World Agroforestry Centre
TRANSFORMING LIVES AND LANDSCAPES

Economic Analysis of Improved Smallholder Rubber Agroforestry Systems in West Kalimantan, Indonesia - Implications for Rubber Development

Yuliana Cahya Wulan
Suseno Budidarsono
Laxman Joshi

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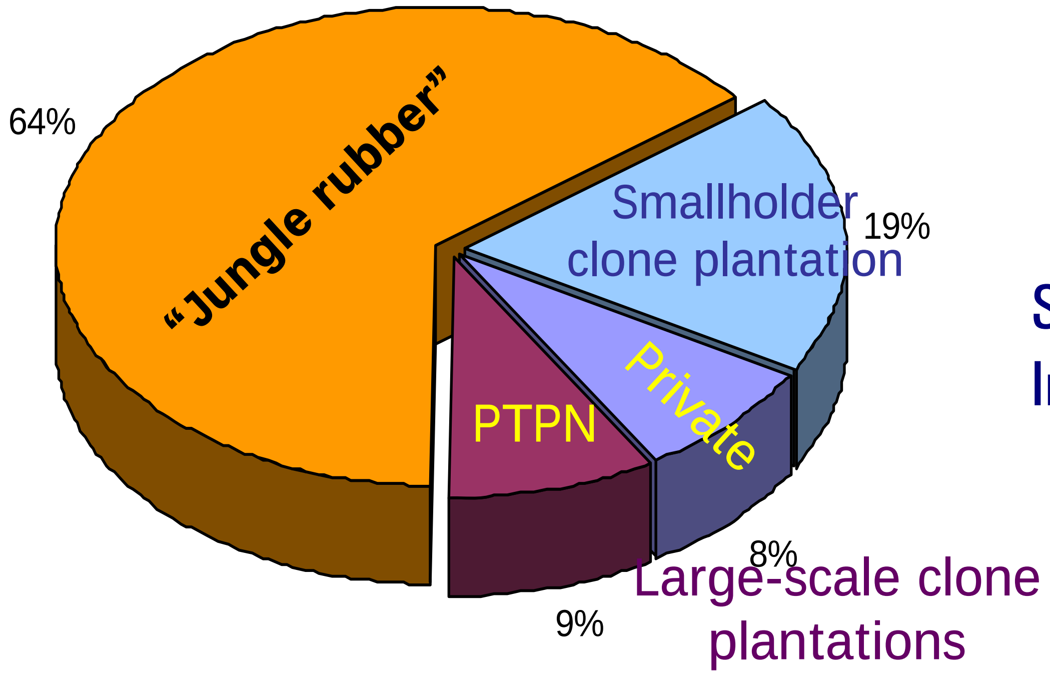
Presentation outline

- Natural rubber in Indonesia
- Improved rubber agroforestry systems
- Economic data assessment
- Scenario testing - examples
- Conclusions

Indonesia has 3.3 million ha rubber producing 1.8 million ton – 23% of world production

Land under rubber in Indonesia



Smallholders produce 73% of Indonesia's total production

Numerous projects, plans to convert jungle rubber to improved system – but most smallholder farmers have not adopted "improved" system

Natural Rubber production in Indonesia

Smallholder rubber:

- 83% of rubber area (3.3 mill ha)
- Adapted slash and burn system
- Annual crops in first 2-3 yrs
- Unselected rubber seedlings
- Extensive management; little/no input

Consequences

- Slow and heterogeneous rubber growth
- Competition: rubber and forest re-growths
- Mixed vegetation: complex jungle rubber
- Low latex productivity: ½ - ⅓ of estate

Improved rubber-based agroforestry – alternatives to monoculture


- Based on traditional practices, but using clones
- Provide optimal return, diverse and adaptable by farmers
- On-farm trial-demo plots (managed by farmers, monitored by ICRAF)
- Data – bio-physical and socio-economics




Rubber Agroforestry Systems (RAS)

RAS-1: Natural vegetation re-growth outside weed-free strip

RAS-2: Fruit or timber trees between rubber rows; annual crops in inter-rows

RAS-3: Shrubs, cover crops or fast growing trees between rubber rows to shade out *Imperata*

Socio-economic data – analysis

1. characterize socio-economic background of RAS trial participants and compare with non-partiicpants

2. To assess the economic performance of RAS technology and compare with alternatives

3. farm budget analysis - to assess impact of technology intervention and price and policy changes (aid decision making in selection of appropriate technology)

Data

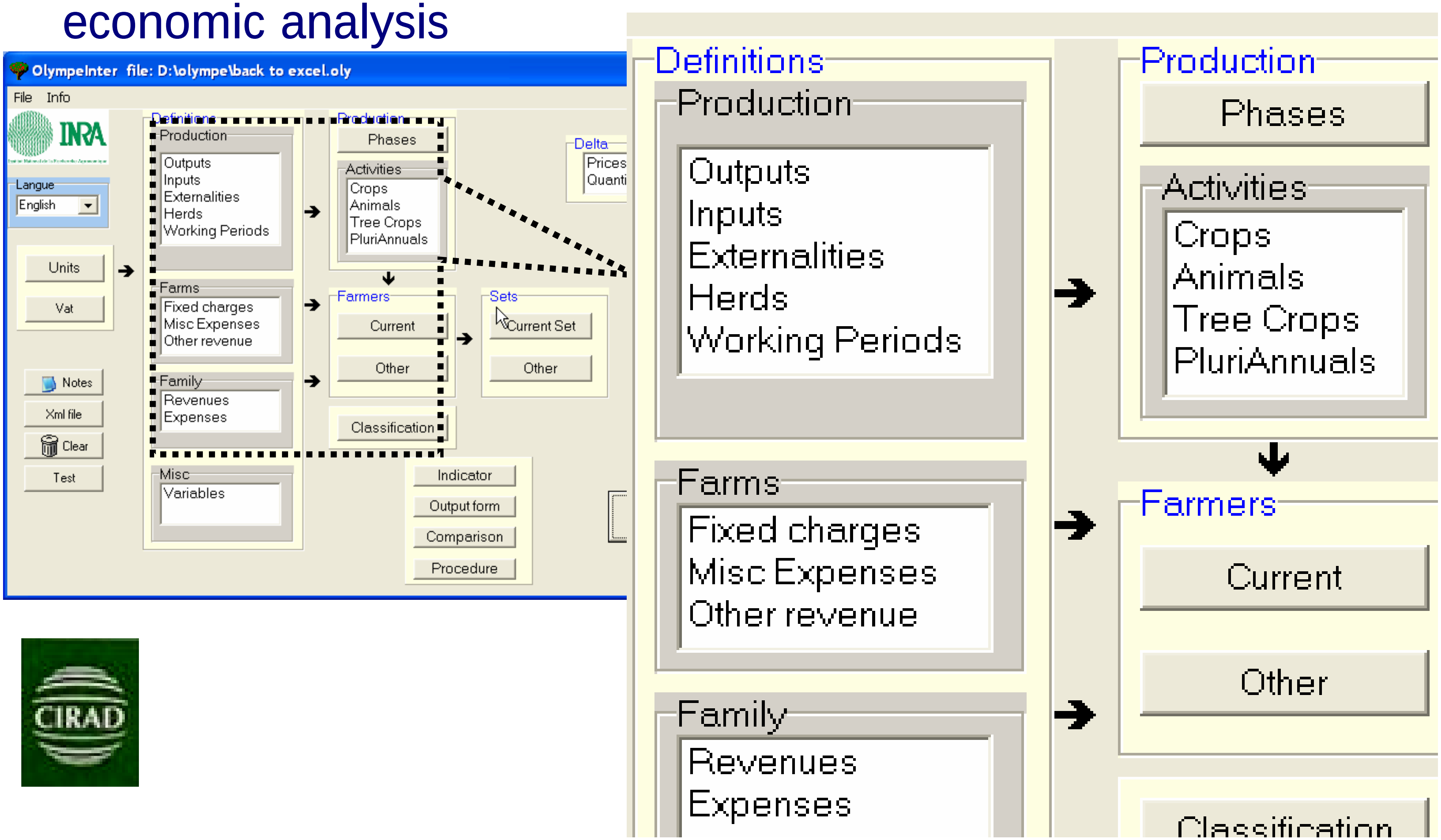
1. Origin of different sources of income
2. Cost of production (farm inputs - fertilizer, agro-chemicals and labour)
3. Outputs and yields
4. Commodity price – time series

Sources:

- ✓ On-farm trial-cum-demo plots of RAS
- ✓ Farmer interviews – RAS (60) + non-RAS (20)
- ✓ Secondary sources and literature

Olympe

farming system modeling software developed by INRA/CIRAD/ IAMM for constructing farm budget and economic analysis



OLYMPE farming systems modelling

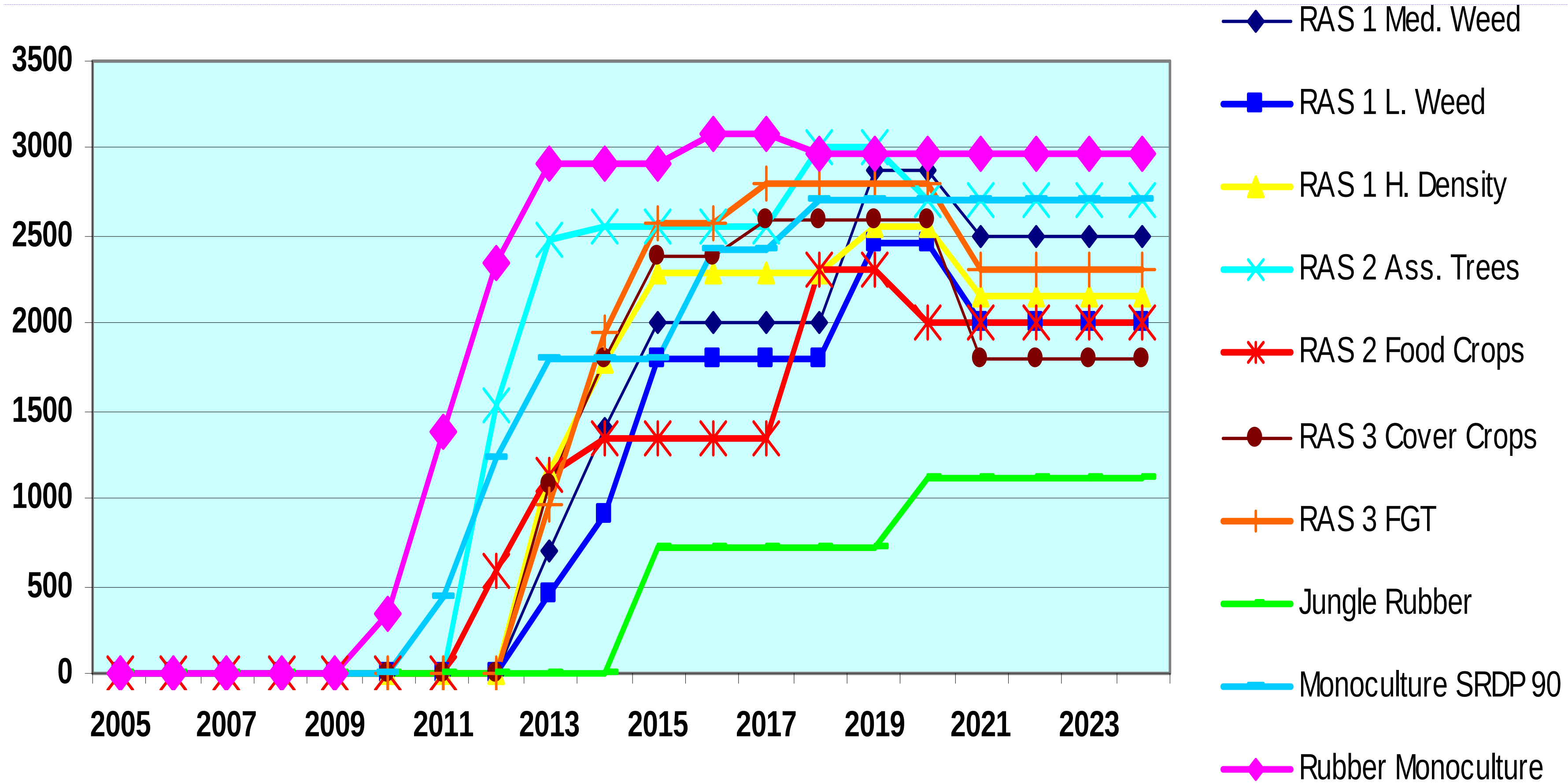
1. Enables modeling of farming systems in order to characterize them and to identify typologies.
2. Provides features for prospective analysis according to price and yield evolution.
3. Permits the analysis at the level of farmer groups.
4. Helps build scenarios according to price, climatic events or various types of risks.
5. Assesses impact of technical choices at the farming systems level – both economical and environmental

Results: **Attributes of RAS Farmers**

1. Average land holding: 5.74 ha/household
2. Rubber area covers about 55% of total farm area
3. Average household size was 4.7 individuals
4. Average family labour used on the farm: 2.7 individuals (709 person-days/year).

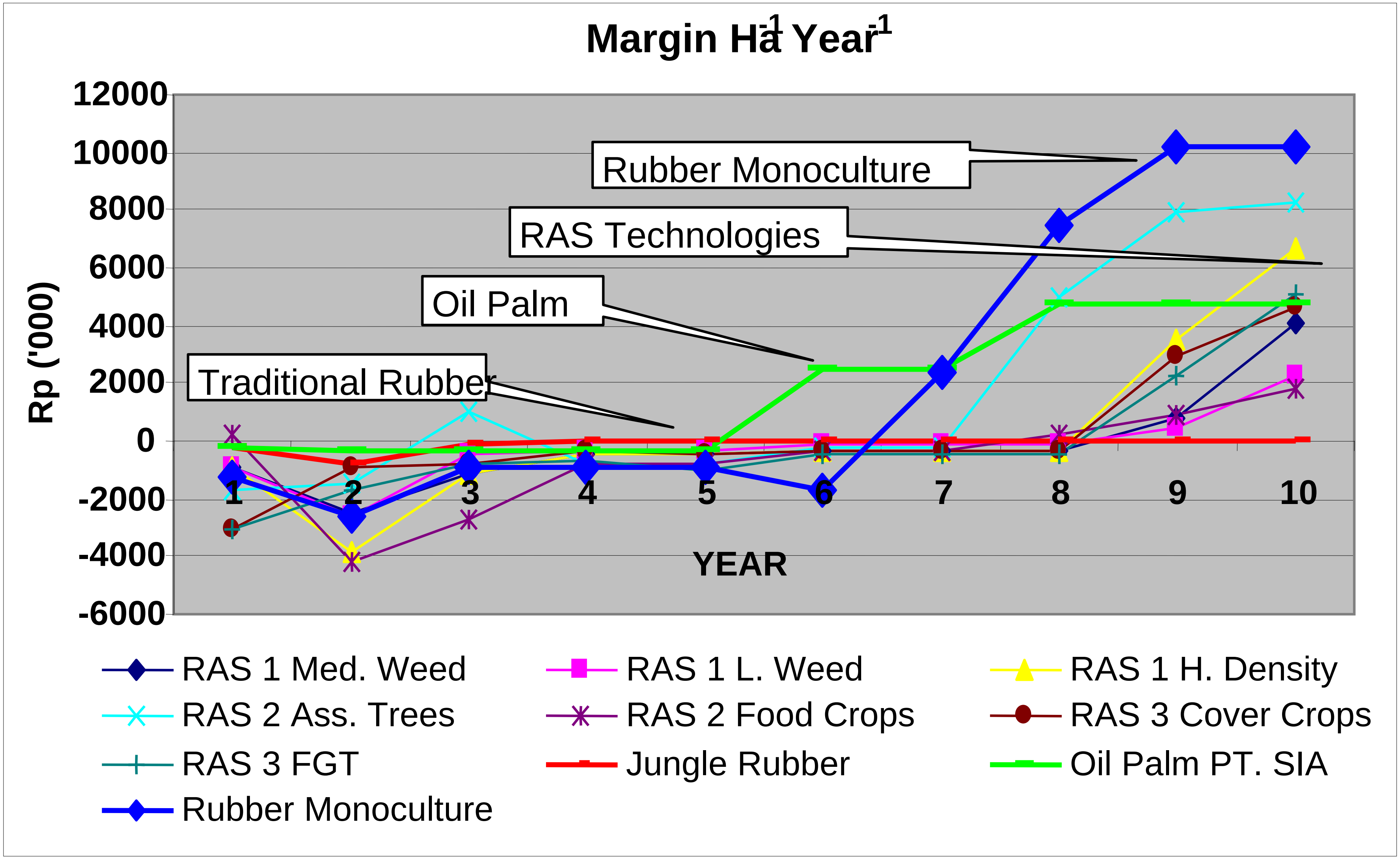
Land use	Area (ha)		
	Max	Min	Average
Irrigated field (sawah)	2.00	0.00	0.32
Upland field (ladang)	2.50	0.00	0.52
Rubber area non-RAS	16.50	0.00	2.34
RAS area	1.50	0.27	0.52
Oil palm	6.00	0.00	1.04
Tembawang/mixed fruit garden	3.00	0.00	0.16

Simulated rubber yield (fresh weight) from different rubber systems



1. Farmers normally tap 200-300 trees a day, 6 days a week
2. Tapping intensity decreases when household labour is needed elsewhere (paddy harvest, off-farm work, social events)
3. Non-rubber products from RAS and traditional systems

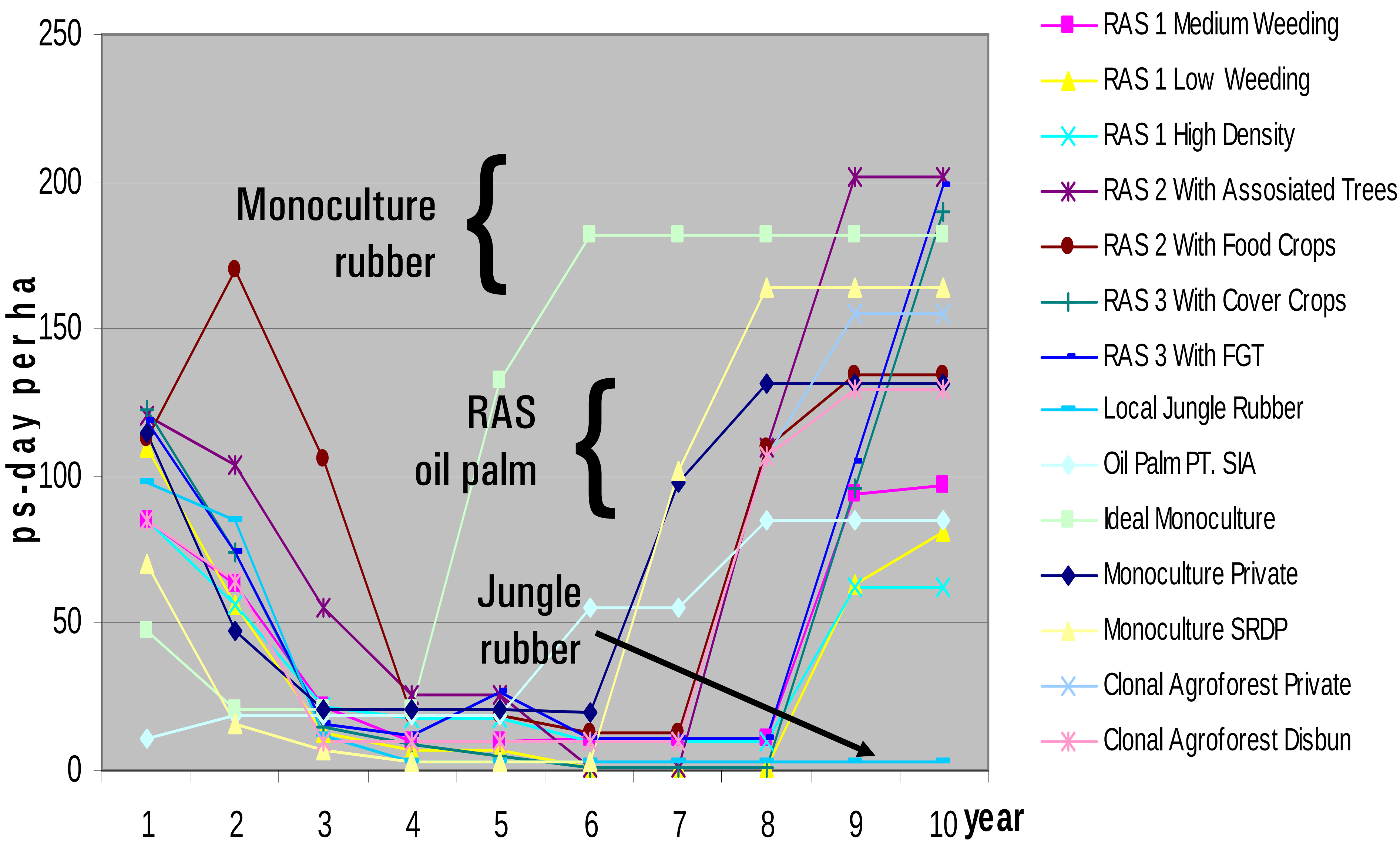
- **Margin: monoculture<RAS<traditional system.**
- **RAS technologies require lower capital and inputs.**



Net Present Value (NPV) and 'discount factor' in long-term investment. [1 US$=IDR 9000; daily wage rate=IDR 20,000]

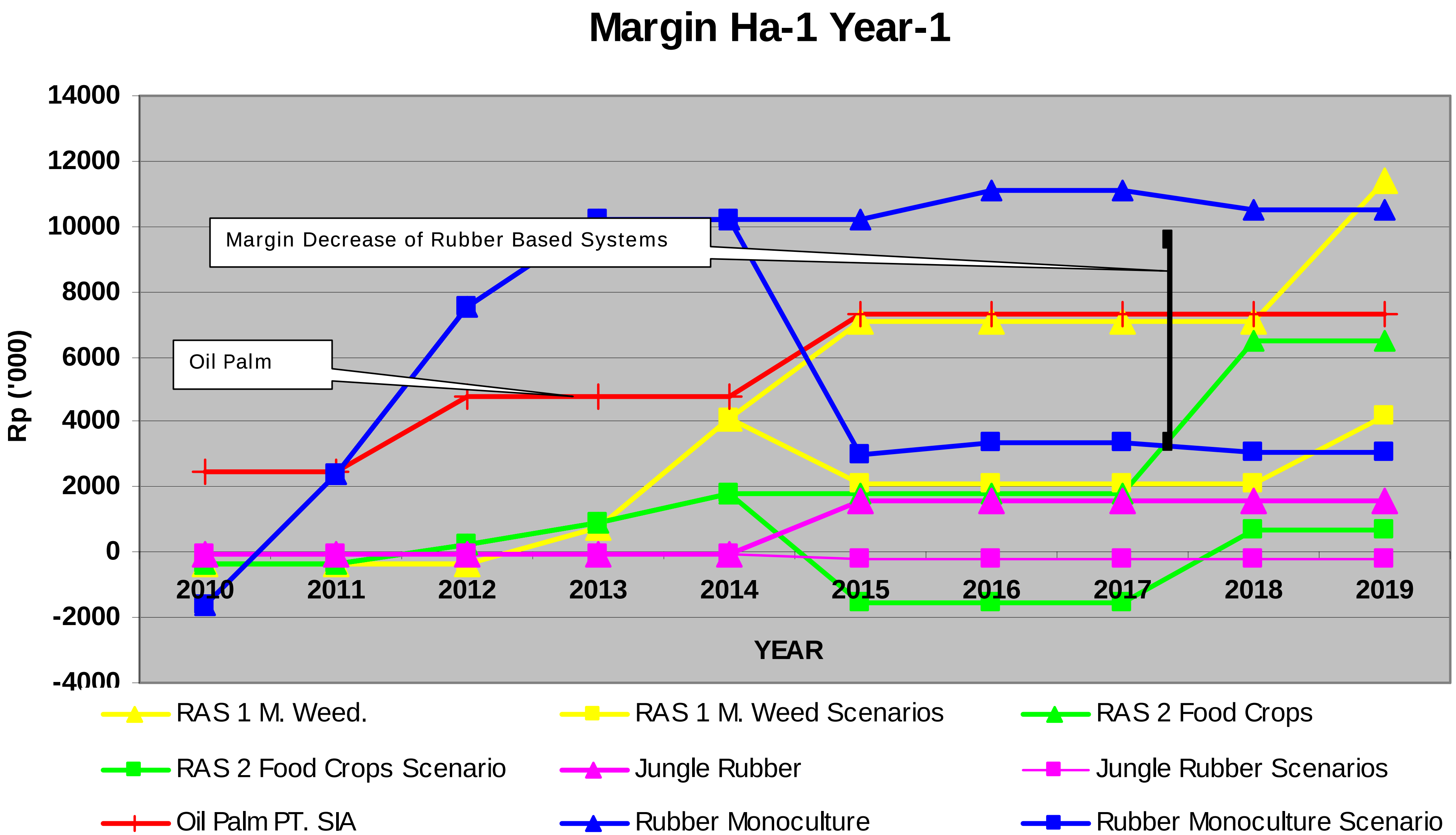
FARMING SYSTEMS	NPV (Rp'000/ha)	YPC (years)	EST. COST (Rp'000/ha)	Return to Labor (Rp/Ps-days)
Jungle Rubber	(1,073)	-	13,629	17,907
RAS 1 Low mgmt	10,087	13	10,874	40,838
RAS 1 Med mgmt	11,197	14	14,318	47,629
RAS 1 High density	13,496	12	12,657	47,629
RAS 2 Food crops	4,116	18	21,834	25,113
RAS 2 Ass. trees	18,316	10	15,373	42,749
RAS 3 Cover crops	2,864	13	19,427	23,189
RAS 3 FGT	7,127	14	18,513	27,683
Rubber monoculture	18,567	10	19,035	35,683
Monoculture SRDP	8,045	14	20,192	29,477

Labor input in different rubber systems



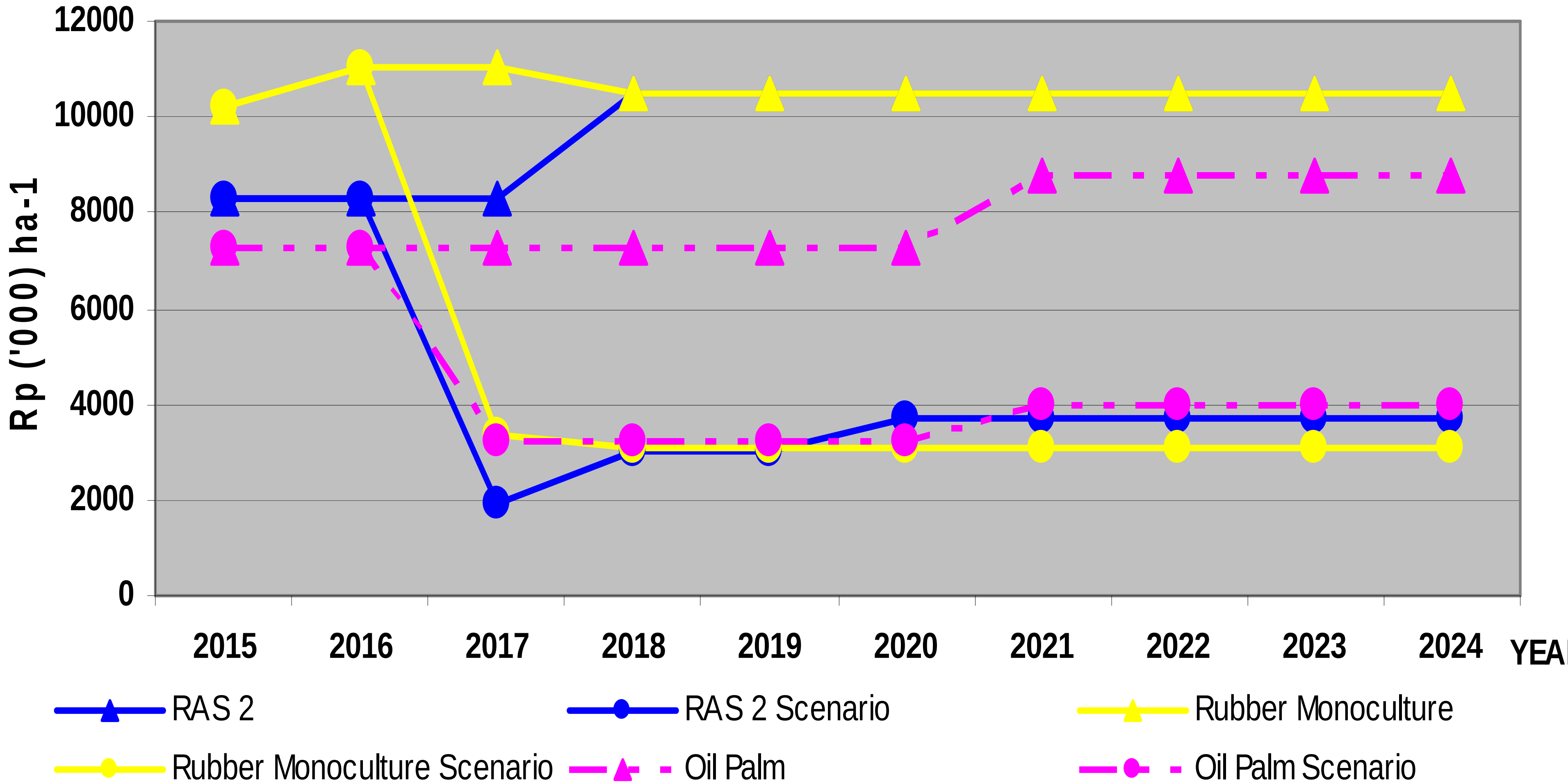
Prospecting commodity price change

Scenario A: 50% reduction in rubber price between 2015 to 2019, other factors remain constant



Prospecting commodity price change

Scenario B: prices of rubber and oil palm drop by 50% and 40% respectively starting 2018



CONCLUSIONS

- **Compared to traditional jungle rubber, RAS technology requires more capital input, but both returns to labour and return to land are higher.**
- **Intensive monoculture rubber offers better rubber productivity (yield and profitability), but requires much higher capital and input than alternatives.**
- **RAS technology, can provide smallholder farmers with diversified income and range of NTFPs.**
- **Simulating possible changes (e.g. commodity price) important aspect for informed decisions.**
- **Olympe software is informative and useful for farm budget analysis - customisable outputs.**
- **Olympe - potential decision support tool for choosing between land use alternatives and intensification**

Thank you