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Human Activities and Conservation Awareness between Community Use Zone (CUZ) Areas of Kinabalu Park and Crocker Range Park, Sabah

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Abstract

The Parks Enactment 1984 prohibits any human activities in the Park in order to conserve the natural ecosystem but in reality there are some people living inside the Park and doing cultivation. Community Use Zone (CUZ) is a management option in an attempt to strike a balance between the conservation priorities of the Park and the livelihoods of the local communities who depend on the Park for survival. This study looks into the relationship between types of crops planted within the CUZ areas, evaluate the contribution for the local communities' livelihood, and determine the perception and conservation awareness of local community activities. The data for this study was collected by using face-to-face interview technique. Closed and open-ended structured questions were used in the interview. Apart from that observation was useful to obtained information which cannot achieve from structured interviews. Percentage, mean and range were used to summarize the results. With the use of socioeconomic survey and economic valuation on sales products approach, it was possible to determine the objectives of this study. Major crops grown are permanent crops such as rubber trees, fruit trees, and cash crops such as vegetables, cocoa and coffee trees were identified as the type of crops that were cultivated for economic sources by farmers in Kg. Sayap, Kota Belud and Kg. Mongool Baru Ulu Senagang, Keningau/Tenom. Rubber trees contributed the highest source of income followed by fruit trees such as durian, langsat and rambutan, cocoa trees and vegetables. The study showed that the perception and conservation awareness of the local communities in both villages had high awareness level. They are aware of the issues that concerning forest conservation. The study had determined that the CUZ is a tool management for the local communities to survive their living which is recommended to be applied but further research on the local communities' livelihood dependency on protected areas should be conducted for the sake of forest conservation.

1. Introduction

Kinabalu Park and Crocker Range Park (CRP) are surrounded by human settlement on all corners of its boundary. The local communities still rely on the natural source of the forest such as plants for food, medicinal plants, firewood, and hunting wild animals.

According to Nais [1] the Park was gazetted in 1964, the exact area was designated on map with precise coordinates. Based on the map and coordinates, approximate boundary on the ground was demarcated by the Park rangers using hand-held compasses. It is not precise but the local communities took the mark boundary to be the precise and permanent boundary. The local communities then started to subdivide, cultivate and develop the areas which at that time was 'outside' the marked boundary. In 1984, the Parks Enactment 1984 came into law with certain amendment to the initial area designated as Kinabalu Park. Based on this new set of coordinate, the Park started ground surveying the exact and legal boundary, contacted to licensed surveyors. Massive discrepancies with the old boundary surfaced, with many lands cultivated, developed or even inhabited by the villagers turn out to be inside the proper and legal Park boundary. This is the main source of dispute between the Park and the surrounding communities.

CUZ is a zoning tool of community use areas which has been accepted as the most reasonable short-term strategy to address land use management issues inside the CRP. This option will incorporate traditional cultivation areas under the Zoning Plan. As such, traditional cultivation will be allowed inside CUZ on condition that these activities are controlled by Sabah Parks. After the establishment of CUZ, other management options, such as land swap, may be considered. However, the procedure for executing this land swap may be complicated due to managing the balance of the local

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communities with Park laws, by considering options either resettlement or to remain. This option depends on the settlement history [2]. CUZ will be applied at other Park's areas when it is established.

With regard to CUZ inside the Park areas there is no comprehensive study has been done on CUZ. Types of methodologies being need have not been determined on CUZ. As there were not researches made, no publications are available for references by any intending researchers. The researches or assessments are very important so as to come up with recommendation on how to control and monitor the activities of the local community's activities within the study areas.

This study is aimed at two important objectives. First, to identify types of crops planted within the CUZ areas and evaluate the contribution for their livelihood. Second, to determine the perception and conservation awareness of local community activities. This study attempts to identify how well the CUZ can brings conservation awareness which contributes to whether conservation awareness should be evaluated or not, therefore this study should be conduct.

2. Materials and Methods

2.1. Study Areas

Two villages selected for the survey which are from different National Parks (Figure 1) and community classification. Kg. Sayap, Kota Belud is one of the villages which are located near to the dispute area of Kinabalu Park boundary. Local communities claimed that their ancestor's land was within the Park boundary long before the Park was established. The villagers are predominantly Dusun. Cultivation of the village people is estimated 234.37 ha inside the Park areas.

The village of Kg. Mongool Baru Ulu Senagang, Keningau/Tenom is located inside the CRP areas where the local communities are engaged in cultivation and natural resource gathering. This village existed in 1974 by a few people that had migrated from Kg. Salalir, Kg. Tahol and Kg. Mongool Pensiangan from the Nabawan district. The villagers are predominantly Murut. The village and cultivation area is estimated 187.96 ha.

Source: [2]

Figure 1: Map of parks in Sabah, Malaysia.

2.2. Socioeconomic Survey

Socioeconomic survey was done by distribution of close-ended and open-ended questionnaire owners of cultivated ground. The questionnaires are divided into five main sections; (i) Part A: Information of study area village, (ii) Part B: Respondent background, (iii) Part C: Information on land cultivation, (iv) Part D: Valuation of products, and (v) Part E: Conservation and perception awareness.

The interview was conducted according to the involvement of local communities which were involved in the land cultivation within the Park areas. Name lists of farmers were provided by Sabah Parks. The survey population is 100% of population sample size based on the local communities' utilization of land, their perception towards forest conservation and conservation awareness.

2.3. Economic Valuation on Non-Timber Forest Products (NTFP)

The commercial value of the local communities was determined from the income they earned from generated crops cultivation within the CUZ areas. Whether the products are sold, market price will be used to calculate the gross income generated. According to Sathirathai [3] when the products are used only for

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subsistence purposes, the gross income will be estimated based on surrogate prices for which two kinds of approach may be applied.

Local direct use value=Net income generated for local use= $\sum$ {Pi Qi – Ci} [3]. Whereas P is the prices of i, Qi denotes the amount of product i being collected, and Ci is the costs involved in the collection of product i.

2.4. Percentage and Mean Analysis

Data analysis was done by using percentage method. This method is to represent raw data within a percentage. Example: (Amount ÷ Total) = Percentage. The mean refers to measurement of central tendency and it is the one to which most people attach the word 'average' [4].

2.5. Conservation Awareness

The methodology of conservation awareness will help to establish patterns and relationships that exist amongst local community in CUZ areas. The recommendations are as the following:

i. Preparation of information gathering prior to the assessment.
ii. Information gathering during the assessment: on-site observations and interviews.
iii. Collaborative analysis and strategies.

The recommendations of (i) and (ii) will be carried out by socioeconomic survey and observation while (iii) will be conducted using the data analysis methods.

3. Results and Discussion

One hundred and twelve (112) respondents had been interviewed; 65 people in Kg. Sayap and 47 people in Kg. Mongool Baru Ulu Senagang. The percentage of distribution was 100% according to the involvement of local communities within the Park areas for both villages as shown in Table 1.

Table 1: Respondent background.

Village	Respondent	Age	Job	Income (RM)
Kg. Sayap, Kota Belud	65	26-77	Farmers 85% Government 9% Private 6%	50-2000
Kg. Mongool Baru Ulu Senagang, Keningau/ Tenom	47	21-85	Farmers 85% Government 11% Private 4%	150-2000

3.1 Information on Land Cultivation

The areas of cultivation of the local communities in Kg. Sayap (Table 2) were estimated 45.47 ha with over 28 species of crops specified and approximately 15,947 trees planted since 1960s until early 2000s [5]. There was no land title except 10 people had applied for LA. Approximately 78% local communities or 51 cultivation lands are actively in cultivation with 44 huts within each land owners. The local communities does not live inside the Park, the distance from the village to the boundary is approximately 3 km.

Table 2: Land use information of Kg. Sayap.

Item	Information
Size of cultivation area	45.57 ha
Type of crops	28 species
No. of trees	15,947 trees
Year of opening land	1960s, 1970s, 1980s, 1990s, 2000s
Land title	10 Land Applications (LA)
Active cultivation land	51 active cultivation lands
Building structure	44 huts

According to the respondents, paddy hills and paddy fields were cultivated before but nowadays they do not cultivate it within the Park areas. The cultivation of paddy hills and paddy fields were practice outside the Park areas. Table 3 shows the crops that have been planted in Kg. Sayap.

Table 3: List of crops planted in Kg. Sayap.

No.	Local Name	Scientific Name
1.	Getah	*Hevea brasiliensis*
2.	Pisang	*Musa* sp.
3.	Durian	*Durio zibethinus*
4.	Tarap	*Artocarpus odoratissimus*
5.	Nanas	*Ananas comosus*
6.	Cempedak	*Artocarpus champeden*
7.	Langsat	*Lansium domesticum*
8.	Rambutan	*Nepehelium lappaceum*
9.	Manggis	*Garcinia mangostana*
10.	Avocado	*Persea americana*
11.	Nangka	*Artocarpus heterophyllus*
12.	Bambangan	*Mangifera pajang Kostermans*
13.	Betik	*Carica papaya*
14.	Limau manis	*Citrus suhuiensis*
15.	Limau nipis	*Citrus aurantifolia*
16.	Limau kasturi	*Citrofortunella microcarpa*
17.	Kobis	*Cruciferae* sp.
18.	Bunga	*Brassica* sp.
19.	Sawi	*Brassica* sp.
20.	Timun	*Cucumis sativus*
21.	Tomato	*Lycopersium esculenlum*
22.	Lada/cili padi	*Capsicum frutescene*
23.	Lada/cili putih	*Capsicum* sp.
24.	Lada hijau	*Capsicum* sp.
25.	Lada besar/pepper	*Capsicum* sp.
26.	Bawang kampung/kucai	*Amaranthus hybridus*
27.	Kacang tanah	*Arachis hypogea*
28.	Ubi manis	*Ipomea batatas*

In Kg. Mongool Baru Ulu Senagang, the village and cultivation areas (Table 4) were estimated 187.96 ha with nine species of specified crops identified for product selling which had been planted since 1975 until recently. Thirty one (31) people declared that they had applied for LA. The village is occupied by 38 families consist of 27 houses, while five families are living outside the Park areas.

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Table 4: Land use information of Kg. Mongool Baru Ulu Senagang.

Item	Information
Size of village and cultivation area	187.96 ha
Type of crops	9 species
Year of opening land	1975, 1980s, 1990s, 2000s
Land title	31 Land Applications (LA) – declared by villagers
Building structure	27 houses (38 families)

Table 5 shows the species of crops frequently cultivated such as cash crops and permanent crops in Kg. Mongool Baru Ulu Senagang.

Table 5: List of crops planted in Kg. Mongool Baru Ulu Senagang.

No.	Local Name	Scientific Name
1.	Getah	*Hevea brasiliensis*
2.	Koko	*Theobroma cacao*
3.	Kopi	*Coffea robusta* *Coffea liberica*
4.	Durian	*Durio zibethinus*
5.	Langsat	*Lansium domesticum*
6.	Rambutan	*Nephelium lappaceum*
7.	Cempedak	*Artocarpus champeden*
8.	Kelapa	*Cocos nucifera*
9.	Paddy hill	*Oryza* sp.

3.2 NTFP's Sales Products

The rubber trees (*Hevea brasiliensis*) are the highest producer with an average of 1400 kg per month. This product had contributed to the income of the local communities in Kg. Sayap with an estimated average income of RM13,150.00 per month. Additionally, locally known lada/cili putih (*Capsicum* sp.) is the highest product price with an average income of RM1,820.00 per month. The harvests are annually compared to other cash crops such as the fruit trees which it is on seasonal base. However, there were no reports of cultivating neither timber trees nor plantation trees. Table 6 shows the sales products of Kg. Sayap per annum.

Table 6: Sales products of Kg. Sayap per annum.

Product	Price of product (RM/kg)	Amount of product being collected (kg)	Cost involved in collection of products (RM)	Total (RM)
Getah (kepingan)	5.00-5.50	900	50.00	9400.00
(kentalan)	3.50-4.10	500	50.00	3750.00
Durian	2.00-10.00	350	190.00	16435.00
Nanas	1.00-4.00	200	160.00	3300.00
Tarap	0.50-6.00	100 fruits	85.00	2215.00
Pisang	0.50-3.50	150 combs	90.00	2010.00
Lada/cili putih	5.00-15.00	50	80.00	1820.00
Cempedak	1.00-6.00	80 fruits	140.00	1540.00
Langsat	2.00-4.00	100	90.00	1310.00
Rambutan	0.50-2.50	150	80.00	820.00
Manggis	2.50-4.00	80	70.00	760.00
Sayur kobis	1.50-4.00	80	90.00	710.00
Lada besar/ pepper	3.00-6.00	60	90.00	690.00
Sayur bunga	1.00-7.00	60	90.00	390.00
Nangka	1.00-5.00	50 fruits	30.00	370.00
Avocado	1.00-4.00	100	140.00	360.00
Sayur sawi	1.00-3.00	60	90.00	270.00
Tomato	2.00-4.00	50	80.00	270.00
Bambangan	1.00-5.00	50 fruits	60.00	240.00
Limau manis	2.00-2.50	50	40.00	185.00
Lada/cili padi	1.00-4.00	30	50.00	160.00
Lada hijau	3.00-4.00	30	50.00	160.00
Timun	2.50-3.00	30	25.00	140.00
Limau nipis	1.50-2.50	30	50.00	130.00
Limau kasturi	1.00-2.00	30	20.00	115.00
Kacang tanah	3.00	30	20.00	70.00
Ubi manis	1.50	50	25.00	50.00
Betik	2.00	40	40.00	40.00
Kucai	1.00	60 ties	25.00	35.00
TOTAL	**0.50-15.00**	**3060 kg 150 combs 280 fruits 60 ties**	**2100.00**	**47,745.00**

According to Table 7, the rubber trees contributed as the major income for the local communities of Kg. Mongool Baru Ulu Senagang with an average of 7,000 kg per month with an estimated average income of RM36,480.00 monthly. This product is also the highest product price among eight species listed. Cocoa also contributed to the income with an average of 800 kg with estimated average income of RM95,50.00.

Table 7: Sales products of Kg. Mongool Baru Ulu Senagang per annum.

Product	Price of product (RM/kg)	Amount of product being collected (kg)	Cost involved in collection of products (RM)	Total (RM)
Getah (kepingan)	5.80	5000	60.00	28940.00
(kentalan)	3.80	2000	60.00	7540.00
Koko	1.20-2.80	800	50.00	9550.00
Langsat	1.50-2.00	300	10.00	2090.00
Durian	1.00-3.00	200	10.00	1190.00
Rambutan	0.80-1.70	200	10.00	990.00
Kopi	4.50	80	50.00	310.00
Cempedak	3.00	40 fruits	10.00	110.00
Kelapa	0.50	50 fruits	10.00	15.00
TOTAL	**0.50-5.80**	**8580 kg 90 fruits**	**270.00**	**50735.00**

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3.3 Perception and Conservation Awareness

The perception and conservation awareness were based on the local communities awareness towards their concern of forest conservation.

Table 8 shows the result of interview that had been conducted among villages showing the local community's perception towards Sabah Parks enforcement. Under the perception awareness, 81% of the local communities' are aware of the Sabah Parks existence. This means that almost of the local community are aware that such activities as cultivation and gathering forest products within Sabah Parks are prohibited. Local communities that had seen the signs of Sabah Parks boundary amounted to 97%. Those in Kg. Mongool Baru Ulu Senagang are higher of 100% can be attributed to the situation of the village's location within the Park.

Eighty nine percent (89%) are aware of being forbidden to utilize land for cultivation and gather forest products in the Park. The local community contributes their understanding on the importance of forest as high as 88% which considering the establishment of Sabah Parks is necessary in conserving the forest. Approximately 83% of the local community understand and agrees on forest conservation. Kg. Mongool Baru Ulu Senagang is 100% high level in understanding conservation and supports the conservation activity, compare with Kg. Sayap of 68% only. This shows that both villages agree on environmental preservation.

The local communities of both villages equally agree and disagree on forest felling for the purpose of agricultural utilization causes forest destruction. This is considered as they depend on the forest for their daily lives. There were no differences among both villages.

Table 8: Perception awareness of local communities concerning of forest conservation.

Statement	Percentage		TOTAL
	Kg. Sayap	Kg. Mongool Baru Ulu Senagang	
1. Do you know the existence of Sabah Parks?			
YES	71	91	81
NO	29	9	19
2. Have you ever seen the signs of the Sabah Parks boundary or warning boards?			
YES	94	100	97
NO	6	-	3
3. Do you know it is prohibited to use land for agricultural purpose and gather forest products within Sabah Parks?			
YES	83	96	89.5
NO	17	4	10.5
4. Do you understand the importance of forest?			
YES	77	98	87.5
NO	23	2	12.5
5. Do you understand what conservation is?			
YES	68	96	82
NO	32	4	18
6. Do you want your surroundings to be conserved?			
YES	74	100	87
NO	26	-	13
7. Do you want to be involved in conservation activities?			
YES	62	100	81
NO	38	-	19
8. Forest felling for the purpose of agricultural utilization may cause forest destruction.			
AGREE	49	51	50
DISAGREE	51	49	50

Table 9 described the conservation awareness which emphasize on the correlation of fertility of soil and the purpose of land cultivation. For the first time attempt of cultivation, both villages are 86% fertile in soil. However, comparing with nowadays, the fertility of soil had reduced to 48% where another 48% falls to little bit fertile. Thirty nine percent (39%) of local community uses fertilizers, where the usage resulted from the increasing of crops production.

Land cultivation had contributed 64% usage for self-consumption during the first attempt. Nowadays, 16% of local communities were to sell the products and 21% cultivate for self-consumption and gain economic sources. By comparing between first attempt and nowadays, 48% had reverse cultivation to gain economic sources, while 27% still maintain for self-consumption and 26% for both. With 65% of people cultivating new crops is the fact of producing the variety of crops cultivation.

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Table 9: Conservation awareness of local communities concerning of forest conservation.

Statement	Percentage		
	Kg. Sayap	Kg. Mongool Baru Ulu Senagang	TOTAL
1. The first time you attempt cultivation inside the Park areas, was the soil fertile?			
NOT FERTILE	3	-	1.5
LITTLE BIT FERTILE	20	6	13
FERTILE	77	94	85.5
2. How about nowadays, is the soil still fertile as before?			
NOT FERTILE	6	2	4
LITTLE BIT FERTILE	28	68	48
FERTILE	66	30	48
3. Do you use any fertilizer for your cultivation?			
YES	55	23	39
NO	45	77	61
4. For the first time you attempt cultivation, what was the reason?			
SELF CONSUMPTION	40	87	63.5
ECONOMIC SOURCE	22	9	15.5
BOTH	38	4	21
5. If you are still active doing cultivation, what is the purpose for?			
SELF CONSUMPTION	44	9	26.5
ECONOMIC SOURCE	48	47	47.5
BOTH	8	44	26
6. Is there any difference between type of crops cultivated nowadays than the first time attempt?			
YES	51	79	65
NO	49	21	35

In Kg. Sayap, the main crops grown primarily for sales products are fruit trees. Most of the land is double-cropped with other species of annual crops such as pineapples, cassava, maizes, and chillies. Vegetables such as cabbages, mustard, *sayur bunga*/Chinese flowering green vegetable, tomato, and variety of chillies are grown anytime since the climate is cool. The main crops cultivated in Kg. Mongool Baru Ulu Senagang are rubber trees. Majority of the farmers grows rubber trees surrounding the house compound. Cocoa and coffee trees are also grown around the house compound. The water factor is not a problem because the source of water is taken from within the Park and it is unlimited.

The number of different species of crops planted is related to such factors:

i. *Population growth*
The increased of population urge the tendency to grow cash crops. It is also a factor for a household do not have enough land to support themselves.

ii. *Employment*
Majority of the local community do not have good jobs, this encourage them to concentrate on agriculture especially in Kg. Mongool Baru Ulu Senagang.

iii. *Market demand*
The local community plants many subsistence crops species especially fruit trees and vegetables in Kg. Sayap, while in Kg. Mongool Baru Ulu Senagang are rubber trees and fruit trees. More farmers are concentrating on economic valuable crops such as rubber trees and vegetables to gain higher economic value.

iv. *Increase the standard of living*
Through development, local community wants to improve the quality of life. They need more money to purchase goods such as education, transportation, electricity and many more.

Rubber trees, fruit trees such as durian, langsat and rambutan, cocoa trees and vegetables are products which contributes the most for the local communities' source of income. The average value contribution of rubber trees in Kg. Mongool Baru Ulu Senagang is 7,000 kg with generated income of RM36,480.00 monthly. This contribution is higher than in Kg. Sayap where the average value contribution of rubber trees is only 1,400 kg with generated income of RM13,150.00 per month. Seasonal crops such as durian had contributed 350 kg gaining RM16,435.00 at Kg. Sayap which is more than in Kg. Mongool Baru Ulu Senagang with the average value of 200 kg gaining RM1,190.00. Annual crops are cultivated in Kg. Sayap but are not practice in Kg. Mongool Baru Ulu Senagang. The average value contribution from lada/cili putih is 50 kg generating RM1,820.00 which is the highest contribution among vegetables products.

The road accessibility and potential market are the factor of influencing the sources of income of the local community. From the study that had been conducted

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at Kg. Sayap and Kg. Mongool Baru Ulu Senagang, it is clearly shown that cultivating rubber tree is the highest value product. In the perception awareness section of both villages, local communities in both villages had a high awareness level. Both local communities showed low negative perception towards protected areas. The local communities are moderate in terms of forest felling which may cause forest destruction. It is related to their daily activities within the Park.

The conservation awareness section showed that Kg. Sayap experienced low reduction of the soil fertility. While in Kg. Mongool Baru Ulu Senagang are high in reduction. This relates to the usage of fertilizer where local communities in Kg. Sayap had moderate usage, while local communities in Kg. Mongool Baru Ulu Senagang are low in fertilizer usage. The main product in Kg. Mongool Baru Ulu Senagang is rubber trees where the trees do not need the usage of fertilizer. In Kg. Sayap, most local communities cultivate annual cash crops such as vegetables, pineapples which needed fertilizer. Local community in Kg. Sayap uses pesticide such as herbicides. This causes hazards where the residue accumulated into the ecosystem. The use of fertilizers is due to the poor natural soil fertility of the cultivated lands. Land becomes scarce and limited, and a piece of land is used over and over again such as paddy, pineapples, vegetables which leads to leaching, erosion and reduces natural fertility of the soil. The large proportion of respondents who disagree on agricultural activities as threats to biodiversity and environment, suggest a low priority given to environmental awareness among the community. It appeared that agricultural was undertaken without consideration to sustainable land use practices, with large amount of land being cleared for cultivation and infrastructural development at the expense of valuable habitat.

4. Conclusion

Population is increasing and by comparing to the shrinking amount of available land for settlement and cultivation relates to the situation at Kg. Sayap and Kg. Mongool Baru Ulu Senagang. The need to survive for living and children's education is a contributing factor of the local community's activities within the Park areas.

The types of crops cultivated by the local communities of both villages within the Park areas are permanent crops and cash crops which had contributed a large amount of income monthly to sustain their livelihood. For both villages the average range individual flow of income per annum can be describe as the followings; rubber trees generated RM1,095.83 (Kg. Sayap) and RM912.00 (Kg. Mongool Baru Ulu Senagang), fruits trees generated RM2,289.76 (Kg. Sayap) and RM2,229.33 (Kg. Mongool Baru Ulu Senagang), and vegetables generated RM1,960.37 (Kg. Sayap), were the type of crops cultivated either for self-consumption and economic sources. Apart from gaining economic sources from cultivating within the Park, local communities at Kg. Sayap have other cultivation lands which are located outside the Park areas.

Perception awareness of the local communities shows that they agree for the vital importance of environmental preservation but also disagree with the Park's regulation of prohibiting them from occupying the forest for cultivation and settlements. Based on the result, the local communities at Kg. Sayap have other cultivation lands which are located outside the park areas. Since they had other land outside the Park areas and receiving additional economic sources, which is more generating income than products that are planted within the Park.

Conservation awareness of local community activities can be elaborated through determining the ecological function of the land from the natural stand. Once the local communities alter the natural stand by replacing it with cash crops such as rubber trees, that particular crop do not maintain the ecosystem balance. Planting rubber trees has its own nutrient cycle it may uses the dried leaves as nutrient. When another type of crop been planted beneath nearby the rubber trees, the nutrient will flow and absorbed by the new crop. The kind of nutrition the rubber trees need are not the same nutrients intake with the other type of planted crops needed. By looking into that parameter, it can be seen that the conservation awareness has been reduce. By comparing the parameters, through the study done on CUZ activities in dispute areas of protected areas had determined that the CUZ is a tool management for the local communities to survive their living which is recommended to be applied but further research on the local communities' livelihood dependency on protected areas should be conducted for the sake of forest conservation. Since the settlement and cultivation areas had been opened for many years and the land had been exposed to development.

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