

# Improving Productivity of Unoccupied Land Through Wetland Cultivation at the Former Shifting Cultivation Areas at the Forest Regions of Kapuas District, Central Kalimantan, Indonesia

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**Abstract** Forest region management model in Indonesia applied the separated pattern between forest a real versus non forest areal although a portion of forest area in the form of unoccupied and neglected land already be used to agriculture, plantation, and settlement. The peoples at the surrounding forest regions had been depended of their life on the shifting cultivation pattern to get food during the long time ago. This cultivation cause degraded forest and lose out of the children education. This research was focused to replace the shifting cultivation with settled cultivation in order to minimize degraded forest at the forest regions using the intensive cultivation. The research was located at Mandau Talawang Sub-District, Kapuas District, Central Kalimantan Province, Indonesia at 2010 to 2014. Data of paddy yields from settled cultivation and shifting cultivation were got from 15 households were taking by random. Data analysis using the homogeneity test, analysis of variances and least significant difference (LSD) test using SPSS 19.0 for Windows. Research result indicated that produce paddy yields from settled cultivation are significantly more than shifting cultivation, namely 0.91 to 1.07 ton ha<sup>-1</sup> or 1.01 ton ha<sup>-1</sup> in average and 4.1 to 5.24 ton ha<sup>-1</sup> or 4.78 ton ha<sup>-1</sup> in average respectively. Thereby, settled cultivation could to reduce degraded forest, to improve unoccupied and neglected land productivity at the forest regions, and keep the local children education.

**Keywords:** degraded forest, paddy yield, settled cultivation, shifting cultivation

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## 1. Introduction

Indonesia's forest region is 120.353.104 ha in large, however large of unoccupied and neglected land in the forests region are 21.94 million ha [8,9], they are in the form of bushes, underbrush, critical land and grassland as *Imperata cylindrica*, caused by shifting cultivation, forest clear away, illegal logging, poor forest concession at forest regions [11], resident accretion, forest conversion and increasing of wood request [9,17].

Indonesia Ministry of Forestry's policy has been applying the segregate pattern to manage all forest regions. This pattern separates the forest areas and agricultural areas that it call as non forest areas although a portion of forest areas were already used to agriculture activity, such as society garden, plantations, unirrigated agricultural field, and also bushes, underbrush and neglected land [18]. They have obliged all forest regions just for forestry sector, such as timber estate, reforestation, forest concession etc., so they have prohibited others such as agriculture, horticulture, settlement, animal husbandry etc, although a

portion of forest areas had been taken possession by the society for settle met, traditional agriculture (shifting cultivation), and plantation since the long time ago. Thereby this pattern complicated to development of local community surrounding forest regions [22].

The community on the surrounding forest areas had been depending of their life on the shifting cultivation pattern as a work to do to get their food [21]. Nevertheless, in this time, these activity causes much problem to arrange of land use, forest degradation continually, not effective, not efficient, reducing of environment quality and lose out of children education because they are following shifting cultivation activity although that distance very far from their home. The segregate pattern really less as according to condition in field, inclusive of like this case. Carried forward them therewith their farm moving of exit from forest regions are impossible [9]. Integrate pattern policy shall be acceptable along with conducted of construction socialize and improve their agriculture effort although they stay in forest region [21].

Partner shall pattern be developed so that forestry and agricultural activity earn adjacent life well on the around forest region. One of form of community construction on

the around the forest region is Social Community Management on Forest Region (SCMoFR) [6,7,10] that similar with Corporate Social Responsibility. The settled cultivation of paddy at the forest regions is the pilot project that conducted at Kapuas District, Central Kalimantan Province, Indonesia. This pilot project is aimed to substitute the shifting cultivation of paddy to settled cultivation of paddy in order to ended the degraded forest and also to increase land productivity on the forest region. Way of like this beside able to improve productivity of farm and establish food security also can lessen fast of forest degradation and deforestation.

## 2. Methodology

This research was situated at forest regions of Kapuas, and it administratively located at Mandau Talawang Sub-District, Kapuas District, Central Kalimantan Province, Indonesia. The research was conducted to analyze paddy yield from shifting cultivation and settled cultivation. The parameter of paddy yields were collected at 2010, 2011, 2012, 2013, and 2014 that got from 15households

respectively. Type of soil is ultisol [1] with 2.866 mm per year of precipitation [15]. Data analysis of paddy yields using homogeneity test, analysis of varians and least significans different (LSD) test using SPSS 19.0 for Windows.

## 3. Result and Discussion

Calculation of paddy yield from settled cultivation and shifting cultivation system at the research plots is presented at Table 1.

### 3.1. Dryland-Shifting Cultivation

Average of paddy yield from shifting cultivation at the Mandau Talawang as period of 2010 to 2014 start from 0.91 to 1.07 ton/ha (Table 1). On the other case, yield of paddy at shifting cultivation in Kalimantan island was 1.3 to 3.6 ton/ha, in Sumatra island was 2.0 to 3.5 ton/ha and in Sulawesi island was 2.3 to 4.4 ton/ha [14]. Thereby, paddy yields that produced from shifting cultivation at Mandau Talawang District were still low.

**Table 1. Paddy yields from settled cultivation and shifting cultivation systemat Mandau Talawang District at 2010 to 2014**

No.	Household	Shifting cultivation					Household	Settled cultivation				
		Paddy (ton/ha)						Paddy (ton/ha)				
		2010	2011	2012	2013	2014		2010	2011	2012	2013	2014
1	Uhing	0.71	0.91	0.6	0.9	0.95	Rano	4.0	4.5	4.01	5.5	5.75
2	Ancong	1.01	0.98	0.7	0.87	0.91	Mat Karyani	5.3	5.0	4.05	5.7	5.05
3	Buntoro	1.0	1.2	<b>1.8</b>	0.55	1.05	Prawoto	4.5	4.7	5.5	5.05	4.95
4	CilikNyarang	1.2	0.89	0.5	1.1	1.5	Sholihin	6.0	5.7	4.5	5.5	5.05
5	Heni	1.2	1.1	0.6	0.78	<b>1.75</b>	Heni	4.0	4.5	3.5	5.35	5.5
6	Tumbak	0.9	0.78	1.25	0.92	0.75	Juwadi	5.5	5.5	4.0	5.75	<b>6.05</b>
7	Ranying	0.99	1.01	0.7	0.9	0.95	Mela	5.5	5.7	5.78	4.15	4.95
8	Elo	1.02	0.9	1.5	0.75	0.85	Hakim	3.1	4.5	5.0	4.5	5.3
9	Anton	1.3	1.2	0.94	0.81	1.05	TuhuSusilo	4.2	4.1	4.5	4.5	5.00
10	JimadBangkan	0.9	0.92	0.6	1.05	0.95	Kandari	5.1	4.5	4.12	5.5	5.08
11	Koneng	0.72	1.22	0.77	0.85	0.8	Doser	4.0	5.1	4.54	4.55	4.55
12	Elduring	1.29	1.1	0.99	0.95	0.7	Udu	4.0	4.5	3.5	4.23	4.75
13	Soni	1.2	0.99	1.1	1.1	1.5	Alfianto	3.5	4.0	4.5	5.5	5.5
14	KunumUra	1.0	1.32	0.79	1.5	0.55	Korang	3.5	4.2	4.0	4.5	4.95
15	Heru	0.99	1.2	0.88	<b>1.75</b>	<b>1.85</b>	KarnoHadi	4.0	5.0	4.5	5.75	<b>6.21</b>
	Average	1.03	1.05	0.91	0.99	1.07	Average	4.41	4.77	4.4	5.07	5.24

The mean least yield had been around Buntoro at 2013 and Kunun Ura at 2014 each were 0.55 ton/ha meanwhile the mean highest yield had been around Heru at 2013 and 2014, and Buntoro at 2012 and Heni at 2014 each were 1.85 ton/ha, 1.80 ton/ha, and 1.75 ton/ha, whereas the mean all together was 1.01 ton/ha only at the priod of 2010 to 2014 (Figure 1). The mean least yields were caused by a period of leave temporarily (masabera, Ind.) was more short, only 2-3 years, hence the farm land fertility not yet returned well [3,13,14,19]. Short leave temporarily could be caused by more and more changing of farm land become people's rubber plantation, other agricultural plantations [18] and resident accretion especially from newcomer [15,17]. This problem happened also because of agricultural technique applying which still simple and traditional [2,15] or not yet been

done intensively and general caused by lower farm land fertility in Kalimantan island [5,14].

The stages of shifting cultivation i.e. slashing, burning and planting of paddy with dibble (that is wooden tool with a sharp end for making holes in the ground) done in mutual assistance [14,21]. Pursuant to analyse of varians, mean paddy yields at shifting cultivation in the year 2010, 2011, 2012, 2013, and 2014werenot differ significantly with value of sig.=0.613> 0.05. Thereby, all the treatments showed unfavourable result if compared with the information from Noor [14].

### 3.2. Wetland-Settled Cultivation

Average of paddy yield at wetland of settled cultivation at the Mandau Talawang was good enough, those were

from 4.41 at 2010 to 5.24 ton/ha at 2014. This sum up still minimize (Noor 1996, Yustika 2002) although have enough if done by society which live in forest region with marginal land conditions. The highest yield of paddy

obtained by Karno Hadi and Tumbak at 2014, namely 6.21 ton/ha and 6.05ton/ha respectively whereas the mean all together namely 4.78 ton/ha only (Figure 2).

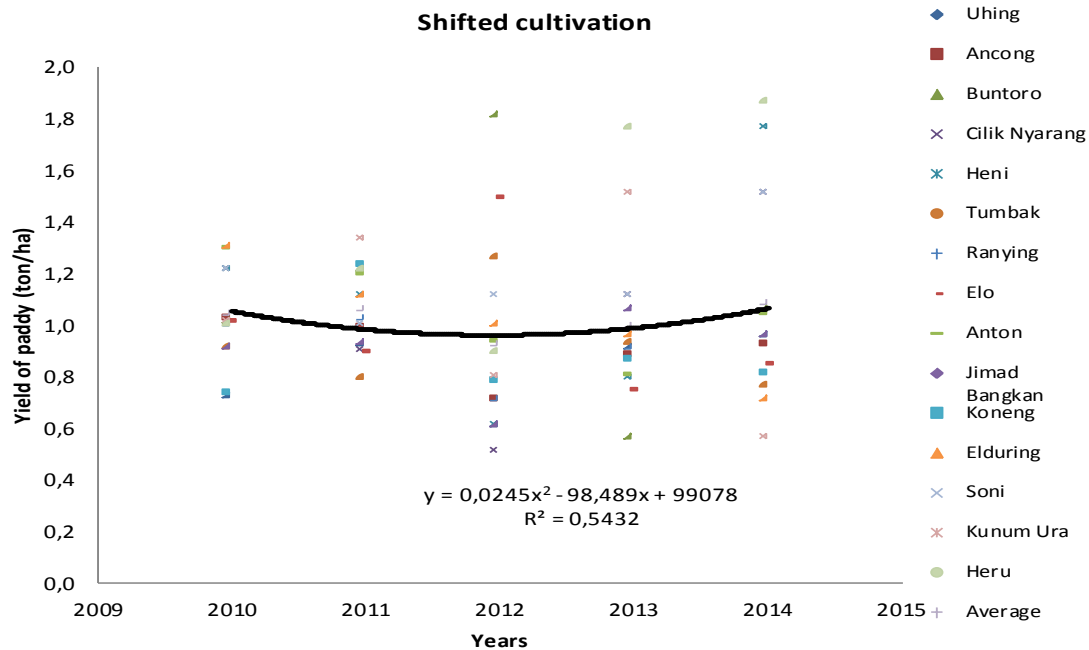


Figure 1. Trend of paddy yield from shifting cultivation at the period of 2010 to 2014

Pursuant to analyse of varians, mean yield of paddy at settled cultivation in the year 2010, 2011, 2012, 2013, and 2014werediffer significantly with value of sig.=0.001< 0.05. Thereby, there are one or more the treatments that more good than others. According LSD test, average of paddy yields at 2010 and 2012 were differ significantly (smaller than) paddy yields at 2013 and 2014, and also paddy yield at 2011 versus 2014, meanwhile paddy yields

at 2013 were not differ significantly with paddy yields at 2014 (Table 2).

Year	2010	2011	2012	2013
2011	0.134			
2012	0.955	0.120		
2013	0.006*	0.199	0.005*	
2014	0.001*	0.045*	0.001*	0.458

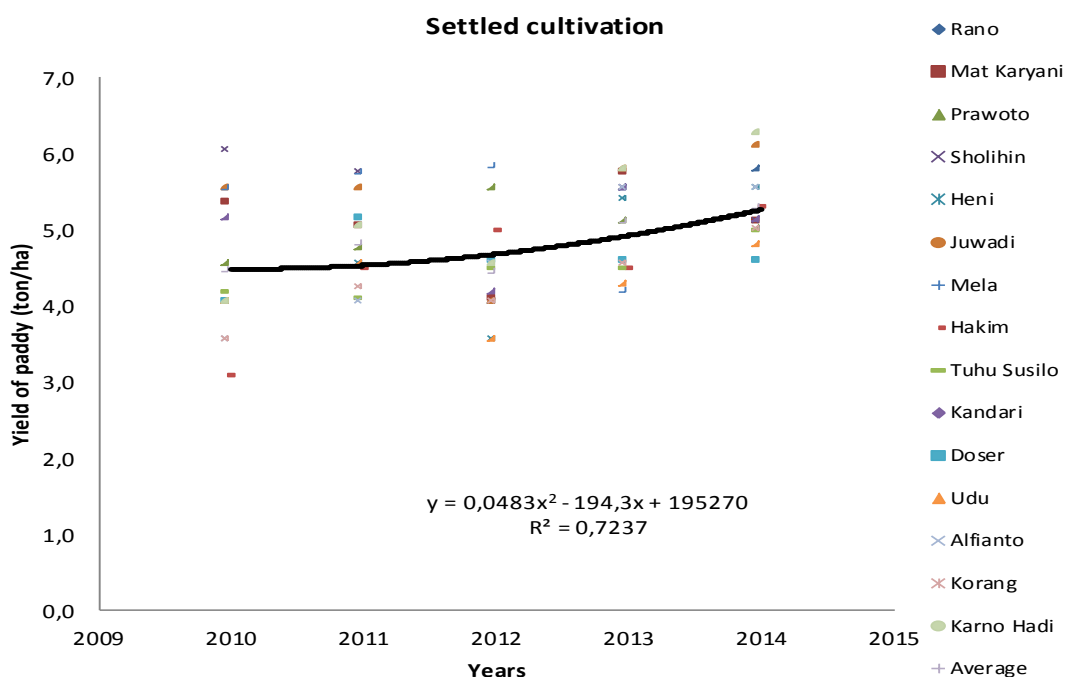


Figure 2. The trend of paddy yield from settled cultivation at the period of 2010 to 2014

Human factor and ugly nursing of rice field maybe determine yield of paddy. Workers of Extension Agent from company had assisted to motivate and improve result of paddy crop. Farmer who coming from Java more succeeding because they had experienced at settled cultivation pattern, like as Mat Karyani, Sholihin, Mela and Juwadi. Happen to transfer their experience and had

an effect on goodness at settled cultivation program in here. The anorganic manure i.e. urea, TSP, KCL and NPK and organic manure had been used to increase of yield. Irrigation from accumulating basin and channel builded to irrigate rice field done every time. Paddy seed had used IR 64, Bengawan Solo and Cisadanefrom Java island [15].



Figure 3. Shifting cultivation (left) and settled cultivation (right) of paddy at the research plots

Existence of this variation indicated that applying the Five Effort of Farmer (Panca Usaha Tani, Ind. i.e. The best of seed, irrigation, land management, fertilization and harvesting) were very important to increase agriculture product [20] also applicable to improve productivity at other neglected and unoccupationlan at the forest regions.

Yield of paddys at settled cultivation were better than shifting cultivation (Figure 4). According to analyse of variant that both patternwere significantly differ with value of sig.=0.00<0.05. Thereby settled cultivation of paddy is better than shifting cultivation of paddy, and it couldto improve productivity of the neglected land and unoccupation land., and also reducing of forest degradation and deforestation on the forest regions.

### 3.3. Comparison

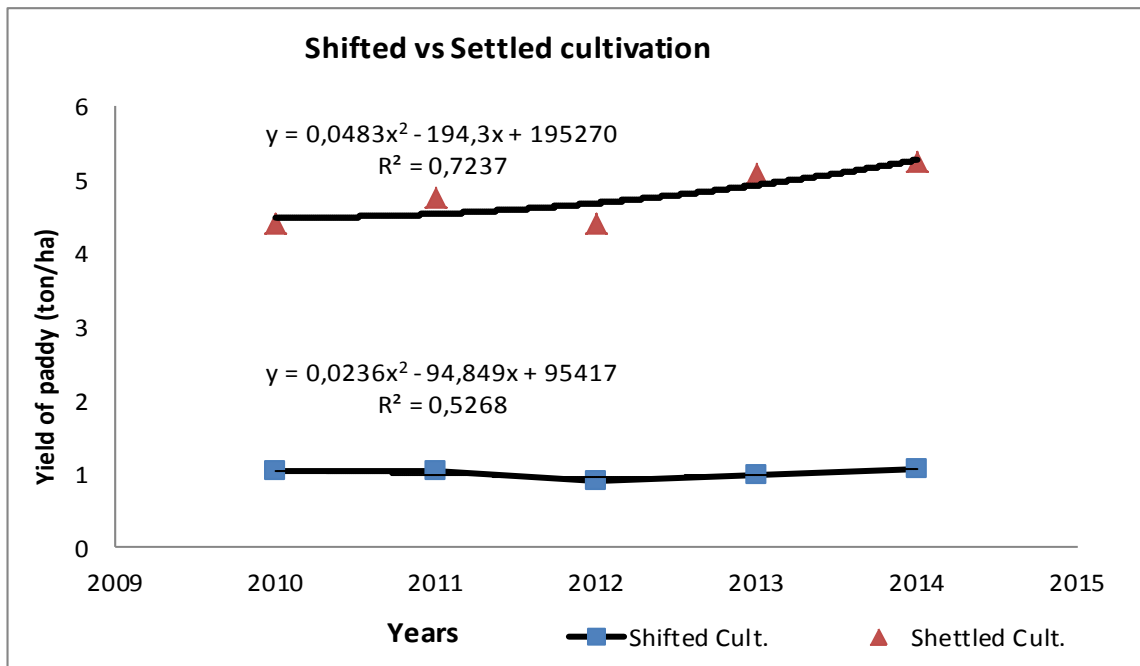


Figure 4. Paddy yields from settled cultivation was better than shifting cultivation

The shifting cultivation that situated at the forest regions cause widely degraded forest, because it use the clear cutting and burning methods. Every year, many traditional farmers slash and burn all vegetation on the forest regions to make the suitable land for paddy

cultivation at Kalimantan [12]. Traditionally local people have worked these soils by shifting cultivation, with a short cropping regime and a longer fallow (during 3 to 5 years) to allow fertility to recover [21]. This allows the top soil to regain some humus and organic matter which are

important as stores of nutrients and for regulation soil moisture and temperature. Nonetheless, shifting cultivation cause degraded forest, destroying of environmental quality and lose out of children education because they were following shifting cultivation activity although those distance is very far from their home.

This research go to show that settled cultivation produce more of paddy than shifting cultivation. Shifting cultivation increase the wide of land utilizing for traditional agriculture at the forest regions, so it increase the degraded forest. Thereby, settled cultivation reduce degraded forest, specially caused by extension of shifting cultivation, and could to improve unoccupied and neglected land productivity, and also keep the local children education. In this time, Indonesia government is better make the mixing between integrate and segregate patterns on the same forest regions with clear boundary usher both so that give optimum benefit on the community, improving of food security, environment conservation and sustainable forest management.

#### 4. Conclusion

Efforts to reduce degraded forest, to improve unoccupied and neglected land productivity, and keep the local children education at the forest region are replaced the shifting cultivation with settled cultivation, because it use the intensive treatment at the fixed site and produce the paddy yield more significantly than shifting cultivation. Paddy yields that produced from shifting cultivation namely 0.91 to 1.07 ton ha<sup>-1</sup> or 1.01 ton ha<sup>-1</sup> in average, whereas from settled cultivation namely 4.1 to 5.24 ton ha<sup>-1</sup> or 4.78 ton ha<sup>-1</sup> in average, and it tend to increase stage by stege.

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