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Determinants of Value Addition in Sago Processing in Southeast Sulawesi, Indonesia

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Abstract: *The study aimed to find out the effect of the amount of raw material, labor, output price, labor wage, raw material price, and price of other inputs on the value added amount in sago processing. Konawe District was selected purposively as study location due to its status as the main sago producing district in the province of Southeast Sulawesi. There were 26 sago processor groups existing in the district, and all of them were taken as respondents. Data and information were collected using questionnaire and analyzed using production structure and multiple regression analysis. Study results show that as a whole, variables of production capacity, the amount of raw material, labor, output price, labor wage, raw material price, and price of other input have significant effect on the value added. Partially, production capacity, the amount of raw material, output price, raw material price, and price of other input each have significant effect on the value added.*

Keywords: *Indonesia, processing, sago, Sulawesi, value addition*

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I. Introduction

Agricultural sector is one of the leading sector in the Indonesian economy and has contributed significantly to Gross Domestic Product, generation of employment, source of foreign exchange, supply of basic foods, and source of income for the majority of people living in rural areas [1]. However, in Southeast Sulawesi province, there has been declining trend in such roles. This can be seen in the decreased proportion of labor force working in agriculture, decreased share of agricultural sector to Gross Regional Domestic Product (GRDP), and decreased growth rate of agriculture [2]. Declining performance of agriculture is related to the low productivity of agricultural sector [2] due to, among others, labor underemployment in the sector and low value commodity output [3]. To increase value of commodity output, there should be renewed focus in agricultural development to put much emphasis on agroindustry as a process of adding value to improve the existing product.

Agroindustry has attracted growing attention as it can improve and stabilize farm income, increase employment, and revitalize primary agriculture and rural economy [3]. Value addition in agriculture enables farmers or processors to maximize their produce both in quantitative and qualitative terms and at the same time receive a bigger share of the final retail price [4]. However, in order to be sustainable, the choice of crop and farming system should be suitable with local agro-ecological conditions and economic needs of farming households. In areas where a food crop is a leading commodity, the focus of agroindustry could be on that crop as it can also improve household food security which is one of the primary objectives of agricultural and rural development.

FAO defines food security as situations where ‘‘all people at all times have the physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life” [5]. Thus with food security it is expected there will be no hunger or starvation. To attain food security, the government has exerted efforts to promote food diversification program to increase production of food crops other than rice [6]. In Southeast Sulawesi, the main traditional food crops are maize, cassava [2] and sago [7]. Sago is grown in swamp-forest areas in the mainland of Southeast Sulawesi and has provided the sago starch as the natural staple food for the inhabitants.

Sago palm is an important crop for communities living in the mainland of Southeast Sulaawesi as the palm produces starch that can be used for food and for various purposes [7]. As foodstuff, sago starch might be used as subsistence food, complementary food, and emergency food [8]. Tolakinese are the main sago eaters in Southeast Sulawesi. For them, the food served at one eating ocassion is considered incomplete without the presence of sago-based meals [9]. Sago can be made into various food and snacks. Sago is commonly consumed by pouring hot water over the slightly sour wet starch and using a stick or a spoon to stir it. The resulting glue-like mass (called *sinonggi*) is eaten with some fish and vegetable dishes [10]. Besides, sago starch has considerable industrial potential as a raw material for the manufacturing of food additives, sugars and flavoring [11]. In fact, due to wide utilization of and high demand for sago starch, if sago agroindustry can be developed properly sago can improve food security and farmers or processors welfare, and support the development of the economy of the local communities [7,12,13].

There are several steps involved in sago starch processing, namely (1) selection and felling of palms, (2) clearing, debarking and splitting the logs, (3) breaking down the pith of the log, (4) extraction of starch, (5) sedimentation and dewatering, and (6) starch drying and packaging [14]. Method of processing is still traditional but its level has changed from domestic to small-scale processing plant (Karim *et al.* as cited in [14]. In this regard, processing operation is done collectively through a group of several people and mechanization has been introduced, such as chainsaw for cutting, a rasper for grating and a pump for washing the pith [15]. These transformations occur as the concept of sago changes from staple food to other starch uses and starch goods use, reflecting the development of the economy of the local communities [15].

According to [16], value added in agriculture sector can have significant influence on employment generation and communities' welfare. Agroindustrial sector can contribute to increased employment opportunities and income generation [17]. Therefore, given the low level of economic development status of sago producing areas in Southeast Sulawesi [18], efforts should be exerted to promote sago processing. Higher contribution of sago in farmers or processors' income and rural employment will enable the increased role of sago in reducing poverty and promoting economic development.

There have been some studies regarding sago processing technology [14,15, 19; 20] as well as profitability and income [21]. However, studies about value addition and its determinants in sago processing are lacking. This study aimed to fill the gap to find out determinants in sago processing in Southeast Sulawesi. The result will be useful to relevant government agencies and development stakeholders not only to optimally utilize sago for poverty alleviation and economic development, but also to promote its sustainability in the long-term.

II. Methodology

The study was carried out in Konawe District of Southeast Sulawesi Province using survey method. Data and information were collected from respondents using interviews based on the questionnaires. Konawe District was selected purposively as study location because it is one of the main sago producing districts in the province, and because it is close to Kendari Municipality as the capital of the province. Respondents were sago processors' groups that are still active in sago processing. There were 26 sago processing groups currently operating in the district. Using census method, all these sago processors groups were taken as respondents.

The amount of value added from sago processing was calculated using analysis of production structure modified from [22]. Multiple regression techniques were used to understand the relationship between dependent variable and independent variables and then assess the importance of various independent variables to that relationship [23]. Dependent variable is the amount of value added (VA), whereas independent variables are production capacity (PC), raw material (RM), labor (L), output price (OP), labor wage (LW), raw material price (RMP), and other inputs price (OIP).

Multiple regression model was specified explicitly as:

$$VA = b_0 + b_1\,PC + b_2\,RM + b_3\,L + b_4\,OP + b_5\,LW + b_6\,RMP + b7\,OIP + E_i,$$

Where,

VA = Value added.
PC = Production capacity
RM = Raw materials.
L = Labor.
OP = Output price
LW = Labor wage
RMP = Raw material price
OIP = Other input price
b_0 = Constant
$b_1 ... b_7$ = coefficient to be estimated
Ei = Error term

III. Results and Discussion

3.1. Value Added

The amount of value added was calculated in order to understand value addition from processing of sago stem (pith) to become sago starch. Value added is calculated from the difference between ouput value and value of raw material and other inputs used in the processing. All analysis components were measured and expressed in the unit of per kg of raw material. Production structure used to find out value added amount is presented in Table 1.

Product value was obtained from multiplication of conversion factor and product price, and the average product value was Rp1,820.35/kg of raw material. Average yield was 7,088.48 kg per month produced from three production cycles. Average labor of workers was 4, starch price Rp3,138.53/kg, labor wage Rp1,286,961.54 per month, raw material price (pith) Rp390.57 per kg, and other input price of Rp353.36 per kg of raw material. Working day is ten days for each production process, with the total 30 days per month.

In this study, conversion factor is the ratio between the amount of production and the amount of raw materials being used in one production process. Conversion factor is 0.58, meaning that 0.58 kg of sago starch will be obtained from 1 kg of sago pith being processed. Labor coefficient (0,00033) is the ratio between labor input and raw materials being processed. Value added is also affected by level of technology used and treatments to the raw materials. Processing is done manually, and the use of machine is for grating and for drawing in water. The amount of value added is averagely Rp1,076.42 per kg of raw material. This figure is obtained by substracting product value with raw material price and other input price. Value added ratio is 59.13% implying that 59.3% of market value of sago starch is processor's income from sago processing. This value added ratio is higher than that in processing of cassava [24], cocoa beans fermentation [25], salak [26], and star fruit [27].

Table 1. Production structure of sago processing

No.	Output, input and price	Unit	Value
1.	Output	Kg	7,088.48
2.	Raw material input	Kg	12,121.49
3.	Labor input	Person/month	4.00
4.	Conversion factor (1/2)		0.58
5.	Labor coefficient (3/2)		0.00033
6.	Product price	Rp/kg	3,138.53
7.	Wage rate	Rp/person	1,286,961.54
	Income and profit:		
8	Raw material price	Rp/kg	390.57
9	Other current input	Rp	353.36
10	Product (4 x 6)	Rp/kg	1,820.35
11	a. Value added (10 – 8 – 9) b. Value added ratio (11a/10)	Rpkg %	1,076.42 59.13
12	a. Labor income (5 x 7) b. Labor share (12/11a)	Rp/kg %	424.70 39.45
13	a. Profit (11a – 12a) b. Profit rate (13a/10)	Rp/kg %	651.72 35.80

3.2 Determinants of value addition

Table 2 presents regression results of determinants of value addition in sago processing Adjusted R^2 is 0.908, implying that 90,80% of variation in dependent variable (value added) can be explained by variation of independent variables (production capacity, raw material, labor, output price, labor wage, input price, and other input price) whereas the remaining 9.20% is due to other variables not included in the model. Correlation coefficient is 0,966 which is positive and close to 1, meaning that independent variable is closely associated with independent variables. With F ratio 36.248 and p <0,05, the model as a whole has statistically significant predictive capability. In other words, overall, independent variables have significant effect on the dependent variable.

Table 2 shows t-value, which reveals the influence of each individual independent variable on dependent variable, and regression coefficient as well. Factors that have significant influence on value added are production capacity (β = 0.366), the amount of raw material (β = -0.137), output price (β = 0.433), raw material price (β = -3.482), and price of other inputs (β = -0.823). By incorporating regression coefficients, the regression equation will be as follows:

$$VA = 417.499 + 0.366\ PC – 0.137\ RM – 19.136\ L + 0.433\ OP + 8.411\ E\text{-}5\ LW$$
$$- 3.482\ RMP – 0.823\ OIP.$$

Table 2. Regression Results of Determinants of Value Addition in Sago Processing

No.	Independent variables	Coefficients	t-value	Sig.	
1.	Constant	417.499	0.791	0.439	ns
2.	Production capacity	0.366	6.897	0.000	s
3.	Amount of raw materials	-0.137	-9.757	0.000	s
4.	Labor	-19.136	-1.871	0.078	ns
5.	Output price	0.433	5.873	0.000	s
6.	Labor wage	8.411E-5	0.544	0.593	ns
7.	Raw material price	-3.482	-3.295	0.004	s
8.	Price of other inputs	-0.823	-2.503	0.022	s
Adjusted R^2					0.908
R					0.966
F ratio					36.248
$F_{Sig.}$					0.000

Notes: ns means non-signficant; s means significant at 5% level

The regression results show that relationships between value added and production capacity and output price are positive, whereas value added and the amount of raw material, raw material price, and price of other inputs is inversely related. This corroborates findings by [28] that total quantity of production positively influenced value addition, meaning that the more a farmer produces the more they will have surplus for value addition. [29] reported that the amount of value added is affected by raw material price and output price. The result is also in accordance with study by [17] that the main constraints in agroindustry development include inadequate supply and the poor quality of raw materials. Quality of raw material is often unsuitable, and the period of availability of the raw material is short and unreliable. With respect to production capacity, [17] argued that obsolete technology is also the main constraint in agroindustry development, as it will result in low efficiency and poor quality of the output. [30] stated that technoware such as tools, equipment, machines, vehicles, and physical facilities will affect quality of output and hence the development of small-scale enterprises.

Raw material price and other input price are determinants of value added amount. This is because the two variables lead directly to increase in production cost. Higher production cost will lower value added amount and profit, which will in turn become a constraint for the agroindustry development [31]. On the other hand, output price has significant influence on value added amount. Higher output price will directly increase value added amount and profitability of processing operation.

IV. Conclusion

The amount of value added from sago processing is Rp1,076.42/kg of raw material, with value added ratio of 59.13%. Overall, the amount of value added is affected by variables of production capacity, the amount of raw materials, labor, output price, labor wage, raw material price, and price of other inputs. Partially, variables of production capacity, the amount of raw material, output price, raw material price, and other input price each have significant effect on the amount of value added. Variables of labor and labor wage do not have significant effect on the value added.

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