

Report on Forage Harvesting Machinery and Implements

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Companies in Nairobi visited on 16th April 2024

Companies based in Nakuru visited on the 17th and 18th of April 2024

The company in Kitengela visited on 19th April 2024

Introduction

ProDairy EA made an inventory of suppliers of brush cutters, forage choppers, silage baling machines, walking tractors/tillers, and 2-drum grass mowers. The full inventory is presented in the report's annexes through a link (or links) to an Excel sheet or PDF brochure. Below is a summary of the suppliers and machinery of first choice (recommended) considering price/quality; these were all visited, and the machinery was inspected.

Other companies visited (mainly in Nakuru) but not presented below are Molo Farming World, Steve Machineries, Jaichi Auto Hardware, Nakuru Tinga, and other local hardware suppliers and fabricators, but the machines on display did not meet the standards we had anticipated to find. These companies are stockists/ distributors who either import or buy from local manufacturers, which poses a knowledge/skill gap as they must involve a third party to train, repair, and maintain these machines. This also poses a risk of non-committal by the third party whom SNV cannot hold liable.

1. Forage choppers.

These are mainly used in chopping forages for silage making and direct feeding. The choppers and suppliers were assessed whether they met the following criteria:

- Output per hour and forage chopping size: We recommend machines with higher output. For the farmer, it saves time, whereas agricultural service providers are mostly paid on the tonnage of silage. The silage-making process is time-sensitive and hence needs a higher-capacity machine.
- Materials used: Durable materials are preferred to ensure the longevity of the forage choppers since they can handle bigger loads and work longer periods continuously without interruptions (breakdowns).
- Design of the machine: Aspects of the design indicate for example if the machine is easily transported. Machines on wheels are preferred (towable). While forage choppers with blowers can load trucks or trailers directly. Another aspect is if the chopper is fitted with knives only or makes use of so-called 'hammers' in the knife cage, this will affect the quality of the chopped material.
- Availability of spare parts, other consumables, and local technicians.
- Cost of forage chopper and turnaround time.

a) Rift Valley Machinery (Nairobi and Nakuru)

RVM is the accredited supplier of JF series forage choppers from Brazil. We found that JF machines are durable/ robust and meet the requirements to support a silage-making business. The recommended choppers are JF 30 EVO, JF 40P, and JF 60 MAXXIUM (See Figure 1 and 2 below) which have a minimum 4,000 kg output per hour. (see PD Farm Machinery inventory: Annexed). Prices start from Ksh 300,000 – 850,000



Figure 1: JF 30 EVO



Figure 2: JF 40P

Advantages of JF Choppers

- Highly durable. Made of hard materials, with quality painting and finishing. There are examples in the field that have worked for many years. They are not prone to breakages when operated under normal conditions.
- Highly versatile. They have provisions to be driven by both electric motor or diesel/ petrol engines, provisions to be mounted on trailers, adjustment of chopping size, and attachments (PTO) to tractors.
- The company employs its local technicians who pay field visits and a repair workshop, it has a good stock of spare parts.

Disadvantages

- Initial purchase cost is high compared to other machines in the same category.
- There is only one supplier in Kenya (RVM).
- The company only has a few smaller types of forage choppers in stock/display. Time needed for importation is approximately 60-90 days.

b) Nakuru Simba



Figure 3 Towing Chopper

The chopper that is recommended for communal silage making (service provider enterprise) or for moving around in farms is the trailer mounted '**Towing Chopper**', **22HP, 4,800 kg/hour** (See figure 3 on the left). According to the company, this is a fast-moving commodity whereby spare parts are readily available. Prices start from Ksh 200,000.

Advantages

- This is a multipurpose chopper. Can grind grains and chop forages.
- High capacity in relation to the relatively low price.
- Highly mobile. It is mounted on a trailer which is part of the machine and sold as such.
- Locally made and appears robust and durable materials were used.

Disadvantages

- The combination of a chopper which can be used for dry feeds (grain kernels, hay, and straw) and wet feeds (fresh Napier, Panicum, or Brachiaria grasses or Lucerne grass or hay). The wet feeds but also the Lucerne hay is often entirely shredded which is not favorable at all. This stimulates (effluent) losses during the chopping, storage, and feeding process.
- For dry feeds the result is better provided the chopping size is not too small. Chopping size less than 0.8 mm has a negative effect on the physically effective fiber which causes the rumen to contract (tickling effect).
- A nice clean cut of 1-2 cm and/or some conditioning of the forage is recommended but cannot be achieved with this machine. Conditioning means that the forage is a little damaged to the outer cell walls which allows bacteria which aid in the fermentation process to get access to the water-soluble carbohydrates (WSC) to set off the fermentation process.
- The chop size cannot be adjusted but depends on the loading speed by the operator(s).

c) Nile Agricultural Machinery (Nairobi) and Crevation International (Kitengela)

They supply the feed crusher machine Model 9ZR -6.8MT/hour. The power source required 7.5KW or 10 HP. This is ideal mostly when using a silage baler. Prices start from Ksh. 350,000/=



Figure 4 a & 4b Forage chopper with conveyor. Right figure detail with specs

Advantages

- Lightweight, compact machine easily transported on a pick-up truck or in a Toyota Probox.
- A conveyor belt allows easy loading and equal distribution of forages in the chopper.
- Can achieve a high capacity of 6800 kg/hour.
- Has adjustable and good chopping size (6-8mm)
- It takes about 2 weeks after ordering for the machine to be delivered.
- Ideal machine for silage baling enterprises when loading the silage baler.

Disadvantages

- Made of light materials hence may break easily.
- New model in Kenya. Spare parts are not (yet) easily available.
- Mobility is limited.

Table 1 Comparing different models of forage choppers. (the columns in yellow are readily available)

Local Supplier	Rift Valley Machinery (RVM)			Nakuru Simba	BenMwao	Crevation
Model	JF 30 evo	JF 40p	JF 60 MAXIUM	Towing Chopper	Chopper	9ZR -6.8
Country of manufacturing	Brazil	Brazil	Brazil	Locally fabricated	Locally fabricated	China
Process capacity	3500	5000	10000	4000	4500	6800kg/hour
Engine type	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel
Power	7.5	10	30	22	22	8 – 10 HP
Weight				200kgs	200kgs	225kg
Conveyor	N/A	N/A		N/A	N/A	Iron chain automatic conveyor belt
Cut blades quantity	2	3	4	2	2	6
Chopping sizes	4 & 8 mm	11 mm	5 & 13 or 8 & 13mm	Varying	Varying	6 mm
Mobility	Stationary	Trailer provision separately	Trailer provision separately	On trailer	On trailer	Stationary
Price (Ksh)	300,000	395,000	690,000	200,000	180,000	350,000

2. Forage choppers and chaff cutters for smallholder farmers.

2.1. Chaff cutter

These machines are designed to cut forages into smaller pieces. Unlike forage choppers which have hammers, chaff cutters do not crush or condition the forage but only cut it. They are best suited to be used stationary due to their bulkiness and design. They come either with 2 or 3 cutting blades.

Chaff cutters are versatile and can be run by an electric or petrol motor but can also be manually operated and such that the power source can quickly be interchanged. This makes the chaff cutter, a very attractive farm equipment for farmers operating small herds. A chaff cutter can be used for nearly all types of crops especially green forages like most tropical grasses and legumes when harvested fresh. For dry crops such as crop residues the machine is not applicable. Crops such as maize, sorghum or a legume with pods which, ideally, require the grain kernel to be damaged or better even crushed this farm implement is also not a good choice.

The price of the chaff cutter is approximately Ksh 30,000 and incl a motor (petrol or electric) the prices range between Ksh 45,000 and Ksh 65,000. The most commonly available chaff cutter is imported from India. Recommended local suppliers are RVM and Nakuru Simba Machinery.



Figure 5a, 5b & 5c showing petrol, electric and manual powered chaff cutters. These are very strong and hardy farm implements which can easily be maintained and repaired by farmers themselves or a local technician.

2.2. Forage choppers.

Smallholder farmers often have inadequate disposable income to be able to buy more complex machines. On the other hand, uncertainties around forage availability and types of forage required for the herd, would make a multipurpose forage chopper very efficient and attractive for farmers. These are farm machines which start at a capacity of 7.5 HP and are designed such that they can cut or crush not only fresh green forages but also dry roughages and grains and by-products like oil seed cakes.

Table 2. Table below shows small forage choppers recommended for small holder farmers.

Supplier	Rift Valley Machinery (RVM)	Nakuru Simba		BenMwao Machinery
Model	JF 30 evo	Chopper	JD Chopper	Chopper
Source	Brazil	Locally fabricated		China
Process capacity	3500	800	2000	1000kg/hour
Engine type	Diesel/Electric	Petrol/electric	Diesel	Petrol/electric
Power	7.5	7.5	7.5	7.5
Purpose	Only Chop forages	Chopping and grinding grains	Chopping and grinding grains	Chopping and grinding grains
Cut blades quantity	2 blades and hammers	2 blades and hammers/beaters	2 blades and hammers/beaters	2 blades and hammers
Mobility	Stationary	Movable	Movable	Movable
Price (Ksh)	300,000	45,000	80,000	38,000

2.3 Kentrac

The same and other farm implements for feed and fodder is also available at Kentrac.

<https://kentrac.co.ke/feed-making-processing-handling-and-mixing/>

3. Silage baling machines.

a) Nile Agricultural Machinery (Nairobi)



Figure 6 a & 6b Silage baler with conveyor. Left figure details of the baler. Right the silage baler at the warehouse in Nairobi.

Observations

- This unit is suitable for baling small bales of silage (50-80 kg) suitable for smallholder farmers. Or service providers targeting smallholder farmers.
- The machine is mobile and easy to transport. It needs a tractor or truck to tow but can also be loaded on a truck to be transported to various sites.
- The materials used to construct the machine are not very durable (very thin metal sheets) hence may need maximum (regular) care. Use for intensive larger-scale (number of bales per hour and per day) commercial forage production may therefore be a limitation.
- Proper instruction and intensive training are recommended before purchase and usage. The company has one technician in the field in Kenya. In case of a breakdown, the turnaround to have it repaired may take days rather than hours if the repairs need technical expertise from the company and cannot be repaired with local expertise available up-country.
- The baler has an output of a minimum of 4,500 kgs per hour therefore required to be supported by a forage chopper with an equal or higher output for maximum utilization.
- Price Ksh. 990,000/=

b) Crevation International Ltd



Figure 7. Silage baler with conveyor at Crevation International on the right the baler in the field

Observations

- The silage baler needs to be supported by a forage chopper with an output of more than 5,000 kgs/hour.
- The supplier recommends this machine is best suited to be used in a stationary place. It is not recommended to be transported frequently.
- Lizzar Dairies (+254725206657) in Naivasha/Narok is a service provider in Narok using a number of these machines for chopping and baling.
- Prices start from Ksh 900,000.

Table 3 Table indicating comparisons between the two baling machine suppliers.

Company	The Nile Agricultural Machinery	Crevation International Limited
Product	Fully Automatic Silage baler	Fodder baling machine
Country of Manufacturing	China	China
Model	9YDB-55	9YDB-55
Engine type	Diesel engine	Diesel Engine
Power	20 HP	15 HP
Bale size	Φ550*520mm	Φ550*520mm
Bale Weight	35-85 kg/bale	35 – 85 kg/bale
Production	60-120 bales/hour	30-75 bales/hour
Packaging Material	plastic net or rope +film	plastic net or rope +film
Main Machine size	3700*1400*1600mm (excluding diesel engine generator group)	-
Weight	1000 kgs	-
Mobility	Highly mobile	Not recommended to move it around
Price (Ksh)	990,000	900,000
Recommendation	Recommended	Not recommended

4. Walking tractors/tillers

Scaling forage production across the levels of small, medium, and large-scale farming enterprises is highly dependent on the suitability of the mechanization infrastructure deployed. Small-scale and large-scale are mostly covered due to the availability of small machines and large implements. Smallholder farmers mainly use hoes, jembes, machetes, and on the next level brush cutters; in large scale, often commercial fodder production tractor-pulled land preparation implements, and other tractor-operated implements are mainly used. The medium-scale farmers and service providers with the ambition to set up an agricultural service contracting enterprise are in a difficult market segment that is not very well supplied yet with mechanization solutions. This, so far limits smallholder farmers and medium-scale service providers from expanding and working more efficiently. Walking tractors and their implements may solve (some) of these challenges.

a) **STIHL East Africa**

MH 710 ([MH 710 – STIHL \(stihlea.co.ke\)](http://MH710-STIHL(stihlea.co.ke))) Powerful STIHL EHC 700 engine particularly for tilling the soil with different implements for weeding and ridging. Prices start from Ksh. 107,200/= (see detailed information and prices in the link). The machines of STIHL are robust, and strong when operated within the normal capacity. The disadvantage is that STIHL recommends using specific lubricants to be mixed with petrol which are not easily available up-country. STIHL prices are at the high end.



Figure 8. A light hand walking tractor that can be used for land cultivation and weeding in between the rows.

b) **Camco Equipment Kenya Ltd**

The supplier promised to share more information on e-mail which has not been received to date. The walking tractor appears robust and strong. With more capacity than the STIL tractor pictured above



Figure 9. A heavier hand walking tractor that can be used for land cultivation.

c) **Nile Agricultural Machinery**



Figure 10a and 10b 22 hp hand walking tractor with rotovator and seat specs in the figure below

Walking tractor with rotovator and seat	1.Product:two wheel walking tractor with rotovator and seat 2.Engine:ZS1115,single cylinder, 4stroke diesel engine,direct injection,2200r/min 3.Rated output:22HP 4.Cooling method:Air cooling(condenser) 5.Fuel consumption: ≈ 246. 2g/kw 6.Start type:electric key start 7.Tyre:6,00-12 tire 8.Chassis:151 type,min ground distance 180mm 9.Tread:800mm 10.Weight:520kg 11. Size-2680*960*1100mmmm	1set	294800KES
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Advantages

- Walking tractor with the possibility to sit.
- Robust appearance.
- Requires some skills to handle and operate the tractor.
- Ability to operate in the dark with good lighting in front of the tractor.
- Company has mechanics on standby to visit the farm/company in case of mechanical failure.
- In the workshop spare parts are available.
- Prices starting from Ksh 294,800.

5. Forage mowers (hand-held)

a) Stihl East Africa

Brush cutter: Model FS 250 (<https://stihlea.co.ke/product/fs-250/>)

With many extra attachments and thus multifunctional (See box with technical details)



Figure 11. Brush cutter (mower)

Prices starting from Ksh 49,886/=

Box 1: TECHNICAL DETAILS

- Displacement – 40.2 cm3
- Power – 1.6 kW (2.2 bhp)
- Weight* – 6.3 kg
- Fuel tank capacity – 0.64 l
- Cutting attachments:
 - Grass cutting blade 230-2,
 - Grass cutting blade 230-4,
 - Grass cutting blade 230-8,
 - Brush knife 250-3,
 - Circular saw blade 200 (scratcher tooth),
 - Circular saw blade 200 (chisel tooth),
 - SuperCut 20-2,
 - AutoCut 25-2,
 - AutoCut 30-2,
 - PolyCut 20-3,

b) Nile Agricultural Machinery

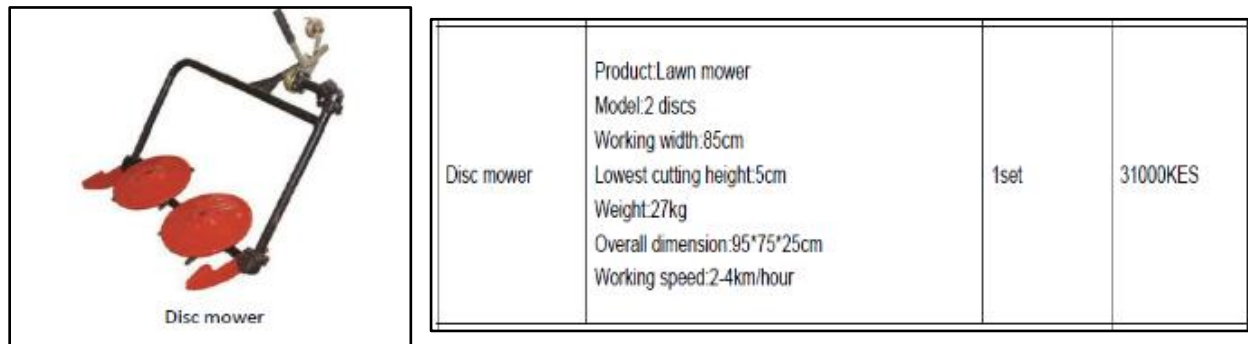


Figure 12a & 12b. A handheld and operated disc mower the left. In the right figure the technical details of the mower.

Observations

- The disc mower cannot be viewed and is not yet available with the companies visited.
- The mobile disc mower is available on order.
- Companies such as Camco and Nile Agricultural Machinery can import at request when given the specifications and customer requirements.
- Prices at Nile Agricultural Machinery starting from Ksh 31,000/=

c) Car and General Motors

Car and General Motors are dealers of Kubota tractors, which are normal 4-wheeled tractors that one can sit on. Starting from 18-20 HP the 45 HP model is the most sold. Readily available farm implements are tractor-driven rotary cultivators, giro-mowers and spring-tine-cultivators. The company also sells Beroni farm implements on order and has a spring tine cultivator for different tractor models in stock. <https://cargen.com/kubota/>

Table 4 Comparison between different types of tractors and implements matching their power and costs.

Tractor Model (Kubota model)	HP	Prices Kubota tractors	Prices in Ksh of implements matching the different Kubota models (excl. vat)		
			Gyro Mower	Tine Cultivator	Rotavator
L45 series	45	2,300,000	595,000	295,000 (9 tine)	485,000
L34 series	34	1,800,000	475,000	250,000 (7 tine)	450,000
B23 series	23	1,300,000	385,000	-	350,000

Observations

- Kubota is a well-known brand from Japan.
- The tractor is strong and robust.
- Prices start at a higher price range compared to the walking tractor but offer a wider variety of implements that can be attached.
- The company has a well-equipped workshop, mechanics on standby, and most models and implements in stock.
- The smaller-sized tractors are not standard, and need implements specifically designed for these Kubota tractors which can be a disadvantage.
- A limited number of readily available implements.



Figure 13a & 13b. The Kubota 4 wheeled tractor 23 series on the left and right the most sold 45 series.

6. Comparison of tractor-mounted 2-drum mowers

Table 4: Comparison of technical specs and prices of 2 drum mowers from 4 suppliers in Kenya. The columns highlighted in yellow are the models available in Kenya.

Local distributor		RM Patel			Holman		RVM	Automobile Warehouse	
Country of Manufacturing		Turkey			Turkey		Brazil	Turkey	
Brand / Model		AgroMaster			Atespar		JF	Matterhorn	
Technical Specifications	Unit	TOB 1350	TOB 1650	TOB 1900	ARM 165	ARM 125	JF 1650 T	MTRM-165	MTRM-195
Number of Drums	pcs	2	2	2	2	2	2	2	2
Number of Blades	pcs	6	6	6	6	6	6	6	8
Transporting Width	mm	1180	1520	1550	1400	850			
Transporting Length	mm	2600	2850	3350	2850	2300			
Transporting Height	mm	1050	1040	1000					
Working Width	mm	1350	1650	1900	1650	1250	1650		1900
PTO Rotation (Tractor)	rpm	540	540	540	540	540	540	540	540
PTO Rotation (Drum)	rpm	1920	1920	1920				1920	2500
Required Power	hp	30-40	45-50	65-70	40-80	30-50	35	25	60-80
Total Weight	kg	331	405	485	350	180	380	360	405
Price (incl VAT)	Ksh		450,000		371, 200		1,786,400		742,402

Observations

- Atespar and AgroMaster merged and are manufactured by one company under the brand name AgroMaster. From a perspective of continuity and availability of spare parts in the future the recommendation is to buy AgroMaster.
- The models of AgroMaster, Atespar and JF all have a working width of 1.65 meters. The Matterhorn model offered has a working width of 1.95 meters the extra 30 cm working width therefore comes at an extra cost of nearly Ksh 300,000/=. A wider working width should come at a lower cost per meter working width.







- The total weight of the AgroMaster is 405 kg which makes it a bit more robust, being an advantage in Kenya where grasses for hay are often harvested at flowering/seeding stage with a crop height of 75-100 cm. In the temperate climate where these mowers are developed
- the pastures are cut at vegetative stage no more than 30 cm height.
- The differences in the 4-wheeled hay rake and its prices are relatively small.
- The recommendation is to choose the AgroMaster brand for both implements.



Figure 14a & 14b. Atespar 2 drum mower ARM 185 in the field with left the specs plate with serial number and date of manufacturing on the mower.

Annexes 1-6:

Note: [click on the icon to open the files](#)

1. PD Farm Machinery Inventory	 PD farm Machinery Inventory PD DC Dra
2. Nile Machinery and Crevation silage choppers, mowers and balers	 Silage Balers and Mowers.xlsx
3. Rift Valley Machinery JF drum mower and Rake	 JF DRUM MOWER AND RAKE.pdf
4. Rift Valley Machinery Technical specifications for JF drum mowers and hay rakes_0001	 Technical specifications for JF
5. The Nile Quotation	 PI N20240416CY frm the Nile Ruth (1).pdf
6. Machine suppliers Contacts	 Machinery contacts.pdf