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Direct Economic Use Value of Sungai Wain Protection Forest to Local Community East Kalimantan, Indonesia

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Abstract

Sungai Wain Protection Forest (SWPF) is one among the protected forests in East Kalimantan. This forest ecosystem provides various economic benefits to support livelihoods especially for the local community. The benefits include direct use of biological and ecological elements and farming. The objective of this study is to measure the economic value of SWPF to support household income. This study was conducted in sub-district of Karang Joang, an administrative territory of Balikpapan East Kalimantan. Respondent of this study is the local community extracting forest resources amounts to 175 respondents. The result shows that the economic value of SWPF for each household in year 2011 was average of Rp. 28,400,815 per household, or with income contribution equal to 54.18 percent. This value came from firewood, palm leaves, rattan and bamboo (biological elements), water (ecological element) and farming (swidden agriculture, fruits garden and mixed garden).

Keywords: economic value, biological element, ecological element, farming.

1. Introduction

Sungai Wain Protection Forest (SWPF) is located in East Kalimantan Province and covers an area of 9,783 ha according to the Forestry Ministerial Decrees No. 416/Kpts-II/1995. This forest area has become the foundation of life for most of local community. Biological and ecological elements obtained from the forest can be used to support livelihoods. These two elements partially provide essential economic values for the subsistence of local community. However, according to the preliminary study, they had begun to decrease both in the potential and the quality. This condition is due to lack of awareness of the various stakeholders, especially the local community, on the importance of protecting forest ecosystem and in addition to the pressures of increasing population growth.

Based on the report from the Management Board for Sungai Wain Protection Forest, to the latest condition of the forest, it is stated that only 39 percent, approximately 3,841 ha of its area were left as natural forest while 41.6 percent or 4,071 ha were damaged during forest fires in 1998 and 17.4 percent or 1,703 ha had its function switched because of land occupation. From this occupied land, around 1,100 ha were changed into forest use area for local community (Management Board for Sungai Wain Protection Forest 2004). They collect non-timber forest products and clear the forest land for farming.

Forests provide fuels, medicine, foods and raw materials for construction and serves as a natural safety net during hard times (World Bank 2009). In terms of economic contribution, forests play a great role, especially in developing countries, in providing income-generating opportunities. For instance, the contribution of Bukit Daun Protected Forest in Kandang Village Bengkulu, Indonesia for the local community income was 32 percent of its total income and the income contribution of a protected forest in Air Lanang Village Bengkulu, Indonesia reached 52.5 percent (Senoaji 2009). Buyinza (2010) states that, based on his research of Mt. Elgon Forest Park in Uganda, contribution of the forest park to the income of local community was quite high, that is 55 percent of the total income. This large amount of income was sourced from medical herbs, building materials, firewood and timber, honey bee, cattle fodder, land conservation, and hunting. Thus, forests do not only provide ecological benefits but also contribute to the welfare of local community.

Sungai Wain Protection Forest (SWPF) which functions as buffer zones, especially to Balikpapan City, also serves as source of livelihoods for the local community. However, uncontrolled extraction may have an impact on the sustainability of the existing ecosystem and leads to limited economic benefits available. Moreover, rapid population growth accompanied by an adequate level of technology in the area surrounding the forest has put pressures on the forest ecosystem. These events suggest a need for establishing conservation because uncontrolled extraction and rapid population growth not only threaten forest ecosystem but may also disrupt forest supply chains. According to Agrawal *et al.* (2013), conservation is necessary to maintain biodiversity, mitigate carbon emissions from deforestation, maintain the provision of subsistence and income-generating forest based resources for local livelihoods, and sustain key ecosystem services.

As the pressure from the local community to SWPF rises, this study intends to examine the role of SWPF in the economy of local community. In order to address this problem, this study measures the economic value of SWPF in supporting household income. The results can be used as a basis for planning management program that can maintain or even increase household

income yet still support the principles of environmental sustainability.

2. Study Area and Duration

The site of this study is the utilization area of SWPF in East Kalimantan Province, Indonesia (see Figure 1). The study lasted for three months, starting from April 2012 to July 2012. SWPF is chosen due to its high accessibility for the local community and society in Balikpapan City to conduct various activities supporting their livelihoods.

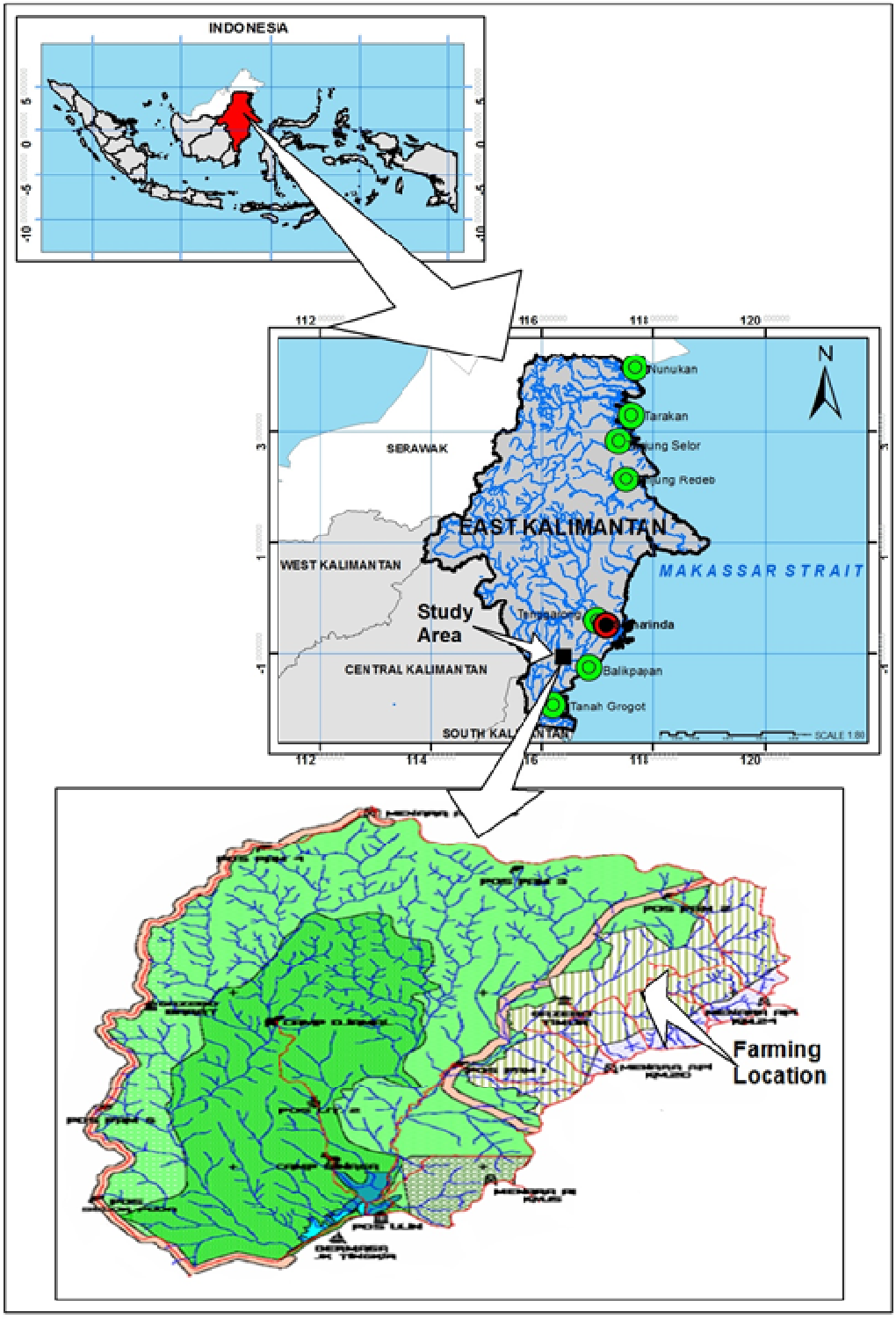

Figure 1. Map of the Study Area

3. Methodology

The object of this study is the local community surrounding and live within the area of SWPF. Samples are taken randomly from the population of local community as much as 462 households. The number of samples is calculated using the formula proposed by Parel *et al.* (1973):

$$n = \frac{NZ^2\sigma^2}{Nd^2+Z^2\sigma^2}$$

Where,
n = number of sample
N = population
Z = Z-value from Z-table on 95% confidence intervals
σ^2 = the variance in the population
d^2 = 5% level of significance

Based on the calculation on the number of samples, it is obtained a result of 174 (∽175) respondents. Data for this study consists of primary data and secondary data. The primary data is obtained from the selected respondents (the local community) and biophysical of SWPF. Techniques used in the collection of primary data are direct interview and field observation through documentation of the forest biophysical conditions. The secondary data is obtained from Management Board for Sungai Wain Protection Forest and Karang Joang Sub-district. It is also collected through the study of literature, information sourced from journals or reports as mentioned in the references.

Analysis began with the identification of the economic benefits of SWPF through descriptive-qualitative analysis and followed by an economic evaluation. Economic benefits are valued based on the calculation of income and expense in 1 (one) year (2011), which is described in the following stages:

1) Gross income of SWPF = revenue obtained from forest use.
2) Cost of forest use = cost incurred in the extraction of forest resources.
3) Net Income of SWPF = gross income of SWPF – cost of forest use.
4) Earnings outside from SWPF = revenue comes from outside forest use.
5) Household income = net income of SWPF + earning outside from SWPF.

Economic contribution of SWPF to household income = Average net income of SWPF / Average household income * 100%;

4. Findings and Discussion

4.1 Income from Biological Elements

Household income from biological elements derived from the use of firewood, roof made from palm leaves, rattan and bamboo. The total income from biological elements can be seen in Table 1.

Table 1. Income from biological elements per household in a year (year of 2011) (n=175)

No.	Biological Element	Gross Income (Rp.)	Cost (Rp.)	Net Income (Rp.)	Explanation
1	Firewood	1,205,000 (241 bundles x Rp.5,000)	409,700 (241 bundles x Rp.1,700)	795,000 Standard Deviation (SD)=1,163,300	A bundle of firewood consists of 20 pieces of firewood with a length of 1 meter
2	Palm Leaves Roof	675,000 (67.5 unit x Rp.10,000)	405,000 (67.5 unit x Rp.6,000)	270,000 SD=1,354,569	A unit of palm leaves roof consists of 10 pieces of palm leaves with a width of 1 meter
3	Rattan	-	-	-	The value of rattan is included in the value of palm leaves roof
4	Bamboo	-	-	-	The value of bamboo is included in the value of palm leaves roof
		T o t a l		1,065,000 SD=1,615,028	-

Total income from biological elements as shown in Table 1 was relatively small, that the average income was only Rp.1,065,000 per household in 2011. Lack of use of palm leaves and small contribution of palm leaves roof in income generation (Rp.270,000 per household) were the causes of this relatively small amount of income from biological elements. There were only 4 percent or 7 respondents use palm leaves to make roof while 53 percent of the total number (92 respondents) use firewood to generate income.

Rattan, bamboo, and palm leaves are included in the value of palm leaves roof because these products are used as supporting or raw materials to produce roof. Thus, cost of roof production includes raw materials and wages (labor costs). From the total cost incurred per unit, 35 percent were cost incurred from the use of rattan, 25 percent were cost of bamboo, 15 percent were cost of palm leaves, and labor costs were accounted for 25 percent of the total cost per unit.

Tabel 2. Percentage of the local community use biological elements

No.	Total Income (Rp./Year)	N (Number of Respondent)	Percentage
1	5,000,000 – 20,000,000	45	48.91
2	> 20,000,000 – 35,000,000	21	22.83
3	> 35,000,000 – 50,000,000	8	8.70
4	> 50,000,000 – 65,000,000	7	7.61
5	> 65,000,000 – 80,000,000	4	4.35
6	> 80,000,000 – 95,000,000	2	2.17
7	> 95,000,000 – 110,000,000	0	0.00
8	> 110,000,000 – 125,000,000	2	2.17
9	> 125,000,000	3	3.26
	Total	92	100.00

Table 2 presents the number of beneficiaries from biological elements based on the total income. The majority of local community use biological elements (firewood, palm leaves, rattan and bamboo) was households with low total income that is around Rp.5,000,000 to Rp.30,000,000 in a year. This condition suggests that there were 53 percent of local community use biological elements as their source of income. Thus, low income households are highly likely to extract biological elements from the forest compared to medium and high income households. On the other hand, the higher the total income received, the lower the local community interested in extracting biological elements from SWPF. This implies that poverty remains as the main cause of biological elements extraction among local community. Therefore, if there is an initiative from local government to establish alternative sources of income, this will be very helpful to preserve SWPF from pressures created by local community.

Figure 2. Products made from biological elements which have an economic value;
firewood (top left), palm leaves (top right), rattan (bottom left) and bamboo (bottom right)

Figure 2 shows some biological elements from the forest that can be extracted. Biological elements are extracted for not only a matter of subsistence of local community but also for the purpose of commercialization. There are some restrictions from the Management Board for Sungai Wain Protection Forest on the types of biological elements that can be collected. Based on regulation of the Management Board for Sungai Wain Protection Forest, biological elements that may be collected are limited to its substances only while fauna or wild animal inside the forest are not to be hunted due to its scarcity caused by past hunting.

4.2 Income from Ecological Elements

Income from ecological elements is defined based on the volume of water that can be used. The total income generated from ecological elements is showed in Table 3 below.

Table 3. Average income from ecological elements per household in a year (year of 2011) (n=175)

No.	Ecological Element	Gross Income (Rp./year)	Cost (Rp./year)	Net Income (Rp./th)	Explanation
1	Water	6,019,811 (an average of 185.22 m^3 use of water/household/year x Rp.32,500)	174,686	5,845,125 SD=5,047,900.30	Price of water is the equalized price set by the municipal waterworks. Cost: logistics costs and water pumping services costs
	Total	-	-	5,845,125 SD=5,047,900.30	-

As shown in Table 3, the average total income from water use was Rp.5,845,125 per household in a year. This value represents the ecological role of SWPF as water supplier for local community. It is important to be reminded that there are still other forest ecological roles which have not been valued, such as protection against food, erosion, land slide, etc.

Figure 3. Sources of water;
well (top left), reservoir (top right) and river (bottom)

Local communities use water for bathing, washing, cooking and water the garden. Yet, up till now, they have no water supply from the municipal waterworks. Figure 3 shows the condition of water supply in SWPF. Although, they do not have water supply from the local government, they acquire water from some water springs inside the forest.

Table 4. Percentage of local community acquiring water based on its sources

No.	Source	N (Number of Respondent)	Percentage
1	Well	88	50.29
2	Reservoir	63	36.00
3	River	3	1.71
4	Well and Reservoir	1	0.57
5	Well and River	20	11.43
6	Reservoir and River	0	0.00
7	Well, River, and Reservoir	0	0.00
	Total	175	100.00

Based on the information from Table 4, it can be seen that well water dominated the use of water by more than 50 percent (50.29%), and then was followed by reservoir as much as 36 percent. Meanwhile, there were only 1.71 percent of total respondent use river solely as their source of water and more than 11 percent use both well and river. Reservoir and river are concentrated in one location; therefore the local community who settled far from this place prefers to make a well at their house.

4.3 Income from Farming

Types of farming activity practiced by local community consist of swidden agriculture, fruits garden, and mixed garden. The average income obtained from farming is presented in Table 5.

Table 5. Average income of farming per household in a year (year of 2011) (n=175)

No.	Type of Farming	Gross Income (Rp)	Cost (Rp)	Net Income (Rp.)	Explanation
1	Swidden agriculture	3,415,460	540,190	2,875,270 SD=14,633,247	Cost: input price and labor
2	Fruits Garden	7,852,369	876,829	6,975,540 SD=47,091,349	
3	Mixed Garden	13,891,137	2,251,257	11,639,880 SD=63,341,549	
Total		25,158,964	3,668,274	21,490,690 SD=77,942,843	-

Among the three types of farming, mixed garden yield the highest revenue of them all (Table 5). This condition was influenced by the number of respondent practice farming and the capacity of farm land. There were 28 respondents practiced mixed garden, 22 respondents of fruits garden and 17 respondents applied swidden agriculture. On the other hand, the capacity of land to be cultivated was 150.25 hectare in which mixed garden dominated the area for farming, as much as 82 hectares (54.58%), area of fruit garden was 43.4 hectare (28.88%) and capacity for swidden agriculture was 24.85 hectare (16.54%).

The amount of total income shown in Table 5 was considered to be quite high since there were a group of local community, at 12 percent, obtained an income of above Rp.100,000,000 in a year. Proportion of local community income from farming can be seen in Table 6.

Table 6. Proportion of local community income from farming

No.	Income From Farming (Rp./year)	N (Number of Respondent)	Percentage
1	100,000 - 10,000,000	23	34.28
2	> 10,000,000 - 20,000,000	12	17.71
3	> 20,000,000 - 30,000,000	4	5.71
4	> 30,000,000 - 40,000,000	5	7.43
5	> 40,000,000 - 50,000,000	3	4.00
6	> 50,000,000 - 60,000,000	6	10.29
7	> 60,000,000 - 70,000,000	2	2.86
8	> 70,000,000 - 80,000,000	0	0.00
9	> 80,000,000 - 90,000,000	2	2.86
10	> 90,000,000 - 100,000,000	2	2.86
11	> 100,000,000	8	12.00
	Total	67	100.00

There are several causes of different amount of income among local community as stated in Table 6. First is the capacity of land to be cultivated. Second is the type of plants and period of farming practices and the last is their experience and knowledge in farming especially for the local community who recently starts farming. In addition, business motives in practicing farming are also contributing to determine the amount of income.

Figure 4. Various farming types practice by the local community;
land cultivation (top left), rice plant (top right), zalacca palm fruit garden (bottom left) and mixed garden (bottom right)

Farming activities as shown in Figure 4 are very reliable in generating income. There were 38.29 percent of population practices these activities. Farming practices are not only a matter of subsistence but it also for business purposes. However, it is important to bear in mind that the practiced farming activities are the ones that do no disrupt forest ecosystem. As the welfare of the local community continued to rise, their awareness on the SWPF forest ecosystem will increase as well.

4.4 Income Contribution of SWPF

Average net income per household in a year is summarized in Table 7.

Table 7. Average net income per household in year of 2011 and the economic contribution of SWPF

No.	Source of Income	Income (Rp./th)	Percentage
1	Firewood and palm leaves roof (biological elements)	1,065,000	2.03
2	Water (ecological element)	5,845,125	11.15
3	Farming (swidden agriculture, fruit garden and mixed garden)	21,490,690	41.00
4	Other sources of income outside SWPF (trading, service sector, employee and etc.)	24,004,620	45.81
5	Total households' income (1+2+3+4)	52,405,435	100.00
6	The economic contribution of SWPF (1+2+3)	28,400,815	54.18

Table 7 shows the importance of SWPF to support the local community income. However, income from biological and ecological elements was relatively small, respectively 2.03 percent and 11.15 percent, compared to farming practices which was accounted for 41 percent of total income and relatively able to support household income. As noted before, this low contribution was due to restriction from the Management Board for SWPF to collect biological elements except for individual consumption. In addition, fauna or wild animal inside the forest

are forbidden to be hunted to avoid extinction. On the other hand, income from ecological elements was also relatively small because of its limited assessment which solely based on the use of water.

5. Conclusion and Recommendation

This paper has examined the role of Sungai Wain Protection Forest (SWPF) and measured the contribution of SWPF to local community income. There are various activities conducted in SWPF including biological elements, ecological elements, and farming. Net income from each activity is added to obtain the economic value of SWPF. The study concludes that, by extracting resources from SWPF, the local community obtained an average of Rp.28,400,815 income per household in a year or with income contribution equal to 54.18 percent in 2011. Farming practices contributed most in generating income while biological elements yield least of them.

The result indicates the importance of SWPF for the economy and subsistence of local community. There is need to preserve functions and benefits provided by the forest amidst threats from rapid population growth which needs more spaces and agricultural fields. In this case, the Management Board for SWPF could work together with local community on forest conservation in order to promote sustainable forest ecosystem.

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References

Affandi, O. (2002) Home Garden: Sebagai Salah Satu Sistem Agroforestry Lokal (Home Garden: As One of Local Agroforestry Systems). *Research Report.* [Online] North Sumatera University. Available from: http://library.usu.ac.id/download/fp/hutan-oding2.pdf. [Accessed: 18th March 2014]

Agrawal, A. et al. (2013) Economic Contributions of Forests. *Background paper prepared for the United Nations Forum on Forests.* [Online] Available from: http://www.un.org. [Accessed: 19th March 2015]

Alcamo, J. et al. (2005) Ekosistem dan Kesejahteraan Manusia: Suatu Kerangka Pikir Untuk Penilaian (Ecosystem and Human Prosperity: A Brain Framework for Evaluation), *Report of Millennium Ecosystem Assessment Conceptual Framework Working Group.* [Online] Millennium Ecosystem Assessment (MA). Available from: http://pdf.wri.org/ehw_indonesian.pdf. [Accessed: 18th March 2014]

Buyinza, M. (2010) Ecological and Socio-Economic Contribution of Mt. Elgon Forest Park, Eastern Uganda. *Jurnal Ilmu Kehutanan (Journal of Forestry Science).* 4.(1). p.28-36.

Local Government of Balikpapan City. (2004*)* Peraturan Daerah (PERDA) Hutan Lindung Sungai Wain No. 11 Tahun 2004 (Regional Regulation of Sungai Wain Protection Forest No. 11 Year 2004). Balikpapan

Management Board for Sungai Wain Protection Forest. (2005) Rencana Strategis Pengelolaan Hutan Lindung Sungai Wain (HLSW) Tahun 2006-2011 (Strategic Plan of Management of Sungai Wain Protection Forest Year 2006-2011). Balikpapan.

Management Board for Sungai Wain Protection Forest. (2006) Laporan Final Pengelolaan Hutan Lindung Sungai Wain (Final Report of the Management Board for Sungai Wain Protection Forest). Balikpapan.

Nanang, M. and G.S. Devung. (2004) *Local People in Forest Management and the Politics of Participation.* Indonesia Country Report. Institute for Global Environmental Strategies (IGES) Kanagawa. Japan.

Oka, N.P., and A. Achmad. (2005) Kontribusi Hasil Hutan Bukan Kayu (HHBK) Terhadap Penghidupan Masyarakat Hutan (Studi Kasus di Dusun Pampli Kabupaten Luwu Utara) (The Contribution of Non-Timber Forest Products to The Forest Community Livelihood). *SOCA* (*Socio-Economic of Agriculture and Agribusiness).* [Online] E-Journal Udayana Univeristy 7(1). p.1-15. Available from: http://ojs.unud.ac.id/index.php/soca/article/view/4148. [Accessed: 18th March 2014]

Parel, C.P. et al. (1973) *Sampling Design and Procedures*. Quezon City: The Agricultural Development Council.

Senoaji, G. (2010) Studi Kesesuaian Lahan untuk Penentuan Kawasan Lindung di Hutan Lindung Konak Kabupaten Kepahiang Propinsi Bengkulu (Feasibility Study of Land in Determining Protection Area in Protection Forest of Konak, District Kepahiang, Province of Bengkulu). *Jurnal Ilmu Kehutanan (Journal of Forestry Science).* 4.(1). p.12-20.

Uluk A., M. Sudana and E. Wollenberg. (2001) Ketergantungan Masyarakat Dayak terhadap Hutan di Sekitar Taman Nasional Kayan Mentarang (Indigenous Dayak People Dependence on the Forest Surrounding Kayan Mentarang National Park). Center for International Forestry Research (CIFOR). Bogor.

World Bank. (2009) Pengelolaan Hutan Bagi Semua (Forest Management for All). *Indonesia Policy Briefs-100 Days Program Ideas.* [Online] Available from: http://www.worldbank.org. [Accessed: 18th March 2014]

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