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Agroforestry Natural and Benefits Stimuli for Improvement of Kerinci Community at Kerinci Seblat National Park (KSNP)

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Abstract

Stimulus is a stimulation that causes reaction or response. Stimuli are factors that affect someone or something to be have. The concept of tri-stimulus amar states that the tri stimulus amar conservation is important in conservation action and consists of natural stimulus, benefit, and religious (willingness).This study aimed to determine whether the species composition of Kerinci communities agroforestry plants in hilly land was a natural stimuli, and to determine whether the income level of the farming community from agroforestry activities was already a benefit to the community. The research was conducted using participatory observation method. The data were analyzed descriptively by making tabulation matrix then rated quantitatively to determine the Cultural Significance Index (CSI) and Index of Importance Value (IIV). Furthermore, natural and benefit stimuli of agroforestry activities for the Kerinci community were described. The results showed there were 27 agroforestry plants with Pelak system and cinnamon plant (Cinnamomun burmannii) which belonged to the Lauraceous family was a plant with the highest ICS (67) and IIV (43). These results indicated that cinnamon plant played an important role in the Kerinci community culture and ecosystems because it was quite abundant in nature. The farmers knew cinnamon bio ecology which means that the natural stimuli of cinnamon were the basis in the selection

of the plant. While products from agroforestry crops could improve the welfare of farmers thus became the benefit stimuli for the community in conducting Pelak agroforestry farming systems. Natural and benefit stimuli were the factors that caused the farmers to conduct agroforestry activities with cinnamon as the dominant plant species.

Keywords: Natural stimuli, benefit stimuli, agroforestry, Cultural Significance Index (CSI), Index of Importance Value (IIV)

1. Introduction

Maintaining the forest in the form of protected areas such as national parks, nature reserves, and recreation parks is one of the solutions to preserve tropical forest areas rich in biodiversity. As for the people living around and even within the conservation area, the forest is a source of livelihood and parts of the rural region, which boundary is marked traditionally and controlled by the village community ownership, and land-use system outlined by customary law. Stipulation of forest as conservation area restricts public access to utilize the forest products. Forests can no longer be utilized by the community, thus causing a conflict.

Various studies showed that the interaction between people and their environment had been interwoven (Michon *et al.* 2000, Hariyadi 2008, Anderson 2009; Purwanto 2011). One of such local people was Kerinci community which inhabited the valley of Kerinci. Aumeeruddy (1994) stated that the Kerinci community had long interacted with their environment shown by their farming system called *Pelak*. *Pelak* was a form of agroforestry that was the combination of various plants of forestry and agriculture within the forest area. Aumeeruddy (1994) stated that Kerinci community had a specific management of their land. Every village in Kerinci had a particular area that consisted of rice farming and hilly land. Selection of the preferred species determined the success of agroforestry systems in increasing the welfare of the community.

This study aimed to identify the plants species composition of agroforestry of Kerinci communities in hilly land and farmers' revenue levels from the agroforestry activities. Another aim was to analyze whether the choice of plants was already a natural stimuli and the benefits value of the agroforestry had been a benefit stimulus for the Kerinci community.

2. Literature Review

2.1 National Park

National park is a nature conservation area which has a native ecosystem, managed by zoning system and is utilized for the purpose of research, science, education, support cultivation, tourism, and recreation (Act No. 5 of 1990). To achieve the objectives, the park is managed by zoning system that is spatial arrangement based on ecological conditions and function, social, economic and cultural of community that aims to facilitate the management of national park (Regulation of the Minister of Forestry No.: P56 / *Menhut*-II / 2006).

National park is expected to have two orientations, that are preservation and conservation orientations (Wiratno *et al.* 2004). Both orientations should be carried out in balance. Therefore the management of national parks should have the following principles: (1)

integration of capabilities and functions in accordance with the purpose of ensuring the sustainability of natural resources and the balance of the ecosystem for the welfare of the community, (2) social and economic functions of the environment embodied and organized by the government in accordance with its carrying capacity, and (3) noticed and recognizedthe rights of indigenous people and their rights over natural resources then regulated it to the extent that does not endanger the natural resources themselves.

2.2 Tri-Stimulus Amar Conservation

Stimulus is a stimulation that causes someone or something to respond to or have a reaction to circumstances (Anwar 2013). The response is known as attitude. Definition of the stimulus in this study was the signals, phenomenon, or symptoms which were shown by the forest ecosystem components and land that could stimulate the community to respond. Signals in this study were informed or indicated by agroforestry activities under taken by the Kerinci community.

Tri stimulus amar conservation is three stimuli that cause a person to take conservation actions. Tri stimulus amar consists of natural, benefit, and religious (willingly) stimuli (Zuhud 2007). Linkage between stimulus and responses in agroforestry system would enable improvement of Kerinci community welfare. This was due to the assumption that bio ecology (natural stimuli) and benefits (benefits stimuli) would be perceived by the community in, ecology, socio-culture, and economic.

This study identified and analyzed the natural and benefits stimuli of agroforestry system that exist in the Kerinci community. Zuhud (2007) stated that establishment of tri-stimulus amar conservation concept need the following prerequisites: (1) it is aimed for a specific and unique local community that have interacted with forest and local natural resources in everyday life for a long time, even already have local knowledge on the biological resources from generation to generation, (2) access rights, ownership, rights to harvest and utilize the biological resources, as in point 1, must be well-defined, and (3) there must be succession of local knowledge from the older generation to the younger.

2.3 Agroforestry

Agroforestry is a land management system that can be applied to agriculture and forests as a result of food insecurity situation in various regions in Indonesia. The vulnerability triggered by deforestation and ecological degradation in tropical regions, energy crisis and high population growth (Kartasubrata 2003). Local community considered agroforestry systems have the ability to fulfill the ecological, economic and socio-cultural function (Suhardjito 2002).

Agroforestry can be defined as a system consisting of a large number of elements such as trees, shrubs, seasonal plants or grass. Physical appearance and dynamics in agroforestry are similar to natural primary and secondary forest ecosystems. Agroforestry system is not a forest that arranged slowly through natural transformation of its ecosystem, nevertheless the area/plantations planted through the process of cultivation. Agroforestry plantations were built on the land that had been cleared and the plants species are enriched. When the land is

limited due to population growth, expansion of logging concession areas, resettlements, and commercial plantation forestry; the remaining lands are mostly agroforestry.

2.4 Community Income Level

Act No. 16 of 1974 on the Basic Provisions of Social Welfare states that social welfare is a system of social life, material and spiritual, which encompass the sense of safety, decency and inner peace that enables every citizen to conduct efforts to fulfill physical, spiritual and social needs as well as possible for themselves, families and communities by up hold the human rights and obligations in accordance to Pancasila and the 1945 Constitution.

The level of welfare can be measured with a simple indicator which is based on physical and spiritual fulfillment in accordance with the standards of living of each family. A family categorized as prosperous fall the physical and spiritual needs are fulfilled. The powerful variable in describing family welfare is the level of family revenue or income which is affected by wages and productivity (Hidayat 1999).Whereas the level of a country welfare can be determined based on the Gross Domestic Product (GDP) that is the index of a country's overall economic output by calculating the industrial production, farmers crop, retail sales and construction expenditures.

However, GDP has some limitations in describing the level of social welfare, namely (1) when there is a great in equality in society (in terms of income distribution), GDP or other indicators which presented in per capita (per person) cannot describe the actual conditions in society, (2) statistical tools used in calculating GDP also failed to capture phenomenon that can improve the social welfare, and (3) presentation of statistical data often leads to misinterpretation of trends of economic phenomenon, (4) GDP is a unit, so it is inadequate to measure welfare over time, especially with regard to the economic, environmental and social dimensions that cover aspects of sustainability.

3. Materials and Method

3.1 Study Area and Ethnographic Background

The research was conducted in Keluru Village of *Keliling Danau* District of Kerinci Regency of Jambi Province from February until April 2014 (2 months). Administratively, Keluru Village was part of *Keliling Danau* District of Kerinci Regency of Jambi Province. North of the village adjacent to the *Danau* KerinciVillage of *Danau* Kerinci District, the south by *Lolo Kecil* Village of Kerman District, the east by Jujun Village of *Keliling Danau* District, the west by Pidung Village of *Keliling Danau* District. The distance from Keluru Village to KSNP approximately 3-4 km, to *Sungai Penuh* District capital 20 km and to Jambi Province capital 450 km.

Geographically, Keluru village covered an area of 559 ha, located between $02^0$10'50"-$02^0$26'30" south latitude and$101^0$30'15"-$101^0$50'20" east longitude. Keluru village had a tropical climate with an average temperature of 22^0C, rainfall of 120.3 mm^3 per year, and high relative humidity ranged from 77% to 92%. The climate in the hilly and mountainous southern part were more varied, even the local climate could be different at a very close distance.

3.2 Socio-Cultural of Keluru Community

The population of Keluru Village was of 543 inhabitants, consisted of 263 men and 280 women (180 hauseholds). More than 54% of the population were labor force (18-56 years). Almost all members of the community (90%) were subsistence farmers while 10% were civil workers and other services. About 41% of the community had high school education.

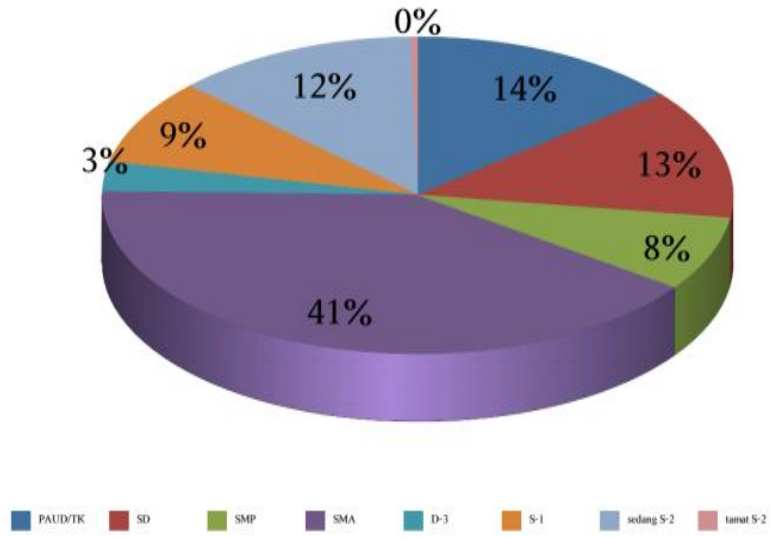

Figure 1. Education Level of Keluru Community

(Source: Village Data 2013)

3.3 Tool and Materials

Voice recorder, digital camera, work map, GPS, equipments for herbarium collections such as scissors, envelopes, mounting paper, plastic bags of various sizes, hanging labels, newsprint, woven bamboo to press leaves, stationery, 70% alcohol.

3.4 Data and Collection Techniques

Data collected included research sites general conditions, social and cultural conditions, composition of *Pelak* plant species, and community revenues from *Pelak* production. Data collection was conducted through participatory observation using structured questionnaire. There were 30 respondents randomly selected from the Keluru community.

The data were analyzed qualitatively by constructing cross tabulation. The Index of Cultural Significance (ICS) adoption by Turner (1988) and Index of Importance Value (IIV) were calculated then analyzed whether they had become as stimuli.

4. Findings

4.1 Plant Composition of Pelak

Identification of *Pelak* plants showed that the composition consisted of 15 crops species from nine families, namely Solanaceae, Poaceae, Zingiberaceae, Fabaceae, Papilionaceae,

Convolvulaceae, Cucurbitaceae, Brassicaceae, and Apiaceae. These crops had been planted on rice fields' boundary. In addition, there were 12 species of plants from 12 families planted in the mixed plantation, namely Lauraceae, Euphorbiacea, Lauraceae, Arecaceae, Meliaceae, Rubiaceae, Graciniaceae, Bombacaceae, Poaceae, Styracaceae, Verbenaceae and Burseraceae (Table 1).

Among those plants, cinnamon (*Cinnamomum burmannii*) had the highest IIV (43) (Table 2), meaning that the existence of cinnamon in natural ecosystems is still quite a lot marked by high density, dominance and frequency. Cinnamon also had the highest ICS (67) (Table 3) which indicated that cinnamon had a value of exclusivity, high quality and intensity.

Table 1. Plant Composition of Pelak

	Local Name	Species	Family	Habitus
A	Rice fields boundary			
1	Cabe (Chili)	Capsicum annum Linn.	Solanaceae	Shrub
2	Cabe rawit	Capsicum frutescens Linn.	Solanaceae	Shrub
3	Jagung (corn)	Zea mays Linn.	Poaceae	Bush
4	Jahe (ginger)	Zingiber officinale Roxb	Zingiberaceae	Liana
5	Kacang belimbing	Psophocarpus tetragonolobus	Fabaceaea	Bush
6	Kacang panjang	Vigna cylindrica (L.) Skeels	Papilionaceae	Bush
7	Kacang tanah	Arachis hypogea Linn.	Fabaceaea	Bush
8	Kangkung	Ipomea aquatica Forsk.	Convolvulaceae	Herbs
9	Kunyit (turmeric)	Curcuma domestica Val.	Zingiberaceae	Herbs
10	Labu siam	Sechium edule SW	Cucurbitaceae	Liana
11	Pare (bitter fruit)	Momordica charantia Linn.	Cucurbitaceae	Liana
12	Ubi jalar	Ipomoea batatas Poir.	Convolvulaceae	Liana
13	Kol (cabbage)	Brassica oleracea Linn	Brassicaceae	Herbs
14	Wortel (carrot)	Daucus carota Linn.	Apiaceae	Herbs
15	Kentang (potato)	Solanum tuberasum Linn.	Solanaceae	Bush
B	Mixed plantation			
1	Kayu manis	Cinnamomum burmannii Ness	Lauraceae	Tree
2	Kemiri	Leurites moluscana Linn	Euphorbiaceae	Tree
3	Alpokat (avocado)	Persea americana MILL	Lauraceae	Tree
4	Pinang	Areca catechu L	Arecaceae	Tree
5	Surian	Toona ciliata	Meliaceae	Tree
6	Kawo/Kopi (coffee)	Coffea arabica Linn	Rubiaceae	Tree
7	Manggis	Garcinia mangostana L	Graciniaceae	Tree
8	Durian	Durio zibethinus Murr.	Bombacaceae	Shrub
9	Bambu (bamboo)	Bamboosa sp	Poaceae	Tree
10	Kemenyan (myrrh)	Styrex benzoin L.	Styracaceae	Tree
11	Kuini	Mangifera foetida L.	Verbenaceae	Tree
12	Kedondong	Cannarium littorale Blume	Burseraceae	

Table 2. Index of Importance Value (IIV) of Pelak Plant

	Local Name	Species	Family	IIV
1	Kayu manis	C.burmannii	Lauraceae	43
2	Kemiri	L. moluscana	Euphorbiaceae	34
3	Alpokat	P. americana MILL	Lauraceae	28
4	Pinang	A. catechu	Arecaceae	20
5	Surian	T. ciliata	Meliaceae	27
6	Kawo/Kopi	C. arabica Linn	Rubiaceae	35

7	Manggis	G. mangostana	Graciniaceae	18
8	Durian	D. zibethinus	Bombacaceae	21
9	Bambu	Bamboosa sp	Poaceae	17
10	Kemenyan	S. benzoin	Styracaceae	20
11	Kuini		Verbenaceae	20
12	Kedondong	M. foetida C. littorale Blume	Burseraceae	17

Table 3. Plant Identification Based on Index of Cultural Significance ICS)

	Local Name	Species	Parts Used	Usage	ICS
1	Kayu manis	C.burmannii	Bark, trunk, branch	Flavor, drink, firewood	67
2	Surian	T. ciliata	Trunk	craft, medicine, primary and mix material	39
3	Kawo/Kopi	C. arabica Linn	Bean	Drink	32
4	Kemenyan	S. benzoin	Fruit, leaf	Ritual, secondary material, medicine	26
5	Jahe	Z. officinale Roxb	Tuber	Seasoning, medicine	24
6	Durian	D. zibethinus	Fruit, trunk	Foodstuff, primary material	24
7	Bambu	Bamboosa sp	Stem	Primary material, building material	24
8	Manggis	G. mangostana	Fruit , fruit skin	Foodstuff, medicine	21
9	Kemiri	L. moluscana	Fruit	Foodstuff, dye	18
10	Pinang	A. catechu	Fruit	Foodstuff, medicine	18
11	Labu siam	S. edule SW	Fruit	Foodstuff, medicine	16
12	Pare	M. charantia Linn	Fruit	Foodstuff, medicine	16
13	Kentang	S. tuberasum Linn	Root	Foodstuff	13
14	Kacang tanah	A. hypogea Linn.	Fruit	Foodstuff	12
15	Jagung	Z. mays Linn.	Fruit	Foodstuff	12
16	Alpokat	P. americana MILL	Fruit	Foodstuff, medicine	12
17	Kuini	M. foetida	Fruit	Foodstuff	12
18	Kedondong	C. littorale Blume	Fruit	Foodstuff	12
19	Kunyit	C. domestica	Tuber	Seasoning, medicine	12
20	Cabe	C. annum Linn.	Fruit	Spice	9
21	Cabe rawit	C. frutescens Linn.	Fruit	Spice	9
22	Kol	B. oleracea	Flower,leaf	Vegetable	9
23	Wortel	D. carota Linn.	Root	Vegetable	9
24	Kacang belimbing	P. tetragonolobus	Fruit	Foodstuff, medicine	8
25	Ubi jalar	I. batatas Poir.	Root	Foodstuff	8
26	Kacang panjang	V. cylindrica (L.) Skeels	Fruit	Vegetable	8
27	Kangkung	I. aquatica Forsk.	Plant	Vegetable	6

Table 4. ICS and IIV of Plants in the Mixed Plantation

	Local Name	Species	ICS	IIV
1	Kayu manis	C.burmannii	67	43
2	Kemiri	L. moluscana	18	34
3	Alpokat	P. americana MILL	12	28
4	Pinang	A. catechu	18	20
5	Surian	T. ciliata	39	27
6	Kawo/Kopi	C. arabica Linn.	32	35
7	Manggis	G. mangostana	21	18

8	Durian	D. zibethinus	24	21
9	Bambu	Bamboosa sp	24	17
10	Kemenyan	S. benzoin	26	20
11	Kuini	M. foetida	12	20
12	Kedondong	C. littorale Blume	12	17

Table 4 showed that ICS and IIV of cinnamon (Cinnamomun burmanii Nees) were equally the highest (67 and 43), followed by coffee (Coffea arabica Linn.) that had ICS and IIV as high as 32 and 35 (Figure 2).

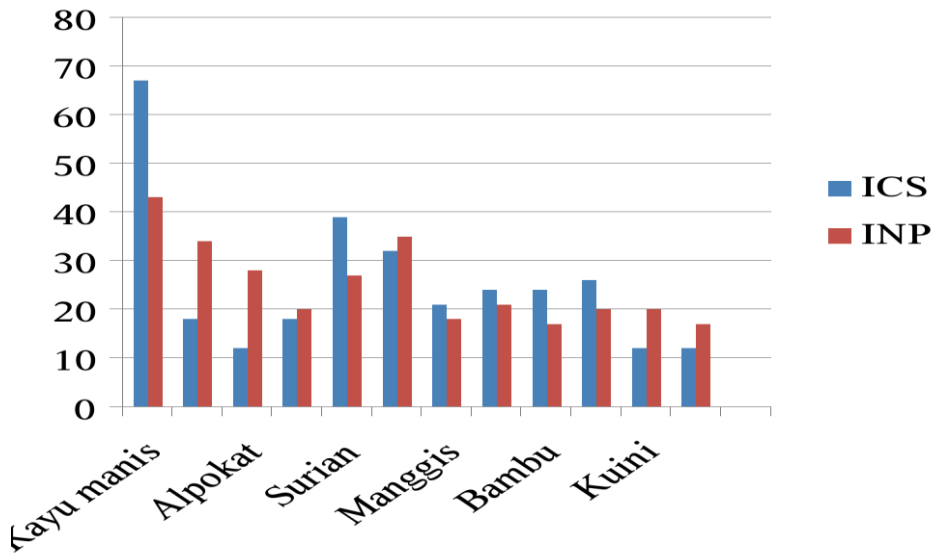

Figure 2. ICS and IIV of Plants in the Mixed Plantation

Plants with high ICS but low IIV (such as surian, mangosteen, durian, bamboo and myrrh) had many use sand were considered important by the community, but more or less difficult to find. Surian with ICS 39 had many cultural uses (intensity, exclusivity and quality) but not extensively plant eddue to lengthy harvest time.Surian wood harvested at the age of 25 years or more, and provide no direct benefits before harvested.The community prefered plants witha short harvest time.

In contrast, plants with lower ICS but high IIV (such as avocado, kuini and kedondong) were not so important for the community, but their presences are aware plenty. This was because the seeds of these plants grow easily simply by throwing the seeds.

4.2 Income Level

Farming in Keluru community had economic and ecological benefits. The economic benefit related to community livelihood in order to meet their daily needs and improve their welfare. While the ecological benefit was closely related to land environment such as soil fertility and water regulation.

Table 5. Number and Percentage of Households by Land Ownership Categories

	Land Ownership	Household	
		Number	(%)
1	Small (0.2-0.5 ha)	6	20.00
2	Medium (>0.5-1.0 ha)	19	63.33
3	Large (> 1.0-2.0 ha)	5	16.67

Interviews of 30 respondents showed that the land ownership ranged between 0.2-2.0 ha which divided into three categories: small (0.2 to 0.5 ha), medium (> 0.5 to 1.0 ha), and large (> 1.0 to 2.0 ha) (Table 5). Approximately 80% of Keluru household owned medium to large land and only 20% owned small land. This indicated that the average land ownership was quite large and none of the households was landless. This was because the available land was quite extensive, both obtained by opening new land or from in heritance.

Soentoro (1981) stated that the land is an important as set for rural communities, because it is a natural resource that can be managed into a source of income. The larger the land owner ship, the greater the possibility of the household to obtain a high income. This was particularly true in Keluru community; a household with larger are a ownership had a better standard of living as could be seen in the level of education, health, and their food choices. Families who had high income levels generally sent their children to pursue higher education outside the village. Community revenue was derived from the production of 15 crops and 12 forest plants which were planted in Pelak (Table 6).

Table 6. Pelak Plants Production per Year

	Plant	Unit	Household	Production	Price (IDR/unit)	Income (IDR)
1	Cabe	Kg	18	25,000	12,000	300,000,000
2	Cabe rawit	Kg	10	15,000	15,000	225,000,000
3	Jagung	Kg	6	1,200	4,000	4,800,000
4	Jahe	Kg	6	80	10,000	800,000
5	Kacang belimbing	Kg	10	90	8,000	720,000
6	Kacang tanah	Kg	15	200	17,000	3,400,000
7	Kacang panjang	Kg	16	100	3,000	300,000
8	Kangkung	bundle	7	700	500	350,000
9	Kunyit	Kg	20	300	3,000	900,000
10	Labu siam	Kg	15	100	4,000	400,000
11	Ubi jalar	Kg	11	100	3,000	300,000
12	Pare	Kg	17	100	4,000	400,000
13	Kentang	Kg	8	80	5,000	400,000
14	Kol	Kg	9	50	3,000	150,000
15	Wortel	Kg	5	200	4,000	800,000
16	Kayu manis	Kg	30	25,000	9,000	225,000,000
17	Kemiri	Kg	12	800	8,000	6,400,000
18	Surian	m3	7	10	2,000,000	20,000,000

19	Durian	Fruit	5	200	5,000	1,000,000
20	Alpokat	kg	5	125	4,000	500,000
21	Pinang	kg	7	150	4,000	600,000
22	Kawa/kopi	kg	14	4,100	9,000	36,900,000
23	Manggis	kg	3	90	8,000	720,000
24	Bambu	stem	12	130	2,000	260,000
25	Kemenyan	kg	20	35	25,000	875,000
26	Kuini	kg	5	160	9,000	1,440,000
27	Kedondong	kg	6	120	4,000	480,000
	Total Revenue					832,895,000

Note: The price was at the time of the study and could be changed at any time

Table 6 showed that the production of cinnamon could reach as high as 25,000 kg per year. Cinnamon bark were cut about 30-50cm, then skinned and dried. Dried bark could be sold or stored. Fresh cinnamon bark could also be sold directly although it must be skinned first. Fresh cinnamon bark was cheaper than the dry. At the time of this study, the price of dry cinnamon bark was IDR9,000 per kg, while fresh bark was only IDR 6,000-7,000. According to respondents, cinnamon prices in previous years were decreased, even fresh bark price as low as IDR 2,500. Table 6 also showed that the total revenue from Pelak was IDR 832,895,000 per year or IDR27,763,167 per household per year.

Sayogyo (1977) stated that the level of welfare can be measured in absolute and relative. Absolute measurement based on the amount of revenue that is converted to the value of rice. There are 3 categories of poverty in absolute measurements, namely (1) poor if the spending is less than 320 kg rice per capita per year, (2) very poor when the spending between 180-240 kg rice per capita per year, and (3) most poor if the spending is less than 180 kg of rice per capita per year.

At the time of the study, the price ofrice was IDR 9.000-10.000 per kg, so that poor people spentless than IDR 2,880,000-3,200,000 percapita per year. If a household consisted of four members, then a poor household spent less than IDR 11,520,000-12,800,000 per year. The average revenue of households from Pelak in the Keluru Village approximately IDR27,763,167, so it could be concluded that no one in Keluru community was below the poverty line. This agreed with the information from the Head of Keluru Village that Keluru community was a prosperous and pre-prosperous community.

4.3 Natural-Benefit Stimuli of Pelak

The result of the study revealed that cinnamon (C.burmannii) was the most culturally important to Keluru community. This plant had the highest Index of Cultural Significance (ICS) and Index of Importance Value (IIV) which indicated that cinnamon was preferred by the community and its existence in nature was plenty. This was closely related to natural stimulus concerning information of scarcity, population, and regeneration of cinnamon. The Keluru community did not understand or captured the signal that conveyed information about scarcity due to high population and regeneration of the cinnamon trees in their Pelak.

Cinnamon natural stimulus existed in the Keluru community because it had been passed down from generation to generation. Zuhud (2007) stated that plants, habitats and cultures are unified as a whole in the community life. Cinnamon and Keluru community had unified so that cinnamon planting was driven by willingness and not by obligation. This was in line with the opinion that various and long term relationship between community and their environment tend to make people appreciate the wholeness of the ecosystem in the long term, contrarily with the community whose relationship to the environment is limited to one or two specific objectives. All of their respondents chose to grow cinnamon and they understood its bio ecology (profile, habitat, morphology and benefits).

As for the benefits stimulus, Keluru community was aware of cinnamon benefits, especially its economic value. Cinnamon is a high-value crop because its bark can be harvested when the plant reach the age of 5years up to 25 years. The community considered cinnamon planting investment (savings) because cinnamon bark could be sold whenever they need money.

Zuhud (2007) stated that the stimulus of species biodiversity was unique and specific and addressed to specific subject as well. Natural and benefits stimuli were ideally simultaneously perceived. However, reality in communities showed that the benefits stimulus of biological resources were perceived more rapidly by the community, gave rise to certain responses. This was because information about the benefits was already evolved. However, if other stimuli (natural and religious) were not understood and not became the stimuli of cinnamon planting attitude then there would be unsustainable cinnamon planting.

5. Conclusions

Composition of plant species in Keluru community's agroforestry (*Pelak*) consisted of 15 species of crops from 12 families i.e. chili, cabe rawit, corn, ginger, star fruit nuts, long beans, peanuts, kangkung, turmeric, labu siam, bitter fruit, sweet potatoes, cabbage, carrot and potato. Other than crops, the *Pelak* also cocnsisted of 12 perennial plants species from 12 families i.e. cinnamon (*Cinnamomum burmannii*), kemiri (*Ledtes moluscana*), avocado (*Persea amaericana*), pinang (*Areca catechu*), surian (*Toona cillata*), coffee (*Coffea arabica*), mangosteen (*Garcinia mangostama*), durian (*Durio zibethinus*), bamboo (*Bamboosa sp*), myrrh (*Styrex benzoin*), kuini (*Mangifera foetida*) and kedondong (*Canarium littorale*).

Cinnamon had significant values inculture and *Pelak* ecosystem which indicated by the highest Index of Cultural Significance (ICS) and Index of Importance Value (IIV). Selection of the plants revealed that Keluru community perceived and responded to natural stimulus of the selected plants as shown by community's understanding of these plants bioecology.

The benefits of agroforestry crops could improve the welfareof Keluru community showed by revenues that were above the poor category when converted to the value of rice percapita per year and the high degree of choicein determining education. This indicates that the selection and management of the agroforestry activities by Keluru communities was a response to benefit stimuli from these activities.

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