Adoption of ISPO Practices in Jambi, Sumatra

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Workshop

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- Lessons from Indonesia and beyond"

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Living in "Desa Sawit" in Jambi

Outline

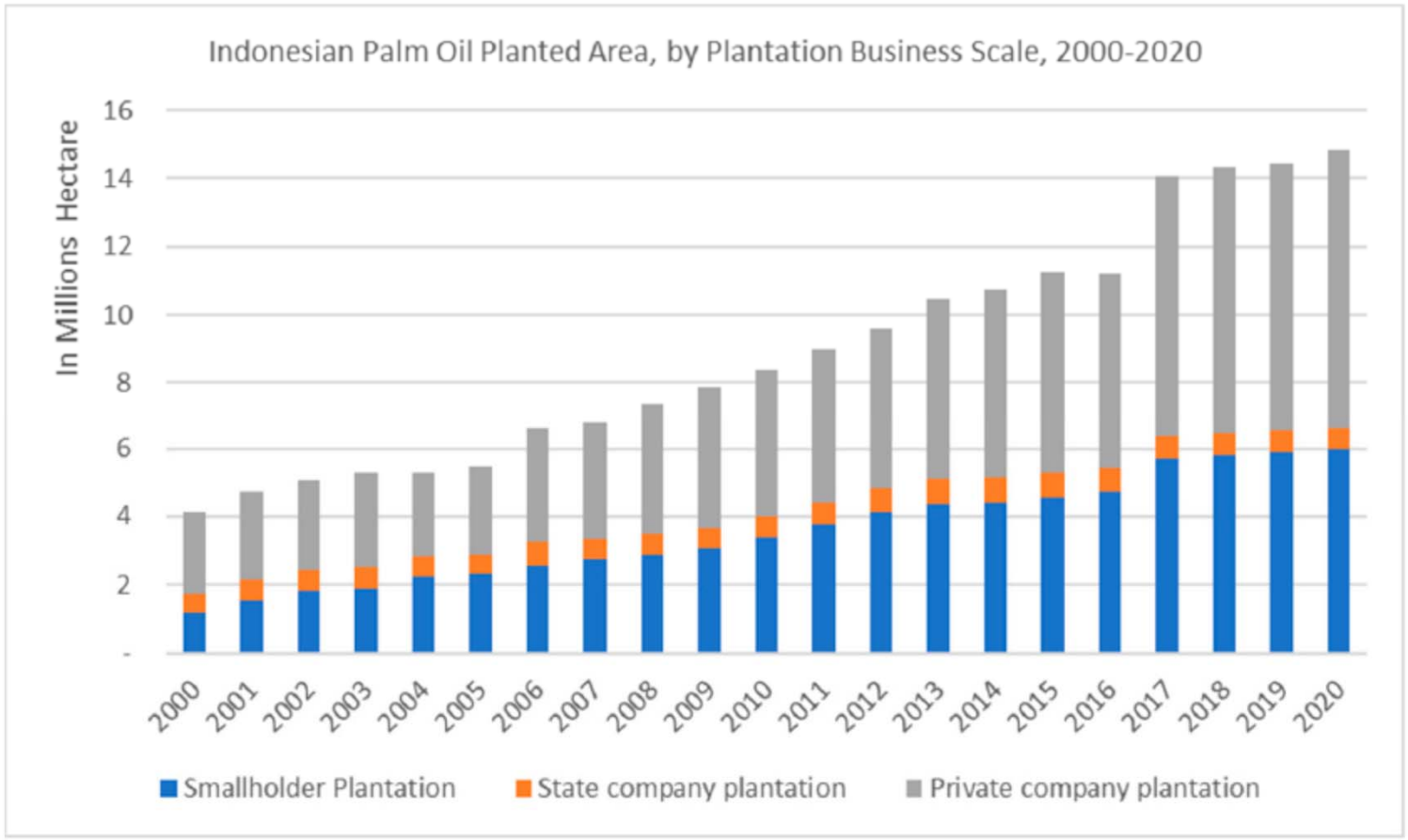
1) Background
2) ISPO: History and current status
3) Case Study of ISPO adoption in three villages in Jambi
4) Cost Benefit Analysis of extension investment
5) Outlook - standards and sustainability:

   A happy marriage?

Background

- Indonesia is the world‘s biggest producer of oil palm
- Oil palm area continues to grow area
- Oil palm expansion in less developed regions of Sumatra and Kalimantan
- Contributed to economic growth and poverty reduction (Susila, 2004; World Bank, 2010)
- GoI goal of smallholder participation (e.g. plasma plots)
- Contract farming as a means for small holder participation and poverty reduction (Cahyadi and Waibel, 2015)
- Negative externalities (loss of biodiversity and local food resources; water pollution, forest fires, social conflicts, etc.)

Area Planted to Oil Palm by Type of Plantation, 2000 - 2022



Source: Putri, E.I.K., et al., 2022

Market Shares of Indonesian Crude Palm Oil, 2000 - 2020

Source: Putri, E.I.K., et al., 2022

Sustainability Standards in Oil Palm Farming

Roundtable Sustainable Palm Oil (RSPO)

- Established in 2004
- Market driven, by global representation of palm oil producers, end-users and other NGO
- Voluntary

Principles:

1. transparency,
2. compliance with laws and regulations,
3. long term economic and financial viability,
4. best practices,
5. environmental and community responsibility,
6. responsible development of new plantings
7. continuous improvements.

Indonesian Sustainable Palm Oil (ISPO)

- Launched in 2011
- Law/ government requirement (led by Ministry of Agriculture)
- Mandatory (since 2020 for all producers)
- Standard established by the GoI

Principles:

1. Compliance with laws and regulations,
2. Good agricultural practices,
3. Biodiversity management,
4. Employment responsibility,
5. Social responsibility and community empowerment,
6. Transparency,
7. Continuous improvement.

ISPO Updates

Ministry regulation

2011

Voluntary for both companies and farmers

Ministry regulation

2015

Mandatory for companies, voluntary for farmers and renewable energy producers

Presidential decree

2020

Mandatory for all companies (now) and small holder farmers (at least in the next 5 years)

Current Status of ISPO Based on Some Recent Literatures

Pramudya et al., (2021):

- *ISPO implementation slow, esp. for independent smallholders*
- *Complex governance structures (national vs. local)*
- *Complicated requirements (e.g. land, business permits, certified seedlings)*
- *Lack of technical assistance, incentives*

Umayah et al., (2021):

- *Jambi province: oil palm cause negative externalities (e.g. forest fires, landslides, etc.)*

Current Status of ISPO

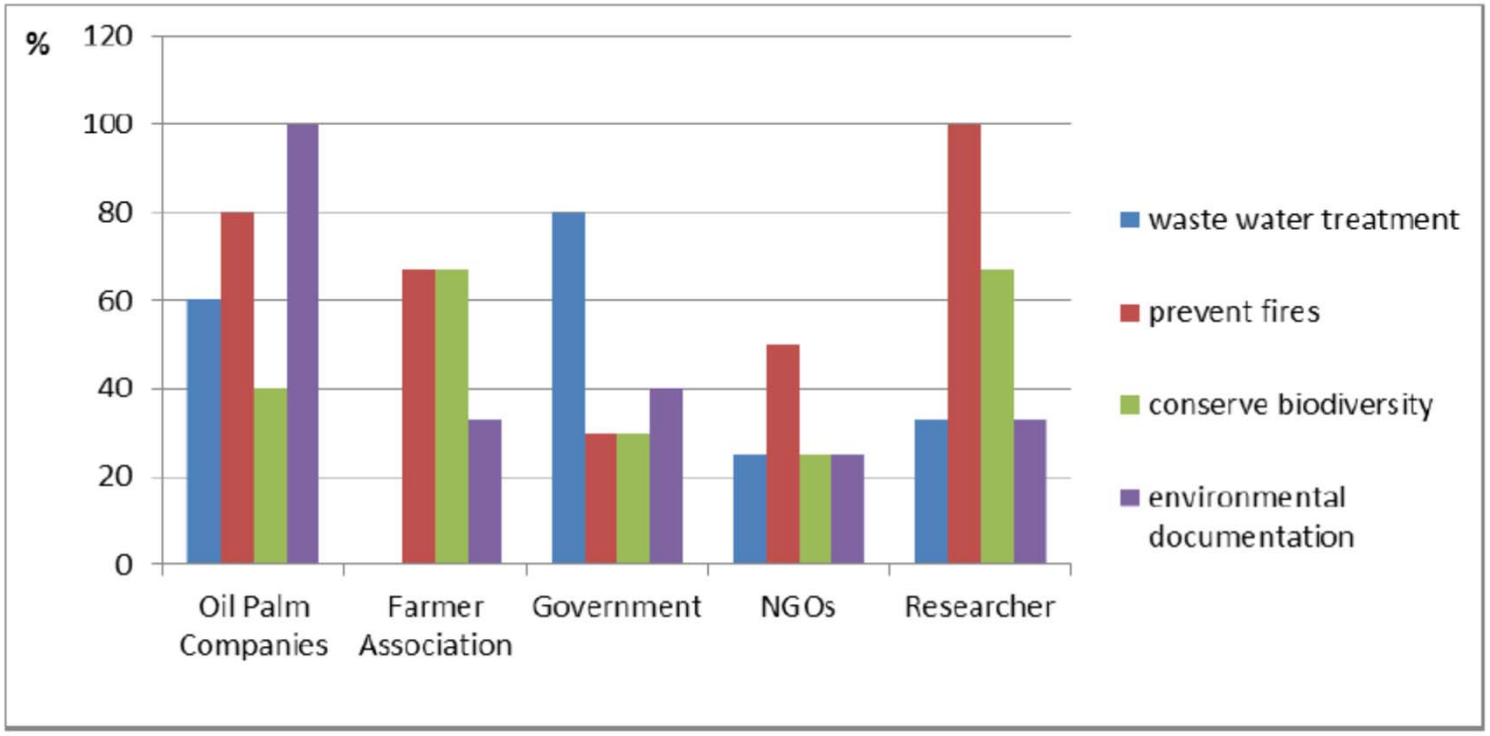
Putri et al., (2022):

- *ISPO faces structural barriers*
- *Regulations absent or contradictory*
- *Multi-level governance make process ineffective or counterproductive*
- *Lack of credibility on sustainability abroad*

Ogahara et al., (2022):

- ISPO *certification standards do not solve problems of low incomes, low yields and insecure land tenure*
- *Certification is a flawed measure sustainability*
- *Interventions such as training for good agrochemical management may help*

Perceptions of ISPO by Stakeholders



Note: Chi-square and Fisher's exact test show significant differences among stakeholder groups for all criteria (see Appendix A)

Source: Stakeholder survey 2013

Figure 3.2: Assessment of environmental effectiveness of ISPO guidelines by stakeholder group

Source: Ernah, 2015

Data Collection and Study Area

- Study area: District of Merangin, Jambi Province
- Villages were selected:
  - (1) Distance of production sites to oil palm mill,
  - (2) Origin of village population (indigenous and migrants from Java),
  - (3) Willingness of village heads to cooperate.

- Sample of 245 households:
  - Three villages:
    - Rawa Jaya
    - Dusu Baru,
    - Mentawak Baru
  - 126 contract smallholders
  - 119 non-contract smallholders
- LSMS type questionnaire includes household characteristics, assets, consumption, income, oil palm practices, shocks and risks, other perceptions
- Surveys in 2010; 2011, 2013, 2015, 2017

Source: Adapted after permission from www.esri.com

Features of Study Villages in Jambi

Characteristics of Oil Palm Smallholders in Study Area

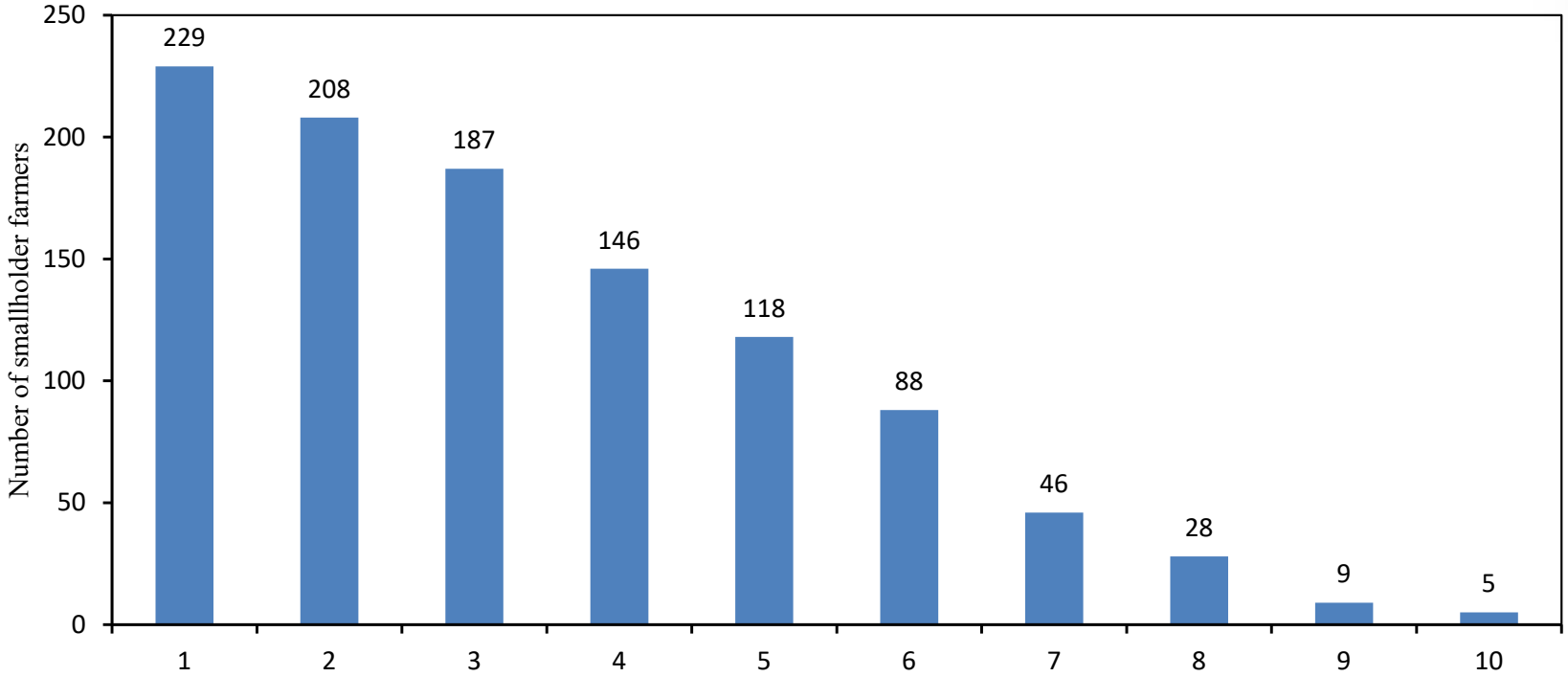
Characteristics	Contract Farmers	Independent Farmers	T-stat
Household size	4.33	4.20	0.70
Age of household head (years)	52.10	45.75	4.04***
Education of household head (years)	5.93	5.83	0.30
Number of working age household members	3.17	2.90	1.59
The length of time staying in the area (years)	24.94	23.38	1.03
Total land size (hectare)	4.59	2.88	4.70***
Oil palm area (hectare)	3.51	1.58	9.01***
Rubber area (hectare)	0.65	0.71	-0.25
Other crops area (hectare)	0.08	0.07	0.27
Livestock assets (US $)	299.90	270.40	0.24
Assets for natural resources extraction (US $)	10.40	4.00	1.74*
Non-farm business assets (US $)	561.00	105.60	1.71*
Non-productive assets (US $)	11,198.50	5,879.00	6.57***
Total net income (US $)	6,267.10	3,141.1	4.83***

Note : * p≤ 0.1, ** p≤ 0.05, *** p≤ 0.01; Household Survey 2010
Source: Cahyadi, 2011

Some Findings on Contract Farming (Cahyadi 2015; 2018)

- Participation in contract farming skewed towards wealthier farmers
- Contract farmers have more land area
- Contract farming has significant positive effects on income but the poverty reduction effect is less clear
- Contract farming insures against price shocks but not against production shocks, i.e. transient poverty remains
- Poor farmers are less able to follow input requirements and have problems to meet companies' credit repayment schemes

ISPO Practices Observed in Study Region in 2013



Source: Own household survey 2013

Considering pattern of adoption we define a minimum of 4 practices as a minimum adoption threshold.
Adopters : 146 and Non-adopters: 94 (2013)

Assuming households using a certain number of ISPO practices in 2013 also applied them in 2010 and 2012:
Adopters : 438 and Non-adopters: 282 (3 panel years)

ISPO Related Farming Practices

No.	Categories	Number of Practices	Number of Households That Follow This Practice	As a % of Total Households
1	Keeping specific records of fertilizer application	1	2	0.86
2	Keeping records of other general material inputs	3	1	0.43
3	Using protective clothing while applying pesticides	1	101	43.35
4	Safety measures for pesticides application	5	211	90.56
5	Applying mechanical Integrated Pest Management (IPM) practices	1	21	9.01
6	Applying other general IPM practices	4	16	6.87
7	Applying Individual oil palm crop maintenance practices	1	40	17.17
8	Other plantation practices according to technical guidelines including hygiene	6	112	48.07
9	Harvesting Fresh Fruit Bunch (FFB) based on maturity	1	79	33.91
10	Other harvesting practices according to technical guidelines	4	120	51.50
	Total	27		

SOURCE: Own calculations based on household survey 2013.

Adoption Models

1) **Threshold model** (measures the decision to adopt a minimum number of ISPO practices subject to risk perception):

   - Recursive Bi-variate Probit Model
   - Risk model

2) **Adoption intensity model** (analyses the number of practices adopted and the factors that can explain it):

   - Endogenous switching Poisson model
     (to account for over-/underdispersion in the data)

Determinants of Adoption Threshold

	Threhold 4	Perceived risk of diminishing productivity
Household characteristics		
Age	-0.007 *	0.004
Gender	0.551 ***	0.065
Education	0.025	-0.009
Household size	0.000	
Have off farm	-0.086	
Have debt	-0.199 **	
Risk taking	-0.218 **	
Have contract	-0.187 *	
Farm Characteristics		
Oil palm age	0.012	0.268 **
Oil palm area	-0.014	0.067 ***
Rubber area	0.016	
Others crops area	-0.056	
Have livestock	-0.075	
Shocks		
Natural disaster	-0.170	0.234 *
Economics shocks	0.255 **	
Perception		
Perceived risk of diminishing productivity	1.798 ***	
Village Condition		
Infrastructure	0.477 ***	-0.733 ***
Access water resources	0.338 ***	-0.208 *
Dummy 2011	0.347 ***	-0.533 ***
Dummy 2012	1.028 ***	-1.571 ***
_Cons	-1.371 ***	0.609
Number of observation	699	
rho	-0.891 **	

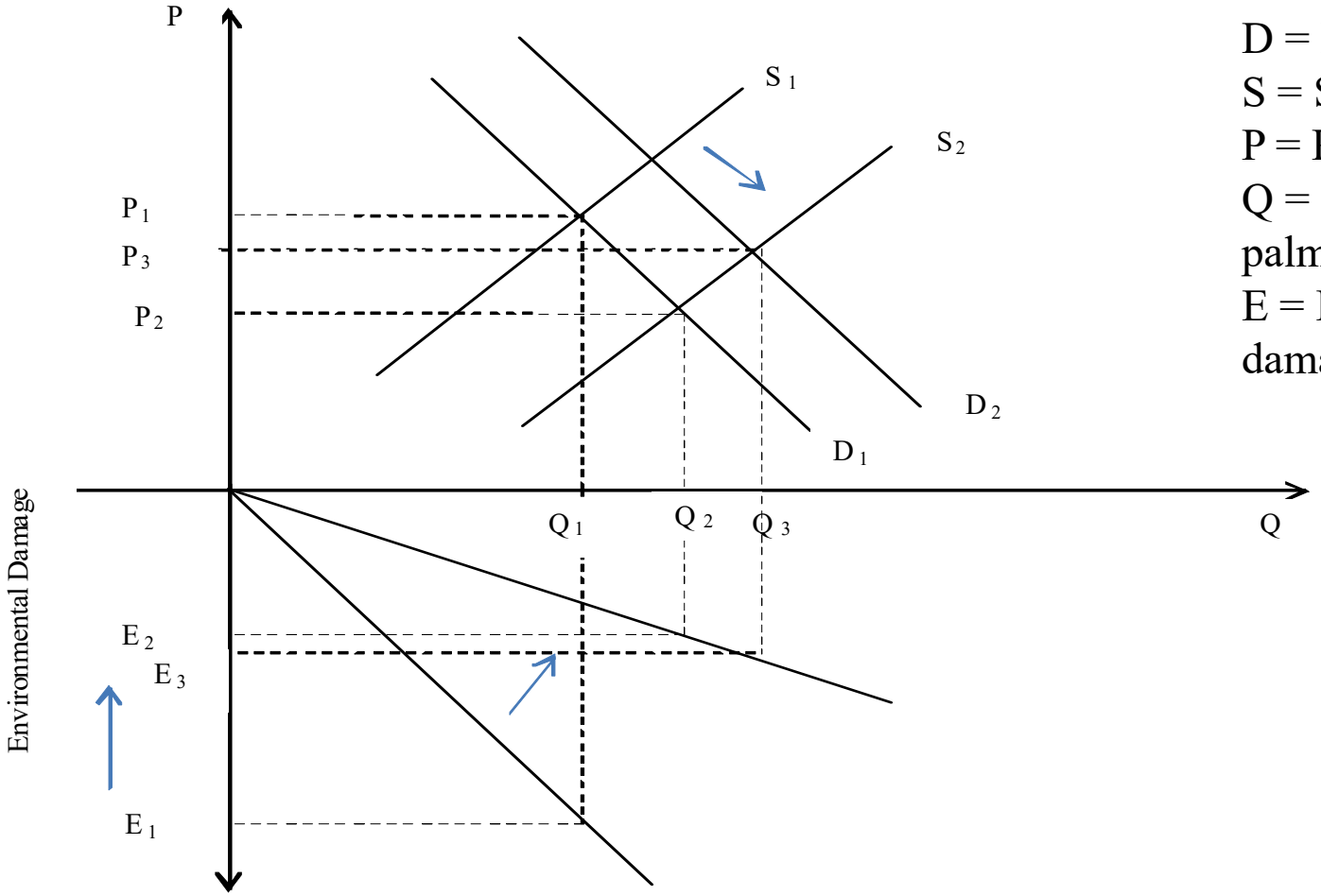
Determinants of Adoption Intensity

	Threhold 4	Perceived risk of diminishing productivity
Household characteristics		
Age	-0.001	0.003
Gender	0.317 ***	0,.00
Education	0.017 **	-0,012
Household size	0.021 *	
Have off farm	0.015	
Have debt	-0.084 **	
Risk taking	-0.090 **	
Have contract	-0.152 ***	
Farm Characteristics		
Oil palm age	0.018	0.295 ***
Oil palm area	-0.002	0.068 ***
Rubber area	0.012	
Others crops area	-0.042	
Have livestock	-0.052	
Shocks		
Natural disaster	-0.062	0.176
Economics shocks	0.114 **	
Perception		
Perceived risk of diminishing productivity	0.426 ***	
Village Condition		
Infrastructure	0.037	-0.728 ***
Access water resources	0.085 **	-0.218 *
Dummy 2011	0.087 *	-0.512 ***
Dummy 2012	0.271 ***	-1.577***
_Cons	0.804 ***	0.660
Number of observation	699	
rho	-0.887 ***	

Summary Results on ISPO Adoption

- Practices comparable to ISPO are limited among smallholder farmers
- Using a minimum threshold of four, 60% can be considered as adopters, if threshold raised to six, adoption falls below 40%
- Adoption threshold and intensity driven by perceived of diminishing oil palm productivity, village characteristics and economic shocks
- Household characteristics strongly and significantly influences adoption intensity
- More adoption requires investment in extension measures

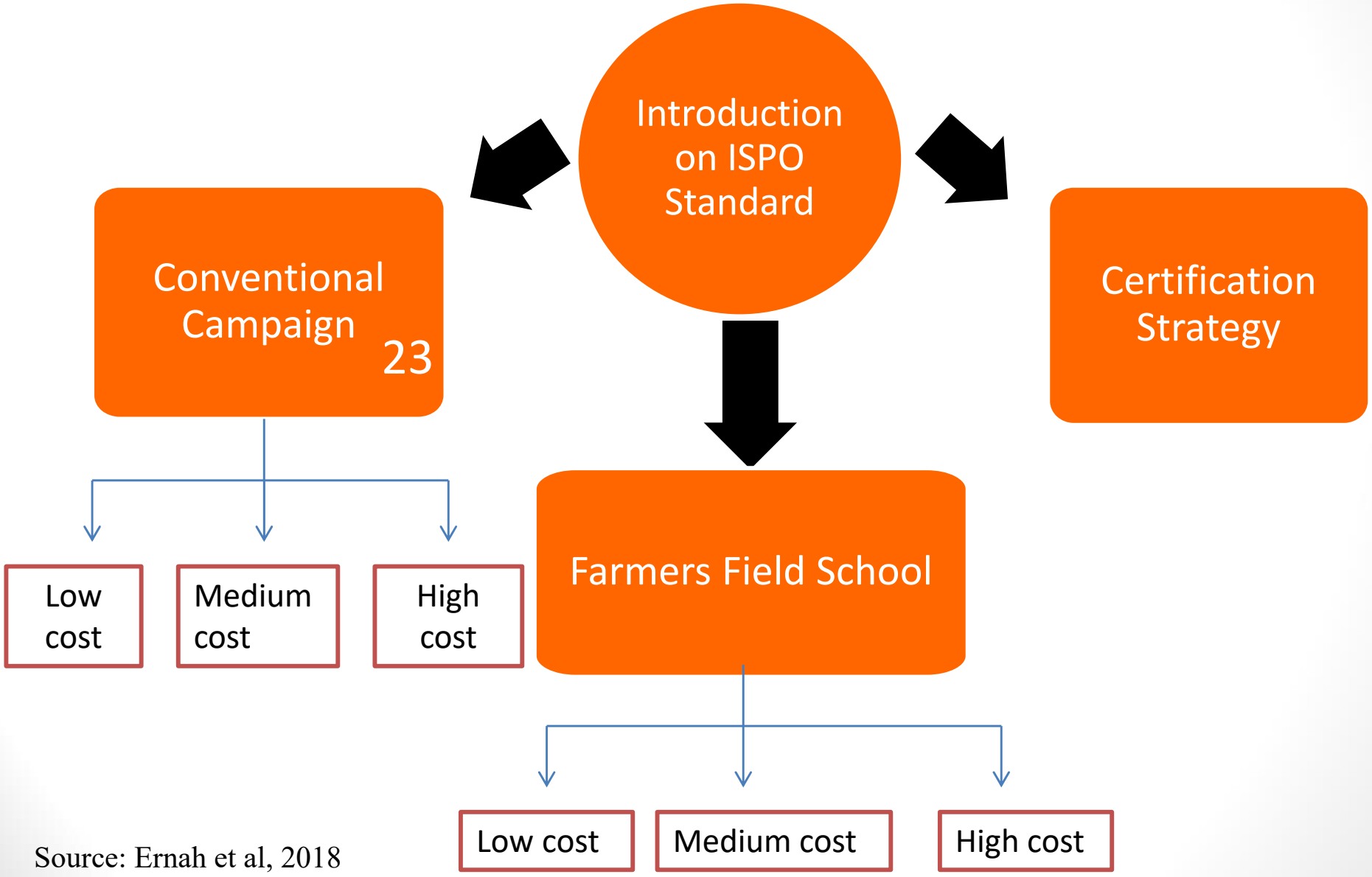
Theoretical Effects of Introducing ISPO Smallholders



Note:
D = Demand curve
S = Supply curve
P = Price
Q = Quantity of fresh palm oil fruits
E = Environmental damage curve

Figure 1: Theoretical effect of ISPO (with and without certification) on Market and Enviroment
Source: Own Illustration

Cost-Benefit Analysis of Extension Strategies to Foster Adoption of ISPO Standards



Source: Ernah et al, 2018

Cost and Benefits of Extension Strategies

Extension Strategy	Conventional Campaign (medium cost)	Farmers Field School (low cost)	International Certification
NPV (IDR/ha)	138,843	174,292	174,083
BCR	2.19	1.70	1.33
EIRR (%)	27	24	18

Results: Selection of Economically Efficient Strategy to Introduce ISPO Standards

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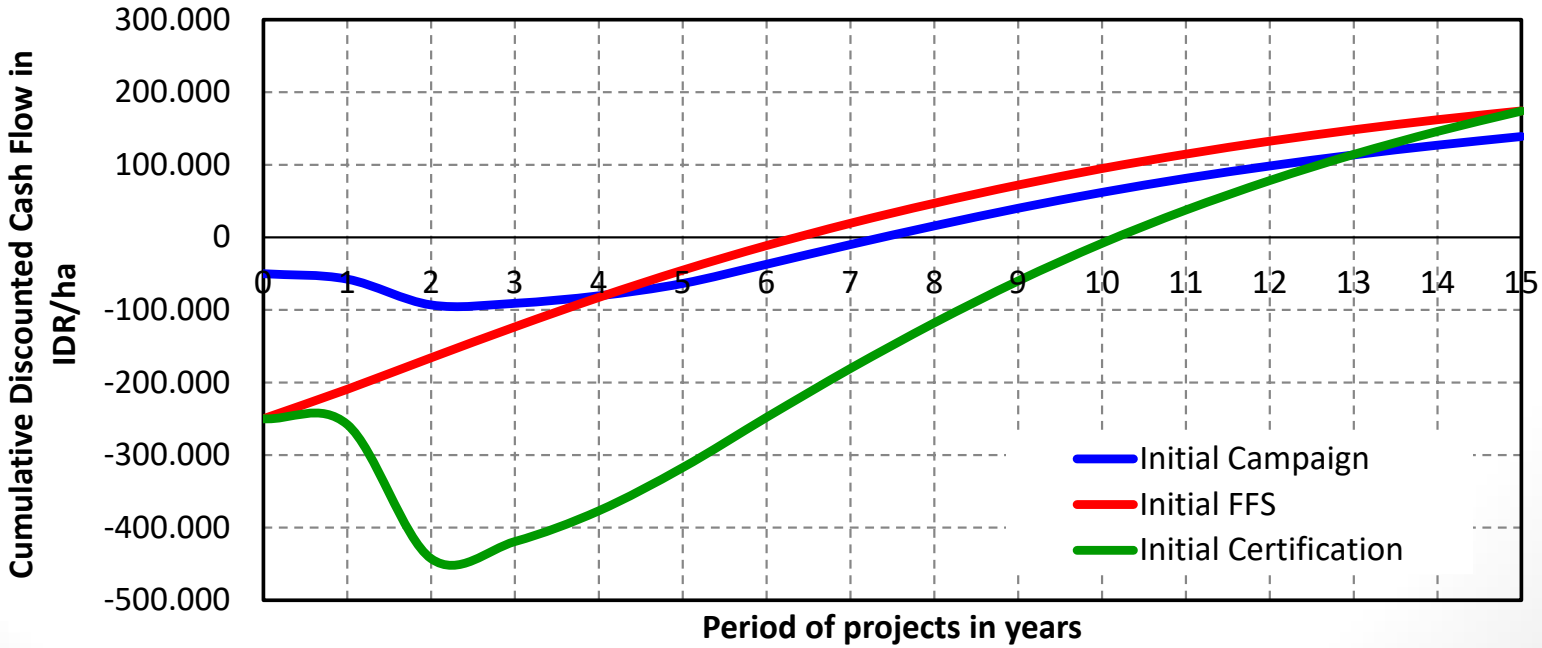

ISPO and Sustainability: A Happy Marriage?

Dimensions of Sustainability:

- Economic
  - Non-negative trend in crop performance, e.g. profits
  - Non-increasing variance in crop performance over time (risk)
  - Non-negative trend in marginal productivity of inputs
  - Zero or minimal increase in external costs
- Ecological
  - Maintenance of natural resource productivity (e.g. biodiversity)
  - Non-negative trend in crop productivity
  - Non-negative trend in crop hazards
- Social
  - Shared prosperity, inclusive growth; equality
  - Minimal occurrence of occupational health hazards
  - Maintenance of social capital (social networks)
  - Communal Integrity

Terima Kasih

"Empat Wanita Cantik dan satu Laki Tua"

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- etc.

Adoption Threshold Model

Recursive Bi-variate Probit Model (Greene, 1997)

Decision to adopt a minimum ISPO Threshold:

$$Y_1^* = ß_0 + ß_1X_1 + ß_2X_2 + ß_3X_3 + ß_4Y_2 + e \quad Y_1 = \begin{cases} 1, \text{if } Y_1^* > 0, \\ 0 \text{ otherwise} \end{cases} \qquad [1]$$

Perceived risk of diminishing oil palm productivity (subjective)

$$Y_2^* = \alpha_0 + \alpha_1X_1 + \alpha_3X_3 + \varepsilon \qquad Y_2 = \begin{cases} 1, \text{if } Y_2^* > 0, \\ 0 \text{ otherwise} \end{cases} \qquad [2]$$

Adoption Intensity Model

Endogenous switching Poisson model (Miranda, 2004)

The poisson model assumes that endogenous variable $ISPO_i$, given explanatory variables V_i, is independent with the conditional function of c

(Assaf et al., 2013)

$$\Pr(c;\Omega) = \frac{\mu^{-\Omega}\ \Omega^{c}}{c\ !} \qquad \text{for } ISPO_i = 0,1,2\ldots10 \qquad [3]$$

where c is the number of occurrences of ISPO practices followed, whose probability is the Poisson mass function $c!$ and Ω is the parameter that indicates the average number of ISPO practices followed

Adoption Intensity Model (cont. …)

To account for the problems of over and under dispersion we implement an endogenous switching Poisson model

The conditional mean function of c_i is as expressed

$\Omega_i = \exp\{ V_i'\gamma + s_i \delta + \theta_i\}$ [4]

Where V is a vector of explanatory variables. The switching variable s_i is a dummy expressed as:

$s_i =$ 1, if $\{ s_i^* = \omega_i \lambda + \psi_i \geq 0,$ [5]

{0, otherwise

Where, s_i^* is a latent random variable and ψ_i is an error term. ωi is a vector of explanatory variables and λ is their unknown coefficient parameter.

The potential endogeneity of s_i is represented using a correlation coefficient ρ between two error terms θ_i and ψ_i