Some requirements for restoration of peatland in the former Mega Rice Project in Central Kalimantan, Indonesia: blocking channels, increasing livelihoods and controlling fires

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Summary

Restoration of tropical peatland is not just a matter of rewetting the surface by blocking channels but also requires involvement of stakeholders in order to improve their livelihoods and to control fire. Water management to restore degraded tropical peatland is in the early stages of understanding and implementation while local people must be involved by providing them with alternative sources of income to exploitation of peat swamp forest resources and also to encourage them to become custodians of the recovering landscape through empowerment to control fire. The results of pilot projects to raise water table levels in degraded tropical peat, to plant 'living trees' in order to increase the incomes of local people, and to establish fire control and fighting teams consisting of local inhabitants are presented, and their effectiveness discussed as models to be applied over larger areas of tropical peatland.

Introduction

The change of climate in the world that has been confirmed by many kinds of disaster in many countries is a consequence of the over-exploitation of natural resources. One of these natural disasters is the big contribution to the green house effect by release of CO_2 and other gases to the atmosphere as a consequence of degradation of tropical peatland. Peatland can be damaged by fire, cultivation for agriculture, digging drainage channels, legal and illegal logging by companies and communities. Over-exploitation of peatland has also been caused by inappropriate development programmes that have not taken into account peat characteristics, government policies that focus on short term incentives and the behaviour of some scientists who have not conducted comprehensive research but sell their professionalism for financial gain.

The significance of climate change in Central Kalimantan has become much greater since the Government of Indonesia opened around one million hectares of peat swamp forest for agriculture (Mega Rice Project, MRP) in 1996. Changes in climate have been indicated by increase in the frequency and extent of flooding in the wet season, an extended dry season, irregularly of rain, movement and speed of the wind, and increase in air temperature. The MRP has destroyed the traditional livelihoods source of local communities, e.g. rubber, rattan, purun and fish (*'beje'* system).

It is not possible to allow the MRP to undergo natural succession or self restoration and still try to utilise the existing channels to irrigate rice field and grow non-native species, especially on thick peat. This will lead to many kinds of disaster including, fire, flood, typhoon, human disease and plant pests. The damage caused to the peatland in and around the MRP must be repaired soon with a new approach that will benefit the local communities surrounding this area, so that the restoration process can be accelerated and succeed. The key to ensure this restoration will be successful is to involve local communities and devolve responsibilities to them, especially for environmental protection, because all causes of peatland damage are related to human behaviour. Limin (2005) asserted that the major threat to peatland in Central Kalimantan is fire that is started and found where there is human access by road, river, channel and lake or where there are settlements and temporary activities inside the peat swamp forest. To restore the former MRP the Government must adopt a new approach and apply a different strategy, namely to consider the carrying capacity of peatland, the culture of local people around, and the economic status of local people.

Table 1. Differences in water table before and after dam construction in Block C of the MRP

Year	Transect 1 Water table (m) & point no.	Transect 2 Water table (m) & point no.	Transect 3 Water table (m) & point no.
2004 vs 2005			
September	0.84 (10)	0.87 (13)	1.08 (14)
October	1.51 (13)	1.34 (13)	1.45 (13)
November	1.04 (13)	0.86 (12)	1.12 (13)
2005 vs 2006			
June	0.59 (12)	0.83 (12)	0.41 (21)
July	0.34 (7)	0.27 (12,13)	0.29 (19)
August	0.12 (18)	0.38 (11)	0.09 (21)

The Mega Rice Project (MRP)

The Mega Rice Project MRP) was established by Presidential Decree No. 82/1995, following Presidential Decree No.32/1990, which allocated peat of thickness less than 3 metres for agriculture and more than 3 metres for conservation. The excavation of channels commenced in January 1996 and was stopped in 1999 by Presidential Decree No. 80/1998.

Size of the area

The total area of peat swamp forest allocated for the Mega Rice Project (MRP) was 1,457,100 ha, divided into five blocks, as follows:

- Block A 227,100 ha (15.59%)
- Block D 162,278 ha (11.14%)
- Block B 161,480 ha (11.08%)
- Block E 337,607 ha (23.1 %)
- Block C 568,635 ha (39.03%)

Establishment of drainage and irrigation channels

The total length of channels established in Blocks A, B, C and D is 4,473 km are: Main Primary Channels (SPI) 187.00 km, Large Primary Channels (SPU) 958.18 km, Secondary Channels 913.28 km, Tertiary Channels 900.00 km and Quarter Channels 1,515.00 km.

Focus for peat fires

Since1997, when Indonesia was affected by a major El Niño event, the over-drained MRP area has been subject to severe forest and peat fires.

Negative impact of MRP

The direct negative impact of MRP was change to the physical condition of this area, especially destruction and disappearance of flora and fauna, including some that were a source of local community income (rubber, rattan, traditional rice fields, fish traps (*"beje"*), destruction of ecosystems, and discontent and destabilisation of local communities. In addition, there are many indirect negative impacts caused by the three main direct impacts: (1) changes to hydrology, (2) land and forest fires occur every year, (3) frequency and intensity of floods are increasing, (4) status of traditional rice fields which were formerly saturated and have now been changed to dry land, (5) the population of plant pests has drastically increased, e.g. rats, (6) local people have become apathetic, feel insecure, (7) incomes have drastically decreased, and (8) some local people have become involved in illegal activities (logging and mining).

Testing for restoration the Mega Rice Project

The failure to develop the Mega Rice Project (MRP) as a major centre for rice production in Indonesia as planned is because the channels were constructed excessively large and instead of holding water inside the peatland they drained it away to the surrounding rivers. As a result the water table was lowered over the entire area causing the remaining vegetation to suffer water stress and become fire prone. The priority for restoration must be to reinstate the hydrological status by building dams to blocking channels.

Blocking channels

Based on dam experiments in the north of Block C the MRP, the water table after dam construction was raised near to the peat surface. The differences in water table before and after dam construction are shown in Table 1 and Fig. 1.

Planting trees for livelihood of local people

Planting of native trees will be successful, if financial inducement is given to local people to look after them and the environment. The Buying Living Tree System (BLTS) is one method that will give benefit directly to the community. Based on the BLTS experiments, the percentage of trees alive after one year is higher than using other methods. The BLTS is not just for economic reasons, but is also a strategy to educate and increase community awareness.

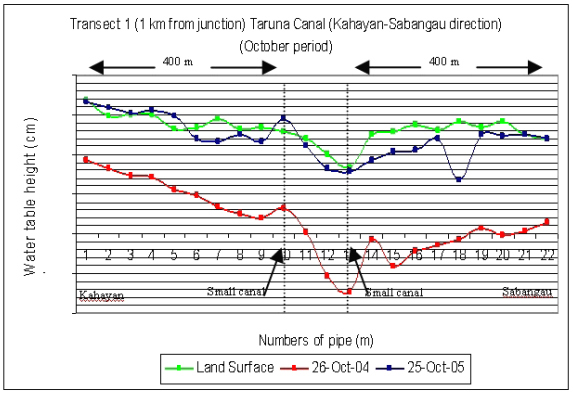

Figure 1. Water table before and after dam construction

Fire control

The restoration programme in degraded peatland, and the maintenance of conservation areas, will fail if fire is not prevented or suppressed. CIMTROP has established a Fire Fighting Team (Tim Serbu Api, TSA) that is organised and operates according to specific strategies and methods (the TSA Concept). The most important TSA Concept is establishing sources of income for the TSA members to ensure they are always available to undertake their high-risk job. In the dry seasons of 2006 and 2007, the TSA protected the Natural Laboratory of Peat Swamp Forest (NLPSF) Kereng Bangkirai Sabangau and the research station in Kalampangan against wild fires.

Redesign of the MRP

The MRP must be redesigned after the hydrological status has been restored so that the utilisation of this peatland is based on its carrying capacity. The implementation of inappropriate projects, including transmigration, must be stopped and relocated to other areas where their success is more feasible. Limin *et al.* (2000) suggested that peatland utilisation must consider the underlying mineral material (Table 2).

Discussion

Restoration of the former MRP will encounter many problems, especially if the regulation of peatland utilisation guidance is not revised according to the peat characteristics. Limin (2005) asserted that utilisation of peatland in Central Kalimantan will be a major threat to the environmental balance because Presidential Decree No. 32/1990 just allocated peat of thickness less than 3 m for cultivation and more than 3 m for conservation, without considering the material underneath the peat. The inland peat of Central Kalimantan is very different in its characteristics and economic potential compared to peat in Sumatra and West Kalimantan because it is located too far from the coast, hills and mineral soils for these to contribute to nutrient enrichment. The Government of Indonesia must be careful to determine the correct criteria for peat utilisation, because of the mistakes in the planning and implementation of the MRP that led to many disasters that affected the social economic status of communities and contributed to climate change. The challenge for restoration of the MRP must be to find a new approach that is relevant to the livelihood, culture, mentality, economy and welfare of local communities. The old approach must be changed, because for a long time reforestation programmes have not succeeded as indicated by the large area of abandoned land that increases year by year. According to the Governor of Central Kalimantan (2007) there are now 7.2 million hectares of this 'critical land' in Central Kalimantan.

The restoration program should be integrated and must benefit the community and promote environmental recovery. Limin *et al.* (2007) show that restoration of degraded peatland can be implemented by a combination of the TSA Concept and Buying Living Tree System (BLTS). Through these programmes, the community will not only benefit economically, but they will also recover their responsibility and awareness of environmental functions. The Government's efforts to rehabilitate the former MRP by modifying the existing channels for managing water for agriculture and not returning this peatland to its natural condition will be a major threat to the peatland ecosystem in the future. The old concept that peat utilisation must start by land clearing must be changed to the new approach, because peat for forest is also wise use of peatland. Limin (2005, 2007) summarised the failure of peatland utilisation in coastal areas as follows: (a) *Handel* system (traditional way), (b) *Anjir* (1880 - 1936 by Dutch Colonials), (c) Polder system (1950 by Schophyus/Dutch Expert), (d) '*Garpu*' (UGM)/ '*Sisir*' system (IPB and ITB) (1969 - 1982), (e) '*Kolam*' system (1980s), (f) Giant canal system (1996, Mega Rice Project).

Conclusions

a. The priority for restoration of the former MRP should be to redesign the entire approach through the new Master Plan, but the restoration testing can be conducted during the Master Plan preparation process.
b. The channel system has created many problems for the peatland ecosystem by lowering the water table, increasing acidity so that the peat has become drier and sensitive to burn and also toxic to growth of crop plants.

Table 2. Criteria concept for utilization of peatland in Central Kalimantan

No.	Depth of peat (cm)	Underlying mineral material	Hydrology	Recommendations
1.	≤ 50	1.1. Mineral/clay 1.2. Sand/granite	1.1. Full support 1.2. Full support and/or unsupported	1.1. Rice/Corn, etc. & fish in "*beje*" system 1.2. Conservation
2.	50 – 100	2.1. Mineral/clay 2.2. Sand/granite	2.1. Full support 2.2. Full support and/or unsupported	2.1. Rice, Corn, and Plantation commodity 2.2. Conservation
3.	100 - 200	3.1. Mineral/clay 3.2. Sand/granite	3.1. Full support 3.2. Full support and/or unsupported	3.1. Plantation commodity 3.2. Conservation
4.	> 200	4.1. Mineral soil or granite	4.1. Full support	4.1. Conservation

c. All channels that cross the deep peat dome and connect to the major rivers must be blocked to keep water in the peat during the dry season.
d. The restoration programme and implementation strategy must be relevant to the community's status, social economic needs and cultural heritage. The Buying Living Tree System (BLTS) and TSA Concept should be considered as strategies, which will increase the community's welfare through providing regular, fixed livelihood.
e. The guidelines for peat utilisation must be revised based on peat characteristics and field condition.

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