

Value Chain Analysis of Turmeric in Ponorogo District, East Java

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ABSTRACT

Turmeric has a long history of use as a spice and a traditional medicine in many Asian countries, especially in Indonesia. Ponorogo District is one of the turmeric producers in East Java Province. Turmeric has been cultivated by the local community for herbal medicine and a source of income for the village community. The purpose of this study is to map the turmeric value chain and identify the value distribution along the chain. Data collection techniques used include key informant interviews, focus group discussions and observations. The data analysis technique used the Andreas framework and marketing margin formula. The results showed a map of the turmeric value chain in Ponorogo District covering the main activities ranging from cultivation, collection and distribution. Actors involved in the value chain consist of farmers, collectors, local traders to exporters. This research found that turmeric marketing has reached India with product specifications, namely dried turmeric whose quality requirements include a maximum moisture content of 14% and a dust content of 5%. The lowest marketing margin for each actor is the farmer with a margin of Rp 1,500/kg.

Keywords: *Biopharmaceutical, Herbal medicine, Marketing margin, Turmeric, Value chain*

1. INTRODUCTION

Turmeric (*Curcuma longa L.*) is known as the “golden spice” as well as the “spice of life” [1]. Turmeric has a long history of use as a spice and also as a traditional medicine in many Asian countries [2]. It has been used as a spice, as a dye for textiles, as a major ingredient of curry powder and as a traditional medicine, especially in Asian countries for the treatment of gastrointestinal and respiratory disorders [2].

The demand for chemicals and products derived from medicinal and aromatic plants is increasing globally and has opened up opportunities to entrepreneurs in adding value to these plants through processing, thereby generating enormous employment avenues [3]. The Pharmaceutical industries and the Cosmetic industries are the prime example of the value addition made to the medicinal plants [3]. Turmeric has many benefits as a medicinal herb because of the high content of compounds or functional components such as essential oils and curcuminoids [4].

Ponorogo District is one of the centers of turmeric producer in East Java Province, Indonesia. Turmeric plants are widely cultivated by local people as ingredients for making traditional herbal medicine or sold in raw form. When the farmer undertake the pre-processing activities like boiling and drying after harvesting it fetches more price than the existing i.e. selling raw turmeric [5]. Typical constraints faced by small processor in developing countries include lack of specialized skills and difficult access to technology, inputs, market, information, credit and external services [6].

Herbal medicine value chains have generally been overlooked compared with food commodities [7]. Not surprisingly, revenue generation tends to be weighted towards the end of the chain and consequently the farmers and producers are the lowest paid beneficiaries [7]. The tangible challenges faced by small holder farmers in the upstream value chain relate to five specific areas: market information, capital and skills, volume, quality, and consistency of supply [8].

Value chains have an impact both on the livelihood of producers and on the composition and quality of products widely distributed and consequently on the consumers [7]. Value chain is important for creating value for the products and it helps in reaching the products to the consumers [9]. It assesses the activities, value added, and prices received at each stage of the product’s journey, from farming by producers to sale to consumers [10]. Value chain analysis involved a sequence of steps, from identification of actors through chain actor mapping, linkages, and quantification of earnings into rewards by various actors using information gathered from observation, rapid appraisals, and the quantitative and qualitative surveys [11].

However, despite the size of trade in medicinal herbs and herbal products, surprisingly, very few studies have looked at the value chain [12]. [7] The paper investigated chemical variability along the value chains of turmeric. [3] The paper discussed about the current scenario of value chain of the medicinal plant industry and how the standardization of the value addition contributes in the trade of medicinal and aromatic plants.

Therefore, the objectives of this study is to map value chains for turmeric and to identify the distribution of values on each actor. Mapping the chain also enables identification of the key actors and their roles in the system, and measures can therefore be determined to improve the chain structure through exclusions, inclusions or building bridges [8]. The results will assist policy makers in understanding challenges and opportunities in turmeric value chain development.

2. DATA AND METHODS

Data collection was carried out from January to April 2021. The types of data collected in this study include primary and secondary data. Primary data collection techniques using key informant interviews, focus group discussions and observations. The number of respondents who were successfully interviewed were 10 respondents consisting of farmers, collectors, local traders and exporters. The interview took place in a semi-structured manner to get a broad overview of the respondents' knowledge. Focus group discussions were held twice with turmeric value chain actors and the government. Secondary data collection techniques by looking for information such as scientific journals, annual reports, import export data and government websites.

The data analysis technique in value chain mapping uses the Andreas framework [13]. Detailed discussion of tools and methods for understanding and mapping the value chain is provided by Andreas framework [14]. The purpose of mapping the value chain is to give a visual presentation of the actors in the chains and connections between them [15]. The mapping symbol as shown in Figure 1.

The main reason why value chain analysis is important is that it helps explain the distribution of income, especially for actors participating in the global economy [16]. The value chain involves analyzing the margins and profits in the chain and can therefore determine which actors benefit from participating in the chain and who need support to improve performance and profits [17]. Analysis of marketing margin using the following formula [18].

$$MM = SP - PP \tag{1}$$

Whereas

MM = Marketing margin

SP = Sell price

PP = Purchase price





Symbols	Information
	Value chain stage
Text	Specific business activity
	Value chain operator
	Business linkages between operators
	- Contracted linkages
	- Free linkages
	End market

Figure 1. Value chain symbols of andreas framework [13]

3. RESULT AND DISCUSSION

3.1. Turmeric

Curcuma longa (common name: turmeric) and one of its biologically active constituents, curcumin, have received increased clinical attention [4]. Turmeric is widely used as traditional medicine, kitchen spice, and natural dyes in Indonesia [19]. The demand and popularity of this plant is increasing; on the contrary, the national supply is still low [19]. Turmeric plant species produces different sizes of mother rhizomes and finger rhizomes [20]. Rhizomes are used as propagating material in turmeric cultivation [20].

3.2. Turmeric value chain map

The present medicinal plants value chain is characterized by the informal nature of its upstream base (producers, gatherers and collectors) and better organized and more formally structured actors downstream (processors and wholesalers/retailers) [21]. As shown in Figure 2, turmeric value chain activities take place

informally between farmers and collectors and are more organized at the processor and exporter level. Middlemen are usually involved in the supply of plant material to herbal manufacturers and any information regarding the origin and primary processing is mainly lost [12]. India is also the top producer of turmeric (*Cucurma longa*), contributing about 78% of the world's production [10].

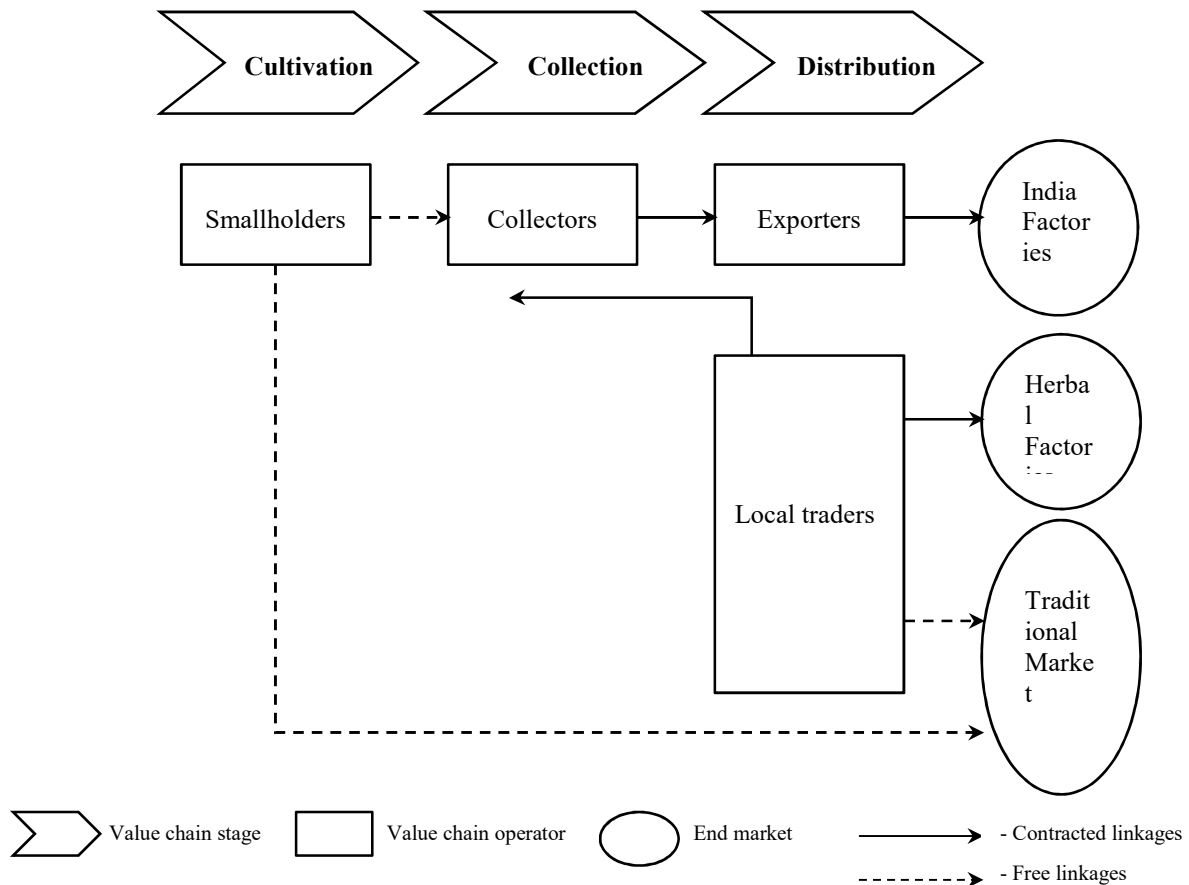


Figure 2. Map of the turmeric value chain in Ponorogo District

3.3. Smallholders

The center for producing turmeric plants in Ponorogo District comes from the sub-districts of Ngrayun, Sooko and Slahung. These three areas are generally highlands. Turmeric plants are cultivated by smallholders along with other biopharmaceutical plants such as ginger, cardamom, curcuma and fingerroot. Turmeric plants also grow side by side with pine forests such as those in Ngrayun District.

The production of turmeric in Ngrayun District has recently started to decrease since the presence of the porang plant. This is due to the demand from the porang processing factory which receives the harvest directly from the smallholders. According to local farmers, porang plants are more profitable for farmers today with higher selling prices and higher production yields than biopharmaceutical plants such as turmeric.

Turmeric cultivation activities by farmers start from land clearing, planting seeds and fertilizing. Turmeric cultivation requires 3 times of fertilization to obtain maximum results. Turmeric can be harvested when it has entered the age of 6-8 months from planting. Eight or nine months later, the crop appears, and it is harvested on maturity [10]. During the harvest season, farmers set aside a small portion of the turmeric obtained to be replanted as seeds and most of it is sold to collectors who come to the location of smallholders.

Marketing of turmeric from smallholders is generally sold to collectors at a price of Rp. 3,000 / kg in the form of fresh turmeric. In addition to collectors who come to farmers' locations during the harvest season, farmers also sell their products to collectors scattered in various locations such as in Slahung, Bungkal, Badegan and Pulung. Turmeric is packed into sacks to be weighed by the collectors and farmers get paid for their crops. In

relatively small quantities, turmeric is also sold by farmers to traditional market traders in Ponorogo District as shown in Figure 2.

Turmeric is one of the main sources of income for rural communities. Unfortunately, farmers are reluctant to process turmeric into value-added products. Turmeric is only sold in wet form, which indicated that there is no touch of any process, so farmers' income is relatively low. One of the factors that make farmers sell in wet form is an urgent financial need, so farmers immediately sell their crops.

3.4. Collectors

In Figure 2, the main activity of collectors is collecting turmeric yields from smallholders. The collector's business process starts from receiving the harvest from the farmers, then it is weighed to find out the amount of money to be paid to the farmers and the next stage is sorting into 3 types consisting of super turmeric, mother turmeric and small turmeric. Super turmeric has a length of around 10 cm, the mother turmeric has a length of around 8 cm with a slightly rounded shape and small turmeric has a length of under 4 cm (Figure 3).



Figure 3. Grading system consisting of small turmeric, mother turmeric and super turmeric

Super type turmeric is sold by collectors to exporters and local traders at a price of Rp. 9,000 per kg. The addition of the process is carried out on small types of turmeric through the process of chopping and drying to increase the selling price at the collector level. Chopped turmeric or better known as sliced turmeric is sold at a price of Rp. 9,000 per kg with a maximum moisture content of 14 percent and a dust content of 5 percent. Sliced turmeric needs many economic activities, like washing, slicing, drying, packing, making small packs, loading, unloading, and transportation [10].

Commercially, turmeric can be sold either fresh or as dried powder [22]. The powdered form of turmeric fetched a higher price, but farmers and processors sold their produce in the form of dry flakes because proper processing units, like dryers and grinders, are lacking [10]. However, dried turmeric powder is more often sold

all around the world but the price varies depending on many factors including quality—ie moisture content, appearance (color), and phenolic contents [22]

Turmeric marketing from the collectors already has ties to exporters and local traders and there are even collectors who get capital from the exporters to buy crops from farmers. Dried turmeric that does not meet the requirements for maximum moisture content will result in the turmeric not being accepted by exporters. Low or substandard quality of turmeric can also reduce the selling price of turmeric.

3.5. Local traders

The main activity of local traders is distributing dried turmeric to herbal medicine factories in Central Java, as well as to traditional market traders both inside and outside the district. One of local traders already have cooperation with about 10 herbal medicine factories outside Ponorogo. Every month dried turmeric is supplied to the factory.

The distribution of turmeric to herbal medicine factories has quality requirements, namely a maximum moisture content of 10 percent and a dust content of 1.25 percent. These quality requirements make local traders have to maintain good quality, such as adding a washing process to remove impurities in turmeric which will have an impact on dust levels and carry out a good drying process which will affect the water content obtained. The open sun drying method has constrained applications for turmeric that can overcome quality deterioration by insects, rodents, inappropriate heating, and unanticipated rain linked with open sun drying, the most common process for turmeric at a small-scale [23].

3.6. Exporters

The number of actors who act as exporters of dried turmeric in Ponorogo District is 4 companies. The company consists of CV. Java Tamarin, CV. Bersemi Lestari, CV. Berkah Jaya and PT. Christian. The four companies whose production locations are in various areas. In addition to dried turmeric, the exporter also trades spices such as nutmeg and cloves.

The process carried out by exporters are consists of checking the moisture and dust content when imported from the collector, if appropriate then re-dried by drying in the sun, sifting and packaging. The downstream actors enhanced the utility of the medicinal plants and impart value to the products through processing and packaging of the products which increases the shelf life of the products [3]. After the production process is complete, turmeric is stored in the warehouse until ready for delivery.

Dried turmeric is exported to India. Turmeric is shipped via container from the port of Surabaya with a

long delivery time of 10-14 days to India. The export system uses the Ex Works (EXW) system, where the buyer has the main obligation to bear all costs and risks to the goods. In addition, the buyer is also responsible for managing the requirements for exporting. The payment system between exporters and buyers uses bank transfers.

In 2020, CV. Bersemi Lestari has shipped 600 tons of turmeric. The number of shipments decreased significantly as compared to the previous year due to the impact of the Covid 19 pandemic. In 2019, turmeric was able to export 1,200 tons to India. The selling price of turmeric to India in 2021 is \$965/tonne. When converted into rupiah and kg, the selling price of turmeric to importers in India is around Rp. 15,000 per kg. There are two factories in India that have collaborated with exporters in Ponorogo. The two factories are used dried turmeric for medicinal extracts and cooking ingredients.

Exporters gain market access in various ways such as marketing through Facebook, creating a account in e-commerce such as alibaba.com, indo network, linkedin and company websites. According to the exporter, the owner of CV. Bersemi Lestari, buyers from abroad are easier to obtain by using accounts at e-commerce providers.

The challenges faced by exporters is that they do not meet the quality standards desired by the buyer. The exporter is willing to reduce the selling price. To that end, the exporter actor has strict standards for each collector who cooperates. This is to avoid inappropriate and non-uniform quality.

3.7. Marketing margin

As shown in Table 1, in the value chain of turmeric exported to India, farmers only get a marketing margin of Rp. 1,500 per kg, this margin shows that farmers get the lowest margin compared to collectors and exporters who each get Rp 6,000 per kg. In the value chain system examined, it was found that downstream buyers, especially manufacturers and consumers pay most of their money for intermediaries' value additive opportunistic pricing due to inherent weaknesses in the chain [21].

The increase in value was due to the addition of value to wet turmeric obtained from farmers processed to become dry turmeric with the condition that the quality of the water content was 14 percent and the maximum dust content was 5 percent. In the turmeric value chain supplied to herbal medicine factories, local traders get a marketing margin of Rp 5,000 per kg, slightly smaller than the export value chain.

Table 1. Marketing margin in the turmeric value chain (primary data processed)

Smallholder	Value Chain (Rp/kg)		
	PP	1,500	1,500
SP	3,000	3,000	2,000
MM	1,500	1,500	500
Collector			
PP	3,000	3,000	2,000
SP	9,000	9,000	9,000
MM	6,000	6,000	7,000
Local trader			
PP		9,000	9,000
SP		14,000	12,000
MM		5,000	3,000
Exporter			
PP	9,000		
SP	15,000		
MM	6,000		
End Market	India Factory	Herbal Factory	Traditional Market

4. CONCLUSION

The mapping of the turmeric value chain has identified the actors involved ranging from farmers, collectors, local traders and exporters. The turmeric commodity produced is in the form of dried turmeric with the main marketing objectives covering processing factories in India, herbal medicine factories in Central Java and traditional markets. There is no processing factory in Ponorogo that utilizes turmeric so that turmeric production from Ponorogo is sent out of the region. Actors who get the lowest marketing margins are farmers, while collectors and exporters get large margins. This is because farmers generally sell in wet form and it is necessary to increase the value of more value-added products to increase farmers' income such as dried turmeric powder.

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REFERENCES

- [1] W. Yan, W. D. Bowen, R. Hopson, A. E. Mathew, and J. N. Jacob, "Biological studies of turmeric oil, part 2: Isolation and characterization of turmeric oil components; cytotoxic activity against pancreatic cancer cells," *Nat. Prod. Commun.*, vol. 8, no. 6, 2013 pp. 811–814, doi: 10.1177/1934578X1300800633 .
- [2] K. Tanaka, M. Arita, D. Li, N. Ono, Y. Tezuka, and S. Kanaya, "Metabolomic Characterization of a Low Phytic Acid and High Anti-oxidative Cultivar of Turmeric," *Nat. Prod. Commun.*, vol. 10, no. 2, 2015, pp. 329–334, doi: 10.1177/1934578X1300800633.
- [3] T. Chhabra, "Value Chain Analysis for Medicinal Plant based products in India: Case Study of Uttarakhand," *An Arch. Org. Inorg. Chem. Sci.*, vol. 4, no. 1, 2018, pp. 449–457, doi: 10.32474/AOICS.2018.04.000176.
- [4] C. T. Peterson *et al.*, "Effects of Turmeric and Curcumin Dietary Supplementation on Human Gut Microbiota: A Double-Blind, Randomized, Placebo-Controlled Pilot Study," *J. Evidence-Based Integr. Med.*, vol. 23, 2018, pp. 1–8, doi: 10.1177/2515690X18790725.
- [5] A. Booker, D. Johnston, and M. Heinrich, "Value chains of herbal medicines - Research needs and key challenges in the context of ethnopharmacology," *J. Ethnopharmacol.*, vol. 140, no. 3, 2012, pp. 624–633, doi: 10.1016/j.jep.2012.01.039.
- [6] A. Booker, D. Frommenwiler, D. Johnston, C. Umealajekwu, E. Reich, and M. Heinrich, "Chemical variability along the value chains of turmeric (*Curcuma longa*): A comparison of nuclear magnetic resonance spectroscopy and high performance thin layer chromatography," *J. Ethnopharmacol.*, vol. 152, no. 2, 2014, pp. 292–301, doi: 10.1016/j.jep.2013.12.042.
- [7] A. Shahidullah and C. Haque, "Linking Medicinal Plant Production with Livelihood Enhancement in Bangladesh: Implications of," *J. Transdiscipl. Environ. Stud.*, vol. 9, no. 2, 2010.
- [8] P. P. Sahoo and K. K. Sarangi, "Value chain analysis of organic turmeric in Kandhamal district of Odisha," *J. Pharmacogn. Phytochem.*, vol. 7, no. 4, 2018, pp. 1130–1137.
- [9] J. H. Trienekens, "Agricultural value chains in developing countries a framework for analysis," *Int. Food Agribus. Manag. Rev.*, vol. 14, no. 2, 2011, pp. 51–82, doi: 10.22004/ag.econ.103987.
- [10] R. Rathore and A. Mathur, "Scope of cultivation and value chain perspectives of medicinal herbs in India: A case study on aloe Vera and Isabgol," *J. Pharmacogn. Phytochem.*, vol. 8, no. 2, 2019, pp. 243–246.
- [11] R. Singh *et al.*, "Value chain analysis of Lakadong turmeric in Meghalaya: A micro-level study," *Agric. Econ. Res. Rev.*, vol. 33, no. 2, 2020, pp. 239–249, doi: 10.22004/ag.econ.310328.
- [12] T. Chagomoka, V. Afari-Sefab, and R. Pitoroc, "Value chain analysis of traditional vegetables from Malawi and Mozambique," *Int. Food Agribus. Manag. Rev.*, vol. 17, no. 4, 2014, pp. 59–86, doi: 10.22004/ag.econ.188710.
- [13] A. Springer, "Manual on Sustainable Value Chain Development Volume," vol. 1, no. January, 2018.
- [14] J. Donovan, S. Franzel, M. Cunha, A. Gyau, and D. Mithöfer, "Guides for value chain development: a comparative review," *J. Agribus. Dev. Emerg. Econ.*, vol. 5, no. 1, 2015, pp. 2–23, doi: <https://doi.org/10.1108/JADEE-07-2013-0025>.
- [15] H. Lie, K. M. Rich, L. R. Kurwijila, and A. M. Jervell, "Improving smallholder livelihoods through local value chain development: a case study of goat milk yogurt in Tanzania Improving smallholder livelihoods through local value chain development: a case study of goat milk yogurt in Tanzania," *Int. Food Agribus. Manag. Rev.*, vol. 15, no. 3, 2012, pp. 55–86, doi: 10.22004/ag.econ.132789.
- [16] R. Kaplinsky and M. Morris, "A HANDBOOK FOR VALUE CHAIN An Important Health Warning or A Guide for Using this Handbook," *Inst. Dev. Stud. Bright. UK*, no. September, 2000, pp. 4–7.
- [17] Department For International Development, "Making Value Chains Work Better for the Poor," *A Toolb. Pract. value Chain Anal.*, p. 165, 2008.
- [18] M. Phiri, L. Y., Dzanja, J., Kakota, T. and Hara, "Value Chain Analysis of Lake Malawi Fish: A Case Study of *Oreochromis* spp (Crambo)," *Int. J. Bus. Soc. Sci.*, vol. 4, no. 2, 2013, pp. 170–181,
- [19] P. A. Anindita *et al.*, "Dataset of agromorphological traits in early population of turmeric (*Curcuma longa* L.) local accessions from Indonesia," *Data Br.*, vol. 33, 2020, p. 106552, doi: 10.1016/j.dib.2020.106552.
- [20] R. C. P. Hemalatha, "Effect of intercrops on growth and yield of turmeric (*Curcuma longa* L.)," *J. Spices Aromat. Crop.*, vol. 26, no. 1, 2017, p. 51, doi: 10.25081/josac.2017.v26.i1.808

- [21] M. Hishe, Z. Asfaw, and M. Giday, "Review on Value chain analysis of medicinal plants and the associated challenges," *J. Med. Plants Stud.*, vol. 4, no. 3, 2016, pp. 45–55.
- [22] S. Hirun, N. Utama-ang, and P. D. Roach, "Turmeric (*Curcuma longa* L.) drying: an optimization approach using microwave-vacuum drying," *J. Food Sci. Technol.*, vol. 51, no. 9, 2014, pp. 2127–2133, doi: 10.1007/s13197-012-0709-9.
- [23] S. Sharma, K. Dhalsamant, P. P. Tripathy, and R. K. Manepally, "Quality analysis and drying characteristics of turmeric (*Curcuma longa* L.) dried by hot air and direct solar dryers," *Lwt*, vol. 138, no. December, 2021, p. 110687, doi: 10.1016/j.lwt.2020.110687.