Socio-economic linkages of rural poverty and forest fire phenomena in a development scenario of peatland rehabilitation and agribusiness revitalisation in Central Kalimantan

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Summary

In an isolated peatland forest agro-ecosystem characterised by a relatively closed socio-economic set-up, rural poverty and forest fire incidents tend to be closely interrelated and mutually influencing factors. From the standpoint of poverty, unfavourable economic conditions associated with insufficient family income encourage more people to get involved in extensive illegal logging, which could eventually destroy various ecological functions and make the peatland ecosystem more vulnerable and prone to fire. It can be shown that the marginal productivity value of labour (MPV) dedicated to intensive farming in such peatland agro-ecosystems is certainly smaller than the comparable MPV of labour for illegal logging. On the other hand, extensive peatland and forest fires, once they spread over the ecosystem, bring negative impacts to people and their farming plots including increased incidence of drought and flooding on agricultural land. In a traditional and labour-intensive farming activity, two changes can be measured, namely: (1) agricultural labour productivity (t ha^{-1} yr^{-1}) appears to decrease over time, even taking into account women's and children's labour contributions; (2) additional family labour (e.g. from grandparents, wives and children) measured in terms of man-working-days (MWD) has to be devoted to dealing with forest fire-related activities at particular times (notably during and after fire/flooding events), which takes effort away from dealing with more important poverty-related problems. Consequently there is an urgent need to investigate socio-economic responses to agricultural or non-agricultural-based programmes on poverty eradication. In addition, forest fire management must be designed carefully to match the household labour availability. The action plan (for restoration and rehabilitation of the former Mega Rice Project) should therefore take into consideration: (1) periodic distribution of family labour availability during 'normal' and 'below-normal' scenarios; (2) the extent of increased income and gendered labour productivity expected to result from a particular remedial programme.

Key index words: social forestry, peatland ecosystem, family labour, rural poverty

Introduction

Agro-forestry agribusiness frameworks have received a lot of attention lately, not least at the UNFCCC meeting in Bali, December 7-15th 2008. The crucial issue is how to get smallholders involved in environmental protection under the CDM (clean development mechanism) and REDD (Reducing Emissions from Deforestation in Developing-countries) carbon trading mechanisms (Cacho, 2007; Murdiyarso, 2007) to minimise sources of global warming. This paper discusses possible frameworks to enable smallholders to become active in forest resource management schemes, for example under the SFMU (social forestry management unit) concept of social forestry, as a means of addressing rural poverty and reducing social conflict (Sjarkowi, 2007).

The technical and social targets of forestry-based carbon trading are certainly not easy to accomplish, and for a less-developed country (LDC, such as Indonesia) there are five main constraints to smallholder engagement in such mechanisms, namely: (1) Lack of medium-term credit; (2) Lack of silvicultural skill; (3) Lack of tenurial security; (4) Lack of commercial economies of scale, and; (5) Lack of institutional capacity (Taylor, 2007). In terms of applying carbon-credit schemes to peatland agro-ecosystems, additional difficulties include: (6) Lack of knowledge of peatland agroecosystem instability; and (7) Lack of rural infrastructure (Sjarkowi, 2006, 2007).

Rural poverty and forest fire: the socio-ecological context

It has been widely argued that forestry based-CDM, and REDD in particular, is a golden opportunity for Indonesia to kill two birds with one stone regarding issues of rural poverty

and forest fire. However, some western countries and also Walhi (a leading environmental NGO in Indonesia) are still unconvinced about whether or not carbon trading could be an effective means for LDCs to contribute to the global war on greenhouse gas emissions. Therefore, in order to have a realistic and saleable transaction scheme, REDD-oriented agroforestry must be subjected to sound scientific analysis prior to its implementation. The main constraints associated with carbon trading from an LDC perspective relate mainly to issues of forest and social engineering. The first five constraints mentioned relate mainly to the social engineering domain while the last two constraints belong to the peatland forest engineering domain. Both social engineering and forest engineering must be undertaken thoughtfully to allow the anticipation of possible problems including: (1) The risk of commitment betrayed when the income stream from carbon trading is not technologically predictable or poorly estimated. This could result in the conversion of the planted forest into rubber or palm oil. (2) As tree crop life cycles are very different from those of agricultural crops, non-tree (food) crops must be treated as supporting crops to a tree crop farming system. This could complicate associated institutional arrangements followed eventually by institutional failure.

Productivity and eficiency: peatland agro-forestry

On a hemic and sapric peat-soil, various agricultural crops could grow productively as long as suitable and appropriate water management is practiced (ALTERRA, 2005). Empirical data show, however, that income earning from cropland is rarely sufficient to support constantly increasing family needs and spending (Marwan and Sjarkowi, 2007). There are three reasons behind this (Sjarkowi, 2006): (1) Low agricultural productivity that tends to be irresponsive to the current state of the art of peatland agronomy; (2) Unstable agricultural commodity prices that are irresponsive to markets with limited demand from small regional populations and agro-industries; (3) Poor transportation infrastructure for generating smallholders incomes but irresponsive to transactional price changes. This agro-economic condition may make REDD-oriented agro-forestry very attractive for many people. It will eventually become apparent that: (1) Seasonal mixed farming could minimise risk and increase sources of income; (2) Seasonal and annual cropping including tree crop farming could isolate any boomerang effects from land expansion associated with more forest conversion.

As a marginal ecosystem Jauhiainen (2004) argued that in their natural state, peatland ecosystems are characterised by interconnections between 4 main factors, namely: (1) Hydrological factors; (2) Flora and fauna; (3) Peat characteristics, and; (4) C-peat deposit. Peat hydrology becomes damaged by the opening-up of peat dome vegetation, which in turn increases peat decomposition and C loss on the peat dome as well as peat subsidence. All of these factors, coupled with the micro-climatic changes that they bring, cause an increase in peat fire incidence. Therefore, as Dana Veltman (2006) concluded in her thesis (based on her research in Sarawak) peatland reclamation for agricultural purposes is technically possible, but must be carried out with extreme care. She implied that any kind of agricultural activity on peatland should not be for agricultural production *per se*; but rather, for the multiple purposes of producing food and non-food products in order to support tree planting. This is because the increased forest cover associated with such activities is likely to promote ecosystem recovery. With regard to forest engineering on degraded peatland ecosystems in Central Kalimantan, there are three operational assumptions that need to be taken into consideration:

(1) Agricultural activities for food production and forest replanting should concentrate on shallow peat found at the rim of peatland landscapes. A combination of silvicultural and agronomic treatments must seek to both maximize benefits from the chosen crop mixtures and consider the need to improve soil structure, ecosystem and function.
(2) In a landscape with peat dome damage, the SFMU model requires the re-vegetation of the peat dome simply by focusing on plants that grow naturally in such environments. In addition to *Shorea balangiran*, an endemic species called *Tumeh* (*Combretocarpus rotundatus*) grows well in Central Kalimantan's peatland ecosystems.
(3) The use of tree crops to revegetate peat domes must be carried out in stages, starting at the margins and gradually working in toward the centre of the dome. As a means of alleviating poverty, tree crop farming can be partially substituted by rubber crop (*Hevea brasiliensis*) planting. In this case a financial scheme called Biocredit can be applied.

Gendered local livelihoods and REDD-oriented agroforestry

Today the lives of local people living within and around peatland ecosystems is constantly being threatened by regional development demands that seek to utilise these ecosystems more profitably. To unorganised smallholders living in rural areas with limited market accessibility and a lack of innovative agribusiness, the remaining (peatland) forest is often considered as a source of land for the next generation to farm. If that occurs, however, then there is a strong likelihood of conflict amongst stakeholders over access to forests (natural or planted) for conversion to agriculture. In such a situation people are likely to work on the principle of 'first come, first served' with the result illegal logging and slash and burn agriculture (including 'paddy sonor' farming) would be considered as justifiable livelihood opportunities. It is precisely this scenario that REDD-oriented agroforestry has the potential to prevent. An agroforestry concept called SFMU (social forestry management unit) was introduced (Sjarkowi, 2006, 2007) following detailed socio-economic research in Central Kalimantan and South Sumatra. This research (Table 1) highlighted the fact that the role of female labour in cash-crop farming (that may potentially support catch crop and tree crop farming) is very important. Likewise, from a simple econometric analysis using cross-sectional data, the tendency of male family labour to favour illegal logging over agriculture, was also apparent.

Table 1. Labor Input for Mustard & Corn Farming, in Kalampangan Central Kalimantan Based on 40 Sampled Smallholders, 2006/2007

No.	Crops	Man Working Days (MWD) equivalent					
		Including harvest & marketing			Excluding harvest & marketing		
		Man	Woman	Total	Man	Woman	Total
	Mustard (0,70 Ha in total						
1.	**main plot)**	14,9	11,65	26,25	11,3	9	20,3
2.	1st cycle (wet season)	14,9	11,65	26,25	11,3	9	20,3
3.	2nd cycle (wet season)	18,9	13,15	32,05	15,3	10	25,3
4.	1st cycle (dry season)	18,9	13,15	32,05	15,3	10	25,3
	2nd cycle (dry season)						
1.	**Mustard (0,45 Ha in total**	15,8	12,65	28,45	12,1	10,1	22,2
2.	**of main plot)**	15,8	12,65	28,45	12,1	10,1	22,2
3.	1st cycle (wet season)	20,3	14,15	34,45	16,6	11,1	27,7
	2nd cycle (wet season)						
1.	1st cycle (dry season)	7,6	5,9	13,5	5,3	4,2	9,5
2.	**Sawi (0,18 Ha in total of**	7,6	5,9	13,5	5,3	4,2	9,5
	home yard)						
1.	1st cycle (wet season)	7,8	6,2	14,0	5,8	4.6	10,4
2.	2nd cycle (wet season	7,8	6,2	14,0	5,8	4,6	10,4
	Corn (0,22 Ha in total of						
	home yard)						
	1st cycle (wet season)						
	2nd cycle (wet season)						
	Total	150,3	113,25	**263,55**	116,2	87,9	**204,1**
	Percentage (P-W)	**(57,04)**	**(42,96)**	**(100)**	**(56,93)**	**(43,07)**	**(100)**

Source of livelihood	Marginal Productivity Value		Main Period of Activity
	2000	2008	
Illegal Logging	Rp1.2 million mo^{-1}	Rp400.000 mo^{-1}	Wet season
Agriculture	Rp350.000 mo^{-1}	Rp350.000 mo^{-1}	Dry season

Gb. 1a: Rainfall Data, Palangka Raya Cent-Kalimantan

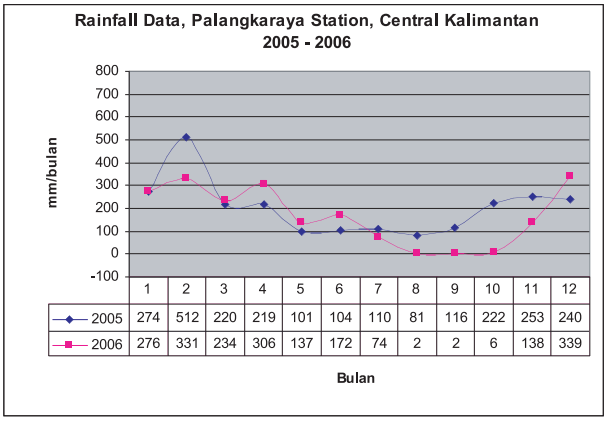
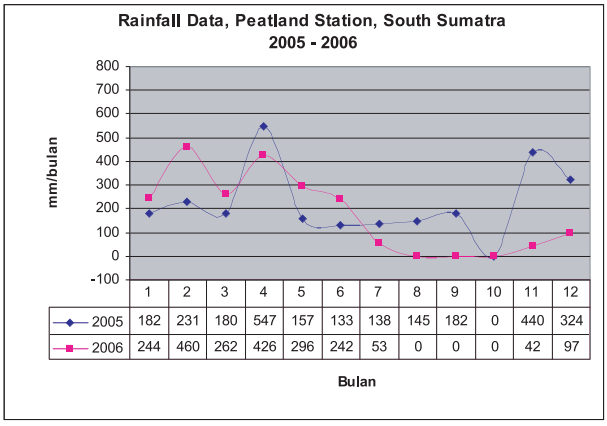
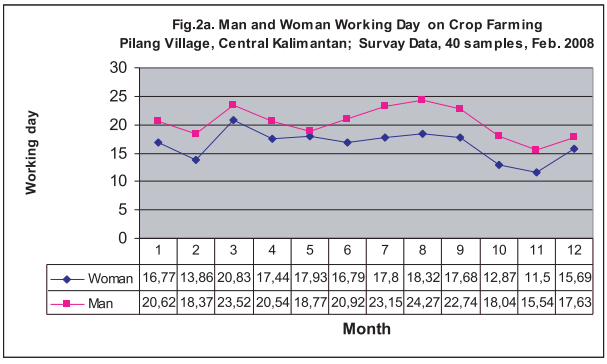
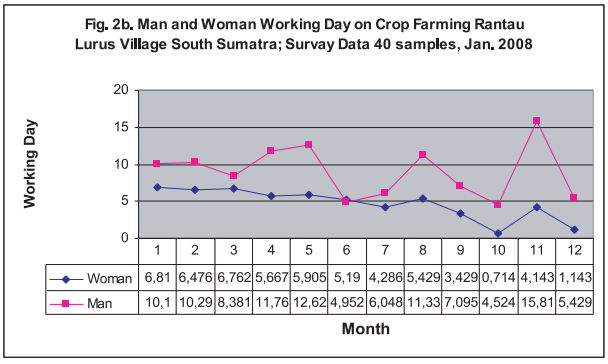


Fig 1b: Rainfall Data, Peatland Region South Sumatra







Conclusion

This paper makes three concluding points:

(1) The vicious cycle of rural poverty and forest fire which is commonly found in degraded peatland ecosystems could potentially be overcome using REDD-oriented agro-forestry. Food crop and catch crop farming is needed to provide socio-economic support to tree crop farming designed for both income generation and peatland restoration purposes.

(2) Socio-economic approaches are crucial as a means of encouraging local institutions to revitalize peatland ecosystems for the purposes of sustaining various traditional but sustainable livelihoods whilst at the same time improving agro-ecological conditions for the benefit of non-tree crop farming.

(3) As a peatland based agribusiness designed for both socio-economic and socio-ecological purposes, smallholder agro-forestry systems could only be developed effectively when small-scale market-based agro-industry can provide added value that will simultaneously help to guarantee fairer and more stable product prices.

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