

Multi-stratum coffee agroforestry

Multi-stratum coffee agroforestry become a priority of cultivation on farmer own land in Sumberjaya, Lampung, Indonesia.

Photo: World Agroforestry/Arif Prasetyo

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CHAPTER NINE

Sumberjaya from conflict to source of wealth

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Highlights

- A coffee-producing landscape in the mountains of Sumatra had become a hot spot of conflicts between forestry officials and farmers
- Engagement by research and development partners became known as Negotiation Support
- Innovative use of policy instruments in Indonesian forestry law did resolve the conflicts
- In a second phase attention shifted to voluntary, conditional rewards for and coinvestment in sediment reduction



Starting point: a pioneer coffee landscape with serious erosion and sediment loading, affecting a new hydropower plant. Photos: World Agroforestry

9.1 Introduction

Setting the scene: a 40,000 ha area, home to 100,000 people, with coffee (robusta) production as primary source of income, living in a huge old crater, with consequences for spatial variability of soil properties from various eruptions and lava flows. Adjacent to the Bukit Barisan mountain range that runs along the length of Sumatra island (Indonesia), the *Way Besai* river feeds one of Lampung's main rivers. Coffee farming expanded here from start of 20'th century, but a large influx from Java (government sponsored + spontaneous migrants) led to a densely populated landscape. The river became the catchment for a hydroelectrical power plant, developed in the early 1990's. This started the '***issue***' that dominated the landscape from that time: evictions of coffee farmers from a 'protection forest' part of the landscape, motivated by concerns over water quantity and sediment load. When ICRAF engaged in the late 1990's, evictions had made it a 'worst case' example of conflict. The 'action research' here became the basis for a 'Negotiations Support System' approach (NSS), where three interacting knowledge systems (local, public/policy and science/modellers ecological knowledge – LEK, PEK, MEK for short) were charted, landscape-level scenarios were explored, as well as reconciliation/ negotiation processes were supported to turn an ugly lose-lose setting into a win-win. The solutions that emerged varied by landscape zone: community-forest management (HKM) agreements for the watershed protection forest, and a number of PES experiments and ES auctions on the private/village lands by the RUPES (Rewarding Upland Poor for the Environmental Services they provide) program[1]. Now, nearly 20 years after the start of the engagement, the landscape has become a source of inspiration (aligned with the 'Source of Wealth' meaning of the name) for watershed management elsewhere in Indonesia[2].

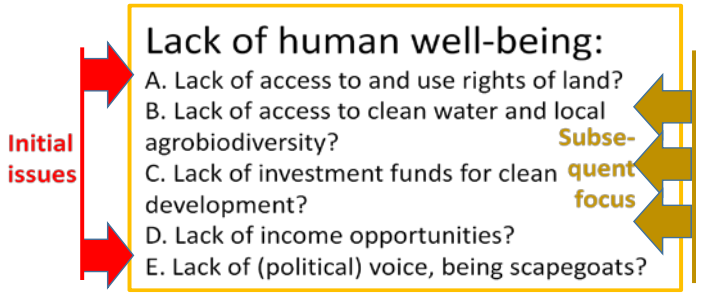


Figure 9.1 Five aspects of rural poverty[3] that were addressed successively in Sumberjaya in a agroforestry action research on agroforestry at landscape, farm and plot level

In the cooperation between ICRAF and a range of national and local partners centred on Sumberjaya (Lampung, Indonesia), three 'learning loops' can be distinguished. In the first the issue at stake was

i) Tenure security for coffee farms in the 'protective forest' zone (NSS)[4]. Once that was on its way to be resolved,

ii) Reducing sediment fluxes from the non-forest zone: voluntary & conditional ES contracts (RUPES)[5,6], and

iii) Increased income from ES-friendly coffee production systems.

Step 1: Negotiation support for resolving tenure conflict

Engagement in the first stage was part of a wider involvement that has been described as 'Negotiation Support System', consisting of two parts: an assessment aimed at bridging between three types of ***knowledge*** (local, policy-based and science-based) of functions, changes and options in the landscape, and an ***action***-oriented process of reconciliation after serious conflict, trust building and negotiated solutions.

After an initial (***exploratory***) assessment by researchers that much of the conflict (expelling coffee farmers from the landscape) was based on mythunderstanding of eco-hydrological relations in the area[7], while the recently approved national Forestry Law included articles that could be used to come to a negotiated set of use rights, we responded to an invitation by local stakeholders to engage and were able to get the funding (from various sources) needed to do so.

Subsequent ***informative*** assessments were aimed at a deep dive into local ecological knowledge systems, biophysical assessments of land use options, erosion and water flows (identifying major diversity in soils as key factor in the differential responses to land use change), and exploration of the rules and underlying concepts of existing public policy for the area, in its historical context (of alternating phases of attracting and repelling migrants).



In the first step, researchers listened to local perspectives and helped translate local concerns and solutions to the negotiation tables with government officials. Photos: Brawijaya University/Kurniatun Hairiah

As a next step, ***decisive*** assessments focussed on the modalities of 'conditional tenure' agreements, with specified restrictions on land use (shift from open to shaded coffee systems). With an initial validity of the agreements of 5 years, the evaluation criteria that could be used to judge their effects in a first phase and turn them into the (legally maximum)

duration of 25 years (renewable) became the next point of analysis and negotiation support. While initially the groups that had best social capital connections with government officials and NGO's could benefit most[8], subsequent scaling up to all of the forest margin within the subcatchment, also included the ecologically higher priority communities.



Breakthrough in the conflict resolution when government officials sat down with villagers to discuss possible solutions for tenure security under 'community forestry' rules. Photo: World Agroforestry

Step 2: Rewards for, and coinvestment in sediment load reduction

Design became a prominent part of the second learning loop when attention shifted to the way the sediment load of the river, with its negative consequences for the hydropower company at the outlet of the *Way Besai* subcatchment, could be tackled on the privately owned lands below the 'forest margin' and collectively improved the conditions of the riparian by planting bamboo, constructing a sediment retention dam and strengthening the river banks. Innovative 'auctions' for contracts to (voluntarily) adopt additional soil conservation measures were designed and implemented at the private lands, with followup research on factors predisposing 'winners' of the contracts, as well as success in completing what had been agreed. At the scale of headwater subsubcatchments a 'Rivercare' contract was designed and followed up.

Step 3: Farmer groups engaged in better marketing

In the third 'learning loop' attention has shifted to options to increase income from environmentally friendly farms, with the initiative shifting to local groups (incl. those initiated around 'River Care') and limited support (mainly in establishing external contacts) by the World Agroforestry Centre team.

9.2 Values at stake

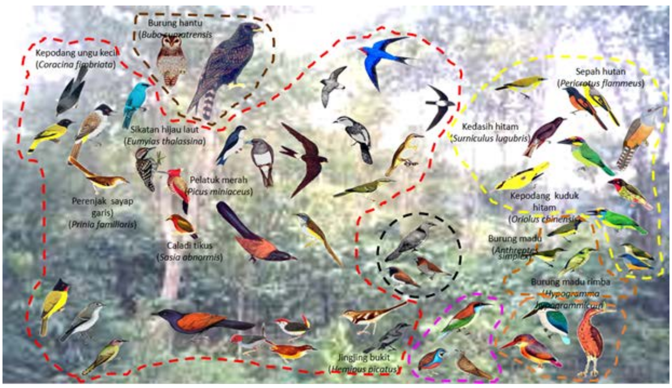
At the start of the learning loops, the conflict involved both instrumental values (land use as basis of local needs and income *versus* water yield as source of hydropower and sediment

loads that reduced their efficiency) and relational ones (perception of 'forest' as sole provider of water security[9]). The 'instrumental' ones could be more easily quantified and challenged and coupled to spatial data[10] than the relational ones. Among the 'relational values' the terminology used for various types of forest and gardens were the tip of the iceberg of underlying value systems. Getting government recognition for some of the local concepts was key in the trust building process.

Before the first phase an expulsion threat to 'forest encroachers' had marginalized a large part of the villages and settlement, and brought them into conflict with provincial authorities (acting on behalf of national forest authorities)[11]. Once solutions to that conflict were at the negotiation table, it became clear that better-connected farmer groups got priority. But the success they had opened doors for others as well, so there was a 'trickle down' when the tenure contract model became widely implemented. From surveys we learned that the Gini coefficient of individual land claims within the community-based tenure contracts differed from that for other land holdings in the village, showing a trend towards greater equity[12]. Specific attention to gender was part of the knowledge/perceptions phase, but did not play a major role in the land tenure and ES contracts[13].



Coffee monoculture



Coffee agroforest

With secure tenure multistrata coffee systems, evolving into coffee agroforests were both economically and ecologically feasible and desirable

Throughout the involvement by researchers multiple metrics remained in focus. Some of these relate to 'land cover' (as the tenure contracts had specified the number of trees per ha that were to be planted/maintained), presence of soil conservation structures ('rorak'), others to water yield and sediment concentrations (the basis of 'river care' contracts) and the income

streams that farmers could expect from various land use practices (in dependence of discount rates and perceptions of tenure security). For the hydropower company a financial assessment of the costs to their operations of current sediment loads of the river was made, to help them assert their 'willingness to pay' for voluntary sediment reduction in the landscape. Within the process as it unfolded there was no perceived need for integral assessments of economic value of the landscape as a whole – our assessments focussed on specific decisions that could be made.

Participation covered a range of meanings: in some parts researchers were allowed to participate in locally led activities, in others it was the reverse. Efforts were made to involve schools in biological water quality assessments[14,15] to broaden the basis for a more evidence-based discussion on environmental impacts of land use.

The Sumberjaya from its inception recognized and reconciled multiple cognitive models and worldviews, in its focus on three interacting knowledge systems[16]. In doing so it unpacked trade-offs and interlinks between values – finding common space for negotiated agreements by challenging dominant views that only 'forest' could provide the watershed services desired. For local people livelihoods and security of tenure (no fear of evictions) were key[17], for the hydropower company its number of operating days and net profit, for foresters a new way of dealing with people in the landscape etc. Once tenure security had been addressed farming techniques that combined farmer income and environmental protection could become the focus[18,19,20].

Table 9.1 Value concepts that appeared to dominate for the various stakeholders in the three 'learning loops'

I. Tenure security for coffee farms in the 'protective forest' zone (NSS)	II. Reducing sediment fluxes from the non-forest zone: voluntary & conditional ES contracts (RUPES)	III. Increased income from ES-friendly production systems
Farmers: tenure security; **Government:** compliance with law; **Hydropower company (PLTA):** operating days; **Scientists:** evidence-based options; **NGO:** fairness	**Farmers:** returns to labour, farm sustainability, clean rivers; **PLTA:** reduced sediment loads for increased efficiency; **Scientists:** fairness/ efficiency balance	**Farmers:** income, reduced risk; **Coffee processors:** blame-free business; **Consumers:** guilt-free quality products; **Conservation agencies:** stop encroachment to national park

9.3 Boundary work

Where 'boundary work' in its initial description involves two main stakeholders 'science' and 'policy', from the start the Sumberjaya case was understood to involve three: 'local', 'policy' and 'science'. This meant three types of primary knowledge boundaries local-policy, local-science and science-policy, and overarching work in the triangle defined by the three boundaries[21]. An

earlier analysis[22] of 'boundary work' in Sumberjaya and its Negotiation Support Systems[23] articulation was provided as example of the most complex case (multiple knowledge systems, multiple stakes). The case also enriched understanding of the 'issue attention cycle', with attention to the various 'boundary objects' that marked progress in respective learning curves for the key stakeholders[24]. In a Social-Ecological Systems perspective, the 'perceived' issues were unpacked, through a series of 'methods' that were subsequently formalized[25]. The issue first was at the 'Who' level (who is living, c.q. is

Table 9.2 Boundary objects that emerged in the three learning loops in Sumberjaya

A. Tenure security

Boundary objects	Trigger	Use	By whom
Water balance and effects of coffee gardens of different age[26,27]	Perception that coffee gardens are a threat to PLTA water supply	Debunking 'myth' about need for 'reforestation'	Used by farmers to challenge government officials during meetings
GenRiver as simple (parsimonious) model of river flow in response to land cover change[28]	Lack of existing models that logically respond to land cover change but don't require intensive parametrization	Hypothesis testing, consistency checks	Researchers, students
Flow persistence as metric of hydrological buffer functions[29,30]	Gap between farmer concepts of flow predictability and formal hydrological metrics	Characterization and scenario studies	Science-Farmer interface
Litter layer as key erosion control[31,32,33]	Need for simple 'soil health' criterion	Differentiating between acceptable and less-desirable LU	Science-Farmer interface
'Kebun lindung' as concept[34,35]	Need for term describing 'protective garden' aligned with 'protective forest'	As communication tool	Used by farmers to challenge government officials during meetings
Discount rate (linked to tenure security) as determinant of profitability of sun vs shade coffee[36]	Concern over continued attractiveness of 'sun coffee'	With lower discount rates shade coffee is economically attractive	At science-governance interface, addressing long-term sustain-ability issues
Draft HKM-contracts[37];	Untested legal oppor-tunity, waiting for its first implementation in 'protection forest'	Contracts were negotiated based on drafts	Government-farmer interface
HKM-evaluation criteria (from 5 to 25 year contracts)	Absence of clear criteria, threatening long term agreements	Becoming national standard	Government-farmer group interface

B. Reducing sediment fluxes (RUPES)

Boundary objects	Trigger	Use	By whom
Spatial sediment source data[38,39,40];	Uncertainty about where most of the sediment came from	Prioritizing areas for soil conservation auction and River Care	PLTA + RUPES team
PLTA-level cost/ benefit analysis;	Background to PLTA 'willingness to pay'	Discussions with PLTA staff	Scientist – PLTA interface
Private lands: auction design & implementation for erosion reduction[41,42,43];	Lack of ideas on how incentivized soil conservation on private lands could work	Pilot application in two communities	Lessons learned for similar auctions elsewhere in Asia
River Care experiment in collective action with conditional incentives[44]	Lack of ideas how collective action can be stimulated in the landscape	Direct PLTA involvement, scientists facilitating	Subsequent replication elsewhere in Sumatra by PLTA
National awards for the best practices of Public-Private-Partnership (PPP) to PLTA	PLTA was considered bringing innovations in implementing the PPP	Mainstreaming of the performance-based scheme within the internal policy of PLTA rather than a one-shot, ad-hoc action	National PLTA management board

C. Increased income

Boundary objects	Trigger	Use	By whom
Farm-level profitability analysis for diversified coffee farms	Need for increased on farm income	Assess tradeoffs between farm components	Farmer groups
District government's agricultural and livestock development programs	Need for diversification on farm income	Local government recognition to farmer groups as 'conservation champions' Longer-term incentive schemes	District government

allowed to live, here), followed by the 'What/How/Where' questions of land use practices. Meanwhile the 'So what?'/'who cares?' of landscape impacts on ecosystem services (esp. aspects of river flow) had to be clarified and serious myth-perceptions in the public/policy level ('no forest, no water') had to be challenged by data that were collected in a transparent manner. Where it showed results rather different from what the engineers/foresters had at first said, a new type of 'boundary work' arose. In first instance the main stakeholders were forest department, hydropower company, provincial government authorities and local

villagers. Later on, the latter group was differentiated by location, ethnic background (and associated political connectivity), wealth and gender. Specific options and strategies differed among groups, with actual performance of the river and farms at the core of it.

9.4 Looking back at enabling and restricting factors

In looking back across the three phases a number of enabling and restricting factors can be identified:

Enabling:

- Remarkable individuals willing to take risk within their institutions,
- Involvement of international and national partners of undisputed reputation, plus locally rooted NGO's,
- Trust building between partners of different backgrounds,
- Semi-transparent 'wall' between the ecological (focused on understanding) and social (focused on negotiation) parts of the team (each with their 'safe space'), allowing sufficient information exchange, but allowing each to proceed at a speed that could lead to quality products.

Restricting:

- Individual team members being restricted by their less-engaged institutions,
- National-scale policy fear of 'precedent' effects; objections to the 'kebun lindung' concept as undermining forest policies,
- Non-existence of national policy that provides an enabling condition on what type of intermediary institution and how environmental funds deriving from performance-based schemes both from private and public sources are managed, distributed and managed. Thus, upscaling of this scheme becomes somehow limited.

A shared understanding of the hydrological relations between forest, coffee, the streams and the hydropower company was essential to give all stakeholders a deeper understanding of the respective 'stakes'. It showed opportunities for a win-win, avoiding the hard choice between hydropower production and farmer's livelihoods.

The analysis suggested that the PLTA and forestry departments' interests were not as strongly aligned as initially perceived. This strengthened those within the Ministry of Forestry in support of 'community forestry'. The process, however, revealed conflicts within the Ministry of Forestry between those fearing 'loss of control' and those in favour of 'community involvement'.

The shift from a 'worst case' of environmental conflict to a 'success story' of negotiated solutions within the framing of the Forestry Law was certainly noticed at the national scale, and helped in triggering efforts elsewhere (with various success rates; generally without the strong research involvement Sumberjaya had had). The current Government of Indonesia (with a Minister of Environment and Forestry who was intimately familiar with the Sumberjaya case from her previous role in the provincial development planning agency of Lampung)

committed to a rapid scaling up of devolution of forest tenure rights – but has so far not been able to meet these expectations.

The ES auctions held and the collective action 'river care' experiment showed how a coinvestment in stewardship rather than 'commoditized ES' was the more relevant framework in this landscape. The PLTA could 'buy' increased community involvement in maintaining the watershed functions embedded with their trust that the local community will keep their commitment, rather than metrics of sediment reduction as the basis for sustaining the contractual agreements between both.

A number of impact studies have assessed the social dimensions of the changes that took place[45,46,47] in the Sumber Jaya landscape, and its wider impacts on tenure conflicts in Indonesia. The sustainability of the ES mechanisms remains a point of concern[48], as coinvestment partners are interested in an initial change, not in indefinite financial transfers. Further ecological analysis showed that in terms of terrestrial C stocks[49], plants[50] and birds[51] as biodiversity indicators and belowground biodiversity, the induced shift towards shaded coffee systems had co-benefits. In terms of N_2O emissions[52] the use of leguminous shade trees involved more complex tradeoffs. Overall, the landscape has shifted from a 'crisis' to 'manageable issues' stage in its development.

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