content of palm oil terrible for their health and the environment. This increase in consumer awareness is supported by [14–18]'s analysis of consumer perceptions of products containing palm oil. Although they know the benefits of palm oil and still buy products containing palm oil, they believe it has harmed the environment and society [14]. The world's palm oil industry continues to face this pressure when the primary users of palm oil stipulate that they only use palm oil made by certified producers.

The Malaysian government, through the Malaysian Palm Oil Certification Council (MPOCC), has introduced the Malaysian Sustainable Palm Oil (MSPO) certification to counter these negative perceptions and address consumer issues that arise. MSPO is a national scheme introduced to Malaysia's smallholders and oil palm milling industry. MSPO has seven principles, one of which is good practice, which includes good agricultural practice (GAP). According to [19], GAP is a set of agricultural management practices used at the farm and post-production levels for producing safe and quality artificial products and food that are sensitive to economic, social, and environmental considerations. Meanwhile, the Department of Agriculture (as cited in [20]) stated that GAP is a resource management system for sustainable agricultural production, increasing productivity and producing safe and quality food. However, the use of the term GAP differs according to the smallholder's needs, the type of agriculture, and the producing country.

For example, in Ethiopia, GAP implementation for soybean farming consists of seven techniques: land selection and preparation, variety and seed selection, inoculation, applying fertiliser, planting, field management, and harvesting. Smallholders implement this GAP to produce good output and minimise costs. It also increase smallholders' productivity, with output as high as 3500–4000 kg/ha (sole crop) [21]. Therefore, soybean GAP is needed in Ethiopia to improve productivity and product quality while also saving costs. Singapore applies GAP in the production of vegetables. Six key areas are used as guidelines for small vegetable farmers: farm location, farm structure, farm environment, farm maintenance, farming practices, and farm management. These practices are formulated based on the Hazard Analysis of Critical Control Points (HACCP) [22]. Thus, the need for vegetable GAP in Singapore emphasises environmental care.

As for palm oil GAP in Malaysia, it comprises nine management techniques: land preparation, soil conservation, weed control, fertiliser application, pruning, pest control, disease control, harvesting, and record keeping. The implementation of GAP by palm oil smallholders is divided into three levels of compliance: compulsory practice, mandatory practice, and encouraged practice. According to [23], palm oil GAP in Malaysia is the basis for increasing productivity and is a requirement for sustainability certification. Therefore, it is necessary to include GAP in MSPO criteria. The purpose for GAP for palm oil in Malaysia is to increase productivity and protect the environment. Although the formation of GAP differs according to the needs of smallholders, the type of agriculture, and the producing country, the goal of GAP is broad and continuous, as it considers the interests of the whole society [24].

Moreover, GAP compliance by smallholders through sustainability certification is more effectively encouraged. Although the impact of GAP is diverse, for this study, only the impact of GAP on the productivity of smallholders is discussed. Regarding productivity effectiveness, Ref. [25] argue that certification schemes such as that of the Roundtable on Sustainable Palm Oil (RSPO) actively promote GAP compliance by palm oil smallholders, which can guarantee increased productivity. A study by [26] in Jambi, Indonesia, found that fresh fruit bunch (FFB) weight increased to 21 kg after the first six months of GAP implementation. The authors of [27,28] also support applying GAP, which is part of the principles and criteria of the RSPO, and found that it achieves high yields. A study by [28] in Kotawaringin Barat District, Indonesia, found that GAP produces significantly higher yields, which increased from 14.5 t/ha/yr to 22.5 t/ha/yr. Therefore, it is clear that implementing GAP through sustainability certification can help increase the productivity of smallholders.

Although there is still no empirical study on the effectiveness of implementing GAP through MSPO on productivity, according to [29], increasing FFB yield up to 30 t/ha/yr can be achieved if smallholders implement GAP according to MSPO. Additionally, according to Mansor (as cited in [30]), it is estimated that the yield of FFBs will increase by at least

30% from the current productivity within three years after the implementation of GAP with technology adoption by MSPO-certified smallholders. In line with such studies, this study also expected the productivity of MSPO-certified oil palm smallholders to increase by implementing GAP in managing their plantations. Nevertheless, although GAP through MSPO promotes increased productivity, the effectiveness of GAP in delivering the well-being of smallholders in oil palm production areas still needs to be determined.

According to [31], well-being is a combination of good feelings that consists of positive experiences, having purpose in actions, and positive relationships. In [32], five indicators of well-being were suggested, namely positive emotions, engagement, relationships, meaning, and achievement (PERMA). These indicators reflect human nature. However, according to [33], sustainable well-being can be achieved through economic and social well-being. Figure 2 shows the sustainable well-being chart introduced by [33] which involves humans (people and community) and the environment (awareness, participation, and lifestyle).

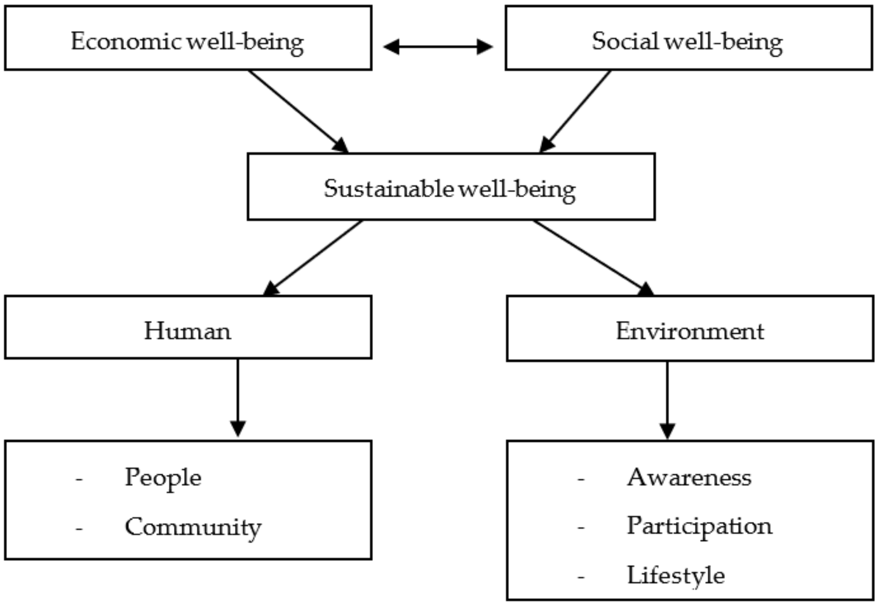

Figure 2. Well-being sustainability flow chart.

Since well-being is key to productivity [34], it is not limited to smallholders. The authors of [35] found that factors such as technology, optimal resources, insurance, market pricing, and tax policy will first impact smallholders' economic well-being and, subsequently, their social well-being. However, previous studies often relate the Sustainable Development Goals (SDGs) when discussing the well-being of smallholders, such as [36–38], which include the well-being of oil palm smallholders [39–42]. The SDGs comprise 17 goals, among which are to end poverty, preserve the planet, and ensure that all people live in peace and harmony by 2030 [43]. According to [44] smallholder palm oil, especially in Indonesia, played a role in achieving 13 goals out of the total SDG goals. Furthermore, the SDGs emphasise that sustainable development must balance social, economic and environmental considerations. For example, the literature review by [40] discussed the impact of palm oil on social, economic, and environmental aspects in addition to health and biodiversity across 234 articles. The study also discussed future strategies based on the SDGs for each of the effects found.

The field of research began to be developed by relating the impact of sustainability certification to the well-being of oil palm smallholders, considering that various certifications had been introduced. Among the palm oil sustainability certifications often used by the world palm industry are those issued by the RSPO, International Sustainability and Carbon Certification (ISCC), Indonesia Sustainable Palm Oil (ISPO), and MSPO. However, most previous studies discussed the impact of RSPO and ISPO on the well-being of oil palm smallholders, such as [39,45,46], with no study on MSPO. Notably, most of the research results found that sustainability certificates help to improve the well-being of oil palm smallholders [45–47].

Furthermore, most previous studies discussed the impact of the oil palm industry on smallholders in terms of poverty and environmental problems, which are important indicators of their well-being [41,45,48–50]. In principle, the income earned by oil palm smallholders can improve households' living standards, eventually ending poverty. A study by [51–53], conducted using data from Malaysia, showed that oil palm cultivation positively affected smallholders' income. This was also found to be the case in Indonesia by [54–57], one of the two countries which are the world's largest palm oil producers. Other producing countries have also proven that oil palm cultivation can increase income and eliminate poverty, such as Ghana [45] and Guatemala [58]. Although the increase in income and poverty can be reduced, the environment's well-being is often at risk.

The environmental issues the oil palm industry faces have negatively impacted the well-being of smallholders and the local community. In addition, palm oil production activities in farms, such as using excessive fertilisers, inefficient wastewater management, using gasoline to kill weeds, and so on, performed by smallholders [59], will harm the environment and humans. Furthermore, according to [9], burning forests and peat land to prepare land for oil palm cultivation will cause the release of carbon dioxide (CO_2), affecting the health of smallholders and local communities. Therefore, GAP is expected to solve the dilemma, curbing environmental issues caused by the oil palm industry, especially those affecting smallholders, in addition to increasing their income and, subsequently, their well-being.

This study aims to (i) measure the smallholder's well-being index, (ii) compare the well-being index by states in Malaysia, and (iii) analyse the relationship between GAP implementation, productivity, and well-being. For objective (iii), this study made the following hypotheses:

Hypothesis 1 (H1). *GAP has a positive correlation with productivity.*

Hypothesis 2 (H2). *Productivity has a positive correlation with well-being.*

This study focuses on the well-being of smallholders, specifically Independent Smallholders (ISHs) who have obtained the MSPO certificate. There are two types of oil palm smallholders in Malaysia: organised smallholders and ISHs. Farm management for organised smallholders is better than that for ISH because they are regulated by several agencies (for example, FELDA, FELCRA, and RISDA), and usually, farm preparation materials and assistance are provided by these agencies. Therefore, they will receive wages monthly even if there is no production that month. On the other hand, compared to organised smallholders, the farm management of ISHs is poor because, according to Mansor (as cited in [23]), from 400 ISH, only 26% apply GAP.

2. Materials and Methods

2.1. Study Area

This study used a quantitative approach to accurately measure respondents' behaviour and levels of knowledge [60]. The population of this study was ISHs with MSPO certification. As of 2020, 129,307 ISHs have obtained MSPO certification (see Table 1). MSPO certification for ISHs is achieved by establishing a Sustainable Palm Oil Cluster (SPOC). A SPOC is established by grouping ISHs into several small clusters, with between 1000 and 2000 ISHs in each cluster [61]. Therefore, each ISH under the same SPOC will be jointly certified under one MSPO certificate. As a result, 162 SPOCs have been formed. Figure 3 shows the distribution of SPOCs in Peninsular Malaysia, Sabah, and Sarawak.

Table 1. Number of MSPO-certified Independent Smallholders by area.

Areas	Number of MSPO-Certified Independent Smallholder								
	2013	2014	2015	2016	2017	2018	2019	2020	Total
Peninsular	-	82	113	438	776	4142	15,732	56,798	78,081
Sabah	-	-	42	42	113	1021	3418	16,758	21,394
Sarawak	-	-	233	233	521	869	7670	20,772	29,832
Total	-	82	155	480	1410	6032	26,820	94,328	129,307

Note: MSPO was launched in 2013; there was no certificate ownership by ISHs in this year.

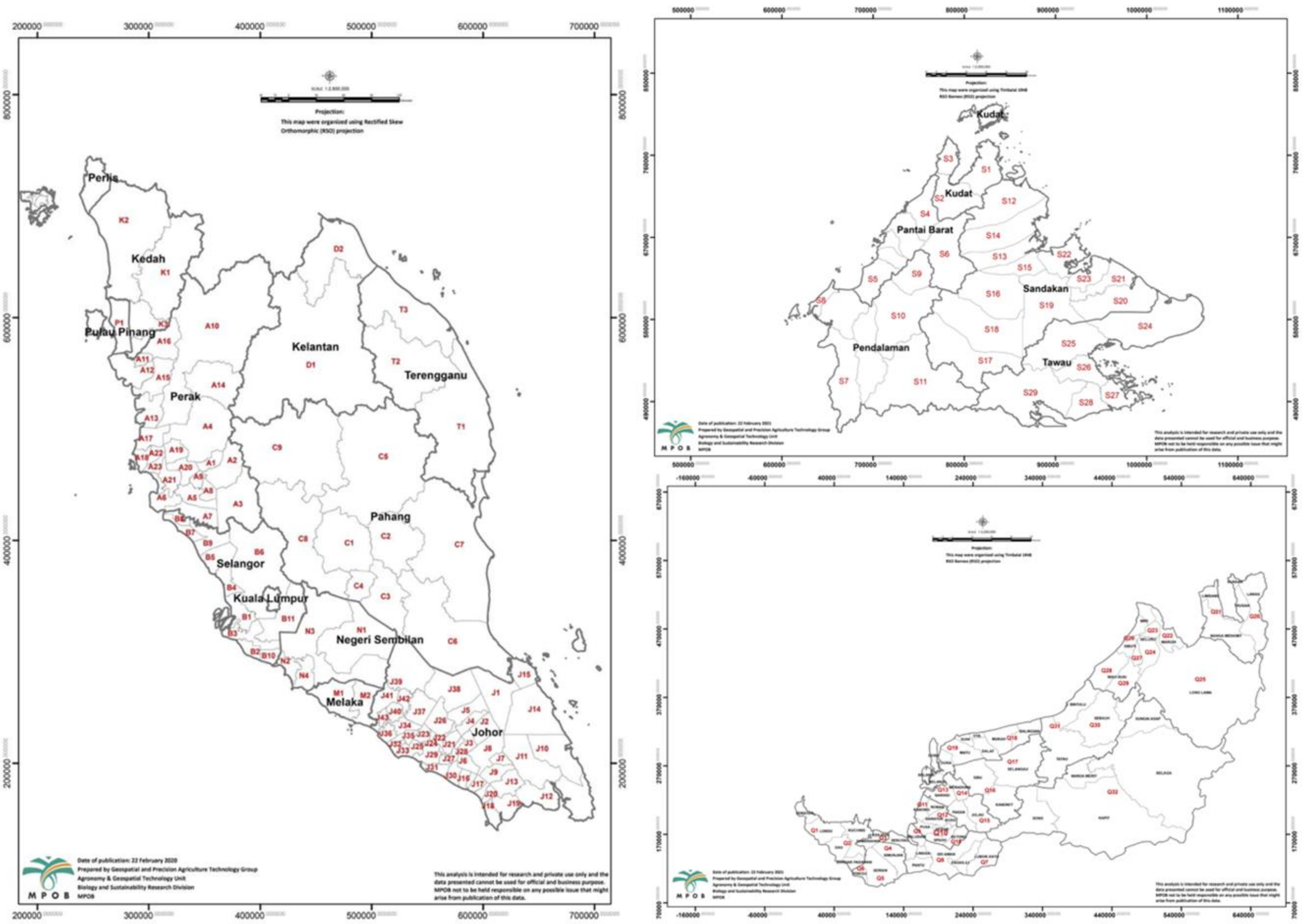

Figure 3. SPOC distribution in Peninsular, Sabah, and Sarawak, Malaysia. Source: Reproduced from [61].

Purposive sampling (PS) was conducted on all the SPOCs. PS is also known as judgement sampling. This sampling involves the identification and selection of individuals or groups who are knowledgeable about the phenomenon of interest [62] and are willing to participate in the research by conveying their experiences and opinions in a clear, expressive, and reflective manner [63]. Therefore, the total population sampling (TPS) method was used for this study by selecting ISHs with experience and knowledge of GAP and who have MSPO certification. TPS is a method that involves all populations that meet criteria such as skill sets, experience, and others in the research conducted [18]. The study determined the minimum sample size by referring to [64,65]. Determination of the minimum sample size according to the method of [64] was determined by the equation below:

$$\frac{x^2 \cdot NP(1-P)}{(N-1)d^2 + x^2P(1-P)} = n \quad (1)$$

where n is the sample size, N is population size: 129,307, x^2 is chi-square value: 3.841, P is population proportion: 0.5 (95%), and d is estimation error (0.05). In numerical form, the equation will be:

$$\frac{3.841(129,307)0.5(1-0.5)}{(129,307-1)0.05^2+3.841(1-0.5)} = 381.83 = 382 \quad (2)$$

wherein, according to [65], the minimum sample size should be ten times the maximum number of arrows indicating latent variables in the constructed SEM structural model. Since the PLS–SEM framework in Figure 4 has 32 arrows, the minimum sample size for this study is 320 samples. Therefore, based on the determination of the sample size by [64,65], the study required a sample size of 320 to 382 for a total population of 129,307 ISHs with MSPO. A total of 564 ISH in Malaysia were interviewed and given a set of questionnaires related to the study. However, only 475 questionnaires were answered completely and used for analysis.

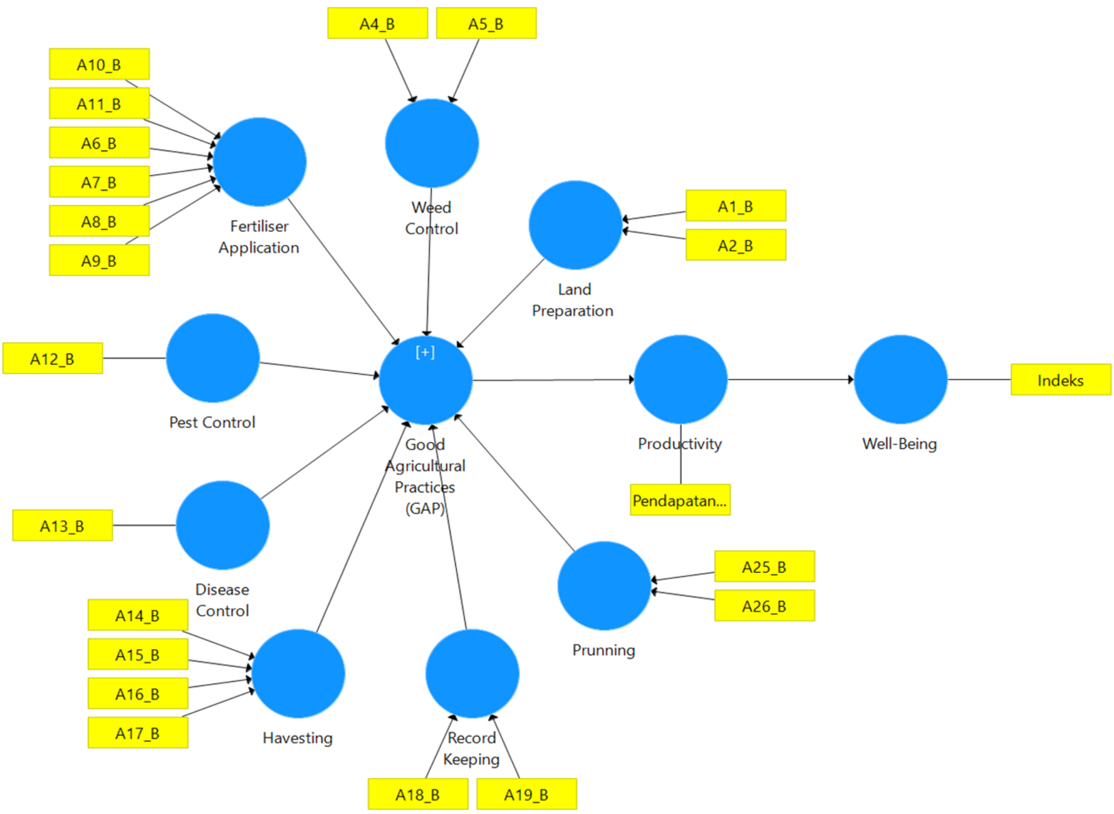

Figure 4. Path model on the relationship between GAP, Productivity and Well-being

2.2. Instrument and Data Collection

The study used primary data in which a questionnaire was the main instrument used for data collection. A semi-structured interview method with selected ISHs was conducted. The constructed questions were from discussions with the Malaysian Palm Oil Board (MPOB) and [66]. The questionnaire has three parts. The first part contains questions related to the respondent's demographic profile and farm information, comprising six questions. The questions are in the form of multiple-choice, two-choice, and open-ended questions. Further, the second part is a question related to the level of GAP implementation, which consists of nine constructs. The nine constructs are land preparation (two items), soil conservation (one item), weed control (two items), fertiliser application (six items), pruning (two items), disease control (one item), harvesting (four items), and record keeping (two items).

The final part is related to the perceptions of their level of well-being after achieving MSPO certification and comprises 50 questions. The questions are from eight constructs, namely income and wealth (ten items), employment and income (two items), living conditions (five items), health (eight items), work and life balance (nine items), education and skills (six items), environmental quality (four items), and subjective well-being (six items). For the second and third parts, the questions are in the form of a Likert scale on a five-point scale. In the second part, scale 1 represents not fully implemented, and scale five is fully implemented, while in the final part, scale one is strongly disagree, and scale five is strongly agree.

Initially, the questionnaire was constructed using Malay and then translated into English by an accredited translator. After that, the study ensured that every word was translated accurately and consistently reflects the initial questionnaire. Next, pre-testing was carried out before the actual data collection. The validity of the questionnaire for this study was evaluated by an MPOB officer and a lecturer from Universiti Utara Malaysia (UUM), an agricultural economics scholar. A total of seven (7) questionnaires were distributed to five (5) ISHs who had obtained MSPO certificates, and two (2) lecturers involved in the field of agricultural economics. Meanwhile, reliability was determined by using Cronbach's Alpha (α) test to determine whether the questionnaire could give the same answer to each population size and sample. The Cronbach's Alpha (α) results at this pre-testing stage showed a value of 0.70 and above, which means that the data obtained is good and effective for this study.

In order to ensure that data collection was done well, TUNAS (Tunjuk Ajar dan Nasihat Sawit) officers were appointed as enumerators to distribute questionnaires and interview respondents in each SPOC in Malaysia. A briefing on how to answer the questionnaire was performed in stages. The first stage involved ICS (Internal Control System) officers, who are the TUNAS officers' supervisors, to inform them of the needs of the study. At the same time, the ICS reviewed the questionnaire to ensure that the questionnaire was ready to be distributed. Then, the ICS explained the results of the briefing to their TUNAS officers. In the second stage, the briefing was given directly to TUNAS officials. This was done to ensure that TUNAS officers understood the needs of the study, and if there were any problems in implementing data collection, the problems could be solved earlier. Afterwards, the questionnaire was ready to be distributed to the actual respondents. The data collection was conducted from April to November 2022.

In addition, this study has obtained ethical approval, since this study is an interventional study involving humans. The Research Ethics Committee of Universiti Kebangsaan Malaysia (REC-UKM) is the authority that provided approval for the research, and the code is UKM PPI/111/8/JEP-2023-018.

2.3. Data Analysis

This study had two steps to achieve its objectives. First was a Principal Component Analysis (PCA) to determine the well-being index [67,68] with STATA 14, and the second was Partial Least Squares Structural Equation Modelling (PLS–SEM) to analyse the relationship between dependent and independent variables [69]. PCA was used to build a new construct to form a well-being index. Before PCA is done, some conditions need to be met: the data does not require normality and homoscedasticity. A sufficient number of data obtained by PCA adequately represent the theoretical construct under study. It can be defined by: (i) the relative values of the eigenvalues (variances of the components); (ii) the total variance explained by the components, which are all components with eigenvalues greater than one that should be retained. The justification is that if all variables were uncorrelated, each eigenvalue (λ) would equal 1. If $\lambda < 1$, the component provides less information than the original variable and should not be used [70].

The well-being index was constructed from 50 items measured using a 1–5 Likert scale indicating the degree of agreement with increasing well-being. A Likert scale measures the indicators from 1 (strongly disagree) to 5 (strongly agree). These items were formed into eight constructs: income and wealth (IW), employment and income (EI), residential (R), work and life balance (WB), health (H), education and skills (ES), environmental quality (EQ), and subjective well-being (SW). Because the construct score generated by PCA might have a positive or negative value, normalisation was carried out by transforming the value using the rank of percentiles to the index, in which the score ranged from 0 to 1. This situation made the total variance explained by the components exceed 50%, which meets the requirements of PCA. Then, indicator scores were assigned with weights derived from the PCA to estimate the well-being index (WI) as below:

$$Well-being\ index = \sum_{i}^{n} W_i X_i \tag{3}$$

where W_i is the weight of the indicator, X_i is the indicator score, and n is the number of indicators.

In the second step, PLS–SEM analysis was used in this study. SEM was chosen because it can show a clear relationship between GAP implementation, productivity, and well-being. Moreover, it can give a simple evaluation compared to other methods, even though the model developed is complex and involves many linear equations [71]. The study uses "smart" partial least squares (SmartPLS) software, version 3.0. SmartPLS, one of the most popular and powerful statistical techniques available to calculate path estimates and model parameters without the concern of normality of data [72], is suitable for both large and small samples. In addition, this study evaluates items for each construct developed. Therefore, SmartPLS is suitable for that analysis.

SmartPLS consists of the measurement model and the structural model properties of data. The measurement model for formative indicators uses variance inflation factor (VIF) and outer weight. The VIF test was used to assess the multicollinearity issue. If the VIF value is less than 3.33, it indicates no multicollinearity [73]. At the same time, the outer weight of the items should be significant [65]. If a particular outer weight is insignificant (p-value < 0.050 and t-value < 1.96), then outer loading and the minimum required value of 0.50 is checked. That indicator is removed if both weights are not significant and outer loadings are less than 0.50.

The structural model was assessed by examining the values of the coefficient of determination (R2), predictive relevance (Q2), and path coefficients. The value of Q2 must be more than 0, which indicates predictive relevance; Q square: 0.02, 0.15, 0.35 for weak, moderate, and strong effects of predictive relevance [74]. The path coefficients should be greater than 0.10 or 0.20 [75] with t-statistics and a significant level [76]. A two-tailed T-test is considered with 1.645, 1.96, and 2.576 critical values of t at a significant level (p-value) of 0.1, 0.05, and 0.01, respectively.

3. Results and Discussion

3.1. Profile of Respondent

The information presented in Table 2 shows that the majority of respondents had an SPM and MCE level of education (39.4%). They were followed by respondents with SRP, LCE and equivalent (18.1%), and UPSR and equivalent (12.6%) education levels. Then, most respondents had experience managing oil palm production for 11 to 20 years, at 40.0%, and 1 to 10 years, at 32.8%. Next, they planted oil palms, starting in 1957, on their farms certified by MSPO, and most respondents planted them from 2001 to 2010, at 38%. Therefore, most of the palm trees were under 20 years old, at 85.7%, and most of the respondents earned income below MYR 20,000, at 50.3%. Regarding farm size, the majority were 1.01–10.00 acres (76.2%).

Table 2. Profiles of respondents.

Information	Frequency	%
Level of education:		
Non-formal education	27	5.7
UPSR and equivalent	60	12.6
SRP, LCE, and equivalent	86	18.1
SPM and MCE	187	39.4
Skills certificate	15	3.2
Diploma/matriculation	51	10.7
Degree	36	7.6
Masters	13	2.7
Experience managing oil palm (year):		
1–10	156	32.8
11–20	190	40.0
21–30	79	16.6
41–50	34	7.2
51–60	11	2.3
61–70	5	1.1
Year planting started		
1957–1990	43	9.1
1991–2000	83	17.5
2001–2010	183	38.5
2011–2018	166	34.9
Age of palm oil (year):		
4–10	174	36.6
11–20	233	49.1
21–30	67	14.1
31–40	1	0.2
Income after MSPO (RM):		
1000–10,000	136	28.6
10,001–20,000	108	22.7
20,001–30,000	84	17.7
30,001–40,000	34	7.2
40,001 and above	113	23.8
Farm size (Ha):		
0.10–1.00	80	16.8
1.01–10.00	362	76.2
10.01–20.00	19	4.0
20.01–30.00	10	2.1
30.01–40.00	4	0.8

3.2. Principal Component Analysis (PCA)

Table 3 shows the mean value exceeded 2.50, meaning respondents "agree" with each construct statement. The Pearson correlation matrix for the eight constructs used in the PCA analysis is shown in Table 4. Statistically significant correlations were observed for all variables ($p < 0.01$).

Table 5 contains the eigenvalues for the first four principal components and the eigenvectors related to each of the principal eigenvalues. Based on Kaiser's criterion [70], only the components with eigenvalues greater than one could be maintained. Thus, in our analysis, we kept only one PC ($\lambda 1 = 5.797$). As regards the covering proportion, those four principal components preserved roughly 0.725 or 72.5% of the total variance. Therefore, a remarkable dimensional reduction was achieved if the information from the first component was used. Kaiser–Meyer–Olkin (KMO) shows 0.9401, indicating the variance proportion in the adequate construct. The coefficients of the eight constructs in the first principal component after standardisation are given in Table 6. It can be observed that all coefficients are positive and almost equal, implying that the five variables participate with equal weights to the formation of the first principal component and, therefore, to the proposed well-being index having the formula:

$$Well - being\ index = 0.3664_{IW} + 0.3118_{EI} + 0.3613_{R} + 0.3393_{WB} + 0.3826_{H} + 0.3650_{ES} + 0.3489_{EQ} + 0.3487_{SW} \quad (4)$$

Table 3. Mean construct of well-being.

Construct	Mean
Income and wealth (IW)	3.859
Employment and income (EI)	3.735
Residential (R)	4.019
Work and life balance (WB)	3.804
Health (H)	4.115
Education and skills (ES)	4.248
Environmental quality (EQ)	4.085
Subjective well-being (SW)	4.457

Table 4. Correlation matrix of the eight constructs used in the PCA.

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Income and wealth (1)	1.0000							
Employment and income (2)	0.6677 *	1.0000						
Residential (3)	0.7918 *	0.6238 *	1.0000					
Work and life balance (4)	0.7062 *	0.5829 *	0.7166 *	1.0000				
Health (5)	0.7744 *	0.6275 *	0.7638 *	0.7108 *	1.0000			
Education and skills (6)	0.7050 *	0.5608 *	0.6855 *	0.6442 *	0.8413 *	1.0000		
Environmental quality (7)	0.6870 *	0.5939 *	0.6427 *	0.5891 *	0.7590 *	0.7465 *	1.0000	
Subjective well-being (8)	0.6615 *	0.5044 *	0.6845 *	0.6180 *	0.7656 *	0.7715 *	0.6930 *	1.000

* significant at level 0.01.

Table 5. Principal Components Analysis.

Component	Eigenvalue	Difference	Proportion	Cumulative
Comp1	5.797	5.204	0.725	0.725
Comp2	0.593	0.144	0.074	0.799
Comp3	0.449	0.147	0.056	0.855
Comp4	0.302	0.019	0.038	0.893
Comp5	0.283	0.045	0.035	0.928
Comp6	0.238	0.043	0.030	0.958
Comp7	0.195	0.052	0.024	0.982
Comp8	0.143		0.018	1.000
Number of observations	475			
Number of components	8			
Trace	8			

Table 7 shows that the mean well-being index was 0.6190, and the mean level of well-being for ISHs (MSPO) was 61.90% in Malaysia. The index indicated that the well-being of those with MSPO certification is positive and acceptable. The finding corresponds with [41,42], which reported that oil palm smallholders had received many benefits through certifications such as MSPO and RSPO. There is no denying that oil palm smallholders have obtained many benefits by participating in being sustainably certified. However, given that 61.90% is slightly more than half, ISH's well-being and quality of life need to be continuously enhanced.

Table 6. Kaiser–Meyer–Olkin (KMO) and coefficient measure of sampling adequacy of the first principal component for the eight constructs.

Variable	KMO	Coefficient
Income and wealth (IW)	0.9360	0.3664
Employment and income (EI)	0.9555	0.3118
Residential (R)	0.9335	0.3613
Work and life balance (WB)	0.9619	0.3393
Health (H)	0.9263	0.3826
Education and skills (ES)	0.9187	0.3650
Environmental quality (EQ)	0.9549	0.3489
Subjective well-being (SW)	0.9475	0.3487
Overall	0.9401	

Table 7. Analysis mean of well-being index according to state.

States	Index
Sarawak	0.6619
Sabah	0.7345
Johor	0.5096
Perak	0.6104
Pulau Pinang	0.5246
Kedah	0.4904
Selangor	0.6387
Negeri Sembilan	0.6469
Melaka	0.3264
Terengganu	0.7217
Pahang	0.6295
Kelantan	0.6123
Overall	0.6190

Furthermore, the highest ISH's well-being was in Sabah (0.7345), followed by Terengganu (0.7217) and Sarawak (0.6619). Conversely, the lowest well-being level was of ISHs in Melaka (0.3264). The result is interesting, given that ISHs in Sabah and Sarawak face greater challenges implementing GAP and being sustainably certified. It was reported in [77] that most smallholders in Sabah and Sarawak have limited access to a broader market, making them dependent on traders willing to travel long distances to collect harvested FFBs. Additionally, smallholders in both states need more support in getting access to seeds, fertiliser, and a workforce.

3.3. PLS–SEM Analysis

3.3.1. Measurement Model

Table 8 shows the mean value exceeded 2.50, meaning respondents "agree" with each construct statement. Table 8 also show the VIFs of all the indicators of land preparation, soil conservation, weed control, fertiliser application, pruning, pest control, disease control, harvesting, and record keeping, ensuring that multicollinearity is not present. The result shows that all VIF values are below the threshold limit of 3.33; thus, there is no issue of multicollinearity of the indicator with the construct. Table 8 also shows the significance and relevance of the formative indicators. In the bootstrapping procedure of 2000 subsamples, the results indicated that all outer weights are significant, with t-statistics > 1.96 and p-value < 0.05, except for two indicators on fertiliser application and one indicator on harvesting. However, all the indicators were retained because the outer loadings exceeded 0.50.

Table 8. Mean, standard deviation, and weight loadings.

Construct/Item	Mean	Weight Loading	t-Value	*p*-Value	VIF	Outer Loading
Land Preparation:						
1. The harvest lane is in good condition	4.385	0.755	10.873	0.000	2.889	0.986
2. The road is in good condition	4.352	0.286	3.803	0.000	2.889	0.896
Weed Control:						
1. Palm oil tree is free from weeds (in radius 2 m)	4.305	0.583	11.1	0.000	1.600	0.908
2. No parasitic plants on the oil palm stems	4.116	0.531	9.723	0.000	1.600	0.888
Fertiliser Application:						
1. Palm oil trees are fertilised in proportion	4.324	0.09	1.381	0.168	3.724	0.821
2. Palm oil trees are fertilised according to nutritional needs	4.282	0.195	2.797	0.005	3.609	0.835
3. Fertiliser is spread around the tree/in the frond pile aisle	4.499	0.438	6.498	0.000	2.694	0.925
4. Fertilising frequency for young trees (<3 years old)	4.221	0.157	2.01	0.045	3.265	0.784
5. Fertilising frequency for mature trees (>4 years old)	4.312	−0.014	0.207	0.836	3.498	0.773
6. Fertiliser is sown within 1 month after receipt/purchase	4.438	0.299	5.676	0.000	1.926	0.821
Pruning:						
1. Pruning the fronds according to the age of the tree	4.322	0.659	5.832	0.000	2.151	0.949
2. Pruned fronds are arranged according to contours or rows	4.425	0.428	3.52	0.000	1.979	0.875
Pest Control:						
1. Farms are free from pest attacks	4.122	1.000	-	-	1.000	1.000
Disease Control:						
1. Farms are free from Ganoderma	4.232	1.000	-	-	1.000	1.000
Harvesting:						
1. Harvesting the ripe FFBs only	4.674	0.296	3.326	0.001	2.765	0.87
2. The stalks are cut (≤5 cm)	4.568	0.396	5.276	0.000	2.394	0.902
3. All the loose fruits are collected	4.581	0.334	4.994	0.000	2.122	0.856
4. FFB and loose fruits are delivered in 24 h	4.691	0.121	1.376	0.169	2.756	0.673
Record Keeping:						
1. Keeping a complete record book	4.215	0.505	4.006	0.000	2.951	0.948
2. Record plantation activity immediately	4.084	0.545	4.385	0.000	2.951	0.956

3.3.2. Assessment Structural Model of Second-Order Constructs

In this study, GAP was specified as a second-order formative construct that comprised eight first-order formative constructs (disease control, fertiliser application, harvesting, land preparation, pest control, pruning, record keeping, and weed control). All the path coefficients of all factors in the first-order to good agricultural practices were greater than

0.10 and significant at *p*-value < 0.01, meaning all factors were essential for building good agricultural practices of palm oil smallholders (Table 9).

Table 9. Assessment of second-order constructs.

Relationship	Path Coefficients (β)	SD	T-Statistics	*p*-Values
Disease Control → GAP	0.151	0.006	25.862	0.000
Fertiliser Application → GAP	0.190	0.006	32.070	0.000
Harvesting → GAP	0.179	0.005	35.337	0.000
Land Preparation → GAP	0.177	0.006	27.577	0.000
Pest Control → GAP	0.158	0.005	29.203	0.000
Pruning → GAP	0.131	0.011	11.838	0.000
Record Keeping → GAP	0.153	0.006	25.217	0.000
Weed Control → GAP	0.185	0.005	37.155	0.000

3.3.3. Assessment Structural Model of Hypothesis Test

The R^2 value, the statistical significance of the Q^2 value, and path coefficient values were used to measure the structural model's overall explanatory capacity of constructs. Figure 5 illustrates the structural model's output. Table 10 shows that the R^2 obtained for member activism is 1.000, which means that 100% of the variance in GAP by all factors is in the second order, whereas the R^2 obtained for productivity is 0.006, which means that GAP explains 0.6% of the variance in productivity. Further, the R^2 obtained for well-being is 0.016, which means that 1.6% of the variance in well-being is explained by productivity. The results for Q^2 for each construct are 0.447 (GAP), 0.004 (productivity), and 0.015 (well-being). Both constructs yielded a Q^2 of more than 0.0, thus showing that the model has predictive relevance.

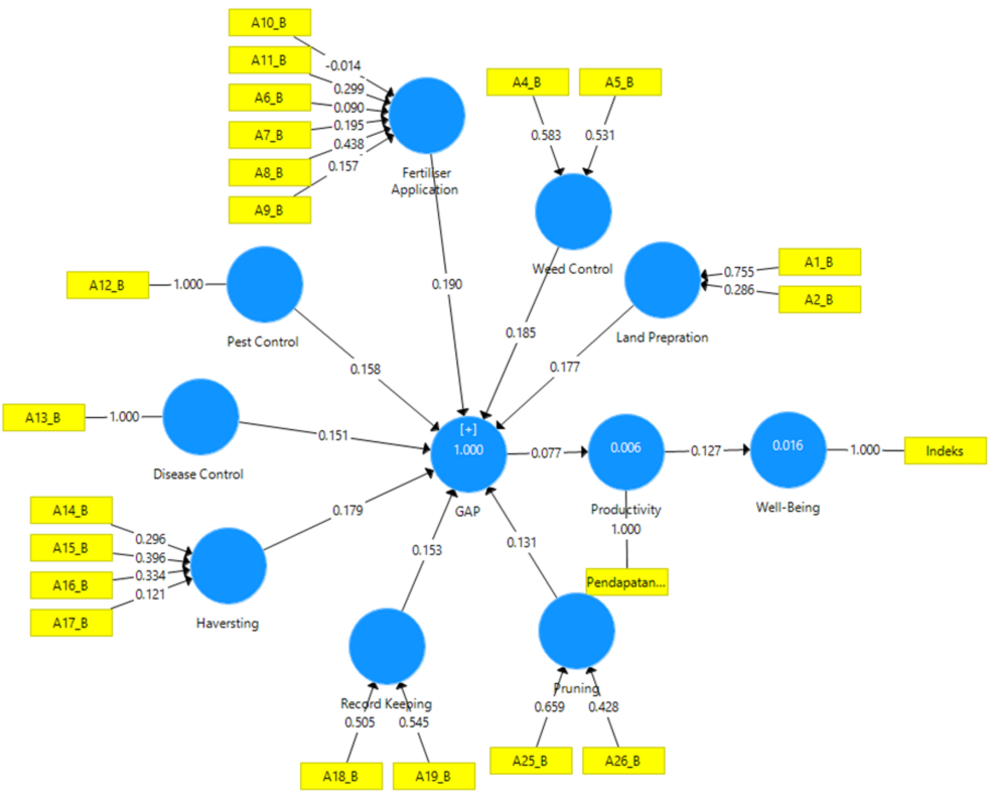

Figure 5. Output Model.

Table 10. R square and Q square.

Construct	R Square	R Square Adjusted	Q Square
GAP	1.000	1.000	0.447
Productivity	0.006	0.004	0.004
Well-being	0.016	0.014	0.015

Furthermore, Table 11 and Figure 5 show the path coefficients along with their t-values and *p*-values. The relationship between GAP and productivity shows that the effect of GAP and productivity (β = 0.077; t-value = 1.826, *p*-value = 0.068) is considered positive and significant, indicating that H1 is supportive. This result supports [21], which states that sustainable agricultural production will increase productivity (income). Further, the relationship between productivity and well-being with a 0.127 value of path coefficients (β) (t-value = 3.040; *p*-value = 0.002) is considered positive and significant, indicating that H2 is supportive. It explains that productivity can directly enhance well-being. This result supports [51,52], who state that economic productivity (income) can increase the well-being of palm oil smallholders in Malaysia, and where one of the impacts of MSPO is shown.

Table 11. Hypothesis testing.

Relationship	Path Coefficients (β)	SD	T-Statistics	*p*-Values
Relation: GAP–Productivity	0.077	0.042	1.826	0.068
Relation: Productivity–Well-being	0.127	0.042	3.040	0.002

3.4. Limitations of the Study and Areas for Further Studies

There were several limitations when this study was conducted. First, respondents in rural areas, especially in the states of Sabah and Sarawak, prefer to be interviewed using their native language. This caused the data collection process to take a long time because the enumerator had to explain the questions one by one. The study also found a limitation in the PLS–SEM analysis when the data was analysed; this analysis cannot be applied when structural models contain causal loops or circular relationships between the latent variables.

Therefore, the study suggests that for future studies, the chosen analysis must have the strength to diversify the research findings, which can bring innovation when data analysis activities are carried out. In addition, index measurement can be done according to [33], which classifies well-being into economic and social well-being to see their well-being from various aspects and as an entirety.

4. Conclusions

Palm oil GAP in Malaysia is the basis for increasing productivity and is a requirement for MSPO [23]. Although GAP through MSPO promotes increased productivity, the effectiveness of GAP in delivering the well-being of smallholders in FFB production areas still needs to be determined. Therefore, an extensive literature review was undertaken to understand GAP's influence on ISHs' productivity and well-being with MSPO certification. As a result, much literature has discussed how good agricultural practices and certification benefit and increase crop productivity [21,27,28]. Nevertheless, some literature reflected otherwise, with results in sustainability certification not necessarily bringing a positive outcome [41]. Therefore, this research was undertaken to (i) identify measures of the smallholder's well-being index, (ii) compare the well-being index by states in Malaysia, and (iii) look at the relationship between the implementation of GAP, productivity, and well-being.

The study used quantitative methods and questionnaires to collect data for 564 ISHs in Malaysia. Then, the study analysed the data using PCA and SEM methods to achieve the objectives. The results showed that when using PCA, Malaysia's ISHs' well-being index was reported at 61.86%, and the ISHs in Sabah had the highest well-being index (0.7345). The study also found that GAP can increase productivity and directly increase ISHs' well-being. Therefore, the ISHs must improve their knowledge, skills, and attitude to ensure that GAP implementation succeeds. This study also provides valuable input to stakeholders such as MPOB, MPOCC, and the Ministry of Plantation and Commodities to ensure that the well-being of ISHs is constantly improved and, at the same time, the sustainability of the oil palm industry can be guaranteed.

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Data Availability Statement: The data presented in this study are available on request from the corresponding author. The data are not publicly available due to might containing information that could compromise the privacy of research participants.

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