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## INSTITUTIONAL DYNAMICS OF CATTLE AND BEEF MARKETING SUPPLY CHAIN IN INDONESIAN DRY LAND AGRICULTURE

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### ABSTRACT

The structure, role and dynamics of various institutions in cattle and beef marketing supply chain management need to be known in detail and comprehensively, so that their performance can be improved. Objectives: 1) analyze the role and institutional dynamics in supply chain management of cattle and beef in dry land agriculture; and 2) formulating efforts to improve the performance of cattle and beef supply chain institutions in dry land agriculture. Methods: A comprehensive survey of cattle and beef supply chain management institutions, covering all stakeholders (farmers, livestock traders, butchers, meat traders, animal markets, slaughterhouses, animal quarantine, transport expeditions, etc.). The data were analyzed descriptively qualitatively and quantitatively, income analysis, and trading margin analysis). Conclusions: 1) The role of cattle and beef supply chain institutions is starting to form a solid network. However, in terms of institutional dynamics, there are still problems with smooth communication and interaction between institutions in transactions, especially at the point of interaction between farmers and village traders; and 2) Transaction costs in the cattle and beef marketing supply chain are still quite high, but the profit for the institution is quite reasonable. The provision of benchmark prices is very important to maintain a fair distribution of profits.

### KEY WORDS

Marketing cost, institution, supply chain, beef cattle, dry land.

NTT Province is an area with a dry land area of 3,491,130 ha (94.57% of the total area of 3,691,421 ha), but the potential for dry land that can be used for dry farming is only about 1,528,308 ha (43.78% of the total dry land area). A sizable population of East Nusa Tenggara (NTT) has taken part in the beef cattle business, which promises financial and other socio-cultural benefits. Various stakeholders play a role in the provision of production, production, industrial, marketing, and consumption facilities for various livestock products (for direct consumption or for other needs) (Chopra, 2006; Fatahilah *et al.*, 2010; Hariningsih, 2012; Lole *et al.*, 2021). The dominant condition of dry land directly affects the pattern and type of agricultural business, including beef cattle farming which is still dominated by subsistence (self-fulfillment) and social standing (status/prestige).

Over time, the beef cattle business has begun to shift from subsistence and social standing to a more commercial nature (market oriented) by taking advantage of the surplus production that can be sold to the market (Lence *et al.*, 2007; Lole, 2013; Priyanto, 2011). Furthermore, Hadi (2012) and Suryana (2008) state that an agricultural product that is able to reach markets further downstream in the vertical structure of the supply chain and closer to the consumer center area will be able to develop faster and facilitate the fulfillment of consumer needs.

With a cattle population in NTT of around 1 million heads in 2019 (around 4.3% of the national cattle population) and occupying the fifth position, it shows that NTT's position and role is very important in supporting the provision of national beef. Moreover, nationally, up to now, it still has quite large imports, reaching around 35-40% of the national demand for meat (Lole, 2013). However, the facts show that the level of ability to supply livestock and meat (to national and local markets) still has obstacles that need to be identified. This can be seen in



the lack of smoothness or difficulty in collecting livestock from villages in an effort to meet quotas for inter-island trade each year (Budisantoso *et al.*, 2008; Lalus *et al.*, 2019; Lole, 2013).

In addition, for beef consumption needs (national and local); the activities of collecting, transporting, slaughtering, and distributing beef to the market to the final consumer follow a series of institutional roles and supply chain management (SCM) performance (Hadi, 2012; Hayami *et al.*, 1987; Hosami, 2014; Lalus *et al.*, 2019; Krova *et al.*, 2021). At the initial trading level (farmer, village trader and sub-district trader level), the SCM structure coincides between the marketing of livestock for inter-island needs and for local production and consumption. At this initial stage, the supply chain flows various types of livestock resulting from transactions in the form of male livestock (fattening products, feeders, young seeds, and rejects) and female livestock (productive adults, young seeds, and rejects). Furthermore, at the final level, the supply chain is divided into two supply lines, namely for inter-island marketing channels (slaughterhouse outside NTT) and local marketing channels (local slaughterhouses and nurseries) (Hadi, 2012; Van der Vorst, 2006; Rachman, 2016; Krova *et al.*, 2019; Lole *et al.*, 2021).

How the specific roles of each agency and supply chain management function in the two cattle marketing channels (especially local marketing) need to be known in detail and comprehensively. Thus, the results can be used to improve the role of the institution as well as its function in the framework of developing livestock in NTT as a whole.

The research aims: 1) describe the structure and role of institutions in the supply chain of livestock and beef in the dry land agriculture of NTT Province; and 2) to analyze the transaction costs of marketing livestock and beef in the dry land agriculture of NTT Province.

## METHODS OF RESEARCH

This research was conducted in Kupang area (include Kupang Regency and Kupang City), NTT Province, Indonesia, which is located in a dry land area with a dry climate. Primary data collection was through interviews with related parties through indeep-interrogation in 5 sample districts, namely Amfoang Selatan, Fatuleu, East Kupang, Sulamu, and West Amarasi Districts. Survey through interviews (guided by questionnaires, in-depth interviews, PRA, and FGD) of samples at sample locations. Secondary data from Disnak and BPS Kabupaten/Kota Kupang, Lili Animal Market, slaughterhouse Oeba/Aldia, Tenau Animal Quarantine, Sea Freight Expedition, Port Administration. and other related parties.

A survey of various parties related to the planning and development of livestock and cattle product business at the Kupang Regency/City level, particularly those related to product marketing, processing and consumption. Respondents at the district/city level, namely Disnak and Bappeda, district heads/village heads, NGOs, cooperatives, farmers, traders (village/sub-district/district/inter-island), butchers, investors, financial institutions, and other parties (key persons). Therefore, an institutional approach was used with the hope of obtaining complete data.

Through an empirical-statistical study, a quantitative approach is used to solve problems, equipped with a descriptive-qualitative approach as needed. Various descriptions of the structure, roles, and functions of each institution and individual/company in the beef cattle marketing chain as a supply chain management (Preckel *et al.*, 2004; Marimin and Maghfiroh, 2011; Monczka *et al.*, 2011; Wang *et al.*, 2014). The strengths and weaknesses of various institutions and related parties will be described in detail and it is hoped that efforts can be found to improve their roles and functions, which are woven into an efficient and effective supply chain system (Paul, 2014; Saaty, 2004).

## RESULTS AND DISCUSSION

In general, the vertical structure of the supply chain for livestock and beef in Kupang District/City is shown in Figure 1 (Lole, 2013; Hadi, 2012; Lole *et al.*, 2021; Lalus *et al.*, 2019). The supply chain for cattle in Kupang Regency starts from village breeders to cattle



slaughterers for local marketing or to inter-island cattle traders for export. On the other hand, the supply chain for fresh beef starts from traders who cut or slaughter cattle (in slaughterhouse and non-slaughterhouse) to local consumers in Kupang Regency and Kupang City.

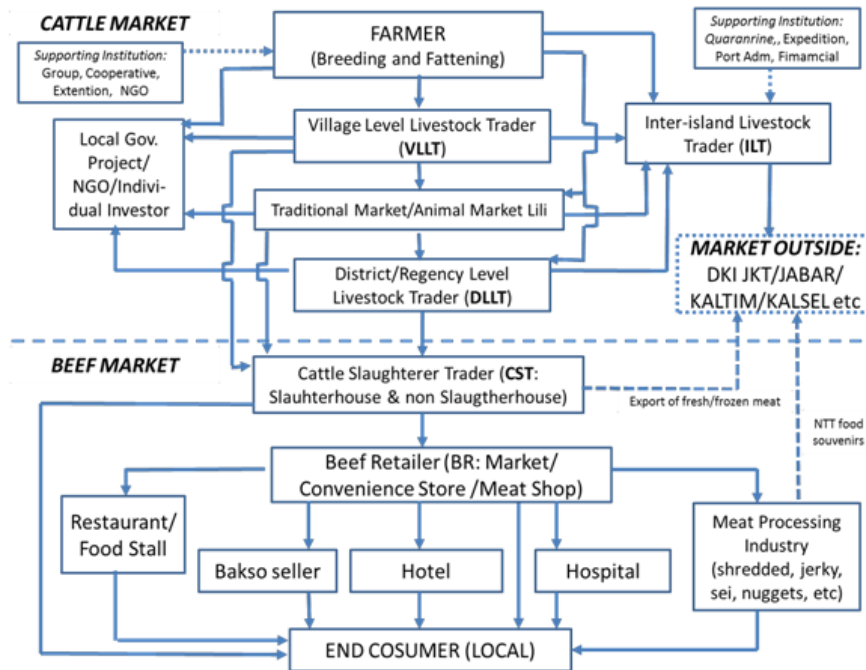


Figure 1 – Supply chain of cattle and beef in Kupang Regency/City

Generally, breeders sell their cows to village level livestock traders (VLLT), whether they are contacted by farmers or visited by VLLT, so that the transaction location takes place in their home or garden. However, a small proportion sell elsewhere (regular markets, animal markets, or traders' residences). The data shows that large cattle buying and selling transactions occur at the Lili Animal Market, where the transaction actors are: VLLT, sub-district/regency level livestock traders (DLLT), inter-island livestock traders (ILT), and cattle slaughterers/butchers (CST). Cattle in the Lili Animal Market come from 5 districts, namely South Central Timor and Kupang (the most dominant), as well as the North Central Timor, Belu, and Malaka (small numbers because they are far away).

In cow marketing, VLLT acts as a cow collector in the village or neighboring villages. This VLLT will sell its cows to PTTK which then also sell them at the Lili Animal Market. Cattle traders in Kupang Regency trade in Bali cattle, because they are adjusted to the supply and demand in this region. Payment in cattle buying and selling transactions is made in cash (cash and carry), because it is the initial motivation for selling cows to get cash.

The determination of the price of cattle in buying and selling transactions between breeders and VLLT is carried out in two ways, namely by estimating the price based on the body condition of the cattle and how to weigh the cattle and then calculating the price. The advantages and disadvantages of these two pricing methods have been described in the previous section (Lole, 2013; Hadi, 2012; Krova *et al.*, 2021).

DLLT generally trades cows for slaughter or seeds/feeders. The amount of sales per DLLT per month for slaughtered cattle and cattle for breeds/feeders is relatively the same. As in VLLT, DLLTs trade cows because of the supply and demand for cows. The demand for feeder cattle for fattening is higher for male cows than for female cows, but the number of cattle slaughtered is more female cows than bulls. The traded cattle come from Belu, Malacca, TTU, TTS, and Kupang (Amfoang, Sulamu, Amarasi, and Fatuleu Districts) which are purchased from village livestock traders. Payment to VLLT is made in cash (cash and carry).



CST (butchers) buy cows for slaughter from DLLT at the Lili Animal Market. Cows are generally from Kupang and TTS districts (40–60 km distance). The price of a cow with a live weight of 300 kg or a meat weight of 100 kg is around IDR 9 million per head. Traders prefer to set prices based on estimated weight of meat to be produced, not live weight (Hadi, 2012; Wiyatna, 2007; Lole *et al.*, 2021; Krova *et al.*, 2021). Payment to DLLT is also made in cash (cash and carry).

BR sells beef at traditional markets (Oeba, Naikoten, and Oebobo Markets) in Kupang City. BR buys beef entirely from CST/butchers in Oeba Slaughterhouse Kupang and sells it in traditional markets. Fresh meat in the form of pure or whole meat (not mixed with other types of meat). Some fresh meat is differentiated according to category and some are not differentiated (for example, hash meat and thigh meat) (Wiyatna, 2007; Rachman, 2016; Hodi *et al.*, 2011; Lalus *et al.*, 2019; Wang *et al.*, 2014).

ILT is generally headquartered in Kupang City, but generally has a temporary shelter in Kupang Regency while waiting for transportation by ship (livestock ship or modification of cargo ships). ILT has decades of experience in cattle trading. Generally, fattening bulls (paron) for slaughter (Jakarta, West Java, East Kalimantan, and South Kalimantan) and a small portion of cows for seedlings (specifically for Flores and other districts in NTT).

Apart from the sale and purchase of anchovies between traders for slaughtering purposes, there are also transactions for buying and selling seeds and feeders for breeding and fattening by various groups, both individually and institutionally. There are various government programs and projects (central, provincial and district), non-governmental organizations (local, regional, national and international), cooperatives/joint business group, and private companies; which develops cows, both for breeding and fattening.

*Roles and Functions of Supporting Service Providers.* Cattle are marketed in public markets (small numbers) and animal markets (large numbers). The main animal market in NTT is the Lili Animal Market. The market operates once per week, but in practice it is between Wednesday–Saturday, where large scale occurs on Thursday and Friday. On Wednesday and Thursday it is dominated by large livestock (cattle, buffalo and horses), while Friday and Saturday are dominated by small livestock (goats, pigs and dogs) and poultry (native chickens). The areas of origin of the cattle are five districts, namely Kupang (23%), TTS (57%), TTU (9%), Belu (5%), and Malaka (6%).

Slaughterhouse Oeba is the UPTD for Animal Husbandry and Animal Health (Agriculture and Forestry Office of Kupang City Government). The location of the Oeba slaughterhouse is about 10 m from the settlement and 40 m from the Oeba Market. Value addition activities have begun to occur in the slaughterhouse which transform live livestock into meat and other products (in the form of livestock product processing industries, both main and by-products). Types of facilities in the slaughterhouse: a place for loading/unloading livestock, a cattle shed, a slaughterhouse (a combination of a dirty room, clean room, withering room, and offal washing room), meat transportation equipment, and a slaughterhouse office

The number of slaughtered cattle in the Oeba slaughterhouse is 10,548 heads (2019) and 7,751 heads (until September 2020). The number of slaughtered during January–September 2019 was 7,734, which means that the number of slaughtered during January–September 2020 was quite stable. The number of CST who slaughtered cows in this slaughterhouse was 16 people.

The construction of the Bimoku slaughterhouse (replacing the Oeba slaughterhouse) with more modern facilities and larger capacity is approaching the operational stage. Currently, they are still waiting for the process of transferring management to the Kupang City Government while continuing to complete various facilities, including the provision of water and electricity.

The Kupang Agricultural Quarantine Center is located 200 meters from the Sea Port of Tenau (Kupang City). This Quarantine Center carries out its main duties and functions (tupoksi), namely the supervision of inter-island livestock traffic, both entering and leaving the Province of NTT, especially in the West Timor Region.



The export of cows through the Quarantine Center in 2019 according to the quota is 69,650 heads (shipping frequency 928 times), while from 2020 to September it reaches 58,746 heads (shipping frequency is 652 times). When compared to January-September 2019 with a total of 48,712 birds, then shipments for the same period in 2020 increased by around 21%. The amount of expenditure is more during the dry season, namely August–October according to the large supply of cattle in this period.

The task of the marine expedition is to serve cattle handling services from the Port of Tenau (Kupang) to their destination. In Kupang, there are only 2 owners of sea freight forwarding services for transporting livestock, who always work together every time they ship cows. The sea freight forwarder does not have its own ship. During the last few months (August to October 2020), cattle were sent to Java and Kalimantan. Shipment uses the Animal Cemara Nusantara Ship and a modified one-way chartered cargo ship. An animal boat with a larger capacity is still needed at a more affordable cost. Specialized animal vessels are able to reduce body losses to 8–10% (modified cargo ships have a shrinkage rate of around 13–15%).

The Kupang Port Administrator Office (ADPEL) is under the Directorate General of Sea Transportation (Ministry of Transportation). In accordance with its main duties and functions, ADPEL is responsible for the safety of the ship and the contents of the ship (goods and passengers) from the port of departure to the port of arrival. In relation to the transport of live livestock between islands, ADPEL wants a special livestock vessel with adequate capacity. Therefore, ADPEL requires that if using a cargo ship, it must be modified by making temporary pens, and the ship only contains livestock (not to be mixed with other goods and passengers).

Table 1 – Number of slaughtered cattle according to sex at slaughterhouse Oeba, Kupang City, in January-August 2021 (head)

Month	Male		Female		Total (Head)
	Head	%	Head	%	
January–February	471	32.13	995	68.04	1,466
Marc–April	533	31.54	1,157	68.05	1,690
May–June	596	32.06	1,263	68.02	1,859
July–August	1,115	67.05	584	31.96	1,663
Total	2,715	40.66	3,963	59.07	6,678

Source: Slaughterhouse Oeba Kupang, October 2021.

Table 2 – Type and amount of transaction costs in selling beef cattle in Kupang Regency

Type of transaction cost	Unit	The amount of costs (IDR)	Proportion (%)
Information search (pulse)	IDR/acces info	7,000	4.86
Village retribution	IDR/head	18,000	12.50
Animal transportation	IDR/day	25,000	17.36
Farmer consumption	IDR/head	35,000	24.31
Market retribution	IDR/head IDR/head	14,000	9.72
Feed cost	IDR/day	15,000	10.42
Others (cigarettes and betel nut)	IDR/head	30,000	20.83
Total Cost		144,000	100.00

Source: Primary Data (processed).

*Analysis of Marketing Costs and Market Participants' Profits.* The types of transportation costs incurred by the farmer when deciding to sell cattle (either at the business location or at the animal market) can be seen in Table 2. Transaction costs include: information seeking, village fees, livestock transport, farmer consumption when selling to the market, market fees, feed costs and other costs. When the farmer decides to sell the cow at the business location, it only costs Rp925,000 for information seeking and village retribution (17.36%). Conversely, when the farmer decides to sell it himself to the animal market, the farmer has to pay an additional fee of Rp919,000 (82.64%) of the total transaction cost.



The purchase price of cows varies, for feeder fattening is around Rp3.75 million per head for a live weight estimated at 125 kg, while the selling price of cows for seed is around Rp4 million. The purchase price of a cow for slaughter is around Rp9 million per head for a live weight of around 300 kg. Most of the transactions are made at the Lili Animal Market. The costs incurred for the sale and purchase of livestock at the Lili Animal Market consist of the cost of transporting livestock to the animal market of Rp935,000, animal market fees of Rp915,000, and animal market crossings of Rp93,000, or a total of Rp950,000 per head. Thus, the profit per village/sub-district livestock trader is Rp9,300,000 for breeds/feeders and Rp9,850,000 for beef cattle, which represent 7.5% and 9.4% of the total cost, respectively.

The total costs incurred are Rp933,897,500 for the purchase of cows and fees at the Lili Animal Market, payment for transportation from the animal market to the Oeba (Kupang) slaughterhouse, purchase of rope/rope to tie the cows, purchase of feed and drinking water, pay for cow carers, processing personnel, and user fees at the slaughterhouse (Table 3). Meanwhile, the revenue amounted to Rp934,492,000, which consisted of sales of meat, skin, head, offal, and others.

Table 3 – Costs and profits of cow slaughterers in Kupang, October 2021

Description	Unit	Volume	Price (Rp/unit)	Value (Rp)
<b>A. Cost</b>				
1. The purchase price of a cow at the animal market of Lili:				
a. Male 450 kg	head	3	9,000,000	27,000,000
b. Female 300 kg	head	2	5,000,000	10,000,000
2. Retribution of animal market	head	5	12,000	60,000
3. Transportation to slaughter house	head	5	70,000	350,000
4. Rope etc	head	5	5,000	25,000
5. Feed and water 5 days in slaughterhouse	head workday	5	60,000	300,000
6. Maintenance personnel in slaughterhouse	person	5	65,000	325,000
7. Management personnel in slaughterhouse	head	5	50,000	250,000
8. Retribution of slaughterhouse	head	5	18,000	90,000
<i>Total Cost</i>				<i>38,400,000</i>
<b>B. Revenue</b>				
1. Beef	kg	686	60,000	41,160,000
2. Skin	sheet	5	100,000	500,000
3. Head, innards, etc	head	5	850,000	4,250,000
<i>Total Revenue</i>				<i>45,910,000</i>
<b>C. Profit</b>				<i>7,510,000 (19.56%)</i>

Source: Primary Data 2021 (processed).

Table 4 – Costs and profits of beef retailers in Kupang, October 2021

Description	Unit	Volume	Price (IDR/unit)	Value (IDR)
<b>A. Cost</b>				
1. Purchase of meat	kg	150	50,000	7,500,000
2. Worker at the stall	person	2	25,000	50,000
3. Security cost	month	1	10,000	10,000
4. Cleaning cost	month	1	10,000	10,000
5. Transportation cost from slaughterhouse to stall	kg	150	500	75,000
<i>Total Cost</i>				<i>7,645,000</i>
<b>B. Revenue</b>				
1. Loin meat	kg	30	65,000	1,950,000
2. Thigh meat	kg	120	60,000	7,200,000
<i>Total Revenue</i>				<i>9,150,000</i>
<b>C. Profit</b>				<i>1,505,000 (19.69%)</i>

Source: Primary Data 2021 (processed).

Note: \*) loss of 5 kg (decreased water content and fat removal).

The total cost incurred by a meat retailer in Oeba Traditional Market (Kupang) is around Rp7.1 million (Table 4). Of the 150 kg of meat purchased, only 145 kg could be sold due to the 5 kg loss in weight as a result of decreased water content and fat removed. With this reduction, the total revenue was Rp7.4 million, so the merchant's net profit was around Rp279,000 (3.92% of the total cost). If we look at the percentage of profits, retail traders have a smaller risk of business loss than cattle slaughterers.



With sales of 530 bulls of beef cattle for a month destined for Samarinda (Kaltim), the costs incurred are around Rp1,886 million, while revenues are around Rp1,938 million (Table 5). Thus, the profit earned was around Rp 52.3 million, which was only 2.77% of the total cost. If calculated on the average per head, the profit is around Rp158,500.

Table 5 – Costs and profits of inter-island livestock traders in Kupang, October 2021

Description	Unit	Volume	Price (IDR/unit)	Value (IDR)
A. Cost				
1. Purchase price	head	350	9,000,000	3,150,000,000
2. Expedition cost	head	350	650,000	227,500,000
3. Retribution	head	350	15,000	5,250,000
4. Load at the port to	head	350	50,000	17,500,000
<i>Total Cost</i>				<i>3,400,250,000</i>
B. Revenue	head	350	12,600,000	4,410,000,000
C. Profit				1,009,750,000 (29.70%)

Source: Primary Data (processed).

Note: \*) livestock weight 300 kg/head minus 13% loss.

The problem faced by traders is that during the rainy season it is difficult to obtain cattle because breeders rarely sell their livestock and transportation is not smooth. The sale of cattle by breeders occurs more during the dry season because farmers need school fees, traditional events, and building houses. Another problem is that if there is a large sea wave, the ship's arrival time at its destination cannot be determined with certainty. Traders prefer Kalimantan as the destination for porong cattle trade because the demand is more and more profitable when compared to sales to Jakarta because of the higher price, lower cost, and lower risk.

## CONCLUSION

The role of cattle and beef supply chain institutions is starting to form a solid network. However, in terms of institutional dynamics, there are still problems with smooth communication and interaction between institutions in transactions, especially at the point of interaction between farmers and village-level livestock traders (VLLT), especially regarding the determination of livestock prices.

Transaction costs in the cattle and beef marketing supply chain are still quite high, but the benefits given to each marketing agency are reasonable in accordance with the level of financing incurred. The provision of a benchmark price based on live weight is very important to maintain the fairness of profit distribution among marketers.

*Suggestions:* 1) Village group institutions and cooperatives (supported by the government, NGOs, CSR, cooperative members, etc.) can provide bailout funds to farmers to wait for the best prices and benefits; and 2) The use of livestock scales at production center is highly recommended to ensure the income of farmers.

## AUTHORS' DECLARATION

The authors declare that there is no conflict of interest for the publication of this paper. All authors read the final manuscript and approved the final version.

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