Assessment of livestock production systems and potential for increasing productivity through improved feeding in Awendo sub-county, Kenya

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Methodology

Description of the study area

The Feed Assessment Tool (FEAST) was used to assess the livestock production, cropping system and local feed resources in Awendo sub-county, Migori county in the Republic of Kenya. Awendo sub-county is one of the counties in Migori county, located in the western part of Kenya. It is about 350 km from Nairobi (the capital city of Kenya) and 156 km from Kisumu city (the largest city in western Kenya) by road. It covers an area of 262 km^2 with a population of 108, 913 (KBS 2009)[1].

The average annual rainfall is 1435 mm with the highest amount of rainfall received in April at 233 mm and the lowest rainfall in July at 56 mm. The region is moderately cool with February being the warmest month with an average temperature of 21.7^{0}C and July being the coolest month with temperatures averaging 19.6^{0}C.

Data collection and analysis

The assessment was carried out in June of 2016 through a focus group discussion with 20 farmers followed by individual questionnaires administered to nine farmers representing three categories of farmers in the region (small, medium and large scale).

The quantitative data collected during individual interviews were analyzed using the FEAST excel template (www.ilri.org/feast), a feed assessment tool that has been developed to help design site-specific strategies for feed supply and utilization. The information was presented in tables, graphs, pie and bar charts. The qualitative data collected using the participatory rural appraisal (PRA) group discussions were synthesized and summarized.

Results and discussions

The following sections detail the findings and recommendations for further action.

Farming systems

Households in the area consist of approximately eight members (range 6–10). Table 1 below shows farmers perceptions on average land sizes for different categories of farmers.

1 KBS (Kenya National Bureau of Statistics). 2009. Census report

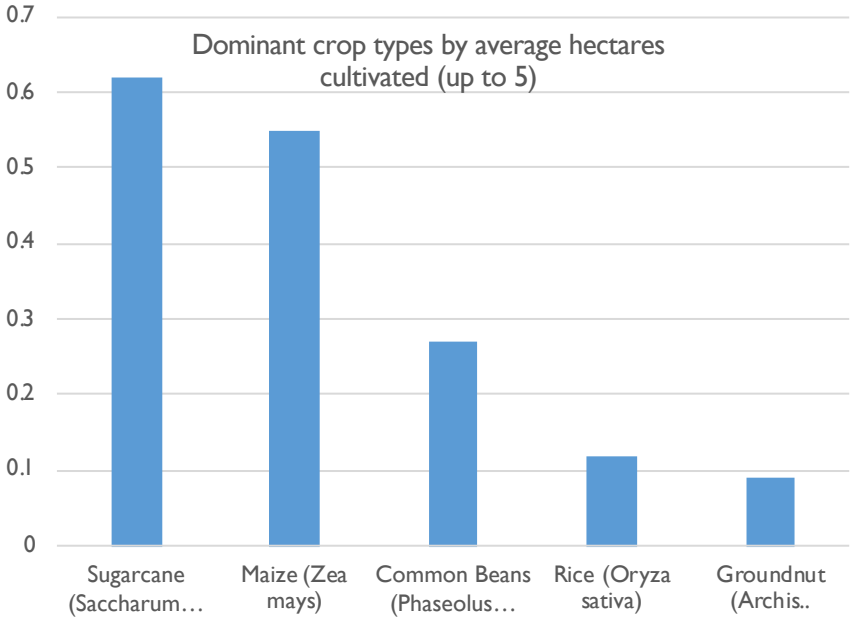
Table 1. Average land sizes owned by different categories of farmers in Awendo sub-county

Category of farmer	Range of land sizes (hectares)	% of households
Landless	0	0
Small	0–1.2	40
Medium	1.2–2	45
Large	≥ 2	15

The production system can be described as a mixed crop-livestock system with most of the farmers keeping local Zebu breeds and a few improved dairy cows. The main cash crop in the area is sugarcane with almost every household having a sugarcane plantation. Sugarcane is mainly grown as a source of income. The food crops grown for subsistence include maize, sweet potatoes, common beans and groundnuts. A few farmers also grow rice. A summary of the land sizes and crops grown is indicated in Figure 1.

Most crops are grown during the long and short rains, thus there are two major cropping seasons in a calendar year—February–June and September–November. Harvesting is done in July/August and December.

Figure 1: Dominant crop varieties that are grown in Awendo



The area has a bimodal rainfall pattern with the long rains (locally known as Chiri) occurring in the months between March and June and the short rains (locally known as Opon) occurring between September and December. The dry season (locally known as Oro) occurs from January–February and again from July–August (Table 2). However, in 2015, there was a major change in the rainfall pattern with more rains being experienced between September and December rather than March to June.

Table 2. Cropping seasons that occur in the study area

Season	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sept	Oct	Nov	Dec
Long rains (Chiri)												
Short rains (Opon)												
Dry (Oro)												

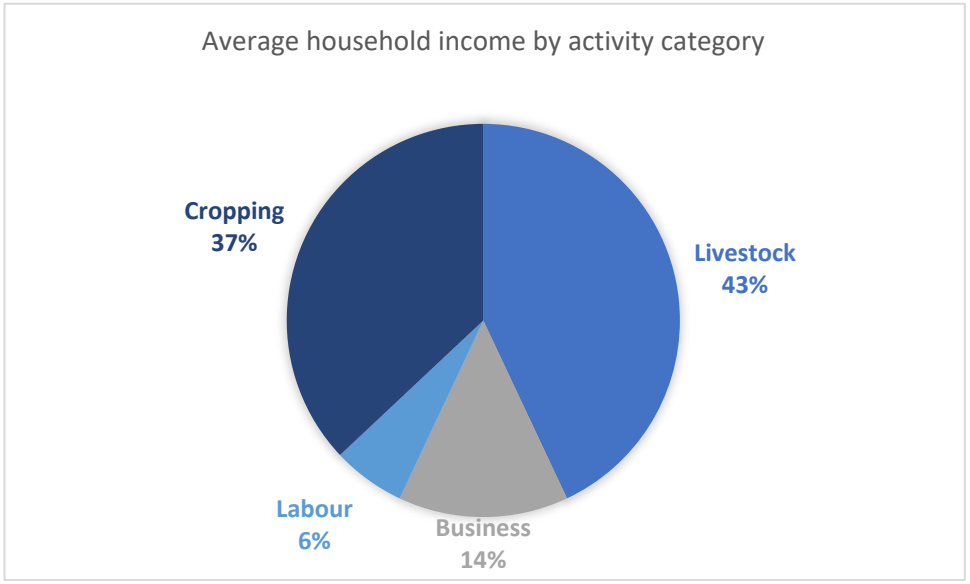
Farmers in the study area use mainly manual labour for planting, weeding and harvesting. For ploughing, most farmers use ox-ploughs and tractors. The cost of manual labour averages KES300 (USD2.97)/day or KES200 (USD1.98) with an additional provision of one meal per day. Labour cost does not vary with gender. The cost of ploughing 0.4 hectares of land using a tractor averages KES3,000 (USD29.7)[2].

Major income sources

Most of the farmers keep the local Zebu cattle but a few farmers keep crossbred dairy cows and purebred cattle. Local chickens are also kept by the majority of the farmers (90%) mainly for subsistence use. These farmers mainly keep improved local chicken such as Kuroiler and Rainbow roosters. Sheep and goats are kept by some farmers mainly for sale in cases of emergency e.g. to generate income for school fees or payment for hospital bills.

Main sources of income for households are livestock production activities such as the sale of milk and other dairy products and the sale of chicken and eggs (43%). Crops, especially sugarcane, also contribute to a major proportion of household income (37%). Maize is grown mainly for subsistence use although some farmers have started growing it on a large scale to supply to local schools. Other sources of income include off-farm businesses (14%) and manual labour (6%) (Figure 2).

Figure 2: Contribution (%) of livelihood activities to household income



2 USD1 = KES101

Major credit sources

Both formal and informal credit sources are used in Awendo. The formal sources include commercial banks mainly Equity, National bank, etc., as well as micro finance institutions. The informal credit sources include merry go rounds (revolving credit schemes) and loans from friends/family.

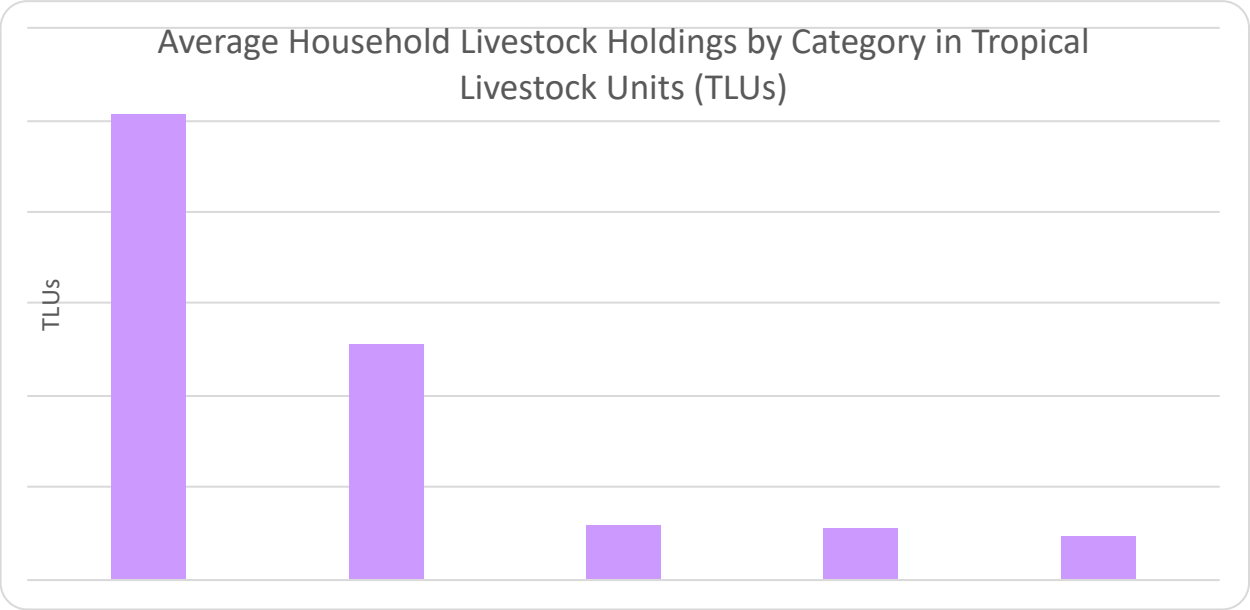
About 50% of farmers have access to credit. Many farmers prefer informal sources (75%) over the formal sources (25%). This is due to the strict rules governing formal credit access, especially the requirement for collateral such as land title deeds, which most of the farmers do not have.

The requirements for obtaining formal credit from banks include presenting collaterals (title deeds, car logbook, etc.), evidence of savings and a bank statement showing activities for a minimum of six months. The requirements for informal credit sources include being a member of a savings group, having savings/shares and guarantors for the loan.

Livestock production systems

Cattle are the most dominant livestock in the area with farmers keeping improved breeds and the local Zebu (Figure 3). Improved dairy cows are kept by 20% of the population, while 80% of the population keep local dairy cows. Cattle are mainly kept for milk, meat and occasionally sold to generate income for school fees and hospital bills. Local cows are also used for dowry payment, and oxen for ploughing.

Figure 3: Average livestock holdings per household in Tropical Livestock Units (TLUs)



The average milk production by local dairy cows is 1.5 litres per day, while the average milk production by improved dairy cows is 5 litres per day. The demand for milk in the region is very high with most of the milk being sold at the farm gate and a small amount taken to local markets. Average price per litre of milk is KES60 in the wet season, while the milk price increases to KES70 per litre in the dry season.

Livestock holdings

The management of livestock differs depending on species. Farmers with improved dairy breeds practice both intensive zero grazing (animals are confined in a zero grazing unit most of the time) and semi-intensive zero grazing (animals are allowed to graze within the compound and later brought into the zero grazing units). The local dairy cattle are mainly tethered alongside the roads and on farms while others openly graze under the care of a herdsman.

However, farmers reported open grazing is becoming less common due to diminishing land as a result of population increase.

Farmers often use the cut and carry method of feeding and Napier grass is the most common feed. A few farmers supplement with *Desmodium* spp., Rhodes grass and sweet potato vines. Farmers also supplement with a dairy meal; a commercial feed concentrate readily available in Agro vets in Awendo town. Farmers also provide mineral licks to the improved dairy cows. However, this is not on a regular basis as most farmers consider mineral licks to be too expensive while others are not aware of the importance of providing minerals to animals.

Animal health services are provided by both government officers and private practitioners, but the services are quite costly for farmers. The average cost of treating East Cost fever (ECF) is on average KES5000 per animal. The county government occasionally carries out vaccinations against foot and mouth and black quarter diseases, charging farmers KES100 and KES20 per animal respectively.

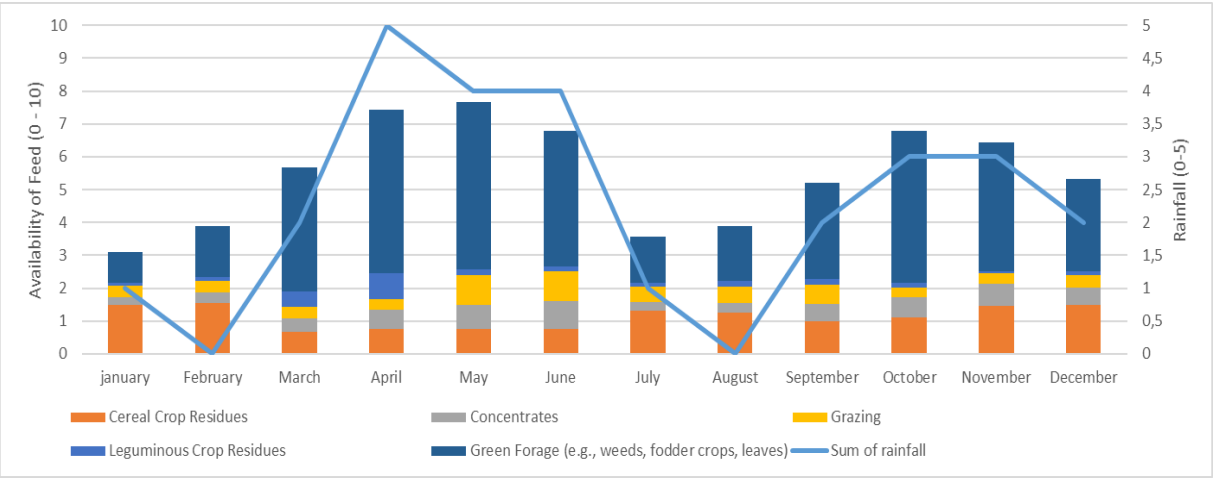
Artificial insemination (AI) services are also available both from the county government inseminators and private inseminators. The private AI providers charge between KES2000–2500 per service. On the other hand, the county government initiated an AI scheme at a subsidized rate whereby a grade cow costs KES700 to inseminate, crosses cost KES100 and local Zebu cattle cost KES50. However, this program has faced a lot of challenges. For example, the inseminators frequently face shortage of fuel making them unable to reach the farmers, which forces farmers to pay for transportation to bring the service to them. Therefore, the government AI scheme costs an average of KES1500 per service if the transport cost is met by the farmer.

Currently, about 40% of the farmers use AI services while 60% use bull services. Most farmers that use AI services have improved dairy cows. Farmers usually use their own bulls and those who must take their animals to other bulls will be charged a fee of KES800–1200 per service.

Feed availability, crops grown and feed purchased

Green forage is the major feed source during the short rains (September–December) and long rains (March–June) when rainfall favors the growth of green forage/fodder. In the dry months (January, July and August), cereal crop residues form the larger proportion of the feed resource base because cultivated fodder dries up and becomes less available. Also, harvesting is done in this season and crop residues are readily available. Crop residues are chopped, mixed with diluted molasses and fed to dairy animals when green fodder is not available. However, the main cereal crop residue used is maize stover; very few farmers use leguminous crop residues. Farmers buy concentrate feed throughout the year in varying quantities. Dairy meal is the main concentrate purchased and is mostly used for lactating cows.

Figure 4: Available feed sources utilized by farmers throughout the year



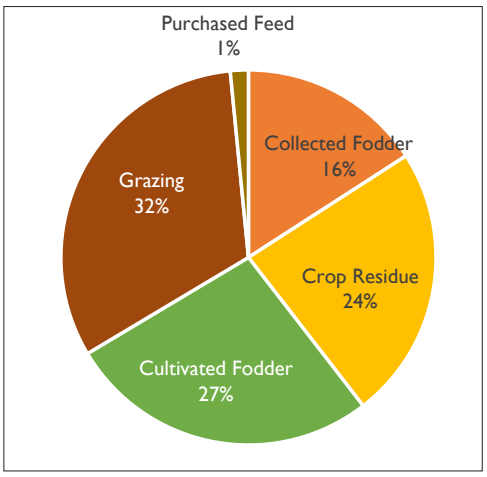
The major forage cultivated by the farmers is Napier grass, with a few farmers growing Rhodes grass. Farmers rely strongly on rain-fed agriculture and they experience green forage shortage during the dry seasons.

Livestock dietary composition

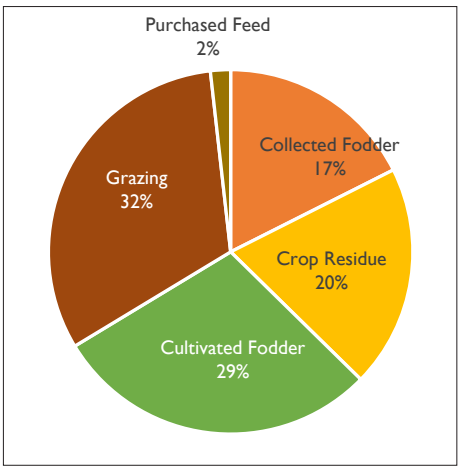
Grazing forms the largest source of feed on a dry matter basis as shown in Figure 5A and consequently, metabolizable energy (Figure 5B) throughout the year. The source of crude protein is mainly cultivated fodder (Figure 5C).

Figure 5A, 5B and 5C: Contribution of dietary requirements in Awendo sub-county

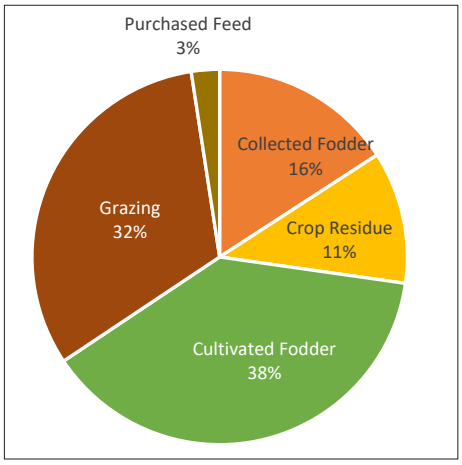
5A) Dry matter intake



5B) Metabolisable energy intake



5C) Crude protein intake



Key challenges and suggested interventions

The main problems faced by farmers are inadequate animal husbandry skills and high cost of constructing standard zero grazing units (Table 3).

Table 3. Problems and proposed farmer interventions within the production system

Rank	Challenges	Suggested interventions by farmers
1	Inadequate dairy production and management skills	Capacity building (conduct farmer training and on-farm demonstrations of various dairy production technologies).
2	The high cost of constructing standard zero grazing units	Farmers can use locally available raw materials e.g. round poles and secondhand iron sheets to construct units instead of purchasing new materials which are quite expensive.
		County government should give loans to farmers for construction of units.
		Farmers need to be linked with financial institutions to get loans for unit construction.
3	Inadequate extension services	County government should employ more extension staff.
		County governments should provide fuel to enable existing staff to reach out to farmers.
4	Prevalence of tick-borne and foot and mouth diseases	Carry out demos on control of tick-borne diseases (spraying).
		Farmers should practice regular spraying of animals.
		County government should carry out regular vaccination against tick-borne diseases, e.g. ECF.
		Control tsetse flies.
5	Poor quality local feeds and high cost of concentrate feeds	Train farmers on how to formulate their own feed (on-farm feed formulation).
		County government or private organizations should establish a reliable feed processing factory in the county.
		More training on fodder establishment and production.

Awendo sub-county has been predominantly a sugarcane growing zone with most of the farmers heavily relying on sugarcane farming at the expense of livestock production. However, dairy farming has been picking up within the region. Most farmers still lack adequate skills on dairy production and rely mainly on Napier grass as feed for the cows with some supplementation with other feeds. Therefore, most dairy animals do not consume balanced feed rations, depending mainly on Napier grass as the source of their nutrients. Some farmers have started growing other feeds like Desmodium (Green leaf), sweet potato vines and Calliandra to supplement Napier grass although this is still in very small quantities and only by a few farmers. Farmers also experience severe feed shortages during the dry seasons due to very low feed conservation or planning.

The farmers indicated the high cost of constructing a standard zero grazing unit as a prohibiting factor in dairy production. A standard unit would cost about KES70, 000 which is not easily affordable by most farmers. The high cost prevents most farmers from owning dairy animals. However, some farmers have resorted to using locally available resources for building the units. Farmers also cited inadequate extension services as one of their challenges since there are only three officers at the department of livestock production who cover the entire sub-county.

Additionally, there is a prevalence of tick-borne diseases, especially East Cost fever (ECF) which is very costly to treat (about KES5000 per animal). This prevents many farmers from rearing dairy animals. Farmers also reported that the cost of concentrate feeds is high, especially dairy meal which costs, on average, KES1800 per 50 kg. Available local feeds tend to be of poor quality and farmers do not purchase these feeds; they rely on Napier grass instead.

Potential interventions and recommendations

1. Dairy farmers need to be trained on dairy cow husbandry, especially on disease control and prevention, proper feeding and nutrition, clean milk production and calf rearing.

2. The poor quality of feeds and high cost could be addressed by teaching farmers how to formulate their own feeds using locally available resources such as sunflower seed cake, maize stovers, molasses, etc. Farmers could be trained on how to make rations equivalent to commercially prepared dairy meal.

3. Farmers should be encouraged to plant different varieties of fodder apart from Napier such as Rhodes grass, *Desmodium* spp., oats, lupins, etc. They can be assisted to purchase these seeds in groups and distribute amongst themselves in the wards.

4. Farmers can be trained on feed conservation measures like silage and hay making. Green maize can be used to make silage instead of only Napier grass.

5. Utilization of crop residues such as maize stovers and sugarcane tops, and using molasses to feed dairy animals could also help in addressing feed shortages during the dry season.

6. Farmers should be sensitized to grow more improved pasture like Rhodes grass rather than rely on natural pasture.

7. The county government in collaboration with private organizations could introduce subsidized vaccination programs against common cattle diseases in the area such as foot and mouth disease, ECF and black quarter disease.

8. Farmers can be linked to financial institutions to provide them with loans at affordable rates to enable them to build standard zero grazing units.

9. The county government could share cost with farmers in the construction of zero grazing units or offer farmers loans.

Summary

Awendo sub-county has a great potential for dairy production given its favorable climatic conditions for fodder production, the availability of crop residues (maize stovers and sugarcane tops) and industrial byproducts like molasses. These can all be used by farmers to make feeds and lower the cost of production. However, sugarcane production has been dominant in the region due to the presence of a sugar factory in the area. Because of this, dairy production has been carried out on a small-scale basis and not necessarily for commercial purposes. There is a need to sensitize farmers on the benefits of dairy production as a commercial venture and farmers need more training on dairy cow husbandry and management. Education and training on dairy cow nutrition are needed in order to minimize the knowledge gap and increase production.

Additionally, the farmers fear to invest in dairy production due to the perception that the cost of putting up a zero grazing unit and maintaining a dairy cow is beyond their reach. These farmers need to be encouraged by giving them soft loans or subsidies on construction costs and teaching them how to grow enough feeds and conserving feeds. The cows could also be insured to reduce the risk for the farmers.

Annexes

Table 1. A summary of the core context attributes

Attribute	Score	Question 1.8 FEAST discussion guide
Availability of cash/credit	2	Question 1.10 FEAST discussion guide
Availability of input delivery	3	Based on facilitator's best judgment
Availability of knowledge	3	Question 1.6 FEAST discussion guide
Availability of labour	4	Question 1.8 FEAST discussion guide
Availability of land for cultivation	2	Question 1.9 FEAST discussion guide
Availability water in the growing season	4	Question 1.5.2 FEAST discussion guide
Availability of feed in dry/cool season	2	Based on facilitator's best judgment
Availability of feed in the growing season	3	Based on facilitator's best judgment
Quality of feed	3	Based on facilitator's best judgment
Quantity of feed	3	Based on facilitator's best judgment

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