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Farmer Empowerment to Increase Productivity of Sago (*Metroxylon sago spp)* Farming

Marliati Ahmad

Faculty of Agriculture, Islamic University of Riau, Jl Kaharudin Nasution 103, Pekanbaru Riau, 28284, Indonesia
E-mail: marliatiahmad@yahoo.com

Abstract-- **Domestic and world demand for sago starch continues to increase, both for the food and non-food resource. To response the opportunity, farmer empowerment need to be encouraged to increase current low productivity (less than 15 tonnes /ha/year). Through famer empowerment, traditional sago farming will changed to be managed farming, which enable farmers to implement and apply recommended technology called Best Management Practices and fulfil other related support to uplift their sago farming productivity.**

Keywords -- ***Low productivity. Farmer empowerment, Best Management Practices***

I. INTRODUCTION

Indonesia is the biggest producer of sago starch in the world, with a production of 585,093 tons / year at this time from the total plant area of 1,843,287 ha (including 1,403,883 ha of natural sago in Papua and West Papua). Sago potential as a source of food and industrial materials has been recognized since the 1970s, but until now sago cultivation in Indonesia is still largely traditional and yet intense managed. Sago plant productivity is still low, at less than 10-15 tons / ha / year, standard rate if farmers manage the garden in general, in line with domestic and global demand continues to sago starch continues to increase, both for food and non-food materials.

Sago palms (sago Metroxylon Rottboell), is a plant that stores starch in its trunk (Metro: pith, xylon: xylem, sago: starch). Sago palms are hypoxanthic plants (flowering one time in the life cycle) and soboliferous (saplings). The life cycle of plants from seed to establish sago seeds take up to 11 years in four periods of the early growth phase or clusters (russet) takes 3.75 years, tillering phase takes 4.5 years, infoloresensia phase (flowering) it took 1 year and phase seed formation takes time for 1 year.

Sago is native to Indonesia, probably origin from the Moluccas and Papua. In these places germ plasma diversity found sago highest. But until now there is no data revealed since the beginning when sago is known. Sago is one of the potential sources of carbohydrates in addition to rice, especially for the people of eastern Indonesia as Irian Jaya and Maluku, as the main food.

Sago plant productivity is still low at less than 10-15 tonnes / ha / year, because sago is not managed intensively. Most farmers still cultivate sago traditional, hereditary, with a little attention and even as a side job. Through intensive cultivation, by implementing Best Management Practices, or recommended technology, sago productivity can up to 25 tons / ha / year. Until last year, sago production of 210 tons or 4% - 5% of the national production potential to reach 5 million tons per year. Optimizing the absorption of production will be done by opening the market of alternative on the energy sector.

The factors inhibiting the low productivity of sago consists of internal factors and external factors. Internal factors derived from sago farmers themselves in the form of low capacity (knowledge, attitudes, motivation and skills) farmers in the cultivation of sago. External factors such as the lack of extension activities and the provision of information due to lack of numbers and competency of agricultural extension field of sago, still strong socio-cultural values that are not visionary and promotion / support the development of sago palm and its products, the lack of performance that does not support farmer groups and the leadership group that did not effective, lack of facilitation from government agencies such as the agro-soft loan support, market information, support transportation infrastructure; national and regional development policy that puts prospective sago as a commodity; lack of proper facilitation and partnership with private companies, the lack of sago processing industry as a buyer and the distant location of sago trunk processing industry.

This paper illustrates the importance of empowerment of sago farmers intensively, to increase sago productivity. Empowerment sago farmer is a step and visionary strategies to improve productivity through: education and training; mentoring; development of systems and tools of marketing of agricultural products; consolidation and security of agricultural land area; provision of financing facilities and capital; access easiness to science, technology, and information; and institutional strengthening of farmers. Empowerment must involve a synergy and contribution of all parties, national and local governments, farmers, entrepreneurs, researchers, in order to realize an increase in sustainable .

II. Potency of Indonesia Sago

Indonesia has the world's largest sago plants. 2,942,278 ha of sago that is in the world, as many as 1,843,278 ha in Indonesia, Papua New Guinea (1,02 million ha), Malaysia (59,000 ha), Thailand (5,000 ha), Filipina (3,000 ha) and other countries (3000 ha). Sago plant spread almost all over Indonesia, from west to east, both large and small islands. Papua is a region which has the largest sago plant (1,60,873 ha), followed by Sumatra (103,312 ha), Sulawesi (45,540 ha), Maluku Islands (41,949 ha), Borneo (8,304 ha) and Java (300 ha) (Table 1).

In terms of species diversity, Indonesia has many kind of sago. In Maluku and Papua are known to have the highest genetic diversity and the potential for the development of a superior kind of sago in the future. Three types of sago famous and most have economic value because the carbohydrate content is the most are Sago Molat (Metroxylon sagus Rottb), Sago Tuni (Metroxylon rumphii Mart), and Sago Ihur (Sylvester Metroxylon Mart).

Sago plants have the ability to produce higher carbohydrate carbohydrates than other crops. From the new plantings, sago started producing at the age of about 10 years. But after that, with the ability to always grow new shoots, sago can continuously produce economically without new planting. Until now, sago starch is known to have the highest yield per unit area per unit time. The ability of plants to accumulate sago starch in its trunk can reach 200 to 220 kg / tree .Production of dried sago starch in Maluku can reach 345 kg / tree (Bintoro, 2012).

When compared with other carbohydrate crops, sago productivity far exceeds the productivity of paddy 10-16 t / ha / yr (2 x planting) and corn 8-10 t / ha / yr (1 x planting), wheat (5 tons / ha / years), potatoes and cassava. This huge potential if managed well can be a potential source of food to meet the caloric needs of 240 million people in Indonesia.

Recent studies demonstrate the ability of some types of sago produced more than 700 kg of dry starch per tree (Bintoro, 2012). Thus, theoretically, with 100 trees per hectare can produce 70 tons of dried sago starch. But for some reason, the results may not be consistent optimistic at figure.

In terms of sago products are multi-benefit products. Sago starch has long been processed into a variety of traditional foods in various regions as a staple food and an extra, is now widely cultivated "modern" like mihun, vermicelli, sago rice, glucose syrup, cakes, breads, salad dressings. Usefulness of sago starch for non-food products such as: bio ethanol, siko dextrin, bio plastics, glues, plywood, textiles, citric acid, lactic acid. Sago pulp is also used as a component of animal feed. Skin sago processed into particle board, flooring and briquettes / fuel. Sago leaves are used for traditional medicine, roof, wall, where sago and crafts.

TABLE I
Sago Palm Stands In The World

No	Country / Provinces	Sago palm planta-tion, hectares	Projected sago flour, tons/years	Actual sago flour, tons/year	Reference
I	Indonesia				
1	Sumatra	103.312	1.549.680	171	
	Aceh	10,396	155,940		Agriculture Ministry of Indonesia (2006)
	Riau Pesisir	69,916	1,048,740	171,000	Riau terkini (2011) dated 30 Mar -11
	Mentawai	3,000	45,000		IPGRI, Roma, 1997
	Selat Panjang	20,000	300,000		National Sago Prima (2012)
2	Java	300	4.5	300	
	West Java	300	4,500	300	BPPT Report (1980)
3	Kalimantan	8.304	45		
	South Kalimantan	5,304	79,560		Agriculture Ministry of Indonesia (2006)
	West and SW Kalimantan	3,000	45,000		Bakosurtanal (1996)
4	Sulawesi	45.54	683.1		
	North Sulawesi	23,400	351,000		Bakosurtanal (1996)
	South Sulawesi	8,159	122,385		Bakosurtanal (1996)
	Central and South West Sulawesi	13,981	209,715		Bakosurtanal (1996)
5	Moluccas	41.949	629.235	227.793	S.Bustaman &A. N.Susanto, 2007, JEP,Vol.XV(2)

	Seram	19,494	292,410	221,793	Bakosurtanal (1996)
	Halmahera	9,610	144,150	6,000	Bakosurtanal (1996), Inhutani (2012)
	Bacan	2,235	33,525		Bakosurtanal (1996)
	Buru	848	12,720		Bakosurtanal (1996)
	Aru islands	9,762	146,430		Bakosurtanal (1996)
6	Papua	1,60,873	2,.418,095	186,000	Greenradio news (26 January 2012)
	Sorong *	499,642	7,494,630	150,000	Bakosurtanal (1996)
	Merauke *	342,273	5,134,095		Bakosurtanal (1996)
	Mamberamo*	21,537	323,055		Bakosurtanal (1996)
	Bintuni *	86,237	1,293,555	36,000	Sagindo Sari Lestari (2012)
	Fakfak *	389,840	5,847,600		Bakosurtanal (1996)
	Biak *	21,537	323,055		Bakosurtanal (1996)
	Jayapura *	36,670	550,050		Bakosurtanal (1996)
	Salawati*	6,137	92,055		Bakosurtanal (1996)
	Papua Barat	40,000	360,000		Austindo Nusantara Jaya Papua, 2012
	Waropen	200,000	3,000,000		Suara.dogiyai.fm (June, 2012)
	Indonesia, total	1,843,278	27,364,170	385,093	Chris Hellier (June 2010)
II	Papua New Guinea*	1,000,000			Chris Hellier (June 2010)
	Papua New Guinea	20,000			Chris Hellier (June 2010)
III	Malaysia, Sabah	10,000			Chris Hellier (June 2010)
	Serawak	53,000			IPGRI (International Plant Genetic Resources Institute), 1997
	West Malaysia	5,000			IPGRI, 1997
IV	Thailand	3,000			IPGRI, 1997
V	Philippines	3,000			IPGRI, 1997
VI	Other countries	5,000			
	TOTAL	2,942,278			

III. Low Productivity Of Sago

Productivity is the ability sago plantation / cultivation of sago starch yield per hectare per year, while the production is the ability to produce planting sago flour. Productivity is the product of the number of stems were harvested multiplied by the average production per stem flour in 1 hectare of land for a year sago. Productivity figures are used as a standard production forecast is 15 tons / ha / year, based on the production of sago productive land for a year with a semi-intensive care that the farmers

Sago national productivity is very low, 317. 4 kg / ha / year, which is the result of the national production of 585,093,000 kg divided with the national land area of 1,843,287 ha of sago per year. This value is only 2.1% of sago starch production capacity projected at 27,364,170 tons / year. The number is also very low when compared with the productivity of sago intensive in Batu Pahat, Malaysia (Flach 1977)

In Maluku, the potential production of sago wet starch wet in average 292 kg / tree and felling potential average 102 tree / ha / yr, then the productivity of wet sago starch ± 30 t / ha / yr. Productivity of cultivated sago can reach 25 t / ha / yr (Flach, 1997; Suryana, 2007). Productivity in Maluku wet sago starch varies between 100-500 kg / tree depending on the species (Alfons and Bustaman, 2005). Tuni sago type has the highest production potential (500 kg / tree) followed Molat types, Ihur, and Makanaru respectively 400, 300, and 250 kg / ha. Type Rattan and Molat .Prickly Rattan Type has the lowest production potential respectively 100 and 200 kg / tree.

From healthy sago plantation and managed semi-intensively in Riau, the average dry starch yield 10 t / ha / yr usual obtained. With the improvement of cultivation techniques and losing control in the process of harvesting and processing, the results still can be increased to 15 t / ha / yr. The number is already several orders of magnitude higher than other starch crops.

Actual production levels of sago starch from Papua only 186,000 tons per year, while production capacity 24, 418,095 tons per year. This rate is significantly different when in comparison with in Malaysia. Starch yield as high as 25 tons / ha / yr are reported in intensive sago plantation in Batu Pahat, Malaysia (Flach 1977).

TABLE II
AREA, PRODUCTIVITY AND TOTAL FARMERS

Province	Area (Ha)	Productivity (kg/Ha)	Total Farmers (KK)
Papua	525	363	1663
Maluku Utara	294	338	292
Maluku	26	300	160
Sulawesi Tenggara	481	230	1883
Sulawesi Barat	2533	352	6670
Sulawesi Utara	5073	274	8155
Sulawesi Tengah	2989	244	3289
Gorontalo	64	333	154
Sulawesi Utara	3691	245	5820
Kalimantan Timur	15	200	42
Kalimantan Selatan	5304	334	14201
Kepulauan Riau	5608	381	1778
Riau	57619	279	16952
Nangroe Aceh Darussalam	10306	343	22731
Total	***94528***	***292***	***83790***

(Source: Ministry of Agriculture, 2006)

A. Factors Cause of Low Productivity

Factors causing low productivity is generally caused that the sago plant management is not intensive and still minimal. Ministry of Agriculture at the Food Sago Festival on 3-4 May 2014 in Jakarta, stated that 92% of sago palm in Indonesia currently displaced.. This shows that the government's commitment to empower farmers sago is still minimal (see Table 3)

When analyzed further, neglect was caused by factors that are interrelated as follows:

1) Lack of knowledge, attitudes and skills of farmers in managing sago : Sago cultivation is carried out by farmers for generations. The technique still practiced by farmers based on knowledge gained from previous generations. Sago processing is still traditional. Utilization of sago as a food is only based on the tradition, with little innovation over the long term. Food sago is also perceived by people as food that is less prestigious.

2) The absence of Sago Cultivation Technical Guide The Standard : Technical guidelines also often known cultivation technology package recommendation or recommended technology package. Lately, the term BMP becomes popular, that sense is a set of best practices in the cultivation and management of sago palms should be implemented in order to obtain maximum crop yield sago. Unfortunately, best practices in the cultivation of sago is still not there, so cultivation of sago still face difficulties in obtaining a sago cultivation guidelines in order to obtain maximum productivity results. Coverage of Best Management Practices in the activities of this is the following: a. Intake of sucker; b. Filling; c. Nursery; d.Weeds control; e.Prunning; f. Harvesting ; g. Control of pests and diseases; h. Census ; i. Water Management; j. Fertilizing; and k. Fire control

3) Lack of extension workers which has Competence in the Sago Cultivation : Until now the policy of increasing the number and quality of agricultural extension / forestry with sago specialisation is still minimal.

4) Strong socio-cultural values that are not visionary and support the development of sago palm and its products: Social values that eating sago low prestige still attached in the center areas of sago, which was formerly in the community sago is the staple food

5) Lack of performance of farmer groups who do not support the promotion of sago plants plus ineffective leadership group : Lack of agricultural extension also cause it. It is different in the area of advanced crop cultivation.

At Meranti Islands Riau, sago plantation owners, buyers of farmer;s trunk sago, owners of sago processing, merchant exporter of sago starch and flour between islands, are member of the sago cooperatives.

6) Lack of agribusiness facilitation of government agencies such as the soft loan support, pricing information, support transportation infrastructure

7) The absence of national policies and significant areas that empower farmers by placing sago sago as prospective commodity

8) Lack of proper facilitation and partnership with private companies,

9) Lack of sago processing industry and the distant location of the processing industry

B. Empowerment of Farmers to Increase Productivity Sago

To improve the productivity of sago, needs to empower farmers that all efforts made to optimize or build farmer's power (capacity) internally (self capacity) and external (the ability to use / access to agricultural resources), so that farmers are able to empower itself (realizes their own and do the best for them in dealing with the problems faced), so that they are aware and full power in agribusiness and shaping a better life.

Efforts conducted through empowerment through education and training, extension and mentoring, development of systems and tools of marketing of agricultural products, and guarantees the consolidation of agricultural land area, ease of access to science, technology and information, as well as farmer institutional strengthening.

Central and local governments hold the key to the empowerment of sago farmers. Other parties such as private companies, NGOs, farmers and other stakeholders will "move on" if the government started. Central and local governments are expected to have a breakthrough to initiate breakthrough development sago agribusiness. Diversified needs of food and energy is the rationale sago farmer empowerment.

IV. CONCLUSIONS

Empowerment sago farmers needed to increase productivity and production of sago flour. This is necessary because the demand continues to increase sago both for domestic and international, as food and non-food

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