

# Honey Supply Chain and Fraud in the Market in Selected Zones of Oromia Regional State, Ethiopia

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**Abstract** – Ethiopia, a leading African honey producer, faces a significant challenge in its honey market due to its traditional production system. Despite efforts, traditional beehives make up 96% of beehives, indicating moderate backwardness. This situation leads to a locally controlled fraudulent honey supply chain. Hence, the purpose of this paper was to expose the existing market chain and frauds based on the data collected from three potential zones of Oromia regional state in Ethiopia. The number of districts and the number of PAs were selected purposefully, whereas 165 households were randomly selected from the existing beekeepers. The study shows that honey is the primary bee product supplied to the market, where over 85% of beekeepers sell honey. However, the market chain is unclear due to higher competition among actors in the level of home-to-home collection of honey in the village. As a premium for quality honey, consumers, including other buyers, are competing to purchase honey from farmers, who are perceived as the first sellers. Generally, unless there are enforced quality standards and responsible traders involved, the current honey marketing fraud is a risk for the health of consumers, artificial scarcity, and disappointing the adoption of modern technology for more production. Finally, further research is required to determine the best strategy for quickly identifying contaminated honey and strategies to stop it for better policy implementation.

**Keywords** – Honey, Market Chain, Traditional, Beehives, Supply.

## I. INTRODUCTION

Ethiopia is endowed with abundant potential for honey [1], and the country leads honey production in Africa [2]. Regardless of continual interventions, the traditional production system shares more than 95% of the sectors [3] with low productivity [4]. As a result, the supply of honey to the world market remains low [5], accounting for less than 2% of the production [6].

The FAO data indicates that between 2005 and 2020, Ethiopia exported about 6807 tons of honey and 5125 tons of wax, with a dollar value of USD 23,300,000 for honey and USD 35,525,500 for wax [7], which is currently declining. Even though the country was ranked 17th with the share of global exports and 2nd with the share of *production* [8], the contribution of the country is far beyond its potential [9]. However, the larger share of honey has been used locally regardless of the opportunity for certified natural organic honey [4] and demand [10].

As a result, the beekeeping sector remains hardly commercialized due to the traditional production system. Still, smallholder farmers are hardly attempting to improve the quality of honey [11] due to the lower price of honey and the distorted marketing system [6]. Additionally, the lack of honey businesses operating on a larger scale [1] coupled with the absence of an organized market channel, has also discouraged farmers from producing high-quality products [11].

Generally, the beekeeping industry collapses into a traditional food value chain with no obvious intervention [12]. The traditional beehives made up 96% of all beehives in Ethiopia and 97% in the Oromia region,

demonstrating a moderate backwardness of the industry [3]. Even though the beekeeping industry is an environmentally benign one [13], the sector has been hardly addressed for its importance. It is therefore not surprising that Ethiopia's export market is continuing to shrink.

Moreover, the honey supply chain is not far from market fraud due to higher competition among honey traders. The problems in honey fraud relate to aspects of safety and quality [14], where the adulteration practices mostly involve fraudulent extensions with sugar syrups, among others. In Ethiopia, adulteration with sugar, sugar syrup, inverted sugar, molasses, Coca-Cola, and melted candy has become common [15]. Though the health risks of these adulterants were not indicated, this fraud has become popular in the local market in the country. However, unless there are enforced quality standards and responsible traders involved, the current honey marketing fraud is a risk for the health of consumers, which further creates a fear of honey consumption, which is very important for health. Particularly, the length of the honey supply chain coupled with free intervention could increase the intensity of this phenomenon. Thus, it is very important to understand the possible occurrence of fraud in the honey supply chain for better policy action.

## II. METHODOLOGY

This study was conducted in three potential zones of Oromia regional state in Ethiopia, where the number of districts and the number of PAs were selected purposefully based on the number of honey hone producers and the number of beehives. With this aim, two districts per zone and two PAs per district were selected. Finally, 165 sample households were selected at the precision level to be used (5%).

The primary data was collected from beekeepers using semi-structured questionnaires, in addition to key informant interviews and focus group discussions with beekeepers of different social and age groups. Finally, secondary data was used from different data sources, such as Ethiopian Statistical Services (ESS) and administrative data from the Oromia Bureau of Agriculture. In the data analysis, descriptive and gross revenue comparisons were conducted.

## III. RESULT AND DISCUSSION

### 3.1. Socio-Economics Characteristics

Most of the respondents were male (93%), of whom at least 85% attended education, including through religion education, schools, and tertiary education (Table 1), with an average of seven (7) years of school attendance (Table 2). The beekeepers have beekeeping experience for at least a year, with an average of 11 years of beekeeping experience with a range of 1-50 years (Table 2). This implies that the study was conducted with experienced and educated beekeepers to obtain good, reliable, and informative data to judge the beekeeping system. However, beekeeping is not the only livelihood of the households; they also rely on livestock and crop production. The field data indicated that 94% and 78% of the households were involved in crop and livestock production, respectively, beside beekeeping (Table 1).

Table 1. Descriptive statistics (Qualitative).

Variables		N	%
Sex	Male	153	92.7
	Female	12	7.3

Variables		N	%
	Total	165	100.0
Produce crop	Yes	156	94.5
	No	9	5.5
	Total	165	100.0
Livestock	Yes	129	78.2
	No	36	21.8
	Total	165	100.0
Education Status	Illiterate	24	14.5
	Literate	141	85.5
	Total	165	100.0
Sell honey	Yes	141	85.45
	No	24	14.55
	Total	165	100.0

Normally, beekeeping is a side activity in most parts of Ethiopia, where the farmers involved in beekeeping support other agricultural production and cover miscellaneous expenditures [9]. It was hardly likely to find a farmer who was solely dependent on beekeeping as a side activity. With these facts, farmers prefer beehives that require minimal labor force for honey production technologies, which are traditional beehives. That is why honey production is still dominated by traditional methods in Ethiopia [3].

Table 1. Descriptive statistics (Qualitative).

Variable	N	Mean	Std. Dev.	Min	Max
Age of household	165	40.55	12.10	18	78
Beekeeping Experience	165	11.28	9.75	1	50
Education level	129	7.02	2.66	1	12
Total family size	163	5.46	3.20	1	20
Total colony	162	20.91	30.75	1	225
MFH number	104	9.56	15.44	1	130
Traditional number	146	13.67	22.76	1	200
KTB number	58	6.84	7.67	1	45
Hive productivity	154	11.01	11.63	0.25	60

On average, the households have about 10 MFH, 14 traditional hives, and 7 KTB hives, with an average 21 colony size (Table 2). However, most of the beehives are traditional, with more than 85% of the respondent's own traditional hives, compared to 63% and 35% of the household's own MFH and KTB, respectively. This study shows a larger number of households are still dependent on traditional beehives (Table 2), regardless of the long history of beekeeping in Ethiopia [16]. However, the study shows that it needs more extension work to

increase the number of modern hives at the expense of traditional hives.

### 3.2. Honey Marketing Practices

The primary bee product frequently marketed is honey, which is predominantly supplied by small-scale farmers. However, due to limitations in the supply of honey across seasons, consumers and collectors are competing for the scarce honey at the hands of beekeepers. As a result, most of the beekeepers were selling honey immediately after harvest (Table 3), while about 63% of households were selling at home (Table 6). The beekeepers are selling immediately due to two major reasons. The first reason was that honey has a natural tendency to crystallize when buyers hardly purchase it. However, the farmers do not know how to prevent crystallization except by storing it in crude form, which has a relatively lower tendency to crystallize. The second reason was the fear of a lack of buyers in bulk except during harvesting season in the area because the price is relatively better for farmers due to different traders flooding from different parts of the country. However, some opportunistic farmers were waiting for a better price season after harvesting honey and storing it in crude form. However, only about 37% of farmers store honey in crude form when they want to wait for a better price by being exposed to direct sunlight at least a day before going to market.

Table 3. Season of honey supply.

Sell Honey	Time to Sell					Total
	No	Immediately	Good Price Season	As Need Cash	Convenient Time	
Yes	0	76	31	6	8	121
No	44	0	0	0	0	44
Total	44	76	31	6	8	165

Additionally, in the market, direct sunlight was frequently used to liquefy crystallized honey and maintain it in a liquid state (Figure 1, Figure 3). The other main goal of direct sunlight exposure is to make it easier to measure in markets using local measurement and exude honey's original or giant visibility to lure or deceive consumers. However, a study shows that direct sunlight exposure to honey decreases its antioxidant capacity [17]. The marketing practice, however, is not attractive in general, regardless of the natural characteristics of honey. Naturally, honey has a hygroscopicity property that describes its ability to absorb and hold moisture from the environment [18]. Until it sells, the liquid honey stays in the open market with no shade, which exposes honey to direct sunlight and dust in the market. Even though no study shows the level of contamination of honey due to exposure to dust, it is normally not healthy for humans.



Fig. 1. Honey selling in open sunlight, Ejere (a) and melting crude honey (Matu) (b), Ethiopia (Photo by Dirriba, 2023).

### 3.3. Production Share of Honey Supply

Honey is a cash commodity for most beekeepers to support the production of other agriculture as a source of income. In the study area, more than 85% of beekeepers were selling honey (Table 1), from which they supply 8%-100%, with an average of 71% of honey produced. However, the amount of honey supplied to the market is varied among the types of beehives. The field data shows that about 75% of the beekeepers supply at least 88%, 75%, and 78% of the honey produced from the MFH, traditional, and KTB, respectively (Table 4). Similarly, about 90% of the beekeepers supply at least about 50%, 33%, and 50% of the honey produced from the MFH, traditional, and KTB, respectively (Table 4). With these numbers, honey produced from MFH and KTB is more marketable than that of traditional hives. Logically, the productivity of traditional hives is much lower than that of other types of beehives [9]. Anecdotally, farmers used to eat the larvae of honeybees, believing that they were highly nutritious. As a result, most households use the honey produced from traditional hives for home consumption, which makes the proportion of honey produced from traditional hives lower than that of other beehives.

Table 4. Proportion of honey sold.

Hive Types	N	Proportion of Honey Sold (%)			
		Mean	Std. Dev.	Min	Max
MFH	80	80.10	22.13	20.00	100.00
Traditional	79	71.86	23.91	8.33	100.00
KTB	42	74.77	22.27	11.11	100.00
Total	122	70.89	23.43	8.33	100.00

### 3.4. Honey Market Chain and Actors

Traditional, small-scale, and unprocessed honey marketing passes through different actors to reach the final consumers. For most of the supply of honey in the market, beekeepers are the first suppliers. However, beekeepers are aware of these chains but sell honey to anybody who can afford to buy their product (Table 4). Particularly, households need to sell immediately after harvest; they were hardly stacked against a single actor due to a lack of formal customer relationships. The field data shows that only 9% of the respondents have written agreements, whereas more than 91% sell to a buyer on the spot (Table 5), either at home or in the market. However, there is no clear flow chain of honey in the study area due to higher competition among actors. Particularly, the role of wholesalers was very high, but their hand is not visible in the market because they collect through collectors and some elite farmers during the honey harvesting season.

The main role of collectors was to collect honey from sellers, primarily beekeepers, and hand it over to retailers, wholesalers, or processors for marginal gain. They are unlicensed actors that work on behalf of the processors and wholesalers to negotiate prices with producers to deviate the product price from the floor price set by processors and wholesalers. Based on either local or international prices, processors and wholesalers set their prices with the background of their marginal gain. Besides their commission gain from their agent, these collectors are trying to expand their margin between the buyer price and the minimum prices of the producers.

On the other hand, the invisible hand of the wholesaler is the most dangerous part of the honey market. Whol-

-esalers collect honey from farmers during harvesting and store it until beekeepers use their supply. However, the critical importance of wholesalers was formalizing the flow of honey on formal routes, which further created access to markets for the beekeepers and sustained the supply of honey in the market. However, they have been challenging the honey market by creating an artificial scarcity by collecting honey in bulk from producers and hiding it in their store for a while until the price of honey inflates to their demand price. This in turn inflates the price of honey and, at the same time, reduces the honey supply in the market during harvesting. However, their role needs to be bound by the rules and regulations of agricultural marketing policy; otherwise, it is dangerous for even the producers.

However, among all actors, consumers are victims of all market fraud in the honey market chain. To increase their margin and, at the same time, reduce the price of honey, the retailers mix honey with other low-cost adulterants. The important notice here is that the retailers supply honey throughout the year in the market, except during the rainy season. However, consumers have no clear approaches to identifying pure honey except the traditional indigenous knowledge of honey color, thickness, viscosity, and odor as a purity measurement. Practically, these parameters do not guarantee the quality of honey with a necked eye in recent seasons due to the further advancement of adulteration practices. However, honey is easily adulterated with low-grade honey, sugars, and other substances [19]. However, different studies indicated that honey adulteration can cause a reduction in its protein content [20]. Hence, this was a great alarm for both government policy and public health to protect society.

Table 5. Actors and their relationship with beekeepers.

Buyers	Relationship between buyer and seller				Total
	Customer	On spot	Kinship	Friend	
Collectors	17 <sup>b</sup>	12 <sup>b</sup>	0	0	29
Retailers	13 <sup>b</sup>	12 <sup>b</sup>	0	0	25
Wholesalers	5 <sup>a</sup>	9 <sup>a</sup>	0	0	14
Exporter	7 <sup>a</sup>	9 <sup>a</sup>	2 <sup>b</sup>	2 <sup>b</sup>	20
Any body	6 <sup>a</sup>	27 <sup>b</sup>	0	0	33
Total	48	69	2	2	121

NB: Each subscript letter denotes a subset of what the relationship between you and your buyer? categories whose column proportions do not differ significantly from each other at the .05 level.

As a thumb rule, to cross-check the purity of purchased honey in the market, consumers were struggling to purchase from farmers, perceived as the only supplier of pure, unadulterated honey. The field data indicated that about 60% of beekeepers were selling at their homes (Table 6), where the buyer came to their home. As compared to other actors, the consumer perceived that farmers are relatively loyal to adulterate but sell at lower prices. However, the beekeepers were not receiving the premium price, though they were perceived as more loyal than other actors due to weak legal enforcement control in the honey market chain.

Table 6. Honey buyers across selling place.

Buyers	Place to Sell Honey			Total
	Home	Village	Nearby Market	
Collectors	20 <sup>a</sup>	2 <sup>a</sup>	7 <sup>a</sup>	29
Retailers	11 <sup>a</sup>	1 <sup>a</sup>	13 <sup>a</sup>	25
Wholesalers	8 <sup>a</sup>	0 <sup>a</sup>	6 <sub>a</sub>	14
Exporter	12 <sup>a</sup>	1 <sup>a</sup>	7 <sup>a</sup>	20
Any body	21 <sup>a</sup>	1 <sup>a</sup>	11 <sup>a</sup>	33
Total	72	5	44	121

Each subscript letter denotes a subset of market place/town) do you sell your honey categories whose column proportions do not differ significantly from each other at the .05 level.

In the current situation, honey reaches the final consumers through 11 possible routes (figure 2), of which the beekeeper-consumer route is the shortest, whereas the route Beekeepers, Collectors, Wholesalers, Processors, Retailers, and Consumers is the longest route, which involves six actors in the chain. The escalation of the number of actors in the routes is attributed to a lack of legal binding force that limits or encourages the participation of actors. However, as the chain length increases, the price increases, the fraud increases, and all failures emerge. The number of routes is also one of the indications of market problems, whereas as the honey product became far away from its source, the number of actors increased.

1. Beekeepers → Collectors → Wholesalers → Processors → Retailers → Consumers
2. Beekeepers → Collectors → Wholesalers → Processors → Consumers
3. Beekeepers → Collectors → Wholesalers → Retailers → Consumers
4. Beekeepers → Collectors → Wholesalers → Retailers → Consumers
5. Beekeepers → Wholesalers → Processors → Consumers
6. Beekeepers → Wholesalers → Retailers → Consumers
7. Beekeepers → Collectors → Processors → Consumers
8. Beekeepers → Wholesalers → Consumers
9. Beekeepers → Collectors → Consumers
10. Beekeepers → Retailers → Consumers
11. Beekeepers → Consumers

Generally, the distribution of scarce resources along multiple routes is a big crisis in the honey market. As the distance from the source increases, the quality of honey deteriorates, whereas the probability of adulteration increases.

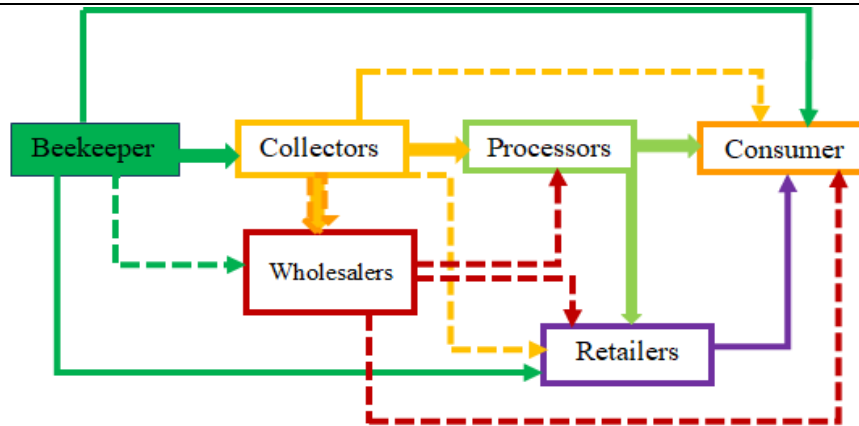


Fig. 2. Honey supply chain (From own honey value chain survey, 2023).

The field data indicates that 73% of the households are selling honey, largely in crude form (Table 3). There are no common buyers in the market, but 24%, 21%, 12%, and 17% of the beekeepers are selling to collectors, retailers, wholesalers, and exporters, respectively, whereas 27% of the beekeepers do not clearly identify to whom they are selling (Table 6). However, only 40% of the beekeepers claimed their buyers were their customers, and only 9% of the beekeepers had written agreements. With this encounter, most of the beekeepers have no clear relationship with the buyer beyond oral communication. However, about 57% of the beekeepers did not have any relationships with their buyers. This implies that the honey supply system is fragmented, with a lot of challenges in its process. Within this situation, the expectation of honey exports becomes a dream unless otherwise the legal intervention would execute.



Figure 1. Appearance of honey in the market, Ejere, Ethiopia (photo by Dirriba M, 2023).

However, this experience has created an opportunity for retailers (adulterers) to mix crude honey with adulterated honey to confuse consumers. This is associated with a problem of traceability and the dominance of unlicensed traders' floods in the honey market system [21]. As it is visible from the photo (Figure 3), the comb in the honey containers implies that it is pure honey, but not. The reality is that retailers in the market purchase pure crude honey from farmers in the market and mix it with their home-adulterated honey in the same market to deceive consumers. Unless consumers are aware of the quality characteristics of honey, the honey on the market is presumed to be pure honey. This calls for policy interventions to address the knowledge gap about honey quality for all actors.

### 3.5. Pricing of Honey

All the decisions made with respect to the elements of the marketing mix are of critical importance, not least the decisions as to what price to ask for the product or service. The task of pricing is reiterative because it takes place in a dynamic environment where cost structures, competitors, new products, consumer tastes, and disposable incomes modify established patterns of consumption.

In the honey market, the pricing objectives remain an illusion from the farmers' side in Ethiopia, though the higher cost of inputs is a big challenge. The pricing strategies of farmers are not well focused in this area due to a poor background for price suggestions. The price-setting background is rooted in the efforts allocated to beekeeping. According to the perception of farmers, beekeeping is a night job coupled with the effort to mount the trees either to catch swarms or to harvest honey. However, there is no figurative proof to determine the floor price of honey in the current situation.

Table 7. Price decision makers.

Buyers	Who decides on your honey price				Total
	Seller	Buyer	Negotiation	Existing Market	
Collectors	8 <sub>a</sub>	14 <sub>a</sub>	5 <sub>a</sub>	1 <sub>b</sub>	28
Retailers	6 <sub>a</sub>	9 <sub>a</sub>	3 <sub>a</sub>	6 <sub>a</sub>	24
Wholesalers	4 <sub>a</sub>	8 <sub>a</sub>	1 <sub>a</sub>	1 <sub>a</sub>	14
Exporter	3 <sub>a</sub>	7 <sub>a</sub>	2 <sub>a</sub>	8 <sub>a</sub>	20
Any body	8 <sub>a</sub>	10 <sub>a</sub>	2 <sub>a</sub>	11 <sub>a</sub>	31
Total	29	48	13	27	117

NB: Each subscript letter denotes a subset of Who decides on your honey price categories whose column proportions do not differ significantly from each other at the .05 level.

However, buyers maintained the most significant influence on honey price-making. (Table 7) for a variety of reasons, including:

- The buyers have better information than the producers during honey purchases.
- The buyer is negotiating the price considering their calculated benefit and risk, whereas buyers have no calculated benefit as a background for negotiation.
- Producers are negotiating based on last year's honey price and the hardness of beekeeping work. In the current study, the farmers were not the final decision-makers but the starters in the price negotiation game. The last decision, whether to buy or not, is autonomous of the buyer's decision. As a result, the intensity of competition, buyers' decisions, and beekeeper acceptance govern the honey price.

### 3.6. Honey Market Failure

The honey market system is supply-driven, where farmers can produce and supply the quantity with the existing quality, colour, and purity they have. Farmers can sell this supply at any moment for a negotiable price in the name of honey. Farmers are commonly selling at home (Table 6), while retailers thrive in the open honey

market. However, once the honey was taken from the hands of producers, the adulteration fraud escalated as the market chain lengthened. The buyer, on the other hand, lacks enough product information and is negotiating primarily based on his observations of the wax and honey content, color, and physical appeal of the honey in the market. In other words, consumers have no clear standard on which to choose the quality among the suppliers in the market but visually evaluate the relative betterment. On the other hand, the retailers in the market are not loyal, expanding their marginal profit by adulterating honey.

The honey that is offered, particularly in the market, favors the retailers' abuse of consumers. Consumers, or more generally buyers, are unaware of the ingredients of honey in the market but driven by the traditional loyalty of being humans. However, based on physical inspection, it was evident that the purity of honey was commonly affected by adulteration with various foreign substances, such as dried beeswax, sugarcane molasses, and sugar (Figure 4). Although further laboratory research is necessary, market surveillance revealed that consumers, particularly those who needed mead, were buying adulterated honey because there were not any other options available for consumers. The consumers, however, were not fully aware of the fraud the retailers were committing against them.



Fig. 4. Honey retailing, measurement and physical observation, Ambo, Ethiopia (Photo by Dirriba M, 2023).

Generally, the market failed to deliver pure honey to consumers. The market failure in honey was clearly observable where the supply of honey on the market is lower with flourished impure honey. Moreover, the small amount of adulterated honey available on the market is not enough to meet the demands of consumers. Even though beekeepers are premium-quality suppliers, the competition to purchase from farmers was higher. However, farmers are not paid for their quality services but rather become victims of traders abuse due to their position to influence price making.

With these facts, buyers are competing to buy pure honey immediately after harvesting (Table 3) at beekeepers' homes before it is delivered to the market. In all study areas, home-based honey selling (Table 6) was common in most parts of the Oromia region in fear of adulteration due to higher competition.

#### **IV. CONCLUSION AND RECOMMENDATION**

In Ethiopia, the traditional production system could not be demolished, though the history of beekeeping was too long in the country. Still, the traditional practices play a crucial role, though they are characterized by many

drawbacks in relation to quality and productivity per hive. The study shows that honey is the primary bee product supplied to the market, where over 85% of beekeepers sell honey. However, the honey market chain is unclear due to higher competition among actors from the beekeeper's village. In the chain, the farmers were perceived to be the only pure honey suppliers, and they were, in turn, blindly paid the lowest incentive for their loyalty efforts. Once the honey was released from the hands of beekeepers, it was ready for adulteration as an incentive to increase profit, particularly as the chain escalated.

However, this fraud is a loss for consumers due to its lower nutritional value as well as health risks. On the other hand, it is a risk for the country due to the higher number of illegal traders without paying the government service, besides their disturbance of the marketing system. Moreover, producers are also victims of their effort to supply pure honey in the market, where consumers perceive it as adulterated honey regardless of their loyalty. Generally, the current honey marketing chain needs to be revisited for fair market practice by the government. Moreover;

- The government needs to protect the beekeepers to generate a fair income from their beekeeping practices, whereas consumers need to access pure honey.
- It needs policy action to standardize the quality of honey in the market with standards and the accountability of involved actors.
- It also requires an extension system to support the awareness of all actors about the quality of pure honey on the market.
- The marketing of honey also needs infrastructure development due to the sensitive nature of honey.

Finally, further research is required to determine the best strategy for quickly identifying adulterated honey and strategies to stop it for better policy implementation.

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