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Research Article

MAJOR STAPLE FOOD TO SECURE FOOD AVAILABILITY IN NAPAN VILLAGE, NUSA TENGGARA TIMUR, INDONESIA

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ABSTRACT

Agrarian reform is a way to create inclusivity and sustainable food security in underdeveloped regions. However the issue of inequitable distribution in under-develop region is not the only problem of agrarian reform. The fundamentals of agrarian matters include farmer access to better staple food production. The objective of this study was to get information regarding the production system of local tubers and cereals in Napan Village. The study was carried out by qualitative method by using of a focus group discussion directed by probe questions. The results verified that the most important major staple food in Napan was tuber which includes sweet potato, yam and cassava as well as cereals which include corn, pigeon pea and lablab-bean. All staple food is consumed nearly daily with simple cooking method. Farmers cultivated those all staple food in their home garden except lablab bean which grow naturally. Low productivity and low quality of staple food were caused by limited agricultural input and technology. This study suggested that all staple food was still important food for Napan's people diet. Improved technology is needed to better plant production and to sustain food availability throughout the year.

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INTRODUCTION

Sustainable food security to improve the access to sufficient, safe and affordable food is needed to feed the local population. Agrarian reform is a way to create inclusivity and sustainable food security in underdeveloped regions by implementing three fundamental pillars: sustainability, accessibility and utilization of foodstuffs (Boyce *et al.*, 2005; Giovannucci, 2012). The act of Agrarian reform covers not only the rearrangement of the agrarian law, lack of access to land was often the driving forces behind poverty and hunger, especially in rural and under-develop areas (Vista, 2013). Fundamentals of agrarian matters, which include farmer access (UNCTAD, 2015) to better staple food production and guarantee the availability of food was also induced lack of food.

In Indonesia, one of access reform problems is low food productivity mainly in under-developed regions due to limited access to agricultural input and technology. Underdeveloped regions are related with multidimensional poverty. Six dimensions feature prominently in poor people's definition of poverty are always hunger, powerlessness, lack access to basic infrastructure, thirst for literacy, and poor health (Maxell,

1999). One of underdeveloped regions in the East of Indonesia is Napan Village, which is administratively located in the sub-district of Bikomi Utara, the district of Timor Tengah Utara, the Province of Nusa Tenggara Timur (Fig 1). The Village of Napan is located in the border of the Democratic Republic of Timor-Leste. However the multidimensional poverty doesn't exist there. The problem arises when the government intensifies rice consumption as staple food. This policy decreased local food production and consumption. Tuber and cereal were the two important plant biodiversity and still the main food of their diet.

Local farmers were growing those three commodities in home garden or land near their village located in lowland and mountainous area; mostly 100-500 m above sea level. The warm area of tropical zone consists of two distinctive dry and wet season, support the local staple food growth and production. Local tubers are drought resistant and grow well at low and middle elevation where annual rainfall is low and sometime no rain in 3-6 month consecutives months.

Local condition of Napan gives a challenge to the people in fulfilling their need of foodstuffs since their vast land has

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relatively low degree of fertility due to low organic matter content and low cation exchange capacity. However planting their own staple food is a way to have food reserves throughout the year. Unfortunately, staple food production system is carried out without appropriate technology, and land productivity was remains low. We supposed that information about cultivation system will be the first step to improve staple food productivity. The study focused on tuber and cereal for several reasons: low productivity and quality, low agricultural input, low technology and high local consumption. The objective of this study was to get information regarding local staple food, as well as its consumption pattern and general cultivation system in Napan Village.



Fig 1 Nusa Tenggara Timur Province in Indonesian Map

METHODOLOGY

Sampling site

Tubers as well as cereals were collected from agricultural area in Komben and Oelfaub area which were relatively high population area in Napan Village. Staple food cultivation practices was documented based on field survey and FGD.

Staple food consumption

Information concerning the type of local food crops obtained from local Agricultural Office. The way to cook local staple food and their consumption were documented through small discussions with housewives. Study of staple food cultivation technology included soil tillage, planting system, fertilizer application, irrigation, pest control, postharvest treatment and market chain. The methodology of this study was qualitative research by using a focus group discussion (FGD) directed by probe questions (Sharmili *et al.*2009). The FGD consisted of structured discussion and was used to obtain in-depth information. Discussion was carried out in village office in Napan. The discussion participants were the head of Napan village, Head of the Bikomi Utara sub-district, farmer's communities, and extension officer of local Agricultural Department as well as and senior community leaders.

RESULTS AND DISCUSSION

Major Staple Food

The most important local staple foods to fulfill carbohydrate need in Napan community were sweet potato (*Ipomoea batatas*(L.) Lam), purple and white (*Dioscoreaalata* L.), cassava (*ManihotEsculenta*Crantz), corn (*Zea mays* subsp. *Mays* L.), and pigeon pea (*Cajanuscajan*(L.) Millsp.)as depicted in Figure 1. Napanlocal people consume those foods at different time throughout the year however they also consumed national staple food, rice which is relatively expensive.

Food Consumption

Sweet Potato

Local name of sweet potato is lakukoli. Napan's people consume sweet potatoes tuber and leaves for the source of carbohydrates, vitamins and minerals in their daily diet. There are two types of local sweet potato:

1. Deep red skin sweet potato with white content, generally elongated
2. White skin sweet potato with white content, generally elongated

Sweet potatoes are consumed by boiling while its leaves are sautéed with vegetables oil by mixing with sweet potatoes tuber or corn var. Pen Muti. Local people have no habit to fry sweet potatoes or process them into processed foods like cake and chips. Plants are cultivated by cutting or runner, planting time take place around February and is harvested in July-August.



Fig 2 Major staple food in Napan Village include (clockwise) sweet potato, yam, cassava, lablab-bean, pigeon pea, and corn

Yam

Lakuseu and Lakuleko is a local name of yam; this is very important staple food for Napan's people since their tuber can remain in soil without any damage to age more than 6 months. But long storage decreases tuber quality. Two types of yam grow in Napan are:

1. Lakuseu is white skin white flash yam which include Lakuseu Fuekase (hairy yam) and Lakuseu molos, non-hairy yam
2. Lakuleko, white skin and purple flash yam

Both variety of yam are eaten by boiling or cooked in traditional way under the pile of heated soil. Sometime they mixed cut yam with cut bananas and shredded coconut, wrap it in banana leaves and burn in low heat.

Plants are never cultivated in large quantities. Farmers grow two or three crops in field or garden. Yam usually are grown under the tree since they climb the tree. Yam grow naturally up to 2 m in heights, the stem is cut on the top when yam is climbing too high. These local food plants are often found on the roadside or in the garden, and may grow naturally without anthropogenic intervention. The harvest time of yam is in August-September, traditionally Napan's people store yam for several month to one year to be consumed or used as seeds in following year.

Cassava

Cassava in Napan is called Lakuhaus. Edible part of cassava which is consumed regularly are tuber and leaves. There are two types of local cassava based on the color of flesh and stem:

1. Yellow flesh yellowish stem.
2. White flesh white stem

People believe that yellow cassava is nutritious staple food since, it is true since it contain carotenoids can act as antioxidant in human diet. People consumes boiled cassava, and never eat fried cassava. Food processing of cassava into processed products like chips or cake is not happen.

Cassava is grown on a traditional intercropping system as a second plant after upland rice and corn. Cassava is harvested about 3-4 months after planting or longer, cassava harvesting from soil is depend on consumer's need.

Corn

In Napan, corn is called pen, three varieties of corn in Napan as follow

1. Pen botof (syn. Flower corn) is a type of corn to be made popcorn. Pen botof consumed as a refreshment food but not as main food. Sometimes the corn cobs are left in plant up to 4 months and harvested lately.
2. Pen muti (syn. Pen kikis) is white corn which is usually cooked with bean leaves or sweet potato leaves become a soup. This corn contain high carbohydrate and gluten so that they cannot be ground
3. Pen fatu is a white corn with thick grain skin. Before cooking, the grain should be pounded with water to remove the skin. People made a kind of soup or sauté of pen fatu with papaya's leaves as well as cassava leaves. Some broken grain is feed to pork or chicken.

In multiple cropping, corn is growing among bean and cassava crops. The corn is harvested at 2.5 months after sowing between January-February during the rainy season.

Pigeon pea

Pigeon pea in local language is Turis; an important pulse consumed often. The pod left old in the tree until hard, they consumed boiled hard bean. Pigeon pea soup mixed with cassava or sweet potato leaves is well knows local cuisine. Traditionally beans are not cooked tenderly. The presence of pigeon pea in a community consumption pattern is important as a source of protein since people rarely consume animal protein unless in the community party.

Lablab-bean

People name it purple flowering nuts. This edible legume grows naturally in the garden, yard and even in roadside. Farmer was never cultivating lablab-bean but people consume the bean as cooked vegetable and even they eat raw unripe bean although lab-lab bean consumption is lower than pigeon pea beans.

CULTIVATION METHOD

Almost all farmers in Napan are subsistence. farm households supply labor for on-farm employment on their farms. They also cultivate other farm in neighboring village to earn the money spent to buy daily needs. Farmer communities in Napan are developing a shifting cultivation and permanent agriculture patterns which are known in Timorese language as "Rene feut" and "Rene tetas". The shifting cultivation conducted to maintain soil fertility after being abandoned for many years. Multiple cropping allows them to harvest food crop throughout the year. In a year, they grow various crops so that they can fulfill their food necessity.

Important food crops grow in Napan with multiple cropping is as follow

1. Upland rice (*Oryza sativa* L.) which takes 3 months to harvest;
2. Corn (*Zea mays* L.) which grown 2.5 months before harvest;
3. Cassava (*Manihot utilisima* L.) and sweet potato (*Ipomoea batatas* L.) which need 3 to 8 months to be harvested;
4. Various annual and perennial legum with edible leaves and bean such as pigeon pea (*Cajanus cajan* L.), bean (*Phaseolus vulgaris* L.) and long bean (*Vigna unguiculata* ssp. *Sesquipedalis*) which takes 3 months to harvest;
5. Yam (*Dioscorea* spp), perennial herbaceous vine that form edible tuber.

Farmer cultivates local food crops with traditional agricultural practices which represent their original farming method. They use local knowledge and natural resources to support plant growth and yield. High degree biodiversity of food crops from annual to seasonal plant including legume in crop rotation maintain soil fertility, hold water and prevent soil erosion (Speir, 2009).

Most of crops (87%) cultivated in dryland without irrigation especially in areas with a slope more than 8%. Without terraces

on sloping land, soil erosion is occurred. Soil fertility and infiltration in recent terraced land was not change but higher yield was recorded due to higher planting density (Posthumus & Stroosnijder, 2010). They practice minimum tiling, a traditional method that protect soil quality and reduce erosion. First they do land clearing by used of cangkul or parang. Plant debris was left over the soil surface as mulch.

Farming inputs was rarely used since they have no enough knowledge about chemical fertilizer and no access to buy chemical fertilizer. Their traditional farming is very similar to organic farming or naturally permanent agriculture. No food crops are grown with organic or inorganic fertilizer. Plant roots left in soil and leaves or stem on soil surface are considered as organic matter source. Multiple cropping with heat and dry resistant legume in the traditional cropping system pattern is a way to supply nitrogen for plant. The deep-rooted legume plant can enrich the soil because its roots are combined with Rhizobium which fix nitrogen. Legume increase phosphorus, iron and zinc acquisition by host (Xue *et al.*, 2016). Traditionally, food crops was planting without spacing, but now in monoculture system, corn is set within a certain spacing between 40-80 cm. Farmers decreased the lengths space between individual plants when they plan to harvest the corn early. Farmers depend on rain fall to irrigate their plants. Annual rainfall in Timor Tengah Utara District is low, 372 mm at 2015. Higher rainfall was recorded at January-December, but no rain between July-December.

Traditional farming system enables to maintain food needs especially that of tubers and corn. However fast development in eastern region of Indonesia can threaten sustainability of food especially in remote and under-develop region such as Napan Village. Strengthening farm access to land which include providing infrastructure and tool/input of food production, technical elucidation towards the benefit receiver, asset support and marketing distribution will be important to maintain the existence of major local food in Napan.

CONCLUSION

The most important major staple food in Napan is tuber which include sweet potato, yam and tuber as well as cereals which include corn, pigeon pea and lablab-bean. All staple food consumed nearly daily with simple cooking method. Farmers cultivate those all staple food except lablab bean which grow naturally. Low productivity and low quality of staple food is caused by limited agricultural input and technology. Farmers cultivate those major foods traditionally without enough input such as organic matter or fertilizer. This study suggested that all staple food is still an important food for Napan's people diet. Improved technology is needed to better plant production and to sustain food availability throughout the year.

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Author's Contributions

R. Hindersah, and N Kurniati designed research; and conducted field survey and Focus Group Discussion; B. Rubiati, H. N. Lita provided essential secondary data; R. Hindersah wrote the paper; N. Kurniati had responsible for all content; H.N.Lita proofed reading. All authors read and approved the final manuscript.

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