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## **Reliance of Suku Anak Dalam to Harapan Rainforest, Indonesia: foodstuff collection preference**

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**Abstract:** This study was aimed to investigate foodstuff collection pattern of Suku Anak Dalam (SAD) based on their accessibility in Harapan Rainforest (HRF) Sumatra, Indonesia. The qualitative and quantitative information was collected from three groups of SAD which consist of 34 households using semi-structured questionnaires. The research observes daily foodstuff collection; hunting/collecting, cultivating/raising and buying. Data was analysed using SPSS and MS Excel to determine the attribute that might point out SAD preference in collecting their foodstuff. SAD in all groups prefers to buy carbohydrate based food (rice) from the nearest vendor, meanwhile for protein-based food mostly depends on fish and egg; they prefer fishing and raising chicken to gain eggs. SAD in all groups have backyard garden and cultivate vegetables, and the modern group often buy vegetable for their daily consumption. Most of food items could be found in the forest, and only rice and spices are imported from elsewhere.

**Keywords:** food sources collection; Suku Anak Dalam; Harapan Rainforest; indigenous people.

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## 1 Introduction

Harapan Rainforest (HRF) was a production forest area of timber concession (PT. Inhutani V in the southern part of the HRF and PT. Asialog in the northern part of HRF). In 2007 HRF is taken over and managed by Restorasi Ekosistem Indonesia (PT REKI) based on two legal contracts; 293/Menhut-II/2007, covering an area of 52.170 ha and 327/Menhut-II/2010 covering an area of 46.385 ha. HRF is located in Jambi and South Sumatra Province, Indonesia. This type of forest is ranked amongst the most biologically diverse forest, but is also one of the most threatened. Sumatran dry lowland rainforests occupied around 16 million ha in 1900. Today a mere of 400,000–600,000 hectare remains. Vegetation cover has dramatically changed in Sumatra within only few decades (Holmes, 2002).

The annual deforestation in Indonesia is 0.5% a year or equal to 0.49 million hectares per years (FAO, 2010). Global-scale conversion of tropical rainforest and agriculture intensification are the major threats of biodiversity and threatening ecosystem function, sustainable land use, and local economics (David et al., 2002; Stuart et al., 2000). Not only the loss of biodiversity is feared, it is also proven that climate change and rainfall will be different on a long run and will affect the wild life and indigenous people as well (Salick and Byg, 2007; David, 2011; Withanachchi et al., 2014).

Many of indigenous societies depend on a limited resources catchment within a few areas to provide them with a wide diversity of resources (Gadgil et al., 1993). Food consumption patterns are repeated arrangements that can be observed in the consumption of food by a population group (Ivens et al., 1992). It covers the types and quantities of foods and their combinations into different dishes or meals based on the typical food culture of the region. Food consumption patterns are not static, it always change by trend, culture, habit and maybe resources (income and bio-availability). Consumption patterns develop over the course of generations and can differ strongly between communities (Jobse-van Putten, 1995). Several factors may cause the difference in the consumption

pattern, e.g. personal preference, habit, availability, economy, convenience, ethnic heritage, religion, and tradition, nutritional and cultural requirements (Ivens et al., 1992; Whitney and Rolfes, 1999; Vringer and Blok, 1995; Von Braun and Paulino, 1990; Musaiger, 1989; Wandel, 1988; Von Braun, 1988). Food consumption pattern may depend on food stuff availability surrounding area as well (David, 2011). The collection of foodstuff traditionally depends not only on the availability of food stuff but also their preference and regular food habit.

Suku Anak Dalam (SAD) is an indigenous tribe residing in HRF. In the last decades, SAD has changed their habits from nomadic to be more permanent. However, in daily activities they kept on practising hunting, trapping and fishing to meet their daily needs. The dietary patterns in societies depend on their household income, biodiversity of landscape and culture. Local food security can be achieved if biodiversity in the surrounding area is sufficient and accessible to meet local needs. SAD has been utilising the remaining biodiversity resource within 20% tropical lowland rainforest.

Indigenous people have a unique social, cultural, need of health compared to other mainstream societies (Kuhnlein et al., 2004). The dietary pattern in societies depends on their household income, geographical and culture (Lipoeto et al., 2001; Davis, 2007; Niehof, 2010; David et al., 2013). The basic idea behind improving local food security consists of two paths: first, accessibility (price, stock) and secondly, the availability (quantity and biodiversity); both are prerequisites to the provision of nutrients and a continuous food supply with locally available resources (David, 2011). Reliance of Suku Anak Dalam on forest can be identified by determination of preference on collecting foodstuff from the forest; therefore the objective of this research is to investigate the relationship between fixed salaries of households (money earned from work) and their preference collecting food from the forest.

## **2 Material and methods**

### *2.1 Study area*

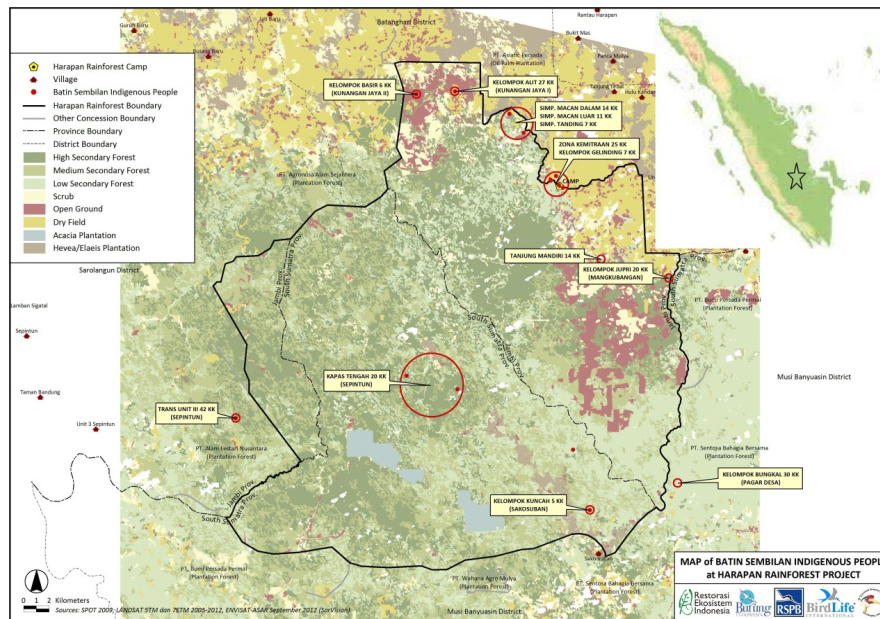
A survey was conducted in vicinity of Harapan Rainforest area, Jambi, Sumatra, Indonesia. Total area of Harapan Rainforest is 98.555 ha. Stratified sampling method was applied. The total of 34 households of SAD participated in this interview. List of questions were intended to determine their preference for collecting/buying foodstuff. These questions include number of family member, sources of income, ages, daily meal intake, forest activity and distance to closer market. Respondents are spreading in ten locations as shown in Figure 1. This research is based on visits in six locations where indigenous people resides; the location covers: Sepintun (trans unit III), Bungku (Kunangan Jaya I, Kunangan Jaya I, Simpang Macan Dalam, Simpang Macan Luar and Pagar Desa (Bungkal), Zona Kemitraan). Meanwhile, Sepintun (Kapas tengah), Sakosuban, Tanjung Mandiri and Mangkubangan were not visited due to mainly difficult access during the rainy season.

### *2.2 Category of respondents*

Respondent are divided into three groups. First group is subsistence group; that means household with no fixed salary; all daily needs are mostly collected from forest, either directly consumed or for sale, this group consists of 13 respondents. Second group is the

supplementary group where households have income source from part-time job (wage), e.g. temporal land cleaner of nearby oil palm concession (PT. Asiatic), this group consist of 13 households. Third group is the modern group: households having fixed salary, they work either in oil palm concession or another job; this group consists eight households.

**Figure 1** Map of Suku Anak Dalam at Harapan Rainforest (the red circle is where the research carried out)



### 2.3 Categories of foodstuff collection preference

Respondents were asked about how they get their daily food. The preferences are divided into three sub-categories which are collecting (harvesting and hunting), cultivating (growing and raising) and buying.

### 2.4 Data analysis

Data was gathered and analysed by using SPSS and statistic descriptive analyses by using MS Excel. SPSS (version 16.0) is performed to analyse income and rice consumption. MS Excel is performed to describe food collection preferences.

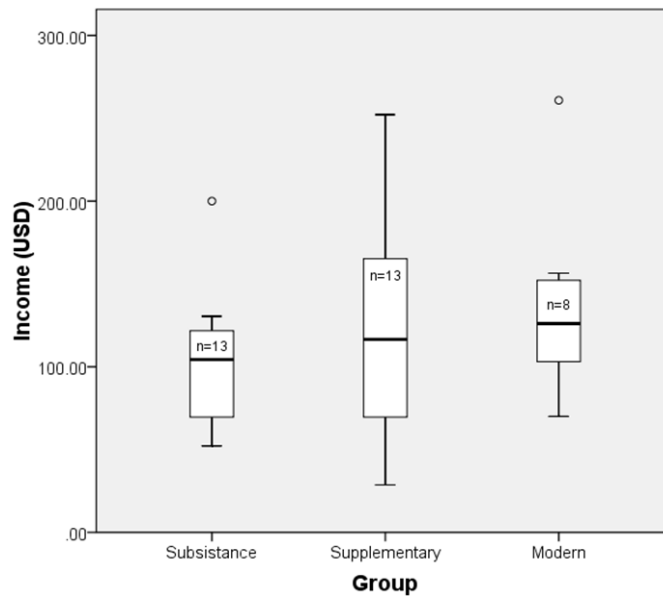
## 3 Results

### 3.1 Household income/salary

Subsistence group does not earn a fixed salary. Household income derived from selling non-timber forest product such as fish, rattan (e.g. *Calamus manan* and *Calamus* sp.), bamboo (*Bambusa vulgaris*), dragon blood (*Daemonorops draco*), wild boar (*S.s.*

*vittatus*), deer (*Muntiacus montanus*), and antelope (*Muntiacus muntjak* and *M. m. montanus*). From selling the non-timber forest products the subsistence group has a monthly income between USD 50 and USD 120 (Figure 2).

**Figure 2** Monthly household income in three different groups (1 USD= IDR 11.500)

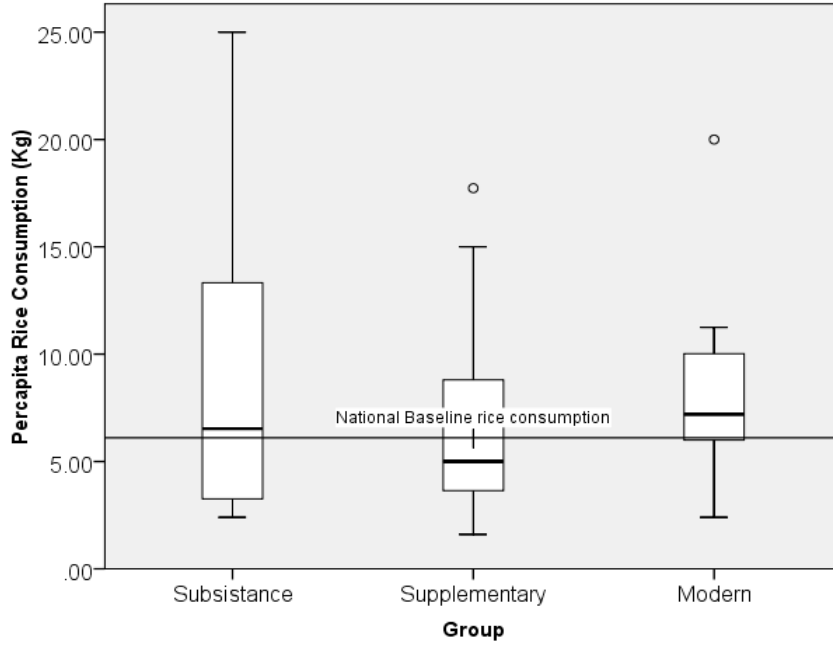


In the supplementary group they get a temporary salary from an oil palm company to do land clearance; fluctuation of income in this group is between USD 35 and USD 250. The supplementary group has an extra income from selling non-timber forest product and a wage from surrounding oil palm companies. Therefore, the supplementary group has the highest income seasonally. The monthly household income also depends on the fluctuation prices of their harvested products. Meanwhile, the modern group has a fixed income from mostly security staff in PT Asiatic. The deviation within the modern group is narrow in between USD 80 and USD 150; this may be due to the fact that they have desk job with fixed timetable. Meanwhile, women and children usually spend the day to do fishing to meet their protein intake. Most of the households in this group do not have other jobs or income from selling forest products. On average, the modern group has the highest average income compared to the supplementary and subsistence group.

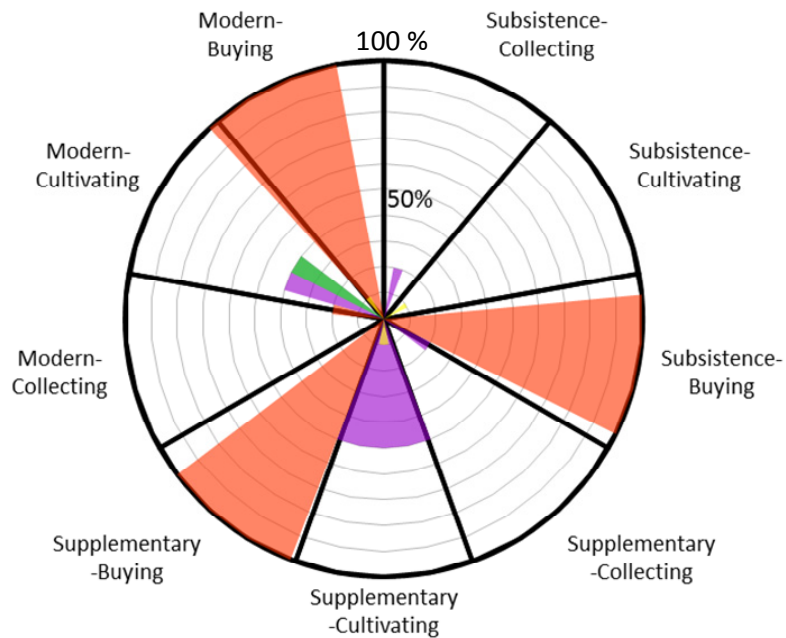
### 3.2 Carbohydrate based on food preference

Both subsistence and modern groups meet an average of rice consumption according to national baseline rice consumption data (BPS, 2012) (Figure 3). The subsistence group sell their non-timber products to buy rice. Meanwhile, the modern group buys rice from their fixed salary. The supplementary group has a consumption below national baseline in rice not because they have less access but because they prefer cultivating cassava (*Manihot utilisima*) and gadong (*Dioscorea hispida*) (Figure 4). In the supplementary group, the preference is more diverse; besides buying from nearest vendor they also have the possibility to self-cultivate and collecting from forest.

**Figure 3** Rice consumption per capita per month



**Figure 4** Distribution preference of household for carbohydrate based food (Brown: Rice (*Oryza sativa*), Purple: Cassava (*Manihot utilisima*), Yellow: Gadung (*Dioscorea hispida*), Green: Corn (*Zea mays spp*))

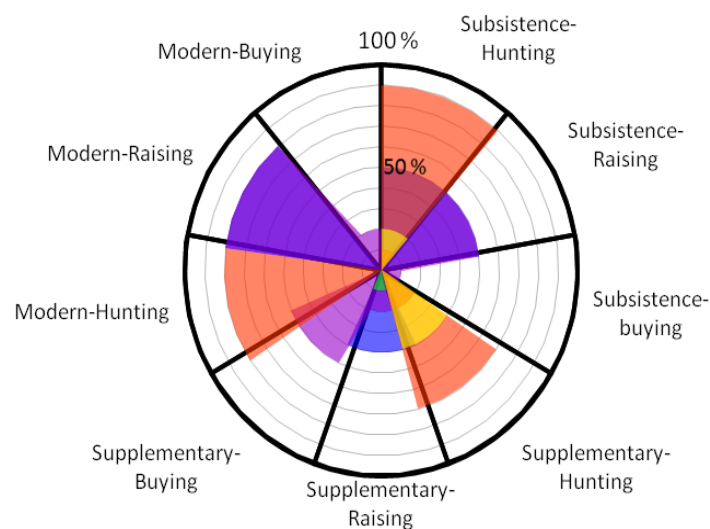


In all groups, there are two rice sources: first from PT. Asiatic which provides monthly rice and most of SAD buys their rice from nearest market. Carbohydrate intake in subsistence group ranged from 3 kg to 25 kg per capita per month. This is reflected from the fact that households in this group are still dependent on wild tubers beside that they have a wide range of household income influencing in purchasing rice. Households in the supplementary group have 2–15 kg carbohydrate intake per capita per month which reflects their ability to purchase other food sources. Meanwhile, households in the modern group have 3–10 kg carbohydrate intake per capita per month which is reflected in their ability to purchase. The modern groups have lower rice consumption. This may be caused by their income preference to purchase protein based food, spices and vegetables. As a comparison, in 2012 National Statistic Office recorded the average national rice consumption per capita of 6.8 kg per month, only the supplementary group is under average national baseline consumption.

### 3.3 Protein based on food preference

The preference of the subsistence group in collecting protein-based food is dominated by hunting/fishing and raising. Most of them depend on fishing (Figure 5). There are two species which often are fished: *Pangasius buchani* and *Bagrus nemurus*. With fishing normally they get 1.5–2 kg of fish per trip. It is relative low than previous decade due to decreasing level of water in the river. The supplementary group differs in preference and still depends on hunting/fishing combined with raising. In the supplementary group when they have an extra income they also prefer to buy eggs. The modern group has the possibility either to buy or even to raise the protein sources.

**Figure 5** Distribution preference of household for protein based food (Purple: Egg, Blue: Chicken (*G. g domesticus*), Brown: Fish (*Pangius buchani* and *Bagrus nemurus*), Bright Yellow: Deer (*Muntiacus montanus*) and Antelope (*Muntiacus muntjak* and *M. m. montanus*), Yellow: Wild Boar (*S.s. vittatus*), Dark Yellow: Malayan soft-shelled turtle (*Dogania subplana*), Light Blue: Duck (*Asarcornis scutulata*))

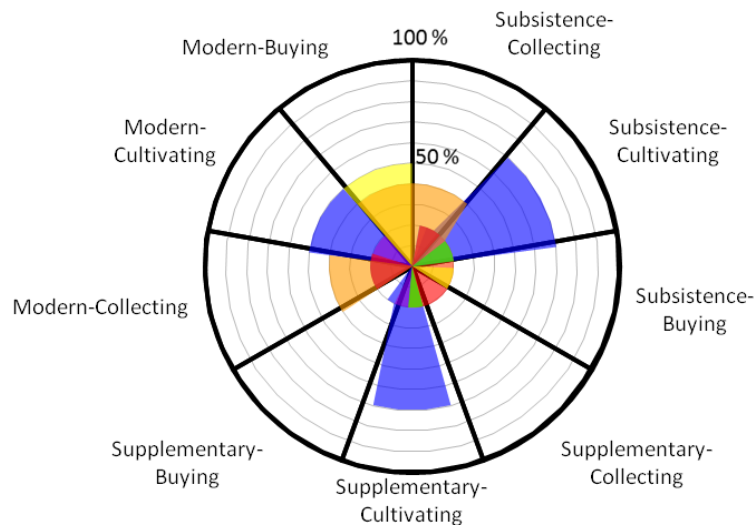


In all groups, egg becomes the second important protein source after fish. *Trionychia* (*Dogania subplana*), deer (*Muntiacus montanus*), wild boar (*S.S. Vitatus*) and antelopes are hunted for self-consumption and for sale at the local market as well as to neighbours (as an extra income for them). In the supplementary group, hunting/fishing is a favourable choice and cannot be compared to rising. The subsistence and supplementary group are still practising hunting wild boar and selling it to get extra income. Meanwhile, in the modern group, most of them prefer to purchase protein-based food compared to the other groups.

### 3.4 Vegetables preference

Similar to protein-based food collection preference, households in the subsistence group depend on forest resources; they still have to collect vegetables for their daily consumption. Meanwhile, in the supplementary group, households have many possibilities to get access to vegetables from both self-cultivation and buying. Households in the modern group prefer self-cultivation of vegetable on their backyard (Figure 6). In the supplementary group they have diverse sources compare to the subsistence group and the modern group.

**Figure 6** Distribution preference of household for Vegetable (Blue: Cassava (*Manihot utilisima*), Purple: Eggplant (*Solanum melongena*), Dark & Light Yellow: Cabbage (*Brassica rapa L & Brassica oleracea*), Bright Yellow: Water Spinach (*Ipomea aquatic Forsk*), Green: Papaya leaf (*Carica papaya L*), Brown: Yellow Sawah Lecttuce (*Limnocharis flava*), Red: Bamboo sprouts (*Bambusa vulgaris*))



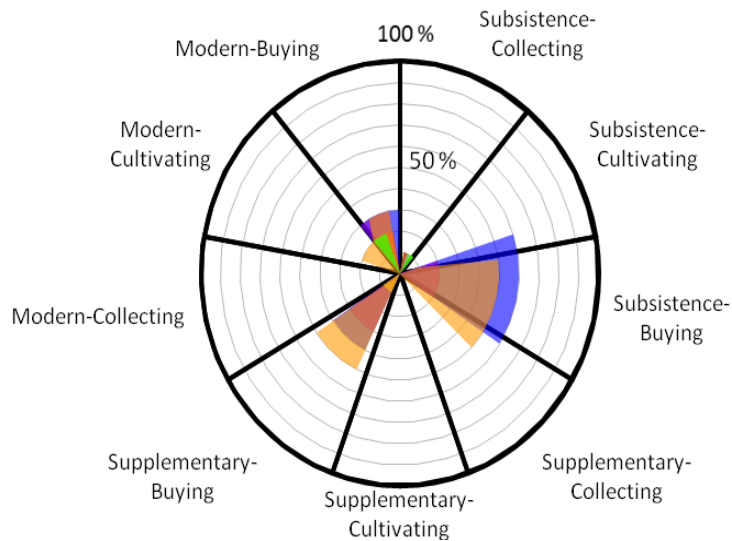
Cassava is a popular vegetable for consumption, easy to get the seed and easy to grow. In the subsistence group and the supplementary group, they have more spaces in their backyard and cultivate some vegetables, i.e. *Manihot utilisima*, *Solanum melongena*, *Ipomea aquatic Forsk*, and *Carica papaya*. All groups still prefer collecting *Bambusa vulgaris*, according to some interviews. This vegetable nowadays is difficult to find. Interestingly, in the subsistence group, some of households still consume coffee leaf as vegetable intake.



### 3.5 Spices preference

The main spices in SAD cuisine are Chilli pepper (*Capsicum annum*), some of SAD self-cultivates these spices due to the high prices but some of them prefer to buy because self-cultivation is facing plant disease (Figure 7).

**Figure 7** Distribution preference of household for Spices (Blue: Shallot (*Allium cepa L.*), Purple: Garlic (*Allium sativum L.*), Dark Yellow: Ginger (*Zingiber officinale*), Bright Yellow: Turmeric (*Curcuma domestica Val.*), Light Yellow: Chili pepper (*Capsicum annum*), Bright Green: Tamarind (*Tamarindus indica L.*), Grey: Asam Kandis (*Garcinia xanthochymus*), Brown: Salam Leaf (*Syzygium polyanthum*))



According to the interviews, most of SAD stated that the availability of Chilli pepper is rare. Shallot and garlic is mostly bought from the closer vendor. In the subsistence group, turmeric (*Curcuma domestica Val.*), tamarind (*Tamarindus indica L.*), Salam leaf (*Syzygium polyanthum*), lemon grass (*Cymbopogon citratus*) are normally collected from forest. In the modern group, most of SAD prefers to buy spices from vendor because they have not much time to go to forest. According to the interviews spices are mostly acquired from elsewhere.

## 4 Discussion

Conversion from wild forest to oil palm in the vicinity of Harapan Rainforest leads to biodiversity loss (Barnes et al., 2014). According to van Noordwijk et al. (2014), the transition from local self-sufficiency of production to market-based livelihood strategies, the income security is a primary driver of food security, even in remote places in Indonesia.

An obvious fact that SAD in all groups prefer to buy their carbohydrate-based foods from closer vendor. Fish and eggs become the more prominent protein compared to other protein sources. Cassava leaf is a common vegetable consumed. Most of SAD is worried

to raise chicken or duck because predators often eat their livestock. This means that for meat sources they are mostly dependent on either fish or deer as chicken and duck are less consumed.

The supplementary group has a wide range of choice in collecting their foodstuffs as they have equal access to the nearest forest and also to the market (economically). According to van Noordwijk et al. (2014), local people in Sumatra rainforest selectively conserved native forest trees that supply dietary diversity, while staple food is mostly purchased. An indigenous person enjoys the diversity of fruits, spices and leafs from agro-forest as sources of nutrition. There is adequate evidence describing that raising fruit and vegetable in traditional agricultural systems and in particular home gardens cannot enhance access to energy, protein and fat but greatly improve the quality and micronutrient content of diets (Frison et al., 2011). The cultivation of home garden and collection of wild foodstuff and herbs, for which generally rural women are responsible, can also play an important role in buffering risk by securing production of crops that can supplement household nutrition and generate complementary income (IFAD, 2010).

Acquiring meat for personal consumption (subsistence) was primary motivation for hunting (fishing) practices. Beside, fishing, most of SAD prefers deer meat for their personal consumption, but wild boar for commercial purposes. As supported by Luskin et al. (2013) most of hunters in Sumatra Rainforest were hunting deer for personal consumption and other animals for commercial purposes. Wild boar has usually been sold to the non-Moslem, Chinese and *Batak* immigrant who reside nearby. Protein-based food in all groups of SAD is related to the most Indonesian religion which fundamentally determine what is allow to eat and what is forbidden (Luskin et al., 2013). Meanwhile, the modern group having less leisure time to collect forest product since their time is mostly allocated for job.

Unlike protein-based foods, vegetables have wide ranges of preferences, particularly in the supplementary group; they have closes access either to forest or markets. The subsistence group prefers to collect and cultivate rather than to buy due to distance to the market and they also have an unstable income. Meanwhile, households in the supplementary group are combining collecting with purchasing; because they have closer access to market.

In the past, a change in food culture has been relatively less compare to nowadays. Most of these relevant factors are themselves now undergoing a rapid change, notably, population growth, displacement and migration with land degradation (Wahlqvist and Lee, 2007). Steffan-Dewenter et al. (2007) explain that expansion of cash crops changes the livelihood strategy of local people from a 'food first' to a 'cash crop first'. People are changes from harvesting forest for direct-consumption to sell it. Land requirements for food are among other things, determined by population size and by the types and amount of specific food consumed (Gerbens-Leenes and Nonhebel, 2002).

Our findings show how socio-economic status (salary and livelihood availability) of household and biophysical landscape influence the preference of household in collecting their foodstuff from forest. First, households with limited income prefer to hunt/collect from forest and depends their daily needs on the biodiversity in the wild. The supplementary households were very fragile in terms of income; they rely on two sources, forest products and non-forest products. Secondly, biodiversity of forest is very important for people who reside in the vicinity of HRF. Most of protein and some spices are available in the forest, only rice is imported from elsewhere. Thirdly, in all

groups, protein based foods and vegetables have a wide range of preference either collecting/hunting, cultivation/raise, or buying. Meanwhile for carbohydrate based food and some spices mostly purchased from elsewhere.

## 5 Conclusion

There is a foodstuff collection preference pattern of SAD in Harapan Rainforest. The main reliance of SAD on HRF is protein sources and vegetable sources. Meanwhile, carbohydrate sources and some spices are mostly purchased from elsewhere. Based on investigation, income/salary of indigenous people also affects the preference of SAD in purchasing foodstuff or collecting from Harapan Rainforest. Vulnerable group prefers to cultivate/raising some foodstuff in their backyard.

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