

TRANSITION FROM EXTENSIVE TAMBAK TO SUSTAINABLE SILVO-SHRIMP CULTURE

Can this be achieved in
East Kalimantan's Mahakam delta?

18 March 2014, Roel H. Bosma

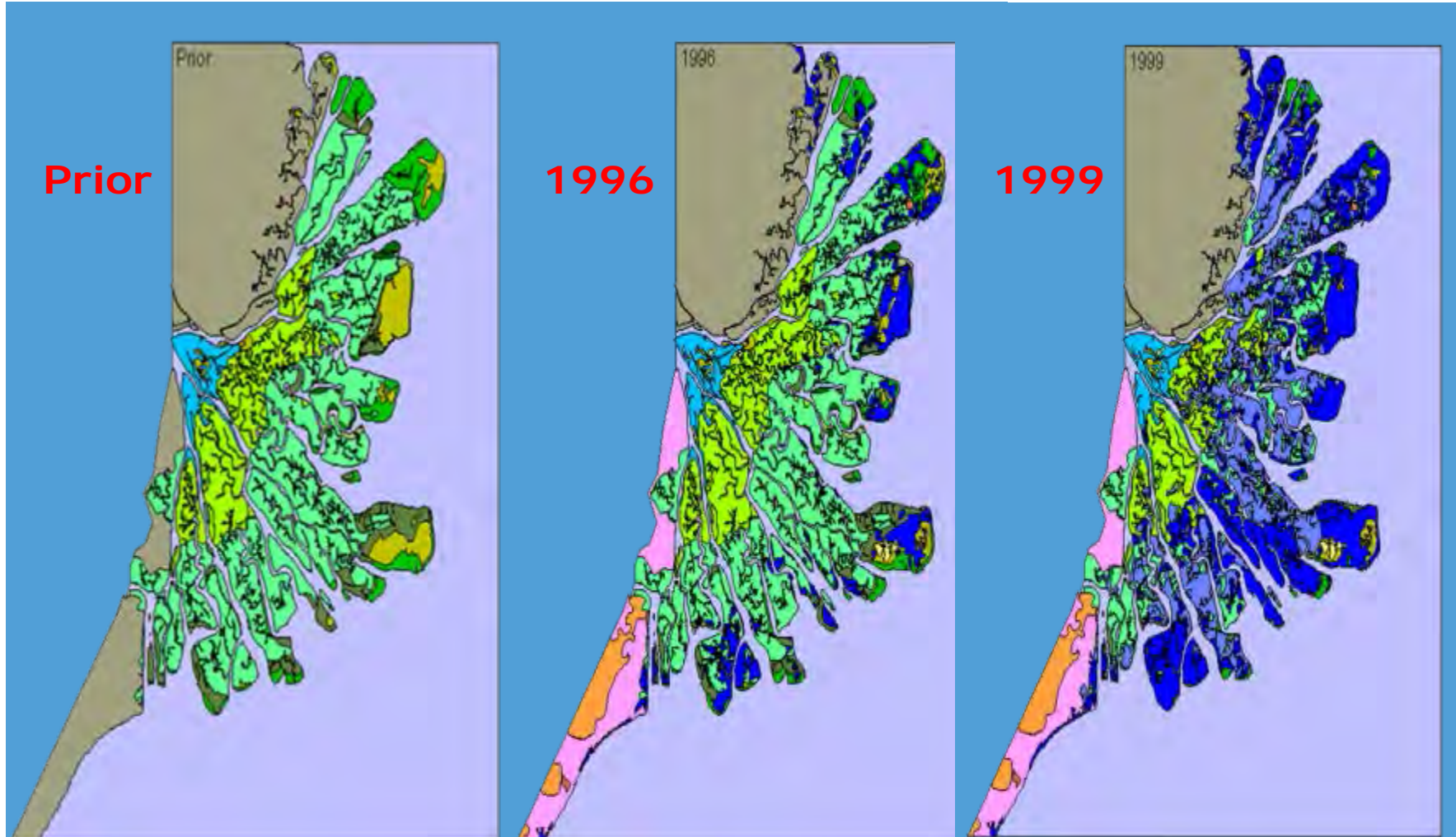


Coastal areas:

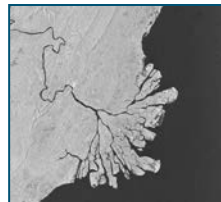
- High productivity possible:
 - Trade,
 - Oil & gaz,
 - Fisheries & Agriculture,
 - Aquaculture.
- Heavily populated,
- Highly subject to changes,
 - often accentuated by Climate Change;
- Many users / interests => Competing Claims.



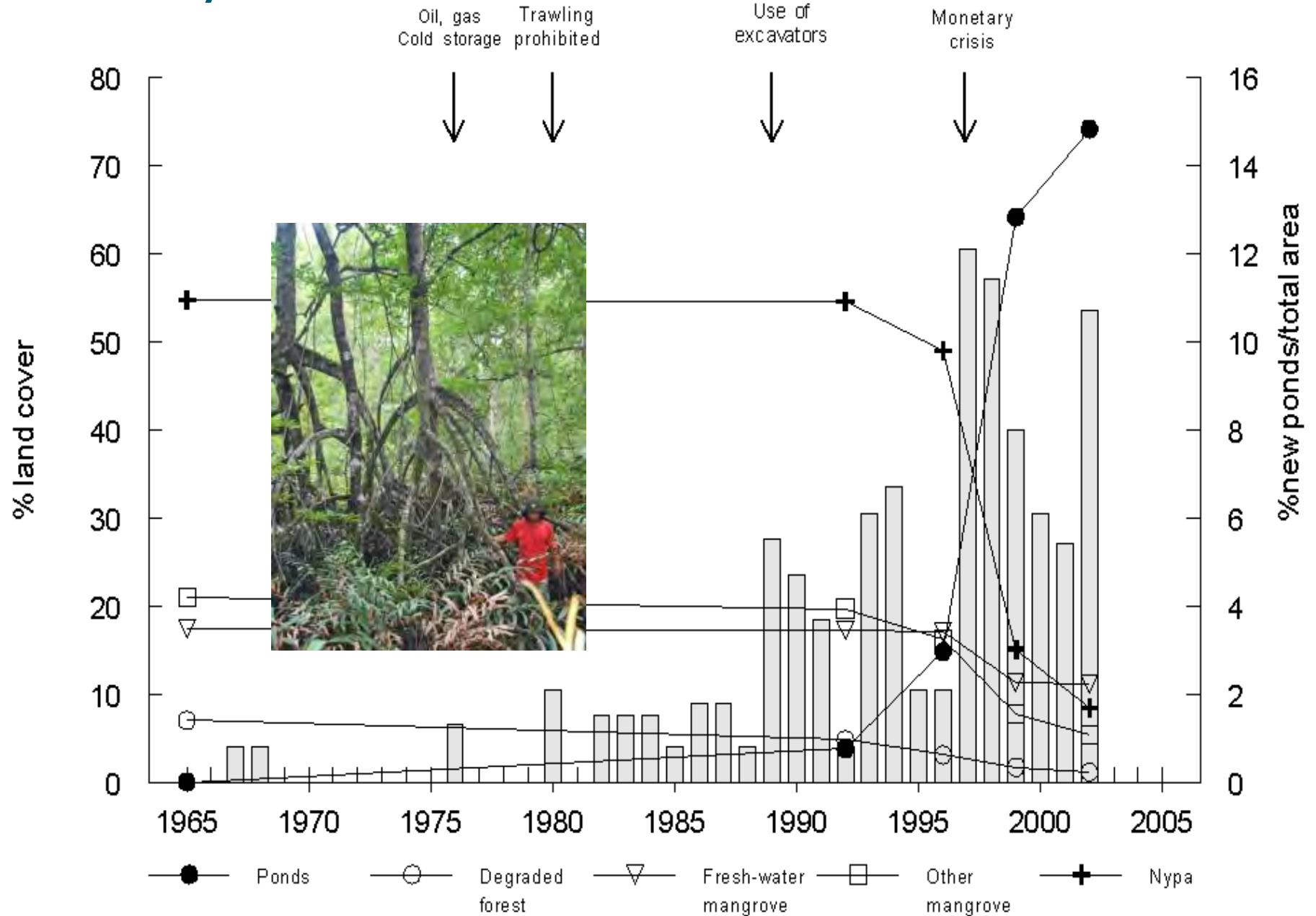
For example: Mahakam delta' shift to aquaculture



Regression of mangrove ecosystem in Mahakam Delta
(Bourgois *et al.*, 2002) (blue colour = shrimp ponds)

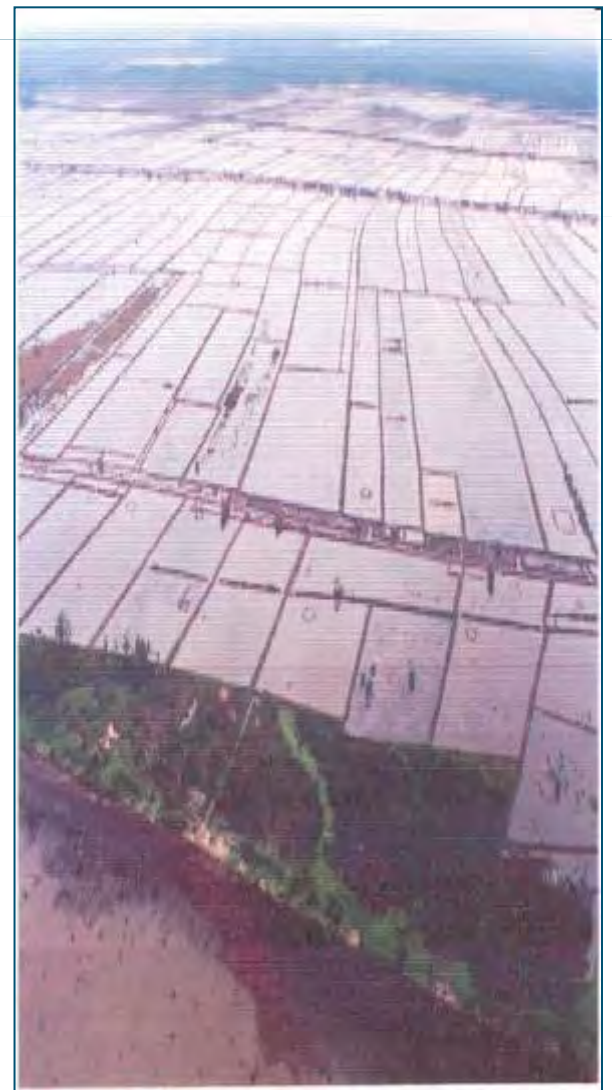


History of shift



Other drivers of shift

- Mangrove's open access
- and Weak institutions;
- Investors => land owners
=> Care-takers for ponds =
immigration of poor
- Since 2006 many abandoned after:
 - Repeated failing shrimp harvest
 - Destroyed dykes.



Low production in Mahakam delta

- No intensification => low yield & shrimp diseases
- Average yield of tiger prawn <50 kg/ha/yr due to:
 - Pond design (large, mostly shallow),
 - Many ponds located on peat soil,
 - Pond management weak,
 - No extension services (training),
 - Frequent disease => harvest once on 3-4.



Low yield drives a vicious circle

■ To survive farmers / care-takers collect:

- Spotted shrimp: 49 kg/ha/yr,
- Crab: 11 kg/ha/yr,
- Milkfish: 70 kg/ha/yr.

■ Some innovate:

- Stock crab,
- Produce naked crab.

■ But many

- Chronic poor
- or abandon = failed gold-rush.
- Low education, low demand non-educated labour



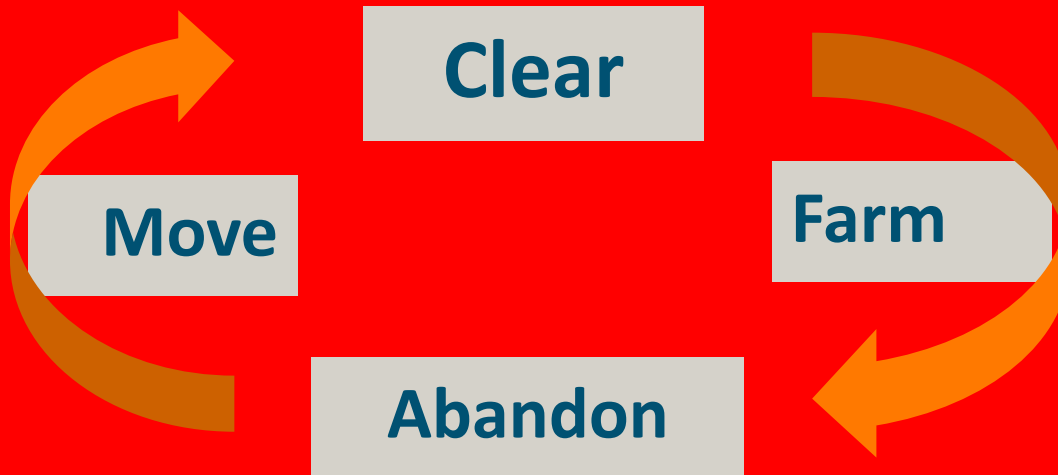
Part of a vicious circle

■ Mahakam delta

- 1999: 75% = ponds
- 2006: 1/3 ponds non-productive
- 2008: 54% = ponds

=> Move to e.g. Berau Delta
(ha of tambak)

Cyclic process of:



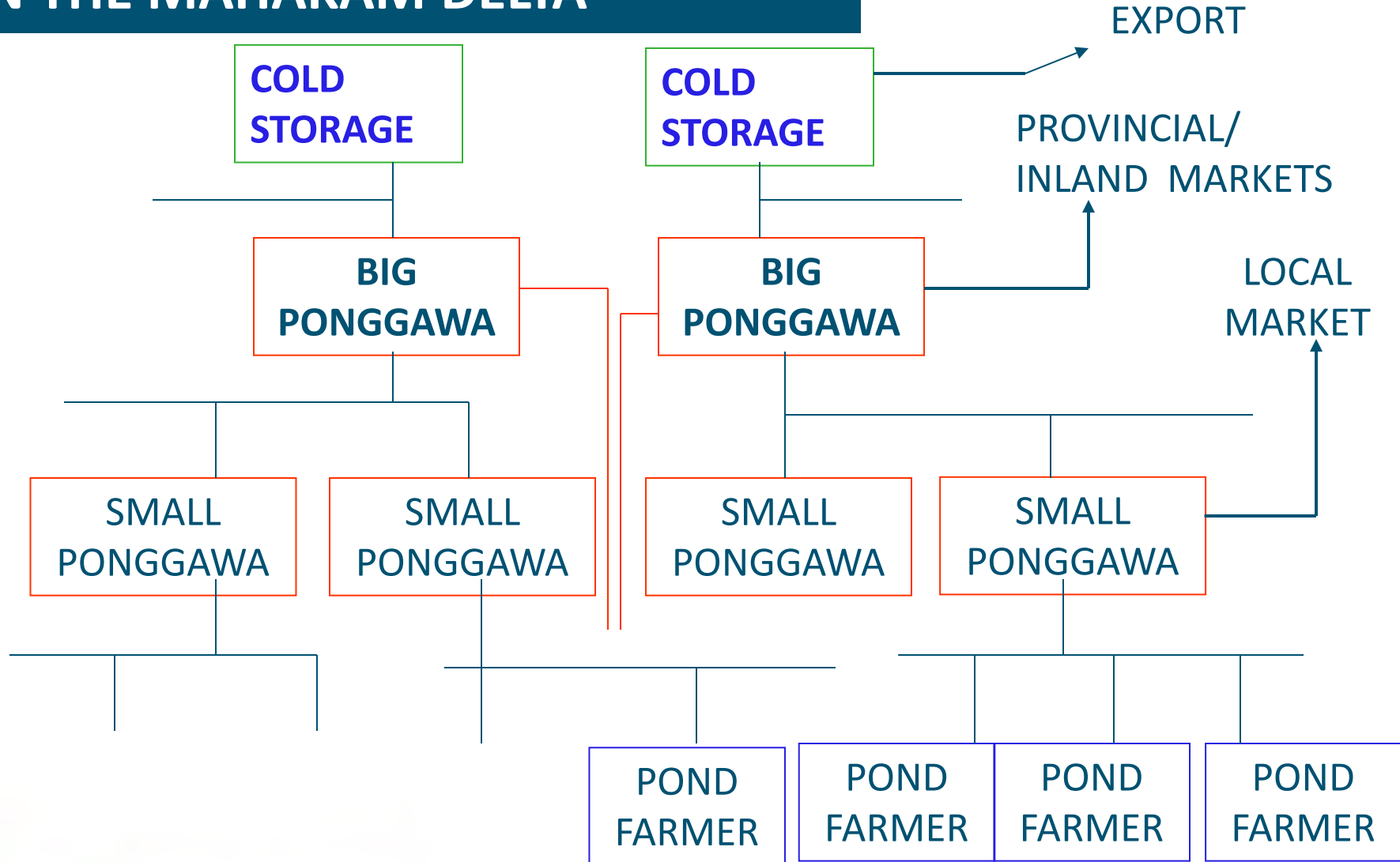
- 1984: 0
- 1999: 236
- 2010: 2,003

Shift back or transform,

- Recovery of functioning mangrove ecosystem:
 - More then 20 years, but no full recovery unless
 - Breaking some dykes
 - Planting trees
- Can we
 - 1. prevent this happening in other deltas?
 - 2. transform into sustainable livelihood system?



ECONOMIC ROLE OF **PONGGAWA** IN THE MAHAKAM DELTA



The institutional triangle accelerating mangrove conversion

SOCIAL & POLITICAL SITUATION

EXTERNAL FACTORS

TRADITIONAL REGULATIONS
=> Easy access to land
ownership at level
Sub-district and village

Weak regulation
and control from
higher government

INTERNATIONAL
MARKET

SOCIO-
ECONOMIC
CONDITION AT
GRASS ROOT
LEVEL

MIGRATION

LAND
SPECULATION

POOR PEOPLE

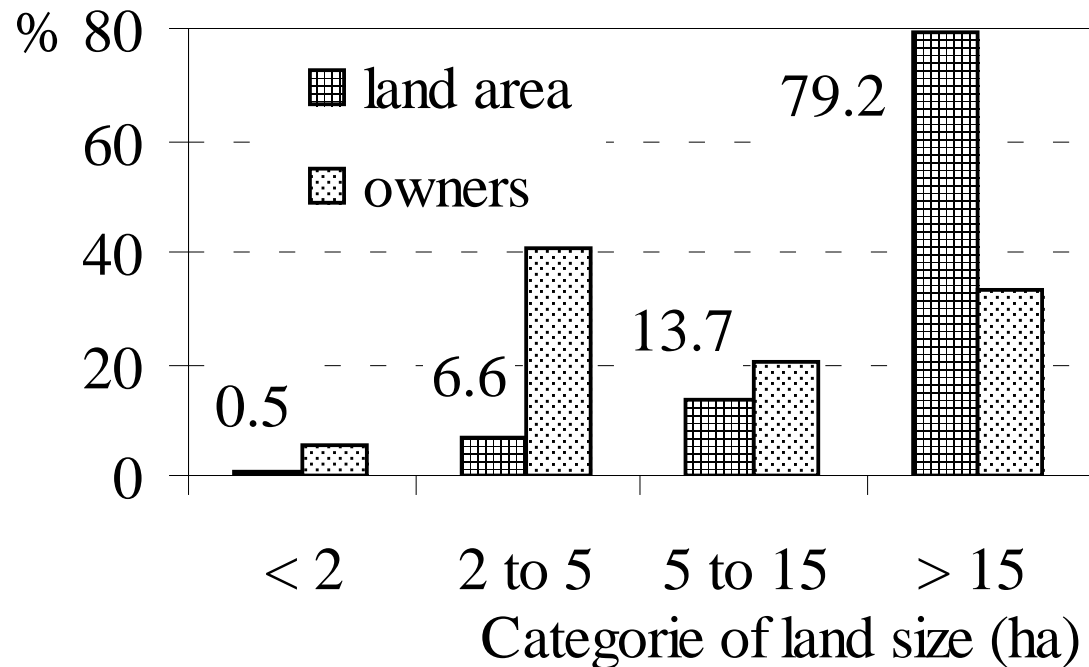
- Need to survive
- Traditional practice
- No training, no funding

ECONOMIC OPPORTUNISTS:

- Patron-client
- Absentee owners
- Cold storages

Power and livelihoods

- Distorted power reflected in land ownership
 - 1st arriving who were successful
 - Owners of excavators: investors, village leaders



- One of 3 villages limited land distribution to 4 ha.

De jure versus de facto property rights

- Before 2000, laws not effective to control mangrove conversion.
- Pond occupation by Surat Pernyataan Penguasaan Tanah Negara (SPPT) from local leaders based on **traditional property rights**.
- => government “no power” to control this **de facto** land occupation by farmers even if **de jure** their ownership on the land is illegal.
- Other reasons for “a weak power” to control the delta:
 1. Potentially huge income for farmers, traders and officers;
 2. No alternative employments for pond farmers if moved;
 3. High cost for compensation of moving farmers from the delta.
- What GO and NGOs are trying:
 1. Restore mangrove by developing silvo-aquaculture system,
 2. Province GO proposed to National Ministry of Forestry to change delta’s status from 100 % KBK (Forest Cultivation Area) to 50% KBK and 50% KBNK (Non-Forest CA).



Shift back and transform to sustainable livelihood

- **Full recovery of mangrove ecosystem on peat soil**
 - Nypah palm => sugar
 - Sago palm
 - Needs assistance & research (selection).
- **Elsewhere: Silvo-aquaculture, mangrove-shrimp**
 - Design: empang tradisional / komplagan / **other**.
 - Better management:
 - extensive systems produce < 300kg/ha.

Learn from experiences

■ Mekong delta: large areas of mangrove-shrimp farms

- 50 to 70% mangrove on farm, but most on platforms
- (Semi-)extensive shrimp production
 - 175 – 400 kg / ha
 - Other products double income
- Good livelihoods if ≥ 10 ha.
- Limited ecosystem services, just like Indonesian type 1:
 - No frequent inundation of mangrove
 - Disconnected from aquatic resources.
 - \Rightarrow low significance for habitat,
 - regulating, supporting and cultural services



Green water shrimp systems in PH



Tilapia (+ sea-bass) in storage/filter ponds:

- Reduction of loss from disease (25%)

- Improved growth rate (>10 %)

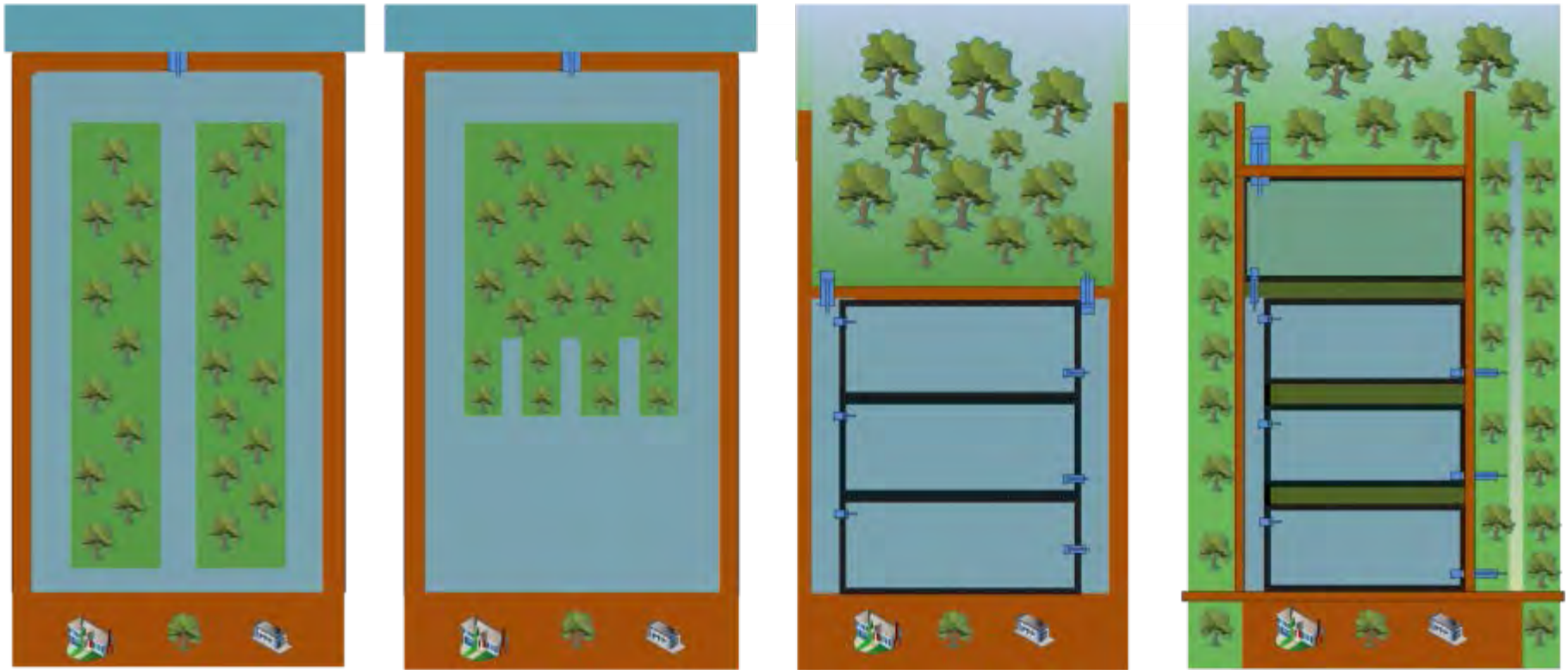
- => Higher margins.

Sample of 60 farmers in 4 provinces:

- in 2008: 25 % practiced GW system

- in 2010 : an estimated 75 %.

Mangrove-shrimp systems



- Mixed systems: (semi-)extensive shrimp culture (pond 30-50%).
- Separated mangrove-shrimp: mangrove cleans effluents.
- Ecologically integrated mangrove-shrimp systems (pond <50%).



Which system combines at best advantages of mangrove and shrimp?

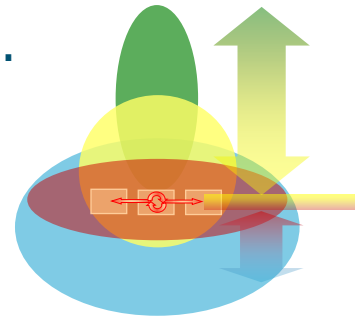
Method:

■ Cost Benefit Analysis (CBA)

- Compares investments considering interest (inflation)
- Thus discounts the cash flows using an interest rate.

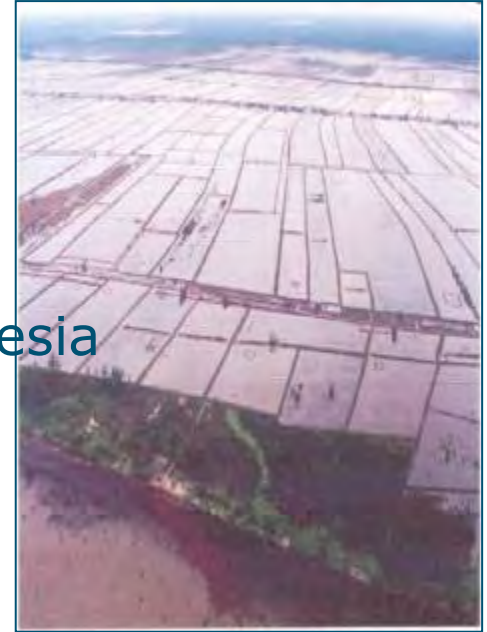
■ Calculates for a given number of years:

- Internal Rate of Return (IRR) =
 - Discounted benefit relative to the investment (%).
- Net Present Value (NPV) =
 - Value of expected cash flows, less cost of investment.
- For various cost and price scenarios => sensitivity analysis.



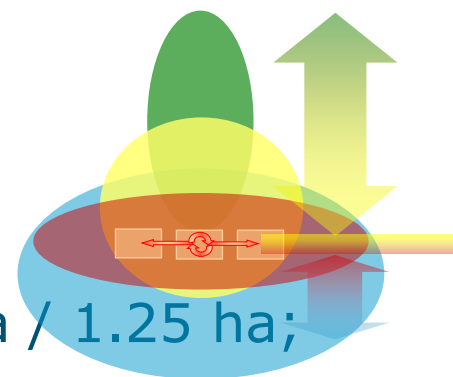
Comparison of four systems

- Farm area of 11 ha, incl. 1 ha service area.
1. Extensive system
 - tambak from Mahakam delta, Indonesia
 - timber from Vietnam and Indonesia.
 2. Green water (GW) and
 3. Intensive shrimp:
 - survey in PH (Bosma & Tendencia)
 4. Mangrove – semi-intensive shrimp



Description of systems

- Shrimp price 6.4 US\$/kg (in 2013 >10 US\$/kg);
- Extensive system: harvest of natural recruits;
- MPR-7 = Mangrove to Pond Ratio 7/1 => 8.75 ha / 1.25 ha;
- GW = includes 1.25 ha of green-water / sedimentation pond.

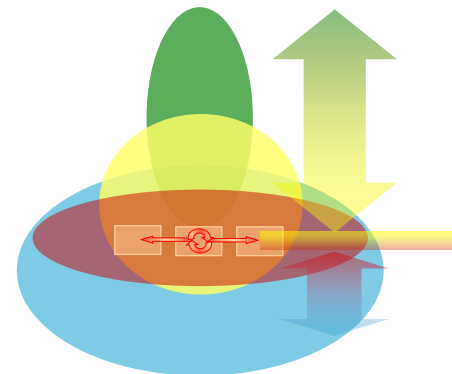


	Production systems			
	Extensive	MPR-7	Non-GW	GW
Pond depth (m)	0.6	1.2	1.2	1.2
Shrimp stocking density (n m ⁻²)	1	10	28	22
Survival rate stocked shrimp	10%	80%	70%	90%
Feed input (kg ha ⁻¹ cycle ⁻¹)	-	5,000	8,900	11,900
Shrimp harvest weight (g)	25	25	28	32
FCR (Feed Conversion Ratio)	-	1.42	1.68	1.91
Total capital costs (US\$)	46,000	100,000	456,000	456,000
Total operating costs (US\$)	4,200	16,100	338,000	321,000
Total income in US\$ per ha	1,000	1,800	29,300	29,400

Result Cost Benefit Analysis

Production systems				
	Extensive	MPR-7	Non-GW	GW
Profit excluding depreciation (\$)	7,800	5,100	13,000	32,000
Profit including depreciation (\$)	7,500	5,000	12,000	31,000
Rate of return on initial cost	17%	5%	3%	7%
Rate of return on operating cost	185%	32%	4%	10%
Pay-back period (yr)	5.9	19.5	35.0	14.3
Total shrimp production (ton/11ha)	0.5	10.9	50.0	46.5

- Extensive system: high RRs even without 1st 3-5 good years,
 - Very interesting for investors looking for short term benefit.
- Income from mangrove-shrimp system intermediate, but
 - without accounting its ecosystems services.
- Green-water system performs better:
 - improved survival and lower cost of chemicals.



Compared to intact mangrove

- Shrimp: 8000 to 30,000 US \$
- **Total Economic Value of Mangrove***:
 - Provision: 44 – 8,300 \$ int.
 - Habitat: 27 – 68,800 \$ int.
 - Regulating: 1,900 – 135,400 \$ int.
 - Cultural: 10 – 2,900 \$ int.
 - South Minahasa: 36,0000 \$ US **

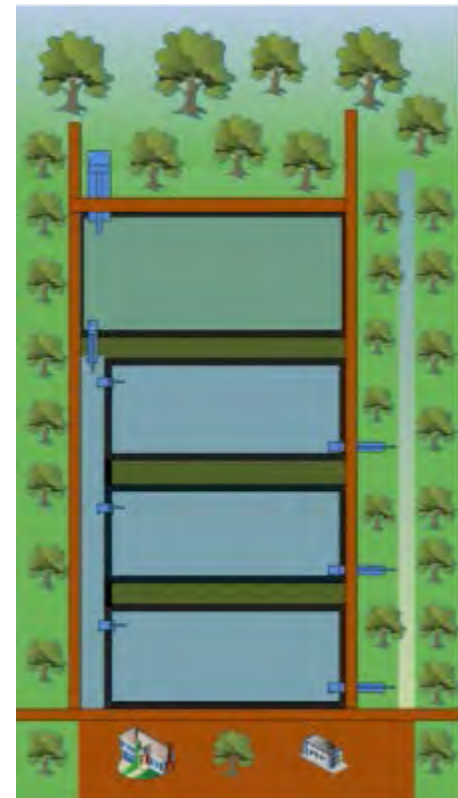
* Russi *et al.* 2013; **Mankay *et al.* 2012



Conclusion - Take home message

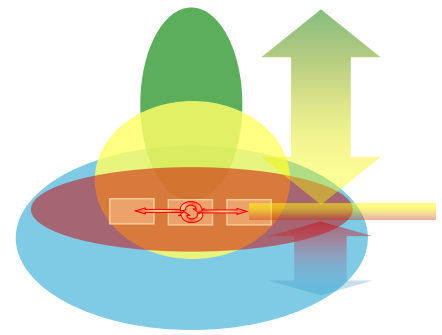
- Maintain livelihoods for sustainability.
- Extensive: high RRs but all/most environmental services lost.
- Mangrove-shrimp income intermediate, but
 - Most services of mangrove forest maintained.
- Ratio total shrimp harvest from 11 ha:

	Extensive	MPR 7/1	Intensive
	1	20	90
● ESS	0	7	0



- For higher national GDP & sustainability
- Mangrove Green-Water Shrimp
- Prevent Mahakam scenario in other deltas

Recommendations



- GO and NGOs in area where mangrove was lost
 - Organise stakeholders.
 - Support transformation smaller farms into silvo-aquaculture farms with mangrove, and filtration and shrimp ponds;
 - Use farmers field-school approach of Mangrove Action project;
 - Organise REDD⁺ income for forest between farms & on water-side.
- GO: strictly control settlement in functional mangrove forest
- Mahakam GO, give large owners forest title in exchange for:
 - Transforming their ponds in ecological mangrove-shrimp.
 - Or for restoring mangrove to cash REDD⁺.
- Certifiers should include off-farm mangrove in compliance.



Thank you and Success

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