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Downstream and Added Value of Kintamani Arabica Coffee Products

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***Abstract* - Kintamani Arabica coffee is already very well known to the public. Several types of processed derivative products from cherry coffee can be made to increase its added value. This study aims to determine the type of down streaming of Kintamani Arabica coffee products using the observation and in-depth interview methods, and to calculate the added value of its downstream products using the Hayami method. The location of the study was determined purposively in Kintamani District, Bangli Regency. Based on the results of the study, it was identified that the dominant downstream products of Kintamani Arabica coffee are green bean coffee, hard skin coffee, roasted coffee, and ground coffee. The most common types of production are green bean and hard skin coffee products, because the demand for these two types of products is higher. Based on the added value analysis, it was obtained that the added value of Arabica coffee products increases from upstream to downstream, namely: hard skin coffee IDR 2,510/kg, green bean coffee IDR 4,617/kg, roasted coffee IDR 6,447/kg, and ground coffee IDR 7,873/kg. High added value is not a benchmark for producers to choose production priorities but is more dominantly determined based on the amount of product demand and the availability of market access.**

Keywords: product down streaming, added value, Kintamani arabica coffee.

I. INTRODUCTION

Coffee is an important agricultural commodity as a foreign exchange earner for Indonesia. Coffee as a fresh stimulating beverage and is generally consumed by the public in the form of drinks. Coffee production in Bali predominantly comes from two types of coffee plants, namely Arabica coffee and Robusta coffee. Based on data from the Bali Central Statistics Agency in 2024, coffee production in Bali was 14,579 tons, consisting of 3,644 tons of Arabica coffee and 10,935 tons of Robusta coffee. Robusta coffee production of 94.35 percent was produced from two districts, namely Tabanan Regency (46.29 percent) and Buleleng Regency (48.06 percent), while Arabica coffee production was mostly (53.79 percent) produced from Bangli Regency (SBP, 2024a; SBP, 2024b). Bangli Regency as the highest producer of Arabica coffee in Bali, is predominantly produced from Kintamani District. Over the past five years (2019-2023), Bangli Regency contributed an average of 53.85 percent of the total Arabica coffee production in Bali Province. Kintamani Arabica coffee is widely known to the public and is one of the Indonesian coffees that has received a Geographical Indication certificate. Kintamani Arabica coffee has a unique taste compared to other types of coffee products. Kintamani Arabica coffee has its own competitive advantages and is in great demand by coffee lovers around the world.

The mechanism of the added value of the agricultural product circulation value chain can be seen from five aspects: primary processing creates form utility, cross-regional transportation creates location utility, storage inventory creates time utility, market division creates acquisition utility, and brand creation creates perception utility (Fan, et. al., 2021). Theoretically, the further downstream an agricultural product is, the higher its added value. Added value is the increase in the value of a commodity because it undergoes a processing, transportation or storage process in a production (Ministry of Finance, 2012). Therefore, it is necessary to identify how many types of downstream products based on Kintamani Arabica coffee have been created and produced by the coffee processing community in order to obtain added value. The study was conducted with the aim of determining the downstreaming of Arabica coffee-based products and calculating the added value of its downstream products.

This research study can provide benefits in providing information on down streaming of Arabica coffee-based products. This is needed to obtain the right direction for Arabica coffee producing communities, business people and policy makers in making regulations related to the development of downstream products of Kintamani Arabica coffee. The development of appropriate products and regulations will have the potential to obtain optimal added value and be well distributed to each stakeholder involved.

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II. LITERATURE REVIEW

2.1 Added Value of Agricultural Products

Value added is the increase in the value of a commodity due to processing, transportation or storage in a production process. In the processing process, added value can be defined as the difference between the value of the product and the cost of raw materials and other inputs, excluding labor. While the margin is the difference between the value of the product and the price of the raw materials only. This margin includes the components of the production factors used, namely labor, other inputs and compensation for processing entrepreneurs (Hayami et al, 1987).

All agricultural product needs to have their added value increased and utilized for the welfare of every stakeholder involved. The development of agricultural products including coffee commodities into various downstream products requires the right strategy to obtain optimal added value. Wibowo et. al. (2021) recommends the development of the Java Ijen-Raung Arabica Coffee agroindustry with potential downstream coffee products being ground coffee. The added value generated from processing ground coffee is IDR 9,320/kg with a value-added ratio of 48.09%.

The relationship between product added value and marketing is needed to generate optimal total income for coffee processors. Although the added value of the product is high, if it is not balanced with wide and efficient marketing access, the added value cannot support good total income. Baihaqi, et. al. (2019) analyzed the added value of export Arabica coffee agroindustry processing and its marketing efficiency value in Central Aceh, Case study at Oro Coffee Gayo. The added value of export Arabica coffee green beans grade-1 (special) and green beans grade-2 (premium) is classified as moderate. Based on the marketing efficiency value, green beans grade-1 and green beans grade-2 Oro Coffee Gayo are considered efficient.

2.2 Coffee Processing and Downstream Products

There are three ways to process coffee: washed, semi-washed, and sun-dried. The 60% of the quality of coffee is determined by these primary and secondary coffee processing. Therefore, to produce good quality coffee and remain competitive in the world market, proper coffee processing is required both in terms of quality and environment, as well as breeding and other pre-harvest activities (Banti & Abraham, 2021). Meanwhile, Fadri, et. al (2020) stated that the quality of the coffee produced can be influenced by the proper harvesting and post-harvest processes. Post-harvest handling of Arabica coffee consists of harvesting, peeling, drying, roasting, grinding, packaging, and storage. Firdissa, et. al. (2022) evaluated the effects of processing and drying methods on the quality of coffee varieties. In general, all coffee varieties processed using the semi wash method and dried using the solar tunnel method produced higher initial total quality and total specialty coffee value, which was assessed below specialty quality Q1.

Cherry coffee processing produces products with added value, but also produces processing waste. Based on field observations, Arabica coffee processing waste from processing units around the Kintamani area has not been widely utilized to date. Utilization of coffee waste is limited to fertilizer. Coffee waste, especially in the wet processing process which is acidic, if allowed to accumulate (solid waste), stagnate (liquid waste), can disrupt the quality of the soil and the surrounding environment. According to Lee, et. al., (2023), coffee waste is often considered a problem, but it can be converted into value-added products if managed with clean technology and long-term waste management strategies. Several compounds, including lipids, lignin, cellulose and hemicellulose, tannins, antioxidants, caffeine, polyphenols, carotenoids, flavonoids, and biofuels can be extracted or produced through recycling, recovery, or increasing energy value.

2.3 Kintamani Arabica Coffee

The total area of coffee plantations in Kintamani District is currently 5,640.44 ha, which is 91.45 percent of the area of coffee plantations in Bangli Regency (Statistics Bangli Regency, 2024). The area of coffee plantations that can be harvested is highly dependent on the area of land conversion from coffee commodities to other commodities and the rejuvenation of coffee plants. Conversion of coffee plantation land by farmers is usually converted into citrus plants. Research on coffee farmers in Rejang Lebong Regency, Bengkulu reported that the high motivation of farmers caused them to convert coffee plants to citrus plants through three patterns, namely intercropping, gradual, and direct cutting due to economic considerations (Ishak, et al, 2021). This phenomenon also occurs among coffee farmers in Kintamani Regency.

Bangli Regency cherry coffee production in 2023 reached 2,017.91 tons and most of it (93.78%) was produced by coffee farmers from Kintamani District (Statistics Bangli Regency, 2024). All cherry coffee produced by Kintamani farmers is processed by coffee processing business units around Kintamani District. Although the price of cherry coffee is relatively expensive, some coffee processors still buy and process it.

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III. RESEARCH METHODS

The research location was chosen intentionally in Kintamani District, Bangli Regency. The location selection was based on the consideration that Kintamani Arabica Coffee already has a Geographical Indication certification and Kintamani District as the highest producer of Arabica coffee in Bali Province. Observation and in-depth interview methods were used to determine the type of downstream Arabica coffee products. In-depth interviews with several key informants of coffee processors were conducted until saturated data was obtained. The Hayami method (Hayami, et al, 1987), was used to determine the added value of downstream Arabica coffee products in three coffee processing companies (X, Y, and Z) in Kintamani District which were selected purposively.

The variable symbols and formulas used in calculating the added value (Hayami, et al, 1987) of each downstream product of Kintamani Arabica coffee are presented in Table 1.

Table 1: The variable symbols and formulas for calculating the added value

No	Output, Input, and Price	Symbols
1	Total Output (kg/production process)	a
2	Raw Material Input (kg/production process)	b
3	Labor Input (person)	c
4	Conversion Factor (kg output/kg raw material)	d = a/b
5	Labor Coefficient	e = c/b
6	Output Price (IDR/kg)	f
7	Average Labor Wages (IDR/person)	g
Income and Profit		
8	Raw Material Input Price (IDR/kg)	h
9	Other Input Contribution (IDR/kg)	i
10	Output Value (IDR/kg)	j = d x f
11	Added Value (IDR/kg)	k = j – h – i
	Value Added Ratio (%)	l% = k/j x 100%
12	Labor Income (IDR/month)	m = e x g
	Labor Share (%)	n% = m/k x 100%
13	Profit (IDR/kg)	o = k – m
	Profit Rate (%)	p% = o/j x 100%
Production Factors Remuneration		
14	Margin (IDR/kg)	q = j – h
	Percentage of Labor (%)	r% = m/q x 100%
	Other Inputs (%)	s% = i/q x 100%
	Owner's Profit (%)	t% =o/q x 100%

IV. RESULTS AND DISCUSSION

4.1 Identification of Downstream Products

Some coffee processing units found in Kintamani District, most of them only process cherry coffee into green beans and hard skin. However, there are also processing units that continue processing their coffee products into roasted coffee and ground coffee. Technologically, all processing units can produce various types of downstream coffee products, with the quality desired by consumers. However, low product demand and high levels of competition, especially for roasted and ground coffee products, mean that this type of product is produced in limited quantities, and only to fulfill orders. In addition, baristas also can mix distinctive and unique coffee, so that the demand for types of roasted and ground coffee is also diverse. The need for coffee for each barista is very diverse in quality and quantity, because each measure of coffee has a different taste. According to Amani & Ihsaniyati (2020), the existence of baristas has a very important role in educating the public about coffee and being the main agent in disseminating information about coffee.

The downstream levels of Kintamani Arabica coffee products that can be identified are: hard skin coffee, green bean coffee, roasted coffee and ground coffee. The dominant downstream products of Kintamani Arabica coffee are green bean and hard skin coffee, which range from 60-70 percent of all processed cherry coffee.The processing of cherry coffee produced by farmers in Kintamani District through wet processing, dry processing and honey processing. In general, the wet processing process is carried out, and there are several process adjustments depending on the situation and conditions at the processing site, such as: water availability factors, weather, economic conditions of coffee farmers or processors, and the number of orders for the type of coffee product. Each processing unit generally has complete processing facilities and facilities, up to the processing of ground coffee products.

Differences in coffee processing methods do not affect the degree of lightness, but do affect the water content, caffeine, polyphenol content and antioxidant activity of coffee beans. Dry processing can be used as an alternative processing method by farmers and processors because it is easier, cheaper, uses water more efficiently and provides products with the highest polyphenol content and antioxidant activity which are good for human health (Mangku, et al, 2022). By considering the flexibility and ease of natural processing (dry process), in fact, most farmers (75%) in Sidomulyo Village have long carried out dry processing and only 25% of farmers have carried out wet processing (Hariyati, 2014).

Processing of green beans with wet processing (full wash): The coffee processing process using the wet processing technique begins by removing the flesh and skin of the coffee fruit using a pulper. The separated coffee beans are then put into a container filled with water. The coffee beans are soaked in water to dissolve the mucus attached to the parchment. The water in the tub is replaced to dissolve the mucus still attached to the parchment. Next, the coffee beans are lifted from the water and dried using sunlight, until the water content of the coffee beans reaches 12 percent. Several coffee processing units in Kintamani District currently have a "greenhouse effect" coffee drying unit, to increase drying capacity and

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production quality. The drying process with this facility produces results that dry faster and are cleaner, not contaminated by other dirt, and the surrounding environment is easier to control. The attached parchment is removed using a huller after the coffee beans are dry. The parchment should not be removed if the processed coffee beans are going to be stored. The wet processing technique is designed to avoid the fermentation process of coffee beans during processing, so that uniformity of taste is obtained.

Based on field observations, there are variations in the wet processing process by doing initial soaking. One variation of the wet processing carried out by coffee processors in Kintamani is by soaking the cherry coffee before the process of removing the fruit skin with a pulper. The cherry coffee is put in a plastic bag or plastic drum with a capacity of 50 kg, then water is added to soak the coffee beans. This initial soaking is with a closed plastic bag or plastic drum, which is carried out between 2-5 days. During the initial soaking process, sometimes the water is replaced after soaking for 2-3 days. This process aims to enhance the unique taste of Kintamani coffee.

Processing of green beans with semi-wet processing (honey processing): The semi-wet processing of cherry coffee beans is also called the honey processing process. Cherry coffee beans after peeling the skin using a pulper are not soaked, followed by the drying process. The coffee beans are directly dried in a condition where there is still mucus or mucilage. During the drying process, fermentation activity also takes place. This coffee processing process is called honey processing, because there is still mucus attached with a texture like honey. The taste that appears in the honey processing process is still strong acidity but accompanied by the emergence of impressive sourness. The semi-wet processing technique is often said to provide an increased body character to the coffee brew.

Processing of green beans with dried processing (natural processing): In the dry processing process, cherry coffee beans are sorted first and then dried directly. Drying uses direct sunlight or in a plastic greenhouse. Higher light intensity is needed in this drying process because the coffee beans are dried while still wrapped in their skin (pulp). The faster it dries; the coffee fruit will be protected from mold and the ongoing fermentation process. In the drying process, if the pile of cherry coffee beans is quite thick, stirring is needed so that all the coffee beans get heat evenly. This is done to avoid the possibility of mold growth, which can cause the coffee flavor to be imperfect. During the drying process, the sugar content in the fruit flesh also provides flavor to the coffee beans. The drying process is stopped when the water content has reached 12%, then the coffee beans can be removed the blackened dry skin along with the parchment.

4.2 Analysis of the Added Value of Downstream Products of Kintamani Arabica Coffee

The agricultural industry can convert input (agricultural material) into output (product) through physical, chemical, and biological (microbiological) processes and produce added value. The calculation of added value using the Hayami method (Hayami, et al, 1987), on coffee products from upstream to downstream, namely hard skin coffee, green bean coffee, roasted coffee and ground coffee for three companies X, Y, and Z is presented in Table 2-5.

Table 2: Calculation of the added value of hardskin coffee

No	Output, Input, and Price	Hard skin coffee			Average
		X	Y	Z	
1	Total Output (kg/production process)	125	120	100	115
2	Raw Material Input (kg/production process)	500	500	500	500
3	Labor Input (person)	4	6	6	5.3
4	**Conversion Factor (kg output/kg raw material)**	**0.250**	**0.240**	**0.200**	**0.230**
5	**Labor Coefficient**	**0.008**	**0.012**	**0.012**	**0.011**
6	Output Price (IDR/kg)	73,000	65,000	60,000	66,000
7	Average Labor Wages (IDR/person)	65,000	65,000	60,000	63,333
Income and Profit					
8	Raw Material Input Price (IDR/kg)	12,000	12,000	10,000	11,333
9	Other Input Contribution (IDR/kg)	1,720	1,500	1,100	1,440
10	Output Value (IDR/kg)	18,250	15,600	12,000	15,283
11	**Added Value (IDR/kg)**	**4,530**	**2,100**	**900**	**2,510**
	Value Added Ratio (%)	**24.82**	**13.46**	**7.50**	**16.42**
12	Labor Income (IDR/month)	520	780	720	673
	Labor Share (%)	11.48	37.14	80.00	42.87
13	Profit (IDR/kg)	4,010	1,320	180	1,837
	Profit Rate (%)	21.97	8.46	1.50	10.64
Production Factors Remuneration					
14	Margin (IDR/kg)	6,250	3,600	2,000	3,950
	Percentage of Labor (%)	8.32	21.67	36.00	22.00
	Other Inputs (%)	27.52	41.67	55.00	41.40
	Owner's Profit (%)	64.16	36.67	9.00	36.61

Table 3: Calculation of the added value of green bean coffee

No	Output, Input, and Price	Green bean coffee			Average
		X	Y	Z	
1	Total Output (kg/production process)	100	100	80	93.3
2	Raw Material Input (kg/production process)	500	500	500	500
3	Labor Input (person)	7	8	6	7.0
4	**Conversion Factor (kg output/kg raw material)**	**0.200**	**0.200**	**0.160**	**0.187**
5	**Labor Coefficient**	**0.014**	**0.016**	**0.012**	**0.014**
6	Output Price (IDR/kg)	110,000	100,000	95,000	101,667
7	Average Labor Wages (IDR/person)	65,000	65,000	60,000	63,333
Income and Profit					
8	Raw Material Input Price (IDR/kg)	12,000	12,000	10,000	11,333

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9	Other Input Contribution (IDR/kg)	3,550	3,000	2,800	3,117
10	Output Value (IDR/kg)	22,000	20,000	15,200	19,067
11	**Added Value (IDR/kg)**	**6,450**	**5,000**	**2,400**	**4,617**
	Value Added Ratio (%)	**29.32**	**25.00**	**15.79**	**24.21**
12	Labor Income (IDR/month)	910	1,040	720	890
	Labor Share (%)	14.11	20.80	30.00	21.64
13	Profit (IDR/kg)	5,540	3,960	1,680	3,727
	Profit Rate (%)	25.18	19.80	11.05	18.68
Production Factors Remuneration					
14	Margin (IDR/kg)	10,000	8,000	5,200	7,733
	Other Inputs (%)	35.50	37.50	53.85	42.28
	Owner's Profit (%)	55.40	49.50	32.31	45.74

Table 4: Calculation of the added value of roasted coffee

No	Output, Input, and Price	Roasted coffee			Average
		X	Y	Z	
1	Total Output (kg/production process)	85	83	70	79.3
2	Raw Material Input (kg/production process)	500	500	500	500
3	Labor Input (person)	8	8	8	8.0
4	**Conversion Factor (kg output/kg raw material)**	**0.170**	**0.166**	**0.140**	**0.159**
5	**Labor Coefficient**	**0.016**	**0.016**	**0.016**	**0.016**
6	Output Price (IDR/kg)	135,000	140,000	125,000	133,333
7	Average Labor Wages (IDR/person)	65,000	65,000	60,000	63,333
Income and Profit					
8	Raw Material Input Price (IDR/kg)	12,000	12,000	10,000	11,333
9	Other Input Contribution (IDR/kg)	3,850	3,200	3,300	3,450
10	Output Value (IDR/kg)	22,950	23,240	17,500	21,230
11	**Added Value (IDR/kg)**	**7,100**	**8,040**	**4,200**	**6,447**
	Value Added Ratio (%)	**30.94**	**34.60**	**24.00**	**30.37**
12	Labor Income (IDR/month)	1040	1040	960	1,013
	Labor Share (%)	14.65	12.94	22.86	16.81
13	Profit (IDR/kg)	6,060	7,000	3,240	5,433
	Profit Rate (%)	26.41	30.12	18.51	25.01
Production Factors Remuneration					
14	Margin (IDR/kg)	10,950	11,240	7,500	9,897
	Other Inputs (%)	35.16	28.47	44.00	35.88
	Owner's Profit (%)	55.34	62.28	43.20	53.61

Table 5: Calculation of the added value of ground coffee

No	Output, Input, and Price	Ground coffee			Average
		X	Y	Z	
1	Total Output (kg/production process)	70	72	65	69.0
2	Raw Material Input (kg/production process)	500	500	500	500
3	Labor Input (person)	9	8	8	8.3
4	**Conversion Factor (kg output/kg raw material)**	**0.140**	**0.144**	**0.130**	**0.138**
5	**Labor Coefficient**	**0.018**	**0.016**	**0.016**	**0.017**
6	Output Price (IDR/kg)	175,000	180,000	145,000	166,667
7	Average Labor Wages (IDR/person)	65,000	65,000	60,000	63,333
Income and Profit					
8	Raw Material Input Price (IDR/kg)	12,000	12,000	10,000	11,333
9	Other Input Contribution (IDR/kg)	4,150	3,400	4,100	3,883
10	Output Value (IDR/kg)	24,500	25,920	18,850	23,090
11	**Added Value (IDR/kg)**	**8,350**	**10,520**	**4,750**	**7,873**
	Value Added Ratio (%)	**34.08**	**40.59**	**25.20**	**34.10**
12	Labor Income (IDR/month)	1170	1040	960	1,057
	Labor Share (%)	14.01	9.89	20.21	14.70
13	Profit (IDR/kg)	7,180	9,480	3,790	6,817
	Profit Rate (%)	29.31	36.57	20.11	28.66
Production Factors Remuneration					
14	Margin (IDR/kg)	12,500	13,920	8,850	11,757
	Other Inputs (%)	33.20	24.43	46.33	34.65
	Owner's Profit (%)	57.44	68.10	42.82	56.12

The conversion process of raw material input of cherry coffee if processed into hard skin coffee reaches an average of 0.230; or 0.187 if processed into green bean coffee; or 0.159 if processed into roasted coffee; or 0.138 if processed into ground coffee. This means that if the production input of 1 kg of cherry coffee can be processed into a production output of 0.230 kg of HS coffee; or 0.187 Green beans; or 0.159 kg of roasted coffee; or 0.138 ground coffee. The value of the conversion process is getting lower upstream, due to the presence of waste material that is not processed into core products. Although the conversion process is getting lower, the downstream products are worth more. For example, in processing cherry coffee into hard skin coffee, there will be processing waste in the form of pulp (fruit skin-flesh), but the value of the processed hard skin coffee product will be higher than the value of cherry coffee. Processing is one of the activities that increases the added value of a commodity. In addition, coffee processing waste (such as pulp, silver skin, mucilage, and parchment) with certain technologies can be utilized as downstream products that can also produce added value.

The increase in the added value of a commodity due to processing must also be supported by other inputs such as labor, machinery and equipment, energy, and other input contributions. The use of labor component input for products further downstream in coffee processing is also increasing. The labor coefficient is the labor input used compared to the input of raw materials processed. The labor coefficient for hard skin coffee products averages 0.011, increasing to 0.014 for green bean coffee products; 0.016 for roasted coffee products, and 0.017 for ground coffee products.

The added value due to the processing of Kintamani Arabica coffee in three companies per kg of input produced in this study is higher from upstream to downstream. The average added value generated for each downstream coffee product, namely for hard skin coffee IDR 2,510/kg, green bean coffee IDR 4,617/kg, roasted coffee IDR 6,447/kg, and ground coffee IDR 7,873/kg. When viewed from the added value ratio (comparison between added value and output value) then hard skin coffee, green beans, roasted coffee and ground coffee, the added value ratios are sequentially 16.42%, 24.21%, 30.37%, and 34.10% (Table 2-4).

In the real business case of Kintamani Arabica coffee, high added value in one type of downstream product is not a

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benchmark for processors to choose this product as a production priority. High market demand for green bean coffee causes processors to prefer this product as a production priority. Selecting the right production output in the upstream-downstream production process system is very important. Research of Syofya (2024) strengthens the paradigm of this coffee producer which states that a strong entrepreneurial ecosystem plays an important role in enabling coffee entrepreneurs to compete globally and create value.

V. CONCLUSION

The types of downstream products of Kintamani Arabica coffee that can be identified are hard skin coffee beans, green beans, roasted coffee and ground coffee. The added value of coffee products increases from upstream to downstream. High added value is not a benchmark for processors to choose production priorities, but rather is based on the availability of market access and the amount of product demand.

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