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Research Article

Cassava Consumption and Food Security Status among Cassava Growing Households in Southeast Sulawesi

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Abstract

Objective: This study was carried out to assess the level of cassava consumption and food security status of cassava growing households. **Materials and Methods:** The study was done in cassava growing villages and respondents consisted of 102 cassava grower-processors. To assess the food security status of respondent's households, the study adopted the US adult food security survey module. Data were analyzed qualitatively and using descriptive statistics. **Results:** Cassava was consumed everyday and became the most consumed staple food which households obtained mostly from own farming. Among cassava based foods, kasoami was the most frequently consumed staple. A great majority of respondent's households (96%) were food secure. **Conclusion:** Cassava had proven suitable with the farming system and local food system and served as key food security crop in the area. Therefore, cassava should be promoted to maintain and even increase its productivity to make sure that households can maintain their diet and livelihoods. Policies to support production and processing of cassava and to promote the availability of cassava products in public markets could contribute to improved rural food security, especially in the time of climate change.

Key words: Cassava, food consumption, food security, household, staple, traditional food

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Data Availability: All relevant data are within the paper and its supporting information files.

INTRODUCTION

Indonesia has various traditional staple foods which once were consumed as the main sources of carbohydrates, such as sago, cassava, maize, sweet potatoes and taro. However, high development priority given to rice in terms of policy and investment has led to increased availability of rice and along with the increase in average annual per capita income, there has been increase in per capita rice consumption and a decline in consumption of traditional foods. Rice has replaced traditional foods as the main source of carbohydrates and its average consumption in 1993 was around 130 kg person⁻¹ year⁻¹ which was the highest in the world. However, consistent with the global trend¹, rice consumption in Indonesia has decreased to 115 kg person⁻¹ year⁻¹ in 2012, but it is still high given the large population of 260 million people to feed and satisfy. Through food diversification program, there has been keen interest from the government to find alternative sources of carbohydrates, especially to enhance food security. Presently attention is turning to traditional root crops, especially cassava, because of its capacity to yield under marginal soil conditions and its tolerance to drought.

Cassava is the 3rd important staple after rice and corn². It is considered inferior to rice, so its human direct consumption declines as real income of consumers increases³⁻⁵. Therefore, cassava is often consumed during food scarcity or pre-harvest period when rice price is high⁶. In Java, traditionally cassava is eaten as staple in the form of boiled tuber, gapek and oyek, tiwul (cassava rice) or as a snack in the form of chips, fermented products and other products^{4,7}. Recently, cassava has successfully been made into modified cassava flour or MOCAF^{8,9} as substitute for wheat flour and as the main raw material for the production of analogue rice¹⁰. However, the amount of cassava consumption continued to decrease^{11,12} from 15.1 kg person⁻¹ year⁻¹ in 1991 to 5.8 kg person⁻¹ year⁻¹ in 2011.

In South Buton district in the province of Southeast Sulawesi, cassava has been the major staple food in rural areas. In this regard, cassava is consumed by processing it first into kaopi¹³ through several steps, which are similar to the first several steps in gari making in Africa, namely peeling, washing, grating, pressing, dewatering and fermenting¹⁴⁻¹⁶. The dewatered cassava mash at the end of fermenting stage will become a solid cake called kaopi. Kaopi is then broken up and kaopi granules are steamed in a cone-shaped basket made of coconut leaf that is put in a pot containing a small amount of water. The steamed food is called kasoami, which

is the most popular staple food consumed from cassava. Kasoami is usually consumed with fish, vegetables or other protein sources¹³.

As the most important local staple, cassava availability throughout the year could support the attainment of food security for the rural households in the cassava growing areas. The role of cassava as local staple food in strengthening food security of the rural households has been reported in various studies both in Indonesia and elsewhere^{4,7,17-21}.

Given the levelling off of rice production and productivity and the recent policy of the government to focus more on non-rice food crops to strive for food sovereignty, the potential of cassava to strengthen food security deserves attention. At the same time as has been the case at the national level, rice availability and increased purchasing power may have changed the consumption pattern or reduce the amount of cassava consumption. In this regard, information about the availability and consumption of cassava is beneficial to promote food diversification and food and nutrition security. Unfortunately, studies regarding cassava based food items and their level of consumption are lacking. Despite becoming the basis of traditional diet of villagers in Buton district, information about household behaviors in terms of choices of cassava against other staple foods is unavailable. This study was done to fill this gap with the main objective being to assess the level of cassava consumption, food security status and role of cassava in the diet of villagers.

MATERIALS AND METHODS

The study was carried out in April-June, 2012 in Batauga subdistrict, which was then part of Buton district (now South Buton district due to proliferation of new districts) in Southeast Sulawesi province, Indonesia. Batauga sub-district is located in the Southern part of Buton island and has a size of 68.83 km². The average temperature varies between 29 and 32°C, while mean annual rainfall ranges between 1,411 and 2,000 mm. The major economic activity of the inhabitants is agriculture. Cassava is the main food crops grown and the area is not suitable for wetland rice farming. Like any other areas in Indonesia, the sub-district has a tropical climate marked by dry and rainy seasons. The sub-district consists of 12 villages. It has 15,672 inhabitants, consisting of 3,858 households. Having good transportation infrastructure, the sub-district is bordered to Bau-Bau municipality which is the main market for agricultural products in the area.

Respondents consisted of farmers who grew cassava and processed it to become kaopi to be sold at the local market.

The number of respondents was 102 selected from the population of 234 farmer-processors in the sub-district using simple random method. Data and information were collected using questionnaires and Focus Group Discussions (FGD). Data collected in the interview schedule included socio-economic characteristics of respondents, staple foods consumption, cassava based foods consumption, food acquisition and food security status. The FGDs were held with two groups of farmer-processors supported by direct observations of processing techniques and local markets. Data were analyzed qualitatively and using descriptive statistics. Results of the survey are summarized and presented in tables and figures. To assess the food security status of respondent's households, this study adopted the US adult food security survey module. The survey module consists of ten questions which do not include questions about children's food security^{22,23}. The questions deal with conditions and behaviors that characterize households when they are having difficulty meeting basic food needs. The responses to each of the questions were coded as either affirmative or negative. Responses of "yes," "often," "sometimes," "almost every day" and "some days but not every day" are coded as affirmative. The first three questions are about food conditions of the households as a whole and the last 7 about food conditions of adults in the households. To reduce respondent burden, 2 levels of screening for the questions were applied. In addition, the questionnaire items were modified to a 30 day reference period rather than 12 month reference period^{22,23}.

The food security status of the each household interviewed is based on the sum of affirmative responses to the 10 adult and general household questions. Households are classified as food secure if they report no food-insecure conditions or only one or two food-insecure conditions. They are classified as food insecure if they report three or more food-insecure conditions. Food-insecure households are further classified as having either low food security (3-5 food-insecure conditions) or very low food security (6-10 food insecure conditions)²³.

RESULTS

Socio-economic characteristics of respondents: All of the households interviewed were farmer-processors who grew cassava and processed it to become kaopi for own consumption or for sale in the local market. The age of most respondents (92.2%) ranged between 15-55 years and only 7.8% fell in the range of 56 years and above, with an average of 46.5 years. This implies that most respondents were in their

active ages. Most cassava growing families (76.5%) had household size of 4-6 members with an average of 5 persons. Households with less than 4 members (7.8%) and with more than 6 members constituted 15.7% each. A large family size meant that more family labor could be made available for cassava production and processing, especially because the use of hired labor was not yet a common practice in the area. However, higher number of family members also means more people to feed, thus putting pressure on the availability of food.

Staple foods consumed in the last 12 months: Respondents were asked a general question of what staple foods they had consumed in the last 12 months irrespective of their frequency of consumption. Figure 1 shows, all respondents reported to have consumed rice and cassava as their staple foods in the last 12 months. On the other hand, the number of respondents who said to have eaten sweet potato and maize as their staples was almost the same, namely 73.5% for sweet potato and 74.5% for maize. Taro was only reported by 21.6% of respondents, making it the least consumed staple in the last 12 months.

Staple foods consumed in the last seven days: Table 1 summarizes respondent's responses when asked about the kinds of staple foods they have eaten in the last seven days. All respondents said to have eaten cassava and 96.1% had eaten rice. Consumption of cassava was consistent with that in Fig. 1 but there was a slight decrease in the number of respondents consuming rice. The significant decrease compared to Fig. 1 was found for the percentage of respondents who ate sweet potato, maize and taro. Sweet potato was consumed by 37.3% of respondents and the figures for maize and taro were 47.1 and 3.9%, respectively.

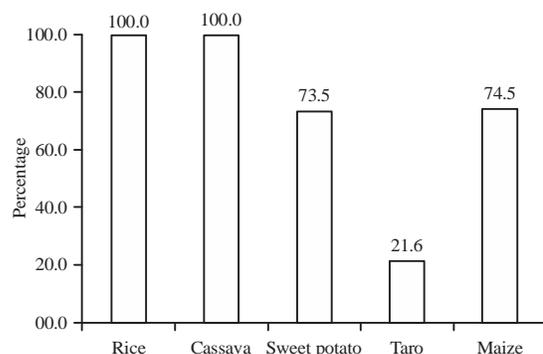


Fig. 1: Number of respondents (%) who consumed staple food in the last 12 months

The study also investigated the number of days of consumption of staple foods. For the purpose of this study, a household was said to have eaten a particular staple food "One day" if the household had eaten that staple food at least once from the total three meals or three eating occasions (morning, midday and evening) a day. With this assumption, respondents were asked how many days they had eaten a particular staple food in the last 7 days. Table 1 shows, in average, cassava was consumed for 6.9 days a week, which was the highest among all staple foods. Rice was eaten averagely for 5.0 days, sweet potato 1.8 days, maize 1.8 days and taro 1.3 days. This finding indicated that (i) Households consumed cassava based foods every day and (ii) Both cassava based foods and rice were frequently served in a meal or in 1 eating occasion and household members could take 1 or both of them depending on their preferences. However, unlike the case of cassava growing villages in Java where cassava was commonly mixed with rice to make the so-called nasi tiwul or cassava rice⁷, in study area both were cooked and presented separately.

Food acquisitions: Respondent households acquired staple foods from 2 different sources: Purchases and own production (Table 2). All respondents who ate rice obtained it by purchasing. On the other hand, the majority of respondents (91.2%) got cassava from their own farming and only 8.8% obtained it by purchasing. Cassava purchase was done in the form of either kaopi or kasoami.

Table 1: Staple foods consumed in the last 7 days

| Staple food | Respondents | | Average day of consumption |
|--------------|-------------|-------|----------------------------|
| | No. | % | |
| Rice | 98 | 96.1 | 5.0 |
| Cassava | 102 | 100.0 | 6.9 |
| Sweet Potato | 38 | 37.3 | 1.8 |
| Taro | 4 | 3.9 | 1.3 |
| Maize | 48 | 47.1 | 1.8 |

Table 2: Percentage of respondents based on source of food procurement in the last 7 days

| Staple foods | Own production | | Purchase | | Total | |
|--------------|----------------|------|----------|------|-------|-------|
| | No. | % | No. | % | No. | % |
| Rice | 0 | 0.0 | 98 | 96.1 | 98 | 96.1 |
| Cassava | 93 | 91.2 | 9 | 8.8 | 102 | 100.0 |
| Sweet potato | 34 | 33.3 | 4 | 3.9 | 38 | 37.2 |
| Taro | 4 | 3.9 | 0 | 0.0 | 4 | 3.9 |
| Maize | 44 | 43.1 | 4 | 3.9 | 48 | 47.0 |

Percentage is based on the total number of respondents (102), No. of selection may not add to n as some respondents did not consumed certain staples, while others selected more than one

With respect to maize, sweet potato and taro, own production also accounted for a substantial share of household's consumption. Of 38 respondents who consumed sweet potato, only 4 households that obtained them through purchases. All 4 households that consumed taro obtained it through own production. Likewise from the total 44 households who consumed maize, only four households obtained it through purchases. For all types of staples, no respondents reported to have acquired them from barter, borrowings and gift from relatives or neighbors.

Consumption of cassava based foods: Cassava was consumed in three different kinds of home prepared meals, namely: (1) Kasoami, (2) Fresh boiled cassava and (3) Steamed dried cassava or keo-keo. Kasoami is prepared from kaopi, which is usually made from bitter varieties. Fresh boiled cassava are made from sweet varieties. Typically, households peel and boil the fresh roots before eating. Keo-keo making is rather similar to gapek making, in which fresh cassava roots are peeled, washed, cut into smaller pieces and sun dried into chips. These dried chips are further made into smaller pieces and steamed.

Table 3 shows the number of respondents according to their frequency of consumption of these 3 cassava based foods in the last 1 year. The percentage of respondents who said that they "Always" consumed kasoami was 88.2% compared to only 11.8% for boiled tuber and none for keo-keo.

Respondents were also asked about the number of days of consuming kasoami, boiled tuber and keo-keo in the last seven days. As indicated in Table 4, the number of days of kasoami consumption was the highest. With the majority

Table 3: Number of respondents (%) according to their frequency of consumption of cassava-made staple foods

| Frequency | Kasoami | Boiled tuber | Keo-keo |
|---------------|---------|--------------|---------|
| Always | 88.2 | 11.8 | 0.0 |
| Often | 0.0 | 14.7 | 0.0 |
| Sometimes | 11.8 | 37.3 | 13.7 |
| Very seldom | 0.0 | 30.4 | 4.9 |
| Never | 0.0 | 5.9 | 81.4 |
| Total | 100.0 | 100.0 | 100.0 |
| Average score | 4.76 | 2.96 | 1.32 |

Table 4: Number of respondents (%) according to days of consumption of cassava based staples in the last seven days

| Food item | Days of consumption | | |
|--------------|---------------------|----------|----------|
| | 1-2 days | 3-4 days | 5-7 days |
| Kasoami | 0.0 | 0.0 | 85.3 |
| Boiled tuber | 17.6 | 1.0 | 14.7 |
| Keo-keo | 0.0 | 0.0 | 2.0 |

having consumed it in 5-7 days a week, kasoami was consumed almost everyday. Boiled tuber was consumed in 1-2 days (17.6%) and in 5-7 days (14.7%). Keo-keo was consumed in 5-7 days, but only by 2.0% respondents.

Household food security: Based on the food security analysis results using the USDA approach, only 7 households reported 1-2 food-insecure conditions, 4 households reported 3-5 food-insecure conditions and the remaining 91 households reported no food-insecure conditions. In this regard, a great majority of households (96.1%) were classified as "Food secure" as they reported zero to two food-insecure conditions and only four (3.9%) fell under the category of "Low food security" status as they reported 3-5 food-insecure conditions.

DISCUSSION

Study results confirmed that rice and cassava were the most important staples in the area and both played a major role for the household's caloric intake in the area. The fact that all respondents consumed them meant that the 2 staples were available and accessible by them all. The availability and accessibility of cassava was not surprising as it was produced widely in the area. Cassava fitted well into the farming system in the area due to its characteristics, such as growing on marginal soils, being easily propagated, requiring little cultivation can tolerate drought and can be retrieved from the soil up to three years after maturity. On the other hand, in view of the fact that rice was not produced in the area, its highly availability and accessibility emphasized the success of rice policy in Indonesia. Specifically, the implementation of food security program through which subsidized rice was distributed to poor households increased significantly the availability and affordability of rice in rural areas in Indonesia, including in the study villages.

Sweet potato, maize and taro were all produced in the study areas but not all respondents still consumed them. While sweet potato and taro in most cases only served as secondary co-staple, maize was once a primary staple along with cassava and could be produced twice a year during the rainy season. In recent years there has been decreasing planted area and production of maize, leading to its decreased availability. A number of factors were responsible for this decline. Similar to findings of a study by Barratt *et al.*¹⁹, respondents claimed that cassava strongly outperformed maize in terms of land productivity and profitability. Erratic climate condition in recent years and lack of proper storage facilities were other reasons for less attractiveness of maize growing.

Findings of this study showed that seen from the frequency of staple consumption in a week, cassava was a dominant source of calorie intake in the respondent's households. This is in contrast to the situation at the national level where the food consumption patterns were leaning more toward rice based staples as reported in various studies. According to Ariani²⁴, cereal (mainly rice) consumption had reached 314 g person⁻¹ day⁻¹ compared to the ideal amount of 275 g person⁻¹ day⁻¹, whereas roots (mainly cassava) consumption was only 40 g person⁻¹ day⁻¹ compared to the ideal amount of 100 g person⁻¹ day⁻¹. During the period of 2005-2009, cassava consumption showed a declining trend from 41.2-26.2 g person⁻¹ day⁻¹. Similarly, Rae²⁵ found that, as a proportion of the total household calorie intake, the mean share of roots was only 2.43% whereas that of rice reached 65.04%. According to Rada and Regmi²⁶, starchy root crops as a share of total calories consumed per capita per day fell an annual average of 2.5% from 20-7% during the period of 1961-2003. Using data from national socio-economic surveys, Ariani²⁴ concluded that staple food consumption pattern was moving from diversified staples to single staple (namely rice), including in the provinces where traditional staple foods were once highly consumed (such as maize in East Nusa Tenggara and sago in Maluku and Papua).

Food acquisition is related to the farming system in the area and types of crops grown by households in their land. For all households, rice was obtained through purchasing because there was no wetland rice farming in Batauga subdistrict and the area had to get rice from neighboring subdistricts or districts that produced rice. Rice purchase was done at traditional market (pasar), kiosk and small shop (warung), as well as from subsidized food program that provided cheap rice for villagers. There were also peddler-retailers who sold rice from village to village using cars. In the past upland rice was cultivated but had largely been ignored since rainfall was recently unpredictable and rice was easily available.

Interestingly, in spite of having own cassava farming, some households bought it for consumption. The main reasons were because they were too busy with other activities so that they did not have enough time to harvest and process their own cassava to become kaopi. In this study they bought kaopi and made it into kasoami. There were also respondents who acknowledged to sometimes buy kasoami because of being too busy to make kaopi for sale.

Study results indicated higher preference of respondents toward kasoami as staple food from cassava compared to other cassava based staples. In most cases kasoami was eaten with soup that contained leafy or fruit vegetables or animal products, such as fish and other

seafoods, which together would improve the nutritive value of the meal. During FGDs respondents were asked what were their reasons for their preference to kasoami. The most frequently expressed reasons were kasoami tastes better, households were in the habit of using it, cheaper, always available, convenient and filled up the stomach better.

While kasoami was definitely the most preferred food among cassava based staples, lesser consumption of fresh tuber was also related to its availability. Fresh tuber came from sweet varieties of cassava and they were not much cultivated because of their susceptibility to wild pig attacks. Since wild pigs were abundant in the area, farmers opted to grow bitter cassava as it was less susceptible to attacks by wild pigs. Moreover, bitter cassava had higher productivity and the taste of its kasoami was much preferred than that from sweet varieties. Bitter varieties could also be "Stored" longer in the soil, allowing the crops to be harvested according to needs.

During the survey it was observed that kaopi had high marketing significance and for many families it was one of the major sources of income. Processors sold kaopi to local traditional market, directly to village residents and to Bau-Bau municipality. More importantly, the high demand for kaopi came also from residents of Kadatua, Siompu and Batuata islands, who regularly came to Batauga during market days to purchase kaopi. With such high market demand, cassava became a cash crop and cassava growing and processing was attractive for villagers and thus contributed substantially to household income of the smallholder cassava farmers.

Nowadays keo-keo as one of cassava-made staple food was less consumed. Keo-keo was often eaten in the past when road condition was bad, vehicles were not available, cassava demand was low and other staples (notably rice) were not so available. When the villages had developed and were more integrated economically with other surrounding areas, cassava growers were more interested to process their cassava into kaopi as it was more profitable and had high market demand. In addition, processing kaopi enabled them to harvest their cassava little-by-little based on the amount of kaopi to be marketed, whereas in making gaplek or keo-keo usually all the cassava crops were harvested at once.

It was evident from these study results that foods were available and accessible for almost all sample households and that their household members could benefit fully as they received an adequate share of the food in terms of quantity and diversity. The food secure status of almost all households was contributed mostly by cassava as the main food crop in the area.

The percentage of food secure households in the study area was higher than the national average (87.9%) for rural

areas in Indonesia in 2002 as reported by Ariani *et al.*²⁷. The percentage of food secure households was even much higher than those reported in various studies in Indonesia²⁸⁻³¹ and in other countries³²⁻³⁵. Despite the differences in the methodology applied for measuring food security and for conducting these studies, it could be said that the percentage of food secure households in the study area was surprisingly high particularly in the context of cassava growing households in rural areas.

The results of the study suggested that in the study area cassava production had positively and largely contributed to increased staple food availability, while income obtained from fresh cassava and kaopi selling had improved food accessibility for respondent's households. At the household level, food access and utilization were usually the most pressing issues³⁶ but both were guaranteed in the study area due to cassava existence. At the same time, the income from fresh cassava and kaopi selling meant sufficient purchasing power and thus households being more possible to manage food security³⁷.

It is worth noting, however, that all 11 households with reported food-insecure conditions were concerned with the affordability to have balanced meals. This could include a combined or varied meal, which included a portion of carbohydrates, proteins and micronutrients for the family³⁸. This is in line with findings of Rachman and Ariani³⁹ and Ariani²⁴ that quality of food consumption patterns at the national level needed to be improved as it was still far below desirable food pattern index. Efforts that could be taken are nutritional training and education to ensure that villagers recognize the need for a balanced diet to eliminate under nutrition as well as to avoid consuming more than is required⁴⁰.

It is also noteworthy that the respondents of this study were cassava growers and processors, so it was understandable that cassava based meals were the dominant source of carbohydrate in their dietary pattern. Their status as cassava growers and processors might be closely related to their high food security status. Owning cassava farm provided them with high level food access, availability and utilization, allowing them to feed the adults throughout the year. However, it is likely that consumption of staple food including that of cassava based would vary across the professions, across seasons and across income quintiles in a given area, so similar studies that incorporated such variations in cassava growing villages need to be undertaken to have more comprehensive picture regarding the role of cassava and food security status among rural households.

CONCLUSION

This study was done to understand cassava consumption and food security status among households that grew and processed cassava. It was evident that production and use of cassava in traditionally cassava growing villages was more popular than any other staples. Cassava was the most consumed staple food and with the average 6.9 consumption days a week, practically respondent's households consumed cassava every day. Among cassava based foods, kasoami was the most frequently consumed staple followed by fresh boiled tubers, whereas keo-keo was not so much consumed anymore.

A great majority of households (96%) growing and processing cassava were food secure. They have enough capacity to cater for their food needs largely through own production of cassava and through purchases of rice. These results were in contrast to some of the preconceived notions about cassava growing households in Indonesia. Contrary to the popular belief that cassava was consumed by poor households with high food insecurity, the study results indicated that the respondent's households did not report indications of food access problems or limitations or only one or two reported indications of anxiety over food sufficiency or shortage of food in the house. To some extent, however, the results were understandable as the area was cassava dependent and respondents were cassava grower-processors whose cassava farms provided them with high level food access, availability, utilization and stability. Therefore, similar studies to cover differences in the professions, seasons and income quintiles need to be undertaken to have more comprehensive picture regarding the role of cassava and food security status among rural households.

Cassava had proven suitable with the farming system and local food system and served as key food security crop in the area. Therefore, it has the potential to be an important part of the solution to improving food security in a time of climate change. This implied that it could serve as a buffer against high food prices and food scarcity which were often associated with rice supply. At the same time, since cassava constitutes a major share of household's diets, a severe loss of cassava could still negatively affect household's diets and wealth. It is therefore important to maintain the cassava productivity, in order to make sure that these households can maintain their diets and their livelihoods. Policies to support own production of cassava by rural households and to promote the availability of cassava products in public markets could therefore, contribute to improved rural food security.

SIGNIFICANCE STATEMENT

In Indonesia rice is the most consumed staple and cassava consumption has shown a decreasing trend. Cassava has been regarded as inferior food and various studies have shown that most cassava growing households are poor. The study found that cassava was consumed everyday and became the most consumed staple food. A great majority of respondents (96%) were food secure. This percentage of food secure households is higher compared to that in cassava growing areas in Indonesia and in the world. This study will inform policy makers that cassava should be promoted in rural areas especially in the traditionally cassava growing areas as it can improve food security at the time of climate change and alleviate poverty.

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