

Prospective Use of Palm (*Arenga Pinnata* Merr.) as Raw Material of Sugar Palm in the Village of Moyag, Bolaang Mongondow, Indonesia

Meity Melani Mokoginta

Faculty of Forestry, University of Dumoga Kotamobagu, Bolaang Mongondow, Indonesia

Abstract This study aimed to describe prospects of utilization of the sugar-palm plant as the raw material of sugar-palm. Data are collected through observations, interviews, and document analysis. The research findings show that cultivation of sugar-palm trees can be used to meet economic needs of households, particularly for education, health, and social life. The development of sugar-palm trees can be done through the expansion of palm cultivation, counseling and supervising the cultivation of sugar-palm plants to increase juice production, and empowering the business-oriented farmer groups.

Keywords Palm Tree, Cultivation, Sugar-Palm

1. Introduction

The sugar-palm plant (*Arenga pinnata* Merr) are scattered in various regions of Indonesia, including in the area of Bolaang Mongondow, District of East Kotamobagu, Moyag village, which is the center of sugar-palm production [1]. Sugar-palm plant has long been known to the rural community and used for the manufacture of sugar-palm, either traditional household or sugar-palm industry [2, 3]. Raw materials were tapped from sugar-palm tree juice derived from the male flowers, this juice can be processed into sugar-palm, beverages, vinegar, and Bio ethanol [4-8]. The sugar-palm plant can produce other food products, such as: "Kolang-Kaling" from their fruits and flour (starch) for cakes, breads and biscuits; this flour are processed from the pith of the palm trunk [9-11]. In addition to their economic benefits, the sugar-palm tree also suggests ecological functions, i.e. soil and water conservation, especially on sloping land in the hills and mountain areas. Sugar-palm tree have certain characteristics that can be used in the rehabilitation of critical lands [12].

The sugar-palm tree capable of producing a variety of non-timber products and has advantages for improving rural income [13]. The low productivity of sugar-palm trees in the village of Moyag are due to the most of sugar-palm trees still grow wild, their cultivation is very simple; as well as product marketing system is not good so that people are not

motivated to cultivate sugar-palm trees. In addition, people often cut down the sugar-palm trees that are old to take their flour, was not followed by the planting of seedlings, thus diminishing population of sugar-palm trees [14, 15].

Each cluster of flower, according [16], produce juice 4-5 liter/cluster, this juice are usually directly processed into palm-sugar, because this juice is not durable saved [17, 18]. Rural communities have main job as a farmer and it is supported by the sugar-palm processing. The sugar-palm business is very interested in the rural community as supporting livelihood, in addition to maize and vegetables farming. The sugar-palm processing activities have long held by the Moyag rural community, these efforts have been done for generations by sugar-palm households, however, the amount of production still cannot meet the market demand. The sugar-palm from the Moyag village suggested the specific characteristic, namely sweet, compact, and brownish yellow color. The Moyag sugar-palm is very interested in the surrounding community because of the good tastes good, sweet and suitable for the traditional cakes.

The high market demand for sugar-palm are not comparable with their production, the main constraint in the sugar-palm production, are (1) the limited number of productive sugar-palm trees [19]. (2) Remoteness of sugar-palm gardens and lack of knowledge about the innovative technologies in juices tapping [20] (3) lack of community knowledge about the economic value of the sugar-palm trees. Based on these problems, the researchers wanted to know: (1) parts of sugar-palm trees that have the high economic value, (2) impacts of the utilization of sugar-palm trees to the local economy, (3) prospects of the sugar-palm development in the Moyag Village community.

* Corresponding author:

memo.mokoginta@gmail.com (Meity Melani Mokoginta)

Published online at <http://journal.sapub.org/ijaf>

Copyright © 2015 Scientific & Academic Publishing. All Rights Reserved

2. Research Method

This study was conducted in the village of Moyag, North Kotamobagu, Bolaang Mongondow. The village of Moyag has been producing the sugar-palm made from palm-juices, their sugar-palm is the best quality that is sweet in tastes, brownish-red in color, and has a distinctive aroma. This study used a qualitative method by focusing on existing resources and potencies of resource development in utilization of sugar-palm trees as raw material for the manufacture of sugar-palm. Resource persons (key informants) are producer of sugar-palm, landowners, farmer of sugar-palm, community leaders, public purchasers, and the regional industry office. Data and information's are collected by field observations, interviews with snowball method up to the point of suture- information, collecting documentations (secondary data) and literature review. Data analysis followed the method of [21], which consists of three flows of activities, namely data collection, data reduction, display and conclusion. Validation of data and information's are done by means of continuous observations, triangulation and discussions with resource persons of producers, buyers of sugar-palm, government agencies and the private sector as a source of information's and sponsor of fund.

3. Results and Discussion

3.1. Usefulness of the Sugar-Palm Trees

Parts of sugar-palm trees that used rural community are root, stem, fibers, leaves, juices, flour and fruits [22]. Leaves are woven into the roof of house and sold at IDR. 15,000 / sheet. The vein of leaves are used to the skewer of meat, each belt of skewer contains of 12 sticks with a selling price of IDR. 2500; the black fibers are used as the broom and it is sold at IDR. 15,000, the palm fiber materials can also be made into straps, sold at IDR. 5,500; the pith flour (starch) can be used in producing any snacks and supplement foods for rice and corn, this flour is sold at IDR. 5000 / kg; fruits are processed into "Kolang-Kaling", and sold at a price of IDR.2500/bowl-cup, and the fruit bunches yield juices which are tapped. Processing of juices into the sugar-palm generate a sufficiently economic value added [23].

Multifunction of sugar-palm trees produced many benefits in improving the local economy [24]. The livelihoods of most of villagers are farmers (owner) sugar-palm trees and sugar-palm producers. The sugar-palm produced in the village Moyag are the best quality, reddish-brown, sweet and has a distinctive aroma [25].

The sugar-palm trees are easy to grow in any gentle slope lands, these plants are easy to grow in any tropical regions. The Moyag village located on the lower-slope of the Ambang Mountain suggests many kinds of sugar-palm trees [26]. The sugar-palm trees can grow well in the coastal zones up to the mountainous zones of 1200 m above sea level.

The number of sugar processors in the Moyag village is 150 households. Palm trees are usually owned by the

non-sugar processor of land owner, sugar processor of non-land owner, sugar processors of land owner. Based on that specification, the most widely involved in sugar-palm production is the sugar processor of land owner. The high price of sugar in the market (up to Rp.18.000 / package) indicating a limited supply of sugar in the market. This happens due to the number of household processor of land owner has not been cultivated palm trees in more intensively. The land owners generally own 1-2 ha of lands with the palm trees, these palm trees are growing wildly and the population is about 10-15 trees in the 1-2 ha of land [27]. Not all of lands are cultivated with palm trees, so most producers buy palm trees from the land owner who has a palm trees. The processes of juices tapping are using bamboo along 1-2 m. The clean and original container can produce a good quality of juices [28].

3.2. Economic Benefits of Sugar-Palm Trees for Rural Community and Social Events

Sugar-palm trees produced a variety of economic benefits to meet the needs of the rural community, one of which is the juices. This juice has a higher sale-value when compared to other plant parts. Juices can be tapped from the bunches of male flower during a period of 3-5 years [29]. Moyag society generally has 1-2 ha of lands and 10-15 palm trees. Each one productive tree can produce up to 7-9 liters juices per day, with period of tapping each bunch is 1.5-3.0 months (average of 2.5 months) [30-32]. Technology and equipment used to tap juices-palm are diverse, ranging from traditional ways to the innovative technologies. [33]

Household processing of sugar-palm in a day can collect 99 liters of juices that is tapped, so that in one month can be obtained as much as 2970 liters of juices. The sugar-palm juices are collected every two days, beginning from the morning and cooked immediately [34]. In the afternoon, juices are tapped back and these juices are mixed together with juices tapped in tomorrow morning, then immediately cooked. Manufacture of sugar-palm takes about 5 hours to process juices into the sugar-palm. On average, juices collected during the two days as much as 198 liters and produce 33 kg of sugar-palm. Within a month can produce 496 kg of sugar-palm. Each land-holder has palm trees at least 10 trees in one hectare [35]. The Moyag communities have an average 1-2 ha of land per household, and their sugar-palm plant 7-11 trees, thereby the households can produce sugar about 496 kg, with an average price of IDR. 4,000 / kg. The sugar-palm package sized about 3-4 kg, so that every single package of sugar-palm is sold IDR. 12.000-16.000. The price of sugar-palm as much as IDR.4.000 / kg, it is multiplied by the sugar production in a month about 496 kg, so the monthly household revenue of IDR. 1.984.000 with an initial capital of IDR. 370.000. The initial capital was spent on equipment such as cleavers, plastic straps to bind bamboo at the time of juices tapping, drum-box of IDR. 200,000 to cook juices. [36] Showed that sugar-palm processing business is very profitable economically. However, the main constraints are limited

availability of raw materials (palm juices) and the high cost of fuels or firewood's.

Numbers of sugar-palm processors in the village Moyag are 150 households with their family labor, namely the wife, children and their neighbors. The labor wages are paid from the sale of sugar-palm products. The sugar-palm processing industry is generally carried out by women; they usually cook palm juices at home or in the gardens. While men (husbands) for tapping palm juices and collecting firewood for cooking the palm juices. This sugar-making process requires labor, so non-family labors are paid based on the production of sugar-palm sold in the market. Earning from sales of palm-sugar is quite beneficial for the household economics in the Moyag village. There are five sugar-palm contribution in improving the economy of rural communities, namely (1) to fulfill any basic needs of food and clothes; (2) to help building any comfort homes, adding to the cost of schooling for children up to higher education; (3) to finance social activities with the local community and surrounding areas, such as family events, marriages, circumcisions, gathering, grief and other rural activities that require any funds; (4) to fulfill any cost for family health-care, (5) to supply any opportunities for villagers who idle or not having any job. [37] Reported the importance of fuels or firewood's in the traditional household sugar-palm industry.

Table 1. Impacts of utilization of sugar-palm trees to the economy of rural community before and after utilizing sugar-palm trees in the productive economic activities

No.	Fulfillment	Before	After
1.	Educational needs	Children education up to junior high school	Children up to higher education
2	Social life's needs	1. Cannot gather any relatives in traditional events due to the limited income 2. Many idle and just gardening waiting three months yield 3. Cannot build a comfort house only stay in the cabin gardens	1. Gathering the relatives in traditional events such as weddings, circumcisions, grief and others. 2. Being the main job and got the production every week to earn any wages 3. Can live in villages by building the comfort housing.
3	Health care needs	Center for community health care	Directly to a specialist treatment and stay in hospital

Sources: Research results (2015).

3.3. Prospects of Sugar-Palm Trees Utilization in Rural Households

There are several factors that can support the development of sugar-palm trees, namely: (1) availability of human

resources with a high work ethics in the sugar-palm processing; (2) availability of suitable lands for investments in sugar- palm cultivation [38]. These resources support any development efforts in production of sugar-palm made from palm-juices. Villagers of Moyag are known as the tenacious and diligent worker since the past until now in producing sugar-palm products. The sugar-palm produced in the Moyag village has their own characteristics and high-demand in the local market and external markets [39]. The Moyag sugar-palm have been popular in all regions, especially Bolaang Mongondow and northern Sulawesi, so the importance of government's role in the expansion of palm cultivating areas to supply of raw materials of palm juices, counseling and assistance in improving quality of sugar-palm products, and strengthening the business working group of sugar-palm. Research results [40]. Showed that the important inputs in producing the sugar-palm are supply of palm juice as raw material, skilled labor and sufficiently fuels (firewood).

4. Conclusions

1. The sugar-palm trees suggested multi functions, one of their economic functions are producing palm juices that have a high value.
2. Results of sugar-palm trees management and processing of sugar-palm can improve the rural household economics, to meet the family needs of food and clothes, social life's, health-care, children education and family employment.
3. The natural resources and human resources suggest large enough potencies to be developed in improving productivity of sugar-palm.

REFERENCES

- [1] Ditjen Perkebunan. 2004. Development of sugar-palm in Indonesia. Proceedings of National Seminar on Sugar-Palm. Research Center of Coconut and other Palm. Tondano, 9 June 2004. pp.138-144.
- [2] Ho, C.W., W.M. Wan-Aida, M.Y. Maskat and H. Osman. 2007. Change in Volatile Compounds of Palm Sap (*Arenga pinnata*) during the Heating Process for Production of Palm Sugar. Food Chemistry, pp.1156-1162.
- [3] Pontoh, J. and A. Wuntu. 2014. Improvement of the sugar-palm processing in the sugar-palm industry in the Masarang Tomohon. Online Jurnal of MIPA Unsrat, 3(2): 68-73.
- [4] Akuba, R.H. 2004. The Sugar-Palm Profile. Development of Sugar-Palm Trees. Proceedings of National Seminar on Sugar-Palm. Research Center of Coconut and other Palm, Tondano, 9 June 2004. Pp.1-9.
- [5] Rindengan, B. and E. Manaroinsong. 2009. The Sugar-Palm Trees. The Biofuels Plantation Crops. The Plantation

- Research and Development Center. Pp.1-22.
- [6] Effendi, D.S. 2009. The Sugar-Palm, Source of alternative energy. *Agriculture Research and Development Magazine*, 31(2):1-3.
 - [7] Effendi, D.S. 2010. Prospects of sugar-palm development (*A.pinnata* Merr.) in supporting bioethanol demand in Indonesia. *Perspective*, 9(1): 36 – 46.
 - [8] Fahrizal, F., Y. Abubakar, M. Muzaifa and M. Muslim. 2013. The Effects of Temperature and Length of Fermentation on Bioethanol Production from Arenga Plant (*Arenga pinnata* MERR). *International Journal on Advanced Science, Engineering, Information Technology*, 3: 55-57.
 - [9] Alam, S. and D. Baco. 2004. Opportunities of development and utilization of sugar-palm trees in South Sulawesi). *Proceedings of National Seminar on Sugar-Palm*. Research Center of Coconut and other Palm Tondano, 9 June 2004. pp.15-21.
 - [10] Maliangkay, R.B., Y. Matana, N. Lumentut and E. Manarainsong. 2004. The sugar palm Cultivation. *The Sugar Palm development. Proceedings of the National Seminar of the Sugar PALm. The Coconut and Palm Crop Research Institute*. Tondano, 9 June 2004. pp.131-137.
 - [11] Sahari,L., S.M. Sapuan, E.S. Zainudin and M.A. Maleque. 2013. Thermo-mechanical behaviors of thermoplastic starch derived from sugar palm tree (*Arenga pinnata*). *Carbohydrate Polymers*, 92(2): 1711-1716.
 - [12] Mujahidin, Sutrisno, L. Dian, H. Tri and A.F. Izu. 2003. The sugar-palm cultivation and its prospects. *Center of Plant Conservation, Botanical Garden, Indonesian Institute of Sciences, Bogor, Indonesia*.
 - [13] Manoi, F. and E. Wardiana. 1990. Development of the Sugar Palm Areas and Production of Sugar Palm in West Java province. *Balitka Bulletin*, 11: 92-96.
 - [14] Tampake, H. and E. Wardiana. 1994. Study of Sugar-Palm Trees Characteristics in Cianjur district, West Java Province. *Bulletin of Balitka. Coconut Research Center of Manado*. Pp.53-57.
 - [15] Nair, S.A., M. Jose, R.J. Thomas and R.V. Nair. 2009. Production of neera and its value addition. *Indian Coconut Journal*, 52(1): 11-13.
 - [16] Rumokoi, M.M.M. 1990. The benefits of sugar-palm trees (*Arenga pinnata* Merr). *Bulletin of Balitka No. 10 / 1990*, pp: 21-28. The Coconut Research Center of Manado, Indonesia.
 - [17] Dachlan, M.A. 1984. Processing of the sugar-palm. *Industry and Agricultural Development, R&D Department*. Jakarta.
 - [18] Faridatul-Ain, M.R., Y.A. Yusof, N.L. Chin and Z. Mohd Dom. 2014. Storage Study of Arenga Pinnata Juice. *Agriculture and Agricultural Science Proscenia*, 2: 218-223.
 - [19] Puslitbangbun. 2003. Program of the Environmental Improvement and Poverty alleviation through the development of the sustainable agribusiness of sugar-palm. *The Plantation Research and Development Center, Bogor, Indonesia*. pp.1-9.
 - [20] Purnomo, E. 1997. Problems and efforts to improve palm sugar production and quality. *Indonesian Sugar Plantation Research Center. Bulletin No.19*, pp.55-58.
 - [21] Miles, M. and A.M. Huberman. 1992. *Analysis of Qualitative Data: Resource Book on new methods of analysis*. UI Press. Jakarta.
 - [22] Iswanto, A.H. 2009. *The Sugar-Palm Trees*. Scientific Paper. University of North Sumatera. Medan, Indonesia.
 - [23] Lubis, W.W., L. Sihombing and Salmiah. 2014. Analysis of added values of sugar-palm industries in the suka maju village, Sibolangit, Deli-Serdang District. *Agribusiness Program, Faculty of Agriculture, University of North Sumatera, Medan*.
 - [24] Sunanto, H. 1993. *The Sugar-palm trees: Cultivation and its Multifunction's*. Kanisius Publ., Yogyakarta.
 - [25] Rumokoi, M.M.M. 1990. The benefits of sugar-palm trees (*Arenga pinnata* Merr). *Bulletin of Balitka No. 10 / 1990*, pp: 21-28. The Coconut Research Center of Manado, Indonesia.
 - [26] Effendi, D.S. 2009. The Sugar-Palm, Source of alternative energy. *Agriculture Research and Development Magazine*, 31(2):1-3.
 - [27] Kusumanto, D. 2008. The Juices Productivity and Tapping Frequency of Sugar-Palm Trees) <http://kebunaren.blogspot.com/produktivitas-nira-dan-frekuensi-sadapan-pohon-aren>. (Retrieved 13 may 2015).
 - [28] Rumokoi, M.M.M. 1990. The benefits of sugar-palm trees (*Arenga pinnata* Merr). *Bulletin of Balitka No. 10 / 1990*, pp : 21-28. The Coconut Research Center of Manado, Indonesia.
 - [29] Heyne, K. 1950. *The Indonesian Useful Plant. Part I*. Translation by the Forestry Research and Development Board. Jakarta. 615 p.
 - [30] Mahmud. D. Allorerung and Amrizal. 1991. Prospects of coconut, sugar-palm, papyrus and gewang trees in sugar production). *Bulletin of Balitka, No.14 / 1991*, pp.90-105. The Coconut Research Center of Manado, Indonesia.
 - [31] Sunanto, H. 1993. *The Sugar-palm trees: Cultivation and its Multifunction's*. Kanisius Publ., Yogyakarta.
 - [32] Soeseno, S. 1991. *The Sugar-palm Cultivation*. Publisher organization Co.Ltd., Jakarta.
 - [33] Hussain, M. D., M.I. Hussain and M. Alam. 1992. Juice harvesting from date and Palmyra palm tree in Bangladesh. *Indian Journal of Agricultural Engineering*, 2(1): 17-24.
 - [34] Dali bard, C. 1999. Overall View on the Tradition of Tapping Palm Trees and Prospects for Animal Production. *Livestock Research for Rural Development*, pp.1-37.
 - [35] Alwia, U., S. Agus, H. Luckman and M. Wahib. 2014. The Impact of Home-Based Business Processing Palm Sugar to Increase Socio-Economic Welfare of Farmers In South Halmahera Regency. *Journal of Business and Management* 16(11): 32-37.
 - [36] Juliana, A., F. Mukhyar and A. Dja'far. 2011. Financial study of sugar-palm industries in the Padang Batung, District of. *Headwaters South Journal of Rural Agribusiness*, 01(03): 222-232.
 - [37] Sopiannur, D., R. Mariati and Juraemi. 2011. Study of the sugar-palm industry income based on their fuels in Girirejo, Lempage village, Sub district of North Samarinda. *EPP*, 8(2): 34– 40.

- [38] Widyawati, N. 2012. Success of the future investment in the sugar palm plantation. Lily Publisher, Yogyakarta.
- [39] Burhanudin. 2005. Prospects of cooperation groups in sugar-palm production). Jakarta.
- [40] Aliudin. S. Sariyoga and D. Anggraeni. 2011. Efficiency and Income of sugar-palm industries in Cimenga village, Cijaku, Lebak District, Banten Province). Journal Agroekonomi (Jour of Agro economics), 29(1): 73-85.