FARA
Forum for Agricultural Research in Africa

Research Report

Status, Opportunities and Challenges of Local Manufacturing of Agricultural Machineries

Insights from Kenya

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About FARA

The Forum for Agricultural Research in Africa (FARA) is the apex continental organisation responsible for coordinating and advocating for agricultural research-for-development. (AR4D). It serves as the entry point for agricultural research initiatives designed to have a continental reach or a sub-continental reach spanning more than one sub-region.
FARA serves as the technical arm of the African Union Commission (AUC) on matters concerning agricultural science, technology and innovation. FARA has provided a continental forum for stakeholders in AR4D to shape the vision and agenda for the sub-sector and to mobilise themselves to respond to key continent-wide development frameworks, notably the Comprehensive Africa Agriculture Development Programme (CAADP).
FARA's vision is to "Reduced poverty in Africa as a result of sustainable broad-based agricultural growth and improved livelihoods, particularly of smallholder and pastoral enterprises" its mission is the "Creation of broad-based improvements in agricultural productivity, competitiveness and markets by strengthening the capacity for agricultural innovation at the continental-level"; its Value Proposition is the "Strengthening Africa's capacity for innovation and transformation by visioning its strategic direction, integrating its capacities for change and creating an enabling policy environment for implementation". FARA's strategic direction is derived from and aligned to the Science Agenda for Agriculture in Africa (S3A), which is in turn designed to support the realization of the CAADP vision.

Disclaimer

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Executive Summary

A study was conducted in Kenya, in the Counties of Nairobi, Kiambu, Kisumu and Nakuru from 2nd to 16th April 2021 to assess the status, opportunities and challenges faced by local agricultural machinery manufacturers. The aim was to make recommendations on how to upgrade the sector and improve the use of agricultural mechanization technologies. Respondents included government ministries and departments, local agricultural manufacturers, and other relevant stakeholders.

A total of 94 local manufacturers and 26 key informants were interviewed, 13 focus group discussions (FGDs) were held and net maps were drawn to show the linkages and the level of influence of different stakeholders in the manufacturing sector.

The study revealed that more than 80% of the businesses were privately owned, 89% were male-owned and majority of the manufacturers had secondary and primary level education with less than 20% having business training. Only 16% of the businesses were affiliated with associations and lack of capital was cited as the major entry barrier.

On the source of design, 72% of the manufacturers reported that they used their own design while 55% copied from other manufacturers, while 54% got designs from request customers and about 10% got theirs from employees' ideas.

On Research and Development (R&D), 47% of the respondents reported having R&D programs with 10% mean revenue allocated. As a result, own inventions were reported by 51% of the respondents, Nakuru county accounted for 75% of such. Potential customers and innovations were identified through observations (45%), field experiments (23%), and surveys (20%). Manufactured machinery consisted of 36% for crop production, 31% for post-harvest handling, and 28% for livestock production. To minimize market risks, most of the manufacturers (62%) used on-demand production while 23% used regular production and the rest used both. The top three machines sold in the previous 12 months were foragede chopper, milling and shelling machines. The study revealed that 31% of the businesses reported that the Kenya Bureau of Standards (KEBS) had tested their machines, while 11% did their own testing and 7% stated that their machines were tested by a manufacturer's association.

Person-to-person advertisement was the most prevalent form of advertisement (65.1%), followed by social media (59%) and showroom (29%). The small-scale farmers were reported to be the predominant customers (83%) while 57% reported medium scale and 28% large scale farmers' patronage. Most customers were from within the county but 22% of the cases were said to be from out of the county. Customers' mode of payment was mainly cash, with some using electronic and bank transfer and most of the profits were plowed back into the businesses and the remainder used in their households. Foreign machinery importers were the main competitors in addition to other local manufacturers.

Engineers were the dominant hired staff (59%) followed by secondary school leavers (56%). Highest level of staff satisfaction was in Kiambu and Nakuru and about 45% of the manufacturers were satisfied with the current education system while 30% proposed more practical training while 3% suggested more theory.

On-the-job training based on informal or formal request by the staff of up to six months was provided by 79% of the manufacturers. Collaboration with the educational institutions was by 20% of the respondents with Nakuru leading and no collaboration in Kiambu. To support their businesses, respondents indicated that they took loans mostly for purchase of equipment (22.3%), buying raw materials (17%), training staff and importing machinery. Some manufacturers were not keen on taking bank loans owing to strict repayment schedules and the main source of loans was commercial banks. Up to 98% of the manufacturers were connected to the national electricity grid. They proposed the reduction of electricity tarrif, value added tax (VAT) and other taxes, stabilization of prices, reduction of market risks and regulation of foreign machinery imports. Policy interventions could include lowering of electricity costs and taxes, regulation of foreign imports, and adherence to certification code to improve market demand. The manufacturing sector in the study areas was mainly independently organized, faced numerous challenges and had potential for improvement.

Introduction

The manufacturing sector worldwide plays an important role in driving economic development through stimulation and sustenance of high productivity growth, job creation, and poverty alleviation. The sector has led to the development of many countries based on its continuous growth that is fuelled by the creation of conducive operating environments. In Kenya, the sector recorded 13.6% rise from the 1960s to 2007 but dropped to 8.4% from 2017 to the present (Kimuyu, 2010; KAM, 2018). The high contribution to the GDP in the 1960s and 1970s was anchored on the import substitution strategy (direct support and tariff protection) but market liberalization and export promotion in the late 1990s led to the decline witnessed (Chege et al., 2014). All this time the informal sector was not being considered but a shift in attitude by state organs led to growth through entrepreneurship, employment, and wealth creation. (ILO, 1972; Kimuyu, 2010).

Overall, the Kenya manufacturing sector has been dependent on the agriculture and services sector and any challenges encountered in these two areas have had a knock-on effect on manufacturing (GOK, 2016). Currently, the sector is part of the government's Big Four Agenda with the aim of achieving 15% GDP by 2022, focussing on agro-processing, leather, construction, oil and mining, steel, and ICT (KAM, 2018; GOK, 2017).

According to a 2016 KNBS survey, manufacturing accounts for 11.2% of all the micro, small and medium enterprises (MSMEs) but only a small proportion of these is involved in machinery manufacturing (GOK, 2016). The manufacturers play a key role in agriculture mechanization by producing local technologies and creating jobs in rural areas (Binswanger, 1986). However, they face challenges related to production and marketing due to competition from multinational companies and other importers despite the comparative advantage in terms of pricing and durability (Daum and Birner, 2017). The present study was therefore conducted to assess the status, opportunities, and challenges faced by local agricultural machinery manufacturers, and make recommendations on how to upgrade the sector and improve the use of local agricultural mechanization technologies.

Methodology

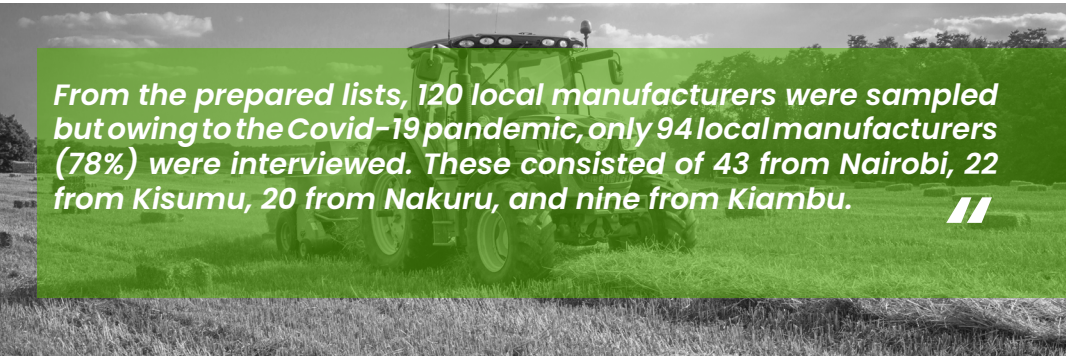
The Study Area

The study was conducted in four counties of Kenya, namely, Nairobi, Kiambu, Nakuru and Kisumu (see annex 1). The counties were selected based on their proximity to regions with high agricultural activities and the presence of local agricultural manufacturers. Nairobi county hosts many agro-based industries located in the city's industrial area. Kiambu is a peri-urban agricultural county with both small- and large-scale agricultural activities with Thika as the main industrial town. Kisumu is located in the Nyanza region with a range of agro-based industries in Kisumu city and other towns with farming and fishing as the main economic activities. Nakuru is an agricultural county where both small- and large-scale farming is practiced and it is the hub for agricultural machinery and equipment.

Sampling and Data Collection

This consisted of identification of local machinery manufacturers from lists prepared with the help of the local agricultural staff. Key informants consisting of local machinery manufacturers stakeholders such as engineers, policy makers and business owners were also identified and interviewed as well as Focus group discussion participants. For each category, there was a targeted number, but the COVID-19 containment measures prevented achievement of the targets. Data collection was undertaken by trained enumerators using questionnaires uploaded on the web based Online Data Kit (ODK). After the interviews, the questionnaires were checked by the supervisors for completeness and uploaded on the server.

Local Manufacturers' Individual Interviews



From the prepared lists, 120 local manufacturers were sampled but owing to the Covid-19 pandemic, only 94 local manufacturers (78%) were interviewed. These consisted of 43 from Nairobi, 22 from Kisumu, 20 from Nakuru, and nine from Kiambu.

Key Informant Interviews, Focus Group Discussions and Net Maps

Key informant interviews and Focus group discussions were held to obtain the views of experts and triangulate the information obtained from the local manufacturers' interviews.

Key Informant Interviews (KIIs):

Key informants were sampled from the list prepared with the help of county extension staff. A total of 26 Key informant interviews were conducted in the four counties consisting of 5 in Kiambu, 9 in Kisumu, 6 in Nakuru and 6 in Nairobi. A checklist which covered the status, evolution, roles, opportunities and prospects of the local manufacturing sector was used to guide the interviews. In Kiambu, key informants were from the university, research organization and the Agricultural Mechanization Service Centre. In Kisumu, key informants were drawn from the Ministry of Industry, three government parastatals, one institute of advanced technology, one from the Agricultural Technology Development Centre and three private consultant engineers. . In Nakuru, key informants were drawn from the university, Agricultural Technology Development Centre, Egerton University, a cooperative society and private consultant engineers. In Nairobi, six key informants drawn from the private and the public sectors were interviewed.

Focus group discussions and Net-maps

Identification of stakeholders for focus group discussions (FGDs) was done to determine the stakeholders, linkages and influence levels in the local agricultural manufacturing sector. A net map analysis tool was used to visualize the level of influence and linkages in production, distribution and policy. The stakeholders were mapped and prioritized based on their influence and roles in the local agricultural manufacturing sector. A total of 13 net-maps were drawn (see samples in annex 1 – 5)

Analysis

The mean, standard deviations and frequencies within and between counties were summarized into tables and graphs plotted. Key informant interviews were subjected to content analysis where summaries were drawn out of the responses within and between the respondents in the counties. Net-maps were drawn to describe the linkages and the level of influence of the different actors.

Results and Discussion

Business Background of Local Manufacturers Background and Manufacturer Characteristics

Table 1 shows the business background of local agricultural machinery manufacturers in the four counties. The results revealed that 89.4% of the businesses were privately and domestically owned of which 59.6% were the founders with a mean age of 42 years and 89.4% being males. The education level of the owners ranged from primary school to masters' degree level 30.9% and 18% had trained in business. The motivation to start a business was a dream or vision for 43% of the respondents while 7% started due to lack of an alternative and 6% said it was family business. About 79% of businesses were registered with over 80% in Nairobi and Kiambu compared to 68% and 70% in Kisumu and Nakuru, respectively. Despite the existence of the Kenya Association of Manufacturers (KAM), only 16% of respondents were affiliated to associations. This denied the local manufacturers access to training, capital, markets and professional services.

Majority (54%) of the businesses were located within suburban areas with a population of over 100,000 thus guaranteeing a source of labour and ready market.

Table 1. Business background of local agricultural machinery manufacturers in Nairobi, Kisumu, Nakuru and Kiambu Counties

	County				
Variable	**Nairobi (n=43)**	**Kisumu (n=22)**	**Nakuru (n=20)**	**Kiambu (n=9)**	**Overall (n=94)**
Business Ownership					
Private sector, domestically-owned (N=84)	88	86	90	100	89
Private sector, foreign-owned (N=6)	12	5	0	0	6
Government-/state-owned (N=3)	0	9	5	0	3
Shareholder companies (N=1)	0	0	5	0	1
Founder/Owner of the business (n=56)	40	82	75	67	60
Age (Years)	38(17)	46(7)	42(8)	46(8)	42(9)
Gender - Male (N=84)	83	96	95	90	89
Educational Level					

Secondary School (N=15)	19	9	25	0	16
Primary School (N=14)	5	27	30	0	15
Certificate/Diploma (N=9)	9	9	5	22	10
College (N=8)	5	5	10	33	9
Bachelor (N=7)	2	23		11	7
Vocational Training (N=2)	0	5	5	0	2
Masters (N=1)	0	5	0	0	1.1
Training in Business administration (N=17)	12	23	15	44	18
Family background or own cultivated land (N=46)	30	68	60	67	49
How did you become a local Manufacturer?					
Dream/vision (N=40)	23	55	65	56	43
No alternative/choice (N=7)	14	0	5	0	7
Family/parents business (N=6)	0	18	5	11	6
Interest (N=1)	0	5	0	0	1
Inefficiency in farming (N=1)	0	5	0	0	1
Got motivation from brother (N=1)	2	0	0	0	1
Is your business Registered (N=74)	86	68	70	89	79
Membership to business Association - Yes (N=15)	30	18	10	0	16
Business Location					
Village/city > 100,000 people (N=51)	79	55	25	0	54
Village/city 10,000-50,000 people (N=16)	7	9	20	78	17
Village/city 50,000-100,000 people (N=15)	14	27	15		16
Village/city < 10,000 people (N=12)	0	9	40	22	13

Entry Barriers to Local Manufacturing

The important entry barriers to local manufacturing business were ranked as lack of capital (53%), machinery (27%), raw materials (22%) and market access (21%) (Table 2). Lack of capital was the main barrier affecting Kisumu (73%) and Nakuru (65%) counties while lack of machinery was highest in Nakuru (55%). This was further confirmed by the KIIs in all counties, who cited a lack of finances to the sector as a major challenge. Previous studies mentioned similar challenges such as high costs of doing business, lack of credit, stiff competition from cheap imports, little research and development as well as low linkage with educational institutions (GOK, 2017; KCIC, 2020; Chege et al., 2014).

Table 2. Entry barriers to a local manufacturing business in Nairobi, Kisumu, Nakuru, and Kiambu Counties

Entry Barrier	Nairobi (n=43)	Kisumu (n=22)	Nakuru (n=20	Kiambu (n=9)	Overall (n=94)
Lack of capital	37	73	65	56	53
Lack of machinery	16	27	55	11.1	27
Lack of access to production factors (e.g. raw material)	12	32	35	22	22
Lack of market access	19	23	30	11	21
Lack of land	0	5	50	22	14
Lack of knowledge/skills	7	18	5	33	12
Enabling environment	2	14	25	11	11
Resistance from people offering manual services	0	5	0	0	1
Regulations by KEBS	0	5	0	0	1
No government support	0	0	0	11	1
Lack of electricity	0	5	0	0	1
Lack of communication at the start	0	5	0	0	1

Source of Product Designs

Sources of product designs were manufacturers' own development (72%), copies from other manufacturers (55%) and customer requests (54%) (Table 3). Ideas from employees accounted for 10%, while internet sources was 1%. The low level of product design ideas from employees may have an implication on the kind of products that the businesses produced.

Table 3. Source of machinery and equipment designs in Nairobi, Kisumu, Nakuru, and Kiambu Counties

Source	Nairobi (n=43) %	Kisumu (n=22) %	Nakuru (n=20) %	Kiambu (n=9) %	Total (n=94) %
Own development (n=68)	70	68	90	56	72
Copy from other manufacturers (n=52)	63	46	45	67	55
Ideas/requests of customers (n=51)	54	32	65	89	54
Ideas/requests of employees (n=9)	9	9	5	22	10
Internet (n=1)	0	5	0	0	1

Products Research and Development (R&D)

The overall portion of revenue allocated to R&D was 13.7% (Table 4). The results also showed that 53.2 % of the manufacturers were conducted their own R&D at different levels across regions with Nakuru county leading (75%) followed by Kiambu county (67%).

Table 4. Products from Research and Development in Nairobi, Kisumu, Nakuru and Kiambu Counties

Research and development	Nairobi (n=43)	Kisumu (n=22)	Nakuru (n=20)	Kiambu (n=9)	Total (n=94)
Research & Development –% Yes (n=50)	44	46	75	67	53
Portion of Revenue spent on R&D (n=50)	13(22)	16(31)	12(9)	18(13)	14(20)

Customer Identification and Innovation

The manufacturers were using different methods to identify customer needs (Table 5). Overall the important methods reported were observations (45%), field experiments (23%), surveys, and focused group discussions (FGDs) (20%). The trend was particularly observed for Nairobi, Kisum,u and Nakuru when the analysis was disaggregated by region. Kiambu manufacturers, however, showed a higher preference for surveys or focused group discussions (56%). Fifty-one percent (51%) of the respondents reported to have invented machines, 75% of Nakuru respondents reported having inventions, and Nairobi had the lowest claim of the invention (40%).

Table 5. Customer needs identification and machine invention in Nairobi, Kisumu, Nakuru and Kiambu counties

Variable	Nairobi (n=43)	Kisumu (n=22)	Nakuru (n=20)	Kiambu (n=9)	Overall (n=94)
Customer needs identification	**%**	**%**	**%**	**%**	**%**
Observations	35	46	65	44	45
Field experiments	19	14	45	22	23
Surveys or focus group discussions	21	9	15	56	20
Visiting the clients where we have installed the machines.	0	0	0	11	1
Through customer demand	0	0	0	11	1
Research from the internet	2	0	0	0	1
Exhibitions	2	0	0	0	1
Customers request	2	0	0	0	1
Academic requirements to graduate	0	5	0	0	1
Machine invention (yes)	40	46	75	67	51

Sectors Where Machinery Were Produced or Used

Machinery developed were mainly for crop production and post-harvest handling (36%), food processing and value addition (31%), livestock production, processing and value addition (28%), and construction (14%) (Table 6). Others were for horticulture, transport, forestry and water supply.

Table 6. Sectors for which machinery were produced in Nairobi, Kisumu, Nakuru and Kiambu counties

Variable	Nairobi (n=43)	Kisumu (n=22)	Nakuru (n=20)	Kiambu (n=9)	Overall (n=94)
	%	%	%	%	%
Crop production and post-harvest handling	26	27	65	44	36
Food processing and value addition	33	27	35	22	31
Livestock production, processing and value addition	23	27	40	22	28
Construction	12	9	25	11	14
Horticulture production, processing and value addition	5	14	0	22	7
Transportation	0	5	20	0	5
Crop spraying equipment	0	0	0	11	1
Forestry	0	0	0	11	1
Water supply	2	0	0	0	1

Machinery and Equipment Manufactured Between April 2018 and April 2021

The most common types of machinery manufactured were choppers (50%), milling machines (46%), shelling machines (32%), cart trailer, threshing machine and water pumps (Table 7). Those that registered low sales (42%) were tractors, wheelbarrows, sprinklers, popcorn machines, solar dryers, hatcheries, de-hullers, peelers and feed mixers.

Table 7. Machinery and equipment manufactured between April 2018 and April 2021 in Nairobi, Kisumu, Nakuru and Kiambu counties

Machinery/Equipment	Nairobi (n=43)	Kisumu (n=22)	Nakuru (n=20)	Kiambu (n=9)	Overall (n=94)
	%	%	%	%	%
Chopping machine	61	9	65	67	50
Milling machine	63	23	35	44	46
Shelling machine	44	5	40	22	32
Cart/trailer	26	5	45	0	22

Threshing machine	21	5	35	33	21
Pump for irrigation	23	5	25	44	21
Generator	28	0	30	22	21
Crusher	30	0	20	22	20
Plough	26	14	15	11	19
Power Tiller	19	5	35	0	17
Harrow	16	9	30	0	16
Boom sprayer	12	5	15	44	14
Sieve/Strainer	23	0	5	0	12
Planting machine	14	5	10	0	10
Incubator	9	5	15	11	10
Direct seeder	9	5	10	0	7
Press for extracting	9	0	10	0	6
Ripper	5	5	10	0	5
Fertilizer dispenser	9	5	0	0	5
Storage facility	2	0	10	0	3
Combine harvesters	5	0	0	0	2
Packing machine	2	0	0	11	2
Steamer	2	0	5	0	2
Others	35	82	0	67	42

Machinery and Equipment Sold Between April 2018 to April 2021 in Nairobi, Kisumu, Nakuru and Kiambu counties

Although there was a challenge of recalling the machinery sold in the last three years, the manufacturers reported that they had sold substantial quantities. Common machinery and equipment sold by more than 10% of manufacturers included millers, choppers, carts, trailers, threshers, ploughs, water pumps, crushers, harrows, power tillers and generators (Table 8). The machinery classified as others included solar driers, peelers, popcorn machines, peelers, chaff cutters, ovens and coffee mills.

Table 8: Machinery and equipment sold between April 2018 to April 2021in Nairobi, Kisumu, Nakuru and Kiambu counties

Machinery/Equipment	Nairobi (n=43)	Kisumu (n=22)	Nakuru (n=20)	Kiambu (n=9)	Overall (n=94)
	%	%	%	%	%
Milling machine	51	9	30	33	37
Chopping machine	49	0	45	22	34
Shelling machine	33	9	20	0	21
Cart/trailer	23	5	30	0	18
Threshing machine	12	5	25	22	16
Plough	21	14	5	11	15
Pump for irrigation	19	5	10	22	14
Crusher	21	0	20	0	14
Harrow	7	9	30	0	12
Power Tiller	12	5	20	0	11
Generator	16	0	5	22	11
Sieve/Strainer	19	0	10	0	11
Incubator	9	5	5	11	7
Boom sprayer	5	0	5	22	5
Direct seeder	7	5	0	0	4
Planting machine	5	5	0	0	3
Ripper	2	5	0	0	2
Press for extracting	5	0	0	0	2
Chaff cutter	0	9	0	0	2
Fertilizer dispenser	0	5	0	0	1
Storage facility	0	0	5	0	1
Packing machine	0	0	0	11	1
Others	37	46	0	44	26

Use of Renewable Energy

Overall, renewable energy powered machinery were incubators (4.3%) with Nairobi County accounting for 7% (Table 9). Kiambu County recorded 11% for incubators, water pumps and threshing machines. Manufacturers in Nakuru County, however, were not stocking any agricultural machinery powered by renewable energy.

Table 9. Machinery sold that were powered by renewable energy in Nairobi, Kisumu, Nakuru and Kiambu counties

Machinery/Equipment	Nairobi (n=43)	Kisumu (n=22)	Nakuru (n=20)	Kiambu (n=9)	Overall (n=94)
	%	%	%	%	%
Incubator	7	0	0	11	4
Water pumps	5	5	0	11	4
Solar dryers	2	9	0	0	3
Power Tiller	2	0	0	0	1
Milling machine	2	0	0	0	1
Threshing machine	0	0	0	11	1
Steam turbine	0	5	0	0	1
Jikos for husking rice	0	5	0	0	1
Fryers/popcorn machine	2	0	0	0	1
Driers	2	0	0	0	1
Briquettes/Solar drier/Solar hatchery	0	5	0	0	1

Reasons given by respondents who were not producing machinery powered by renewable energy are provided in Table 10. They included: low demand for the machinery (45%), lack of knowledge and skills (31%), lack of raw materials, machinery/equipment (17%) and lack of ideas (17%).

Table 10. Reasons for not making machinery/equipment powered by renewable energy in Nairobi, Kisumu, Nakuru and Kiambu counties

Variable	Nairobi (n=43)	Kisumu (n=22)	Nakuru (n=20)	Kiambu (n=9)	Overall (n=94)
	%	%	%	%	%
No demand	42	36	55	56	45
No knowledge/skills	42	18	30	11	31
Never had idea	5	23	45	0	17
No machinery/tools/ equipment	9	14	40	11	17
Not feasible	12	0	5	44	11
It's in the concept stage	0	5	0	0	1
Very expensive	0	0	0	11	1

Production Strategy

Majority of the respondents (62%) were producing on demand and 23% were producing regularly while 11% used both models (Table 11).

Table 11. Mode of production, whether regularly or on demand in Nairobi, Kisumu, Nakuru and Kiambu counties

	Nairobi (n=43)	Kisumu (n=22)	Nakuru (n=20)	Kiambu (n=9)	Overall (n=94)
	%	%	%	%	%
On-demand	54	77	65	56	62
Regularly	33	14	20	11	23
Mixed	7	9	15	33	12
Some are produced regularly others on demand	2	0	0	0	1
Our branch in China does the production, products sold in Kenya	2	0	0	0	1
I modify according to customers demand, I do not make the machinery	2	0	0	0	1

Reason for Producing on Demand

The reasons for producing on demand were; minimize market risks (48%), and lack of capital (37%), and to incorporate customer preferences (22%) (Table 12). Therefore minimizing market risks was the most important in Nairobi, Nakuru and Kiambu, but for Kisumu the main reason was lack of capital (59%).

Table 12. Reasons for producing machinery and equipment on demand in Nairobi, Kisumu, Nakuru and Kiambu counties

Variable	Nairobi (n=43)	Kisumu (n=22)	Nakuru (n=20)	Kiambu (n=9)	Overall (n=94)
	%	%	%	%	%
Reduce market risks	44	27	60	89	48
Lack of capital	33	59	30	22	37
To tailor the construction of equipment to the demand and preference of customers	14	36	5	44	22
Customer demand	0	0	0	11	1
Holding money for a long time	0	5	0	0	1
Not standard	2	0	0	0	1
Research on equipment and innovation is lengthy	0	5	0	0	1
We don't want to tie our funds because you don't know when the customer will come for the ordered machinery	0	0	0	11	1
We just modify the equipment according to customer's specifications	2	0	0	0	1

Quality assurance and warranty

All respondents in Kiambu and Nakuru (100%) indicated that there were standards required for the products compared to Kisumu (77%) and Nairobi (91%) (Table 13). Besides 55% indicated that their machinery and equipment were certified, but official testing was low and was reported by only 29% of the respondents. However, certification (89%) and official testing (78%) in Kiambu was higher compared to the other regions. As revealed by a Kenya National Bureau of Statistics (KNBS) survey of MSMEs, over 1.5 million businesses were licensed while over 5 million were unlicensed and the former could be the ones that involved KEBS in their testing (GOK, 2017).

Table 13. Machinery and equipment quality assurance, certification and testing in Nairobi, Kisumu, Nakuru and Kiambu Counties

Variable	Nairobi (n=43)	Kisumu (n=22)	Nakuru (n=20)	Kiambu (n=9)	Overall (n=94)
	%	%	%	%	%
Are there any standards you need to adhere to? Yes	91	77	100	100	90
Is the machinery you sell certified? Yes	65	36	40	89	55
Is the machinery you sell certified? Mostly	21	9	50	11	23
Is the machinery you sell certified? No	12	41	10	0	17
Is the machinery you sell certified? Mostly Not	2	14	0	0	4
Are your machinery officially tested? No	49	55	95	11	56
Are your machinery officially tested? Yes, all	26	36	5	78	29
Are your machinery officially tested? Mostly	19	5	0	0	10
Are your machinery officially tested? Mostly not	7	5	0	11	5

National and County Licenced Standardization Firms of Agricultural Machinery and Equipment in Nairobi, Kisumu, Nakuru and Kiambu Counties

Results revealed that KEBS was the main firm (16%) that officially tested agricultural machinery and equipment across the four counties, followed by self-testing (11%) and the manufacturer's association (7%) (Table 14). In the KIIs, some informants complained that the main certification body concerned its focus on the formal sector and not the jua kali (KIIs, All study counties, 2021)

Table 14. National and county licenced standardization firms of agricultural machinery and equipment in Nairobi, Kisumu, Nakuru and Kiambu Counties

Testing body/Organization	Nairobi (n=22)	Kisumu (n=11)	Nakuru (n=2)	Kiambu (n=9)	Overall (n=42)
	%	%	%	%	%
Kenya Bureau of Standards (KEBS)	21	14	0	33	16
Self-testing	2	32	0	22	11
Jua kali organization	15	1	1	1	7
No testing	2	0	0	11	2
They are tested by our suppliers	2	0	0	0	1
Tasha daresla	2	0	0	0	1
SGS and self-testing	0	0	0	11	1
Kamukunji association	2	0	0	0	1
Tested internationally (in china)	2	0	0	0	1
Inter tek and SGS.	0	0	0	11	1
Agricultural Technology Development Centre (ATDC)	0	0	5	0	1

Testing Satisfaction, Warranty, After Sale Service and Record Keeping

Most of the manufacturers were satisfied with the services of the testing firm. Majority of the respondents (86%) were offered warranty for their machinery or equipment which was an indication that the quality of their products was probably good. This could be attributed to strict regulations by KEBS and good record keeping culture (Table 15).

Table 15. Testing satisfaction, warranty, after sale service and record-keeping by machinery and equipment traders in Nairobi, Kisumu, Nakuru and Kiambu counties

Variable	Nairobi (n=43)	Kisumu (22)	Nakuru (n=20)	Kiambu (n=9)	Total
	%	%	%	%	%
Satisfaction with the testing body (Very Much)	19	36	5	78	26
Satisfaction with the testing body (Somehow)	16	0	0	0	7
Satisfaction with the testing body (Mostly)	7	5	0	0	4

Satisfaction with the testing body (Not really)	2	0	0	0	1
Warranty (Yes, all)	65	41	30	57	51
Warranty (Mostly)	14	18	55	33	26
Warranty (No)	12	32	10	11	16
Warranty (Mostly, not)	9	9	5	0	7
Do you provide any after-sales services?	82	73	100	100	86
Record Keeping (Always)	74	55	35	78	62
Record Keeping (Mostly	12	9	30	11	15
Record Keeping (Never)	45	23	25	0	13
Record Keeping (Rarely)	9	14	10	11	11

Marketing and Customers

Avenues used to advertise the business

Advertising the businesses was mainly by word of mouth (65%) (Table 16). Others were; social media (60%), showroom (29%), machinery exhibitions (27%) and network of dealers (21%). Word of mouth, which included neighbors, relatives and friends has been an important source of information over the years although social media is the emerging forum and becoming increasingly important and waning.

Table 16: Avenues used to advertise the machinery and equipment business in Nairobi, Kisumu, Nakuru and Kiambu counties

	Nairobi (n=43)	Kisumu (n=22)	Nakuru (n=20)	Kiambu (n=8)	Overall (n=94)
	%	%	%	%	%
Word of Mouth	72	441	75	78	65
Social Media	77	46	50	33	60
Showroom	16	27	65	11	29
Machinery exhibitions	23	23	20	67	27
Network of dealers	12	18	50	11	21
Newspapers	19	5	5	11	12
Display outside the workshop	0	14	20	0	7
Price competitions	2	5	15	11	6
Radio	2	9	0	11	4
TV	5	0	0	22	4
Others	5	14	15	22	11

Most Important Type of Advertisement

The most important advertisement avenues are presented in Table 17. Social media was highly ranked (30%) followed by word of mouth (29%). Social media was the most important in Nairobi county (44%) whereas word of mouth scored 36% in Kisumu county. In Nakuru county, show room (45%) was most important, and in Kiambu, machinery exhibitions was the most important (55%). This could probably explain the reason why many potential users did not know of the existence of some machinery and equipment (KIIs 2021). As stated by Chukwu et al. (2019), there is need to extensively reach consumers to know theire consumption pattern and advertise with a focus on the consumers emotions (Chukwu et al., 2019; Deshpande, et al., 2019).

Table 16: Avenues used to advertise the machinery and equipment business in Nairobi, Kisumu, Nakuru and Kiambu counties

Most important advertisements	County				
	Nairobi (n=43)	Kisumu (n=22)	Nakuru (n=20)	Kiambu (n=8)	Overall (n=94)
	%	%	%	%	%
Social Media	44	18	20	0	30
Word of mouth	35	36	5	33	29
Showroom	2	18	45	0	15

Machinery exhibitions	7	14	0	56	12
Display outside workshop	0	5	25	0	6
Network of dealers	5	0	5	0	3
Newspapers	5	0	0	0	2

Main Customers of the Intermediaries

Small Scale farmers were the main customers (83%) followed by medium-scale farmers (57%) and large scale farmers (28%) (Table 18). Kisumu and Nakuru counties reported 32% and 30% respectively, for processing companies as the main customers.

Table 18: The intermediaries' main customers for machinery and equipment business in Nairobi, Kisumu, Nakuru and Kiambu counties

Intermediaries	Nairobi (n=43)	Kisumu (n=22)	Nakuru (n=20)	Kiambu (n=8)	Total (n=94)
	%	%	%	%	%
Smallholder farmers <1 - 2ha)	86	64	95	89	83
Medium-scale farmers (2-15ha)	67	41	60	44	57
Large scale farmers (15ha)	26	36	25	22	28
Processing companies	12	32	30	22	21
Distributors	14	9	15	11	13
Public Organizations	5	5	10	22	7
Co-operatives	2	9	10	11	6
Others	5	18	0	22	9

Location of the Customers

For the majority of the manufacturers their customers were located within the same village and /or town (72%), but also outside the village/city but within the same Sub-County, County, and Country (65%). Cases of customers from outside the country but within Africa was 22% (Table 19).

Table 19: Location of customers in Nairobi, Kisumu, Nakuru, and Kiambu Counties

Location of customers	Nairobi (n=43)	Kisumu (n=22)	Nakuru (n=20)	Kiambu (n=8)	Total (n=94)
Within the same village/city	67	68	100	44	72
Outside same village/city but within district/sub-county	70	55	60	78	65
Outside district/sub-county but within region/county	63	60	45	56	57
Outside region/country but within country	65	73	60	56	65
Outside country but within Africa	23	18	20	33	22

Method of Payment

The mode of payment for goods and services was cash (93%), 60% by electronic transfer and 53% by bank transfer (Table 20).

Table 20: How customers paid for machinery, equipment and services in Nairobi, Kisumu, Nakuru and Kiambu counties.

How customers are pay	Nairobi (n=43)	Kisumu (n=22)	Nakuru (n=20)	Kiambu (n=8)	Total (n=94)
	%	%	%	%	%
Mostly Cash	95	86	100	78	93
Mostly Electronic	74	18	65	78	60
Mostly In-Kind	5	9	10	0	6
Bank transfer	51	50	60	56	53
Others (specify)	5	5	0	22	5

Need for Deposit before Production of Machinery or Equipment

When asked if, the majority of the respondents (84%) stated that customers needed to make a down payment before they commenced production, while 63% reported that they gave credit (Table 21).

Table 21: Payment agreements and credit requests for machinery and equipment in Nairobi, Kisumu, Nakuru and Kiambu counties.

Payment agreements	County				
	Nairobi (n=43)	Kisumu (n=22)	Nakuru (n=20)	Kiambu (n=8)	Total (n=94)
If down payment was needed before starting to produce (% yes)	77	100	80	100	84
If they give credit to customers (% yes)	63	77	35	90	638
If customers request were met last year (% yes)	81	59	90	44	75

Main Competitors of Machinery and Equipment Manufacturers in Nairobi, Kisumu, Nakuru, and Kiambu counties

Manufacturers within their localities were the main competitors (76%), followed by importers of machinery and manufacturers outside the area but within a country (44%) (Table 22). This finding was further confirmed by two key informants where one decried that, "there are good locally manufactured machinery, yet substandard machinery was being imported. A Key informant from Kiambu narrated a case where Jomo Kenyatta University of Agriculture and Technology (JKUAT) had manufactured a tractor that was appropriate for rough terrain, but 'competition from imported products hampered the opportunity to commercialize it'.

Table 22: Main competitors of machinery and equipment manufacturers in Nairobi, Kisumu, Nakuru and Kiambu counties

Payment agreements	County				
	Nairobi (n=43)	Kisumu (n=22)	Nakuru (n=20)	Kiambu (n=8)	Total (n=94)
	%	%	%	%	%
Manufacturers from area (village/city/ district/sub county)	77	60	100	56	76
Manufacturers outside area but within country	33	36	60	78	44
Manufacturers outside the country but within Africa	5	0	5	22	5
Importers of machinery	49	27	35	100	46
Government programs	0	0	10	0	2

Manufacturers' advantage compared to other importers of machinery

High quality of the products was considered to be their main advantage (77%) compared to other importers of machinery, whereas 46% said after-sale services was their main advantage (Table 23). Other important aspects were availability and price. As confirmed by the KIIs and FGDs, informants felt that the locally assembled machinery were superior to the imported ones (KIIs, 2021).

Table 23: Local manufacturers' advantage compared to the importers of machinery in Nairobi, Kisumu, Nakuru and Kiambu Counties.

Advantages	County				
	Nairobi (n=43)	Kisumu (n=22)	Nakuru (n=20)	Kiambu (n=8)	Total (n=94)
	%	%	%	%	%
Price	37.	27	25	56	34
Quality	67	73	95	89	77
Availability	51	18	25	44	37
Local adaption	12	9	40	22	18
After Sales Services	42	18	65	89	46
Reputation/Brand/Trust	14	18	30	56	22
Others	5	14	0	11	6

Competitors of Local Manufacturers in Nairobi, Kisumu, Nakuru and Kiambu Counties

Manufacturers with the highest mean number of competitors were in Nairobi county (146) followed by Nakuru (23) with Kiambu county recording the least (Table 24). As the KIIs revealed, there was competition from the importers of machinery despite the fact that they were less durable than the locally produced ones (KIIs 2021).

Table 23: Local manufacturers' advantage compared to the importers of machinery in Nairobi, Kisumu, Nakuru and Kiambu Counties.

	Frequency	Mean	SD
Nakuru (n=20)	20	23	17
Nairobi (n=43)	43	146	238
Kisumu (n= 22)	22	5	5
Kiambu (n=9)	9	3	2
Total (n=94)	**94**	**73**	**174**

Outlets for the Manufacturers' Products in Nairobi, Kisumu, Nakuru and Kiambu Counties

Workshops (93%) and network of dealers (38%) were the main outlets mentioned by respondents (Table 25).

Table 25: Machinery and equipment product outlets for manufacturers in Nairobi, Kisumu, Nakuru and Kiambu counties

Advantages	County				
	Nairobi (n=43)	Kisumu (n=22)	Nakuru (n=20)	Kiambu (n=8)	Total (n=94)
	%	%	%	%	%
From Workshop	98	73	100	100	93
Network of dealers	37	27	50	44	38
Others	0	18	5	22	7

Use of Potential Profits

Majority (92%) used the profit to invest in business whereas 83% used it for private purposes.

Table 26: Use of potential profits from the sale of the equipment produced

Advantages	County				
	Nairobi (n=43)	Kisumu (n=22)	Nakuru (n=20)	Kiambu (n=8)	Total (n=94)
	%	%	%	%	%
Invest in business	97.7	68.2	100.0	100.0	91.5
Private use	76.7	77.3	95.0	100.0	83.0
Others	2.3	13.6	0.0	11.1	5.3

Employees, Knowledge, and Skills

Machinery and equipment manufacturers' staff establishment in Nairobi, Kisumu, Nakuru and Kiambu counties

The average number of permanent employees was 8 compared to 4 casual employees (Table 27). Nairobi county manufacturers had the highest number of permanent (12) and casual employees (5) followed by Kiambu with 7 and 4, respectively. On the number of employees hired in the past three years, Nairobi county had the highest number of permanent (12) and casual employees (5) followed by Kiambu with 7 permanent and 4 casual employees. However, Kisumu had the highest casual (4) employees hired between 2018 and 2021. As revealed by the KIIS, the number of trained personnel grew considerably but absorption into the manufacturing sector remained minimal (KIIs All study counties, 2021)

Table 27. Machinery and equipment manufacturers' staff establishment in Nairobi, Kisumu, Nakuru and Kiambu counties

Variable	Nakuru	Nairobi	Kisumu	Kiambu	Overall
	Mean	Mean	Mean	Mean	Mean
Number of permanent employees (Current)	3 (5)	12 (21)	5 (11)	7 (11)	8 (16)
Number of casual employees (Current)	4 (5)	5 (7)	4 (5)	4 (3)	4 (6)
Number of permanent employees hired (last three years)	5 (6)	12 (30)	5 (11)	7 (14)	9 (22)
Number of casual employees hired (last three years)	5 (5)	5 (10)	14 (24)	4 (4)	7 (14)

Employees Educational Background

Majority of employees were engineers (59%) followed by secondary school leavers (56%), certificate/diploma holders (39%), employees educated in agriculture (33%) and business administration/economics/marketing (32%) (Table 28).

Table 28. Educational background of the employees of the machinery and equipment manufacturers in Nairobi, Kisumu, Nakuru and Kiambu counties

Education	Nairobi (n=43)	Kisumu (n=22)	Nakuru (n=20)	Kiambu (n=8)	Total (n=94)
	%	%	%	%	%
Engineering	65	64	20	100	59
Secondary	51	55	85	22	56
Certificate/Diploma	51	23	10	89	39
Agriculture	37	18	55	0	33
Business administration/ economics/marketing	44	18	20	33	32
Primary School	19	41	25	0	23
Vocational Training	33	23	10	0	22
College	19	14	15	44	19
Artisan Skills	19	0	0	0	10
General knowledge and work experience	2	9	0	0	3
In-house training	2	5	0	0	2
Village polytechnics	0	5	0	0	1

Specialized training	0	5	0	0	1
Electronics	2	0	0	0	1
Masters	0	5	0	0	1
PhD	0	5	0	0	1

Satisfaction with Knowledge/Skills of Staff Hired After Training Course Completion

Figure 1 provides employer satisfaction with the knowledge/skills of staff hired directly after they completed training courses. Many of the employers were very much satisfied (45.7%), 23.4% were mostly satisfied while 19.1% were somehow satisfied. Kiambu county had the highest proportion of very satisfied employers (66.75) followed by Kisumu (59.1%), Nairobi (44.2%) and Nakuru (25%).

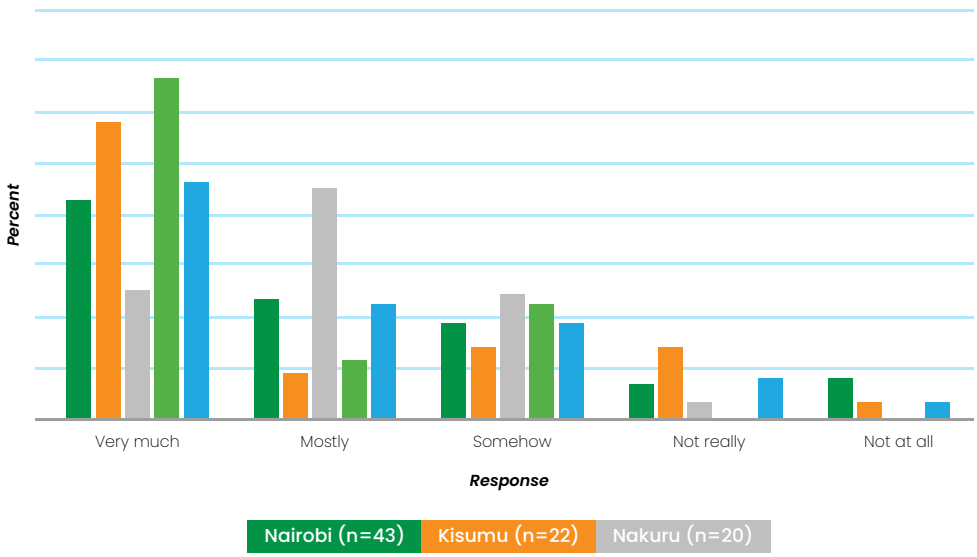


Figure 1. Satisfaction levels with the knowledge/skills of staff hired after completing training courses

Changes Required in the Education System to Meet Labor Requirements.

Many manufacturers (45%) were satisfied with the current educational system. Some (30%) unsatisfied manufacturers suggested 'more practice' or practical before employment compared with 3% suggesting 'more theory'. These findings agreed with previous studies which suggested educational curriculum as inappropriate for the country's manufacturing needs (Chege et al., 2014) (Table 29).

Table 29. Proposed change to education systems to meet the market labor requirements

	County				
	Nairobi (n=43)	Kisumu (n=22)	Nakuru (n=20)	Kiambu (n=8)	Total (n=94)
	%	%	%	%	%
More practice	30	32	30	22	30
More theory	5	0	0	11	3
Better teachers	2	5	0	0	2
Updates curricula	5	0	0	0	2
Offer formal training to the employee	0	5	0	0	1
More institutions of training	2	0	0	0	1
More discipline in school	2	0	0	0	1

Training While Working

Figure 2 indicates that the majority of the manufacturers provided on-the-job training (78.7%). All Nakuru manufacturers provided on-the-job training compared to 90.9% in Kisumu, 67.4% in Nairobi and 55.6% in Kiambu.

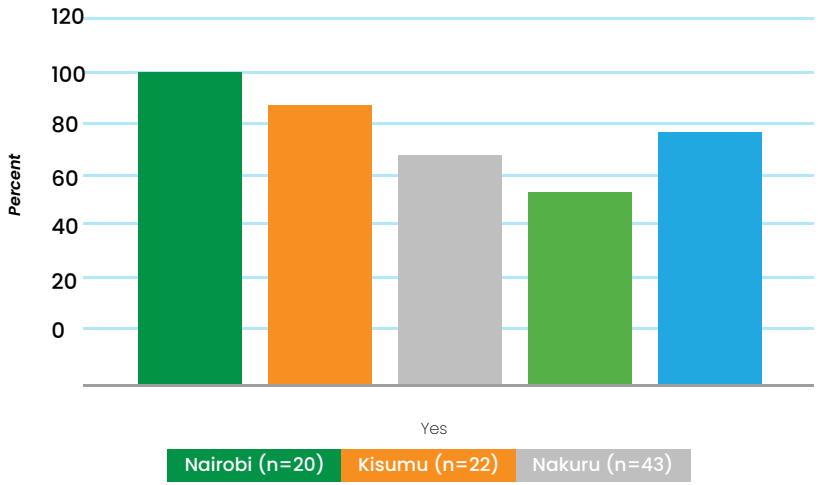


Figure 2. Provision of on-job training

Identification of Candidates for Training While Working

Table 30 shows the mode of identifying trainees for on-job training. The majority of manufacturers depended on 'informal request by trainees (51.1%) followed by formal application process (29.8%), collaboration with training institution (18.1%) and informal request by parents/guardians (14.9%).

Table 30. Identification of trainees

Variable	Nairobi (n=43)	Kisumu (n=22)	Nakuru (n=20)	Kiambu (n=8)	Total (n=94)
	%	%	%	%	%
Informal request by trainees	34.9	68.2	85.0	11.1	51.1
Formal application process	34.9	9.1	35.0	44.4	29.8
Collaboration with training institution	14.0	13.6	30.0	22.2	18.1
Informal request by parents/ guardians	16.3	4.5	30.0	0.0	14.9
Picking from technical background	0.0	0.0	0.0	11.1	1.1
Look for potential in youths	0.0	4.5	0.0	0.0	1.1
Others	2.3	0.0	0.0	0.0	1.1

Payment of Salaries While Training on the Job

About 44% of the respondents indicated that trainees under their pupilage received salaries (Figure 3). Majority of the manufacturers in Nairobi (61%) paid salaries to the trainees while in Nakuru only a few (15%) indicated that they paid salaries to trainees. The category of trainees maybe classified into two, those on attachment and had not completed their studies and who in most instances did not receive salary and then there were those paid on the job, and yet undergoing training. This is somewhat corroborated in Figure 4 where Nakuru led with the collaboration of vocational institutions.

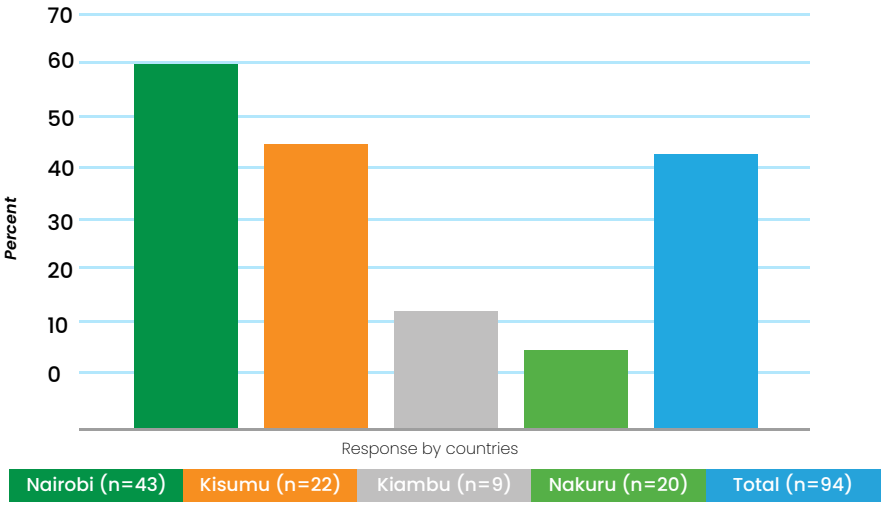


Figure 3. Whether trainees receive salaries

Training Collaborations with Educational Institutions

Some manufacturers (22%) indicated that they collaborated with vocational training institutions for on-the-job training. Nakuru (35%) led in this category followed by Kisumu and Nairobi (Figure 4). Manufacturers in Kiambu county reported no collaborations. One Key informant from Kisumu pointed out that "Our training institution is competency based with capacity to provide training for practical work and we even offer practical training for university students' (Key informant Kisumu). Studies by Chege et al. (2014) decried lack of collaboration between manufacturers and local manufacturers despite many research findings that could contribute towards addressing issues that the local manufacturers faced (Chege et al., 2014)

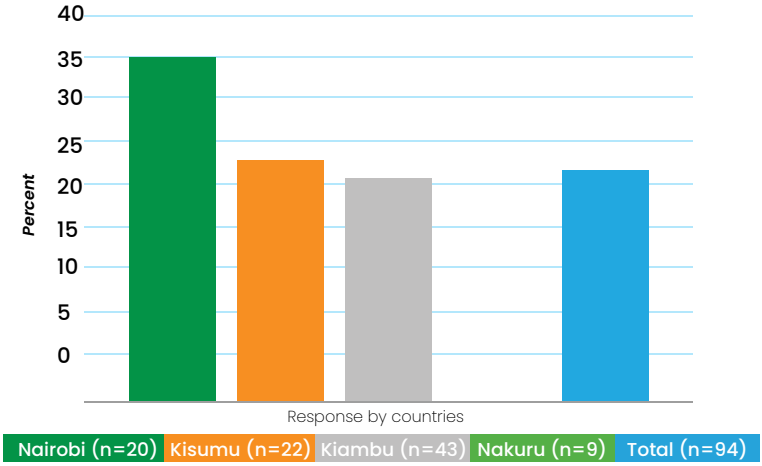


Figure 4. Collaboration with vocational schools for on-the-job training

Length, Costs and Number of Trainees

The average overall period for training was six months with variations across the counties. Nairobi had the longest (10 months), and Kiambu the shortest, with 3 months. The number of trainees, however, was low, probably because of the capacity of the local manufacturers. An average of only 11 overall, were trained in the last 3 years with Kiambu and Kisumu reporting the highest, 18 and 19, respectively (Table 31).

Table 31. Length, costs and number of trainees

Variable	Nakuru (n=20)		Nairobi (n=29)		Kisumu (n=20)		Kiambu (n=5)		Total (n=74)	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Length of the training (months)	10	8	5	3	6	6	3	2	6	6
Number trained in the last 3 years	6	5	8	11	19	44	18	24	11	25
Cost per month	8,833	9,674	10,788	9,040	14,700	11,043	12,500	3,536	11,683	9,325

What Happened after Training on-the job

After the training, majority of the employees (67%) were retained to work for the local manufacturers, while 34% worked for other businesses and 21% established their own businesses. Nakuru (90%) retained the highest number, followed by Kisumu (73%), and both Nairobi and Kiambu at 56 % (Table 32).

Table 32. What happens with the trainees at the end of the on-the-job training?

Variable	County				
	Nakuru (n=23)	Nairobi (n=43}	Kisumu (n=22)	Kiambu (n=9)	Total (n=94)
	%	%	%	%	%
Work for me	90.0	55.8	72.7	55.6	67.0
Work for other business	55.0	23.3	27.3	55.6	34.0
Establish own business	20.0	14.0	45.5	0.0	21.3
Most are on attachment	0.0	0.0	4.5	0.0	1.1
Go back to school	0.0	2.3	0.0	0.0	1.1
Other	0.0	2.3	0.0	0.0	1.1

Enabling business environment
Credit acquisition, use and sources

Respondents who received loans between 2018 and 2021 were 30% of those interviewed. Kiambu county had the highest (44%) and Nairobi had the lowest (18.6%) (Table 33).

Table 33: Manufacturers who received loans

	County				
	Nakuru (n=20)	Nairobi (n=43}	Kisumu (n=22)	Kiambu (n=9)	Total (n=94)
	(n=20)	Nairobi	%	%	%
Yes	40.0	18.6	36.4	44.4	29.8

Purpose for Loans

The main purpose for loan application was purchase of equipment as reported by 22.3% of the respondents followed by buying raw materials (17%) and building of workshop (8.5%) (Table 34). For those who sourced for loans, Kiambu county had the highest percentage of respondents (44.4%) followed by Nakuru (35%) who took loans for equipment. Nakuru county had 35% and 30% of respondents who bought raw materials and built workshops respectively, and this was higher than for any other county.

Table 34. Main purpose for loans

Variable	County				
	Nakuru (n=8)	Nairobi (n=8)	Kisumu (n=8)	Kiambu (n=4)	Total (n=28)
	%	%	%	%	%
Purchase equipment/machinery	35	12	23	44	22
Buy raw material	35	9	18	11	17
Salary of employees	0	2	0	0	1
Buy land	5	0	5	0	2
Build workshop	30	5	0	0	9
Others	0	0	5	11	2

Reasons for Not Taking Loans

Of those who did not take loans, 29.8% stated that they preferred other sources while 28.7% were discouraged by strict payment schedules. Among the respondents from Nakuru county, 40% preferred other sources while those from Nairobi, 34.9% stated strict payment schedules as their main reasons for not taking loans (Table 35).

Table 35: Reasons for not taking bank loans

Variable	County				
	Nakuru (n=12)	Nairobi (n=35)	Kisumu (n=14)	Kiambu (n=5)	Total (n=66)
	%	%	%	%	%
Prefer other sources	40.0	34.9	13.6	22.2	29.8
Strict repayment schedules	30.0	34.9	22.7	11.1	28.7
Others	5.0	11.6	27.3	44.4	17.0
Tedious application process	15.0	25.6	4.5	0.0	16.0
Didn't believe I could get it 2= 3= 4= 99=	5.0	7.0	0.0	0.0	4.3

Other Reasons for Not Taking Loans

Other reasons for not taking loans were mainly own finance as stated by 3.2% of respondents and others as shown in Table 36.

Table 36: Other reasons for not taking loans

	Nakuru	Nairobi	Kisumu	Kiambu	Total
	%	%	%	%	%
Own finance	0.0	0.0	0.0	33.3	3.2
Thinking of applying	5.0	0.0	0.0	0.0	1.1
Started the business with my savings after 21 years of being employed	0.0	0.0	0.0	11.1	1.1
Security needed by banks e.g. logbook, title deed	0.0	2.3	0.0	0.0	1.1
Person reason	0.0	2.3	0.0	0.0	1.1
Organizational bureaucracy	0.0	0.0	4.5	0.0	1.1
Not willing to specify	0.0	2.3	0.0	0.0	1.1
Not interested in loans	0.0	2.3	4.5	0.0	1.1
Not interested	0.0	0.0	4.5	0.0	1.1
I always ask for down payment before a project	0.0	0.0	4.5	0.0	1.1
Government support	0.0	0.0	4.5	0.0	1.1
Don't want	0.0	0.0	9.0	0.0	1.1

Whether Loan was Received

29.8% of the respondents received loans (Table 37).

Table 36: Other reasons for not taking loans

	Nakuru		Nairobi		Kisumu		Kiambu		Total	
	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%
Yes	8	40.0	8	18.6	8	36.4	4	44.4	28	29.8
Total	20		43		22		9		94	

Loan sources

The highest number of respondents (26.6%) received loans from commercial banks followed by those who received from friends or family members (4.3%). None of the respondents received loans from MFIs, NGOs or government (Table 38). As stated by one informant, other avenues should be explored to finance machinery/equipment manufacturing such as 'Creating business spaces in markets and linking manufacturers with MFIs for credit' (Kiambu KIIs, 2021)

Table 38: Sources of loans

	Nakuru (n=8)	Nairobi (n=8)	Kisumu (n=8)	Kiambu (n=4)	Total (n=28)
	%	%	%	%	%
Commercial bank	30.0	18.6	31.8	44.4	26.6
Friends or family	10.0	0.0	9.1	0.0	4.3
Private moneylender	5.0	0.0	0.0	0.0	1.1
Others	0.0	0.0	4.5	0.0	1.1
Micro-finance institution	0.0	0.0	0.0	0.0	0.0
Non-governmental or faith-based organization/ church	0.0	0.0	0.0	0.0	0.0
Government	0.0	0.0	0.0	0.0	0.0

Government Support

The biggest support from government was knowledge and skills as stated by 10.6% of the respondents and credit support was 4.3% (Table 39).

Table 39: Types of government support

Support	Nairobi (n=43)	Kisumu (n=22)	Nakuru (n=20)	Kiambu (n=9)	Total (n=94)
	%	%	%	%	%
Knowledge and skills development	4.7	9.1	30.0	0.0	10.6
Loan/credit	0.0	0.0	20.0	0.0	4.3
Free or subsidized machinery/ equipment, land, factory building, electricity	0.0	0.0	5.0	0.0	1.1
Others	95.3	90.9	50.0	100.0	85.1
Total					

Other type of government support were marketing and grants (Table 39(i)

Table 39 (i): Other type of support from government

	County				
	Nairob	Kisumu	Nakuru	Kiambu	Total
	%	%	%	%	%
Marketing	2.3	0.0	0.0	0.0	1.1
Grants by government	0.0	4.5	0.0	0.0	1.1

Donor Support

Donors provided knowledge and skills as stated by 11.7% of the respondents while 6.4% stated loan and credit as the support received from donors (Table 40).

Table 40: Donor support

Support type	Nairobi	Kisumu	Nakuru	Kiambu	Total
	%	%	%	%	%
Knowledge and skills development	2.3	22.7	25.0	0.0	11.7
Loan/credit	0.0	4.5	25.0	0.0	6.4
Free or subsidized machinery/ equipment, land, factory building, electricity	0.0	9.1	0.0	0.0	2.1
Others	97.7	72.7	60.0	100.0	84.0

Other support from donors

Other type of support included workshops, marketing and grants as stated by 1.1% each (Table 41) However, a key informant strongly felt that 'the country should strive towards self-dependency by seeking internal solutions and reduce on donor dependency (KII, Kisumu 2021).

Table 41: Other supports

Type of support	Nairobi	Kisumu	Nakuru	Kiambu	Total
	%	%	%	%	%
Workshop funded by donors	2.3	0.0	0.0	0.0	1.1
Marketing	2.3	0.0	0.0	0.0	1.1
Grants Sponsored project	0.0	4.5	0.0	0.0	1.1

Infrastructure and Policy Support

Of the business covered in the study, 97.9% had access to electricity grid and 85.1% of respondents stated payment of taxes in last one year while 81.9% stated that there were policies and regulations affecting their businesses negatively (Table 42).

Table 42: Infrastructure and policy support

Support		Nairobi	Kisumu	Nakuru	Kiambu	Total
		%	%	%	%	%
Does the business have access to the electricity grid?	Yes	97.7	95.5	100.0	100.0	97.9
In the last year, did you have to pay any taxes?	Yes	97.7	63.6	80.0	88.9	85.1
Are there any policies and regulations which affect your business negatively?	Yes	88.4	59.1	85.0	100.0	81.9

Factors that influence local manufacturing business Policies that affect business negatively

The policies that affected businesses negatively were local or national taxes as stated by 58.5% of respondents, import regulations as stated by 35.1% and environmental regulations by 22.3% (Table 43).

Table 43: Policies affecting businesses negatively

Policy	Kisumu	Nakuru	Kiambu	Total
	%	%	%	%
Local or national taxes	40.9	80.0	88.9	58.5
Import regulations	9.1	40.0	66.7	35.1
Environmental regulations	0.0	50.0	22.2	22.3
Government competition (e.g. government machinery imports)	0.0	25.0	22.2	13.8
Others	18.2	0.0	11.1	13.8

Other Policies Affecting Business Negatively

COVID-19 and curfew rules affected business negatively as stated by 6.4% of respondents while all other factor were reported by 1.1% of the respondents (Table 44). Other policies that affected business were high duty on imported goods and gender rule in which women had more access to credit than men among others.

Table 44: Other policies affecting business negatively

	Nairobi	Kisumu	Nakuru	Kiambu	Total
	%	%	%	%	%
Covid 19 regulations and curfew restrictions	14.0	0.0	0.0	0.0	6.4
Relocation from place of business	0.0	4.5	0.0	0.0	1.1
Organizational structure to produce in mass	0.0	4.5	0.0	0.0	1.1
High duty on imported goods	2.3	0.0	0.0	0.0	1.1
Government bureaucracy	0.0	4.5	0.0	0.0	1.1
Gender rule	0.0	4.5	0.0	0.0	1.1
Attainment of business permit	0.0	0.0	0.0	11.1	1.1
A lot is required for manufacturers to do exhibitions	2.3	0.0	0.0	0.0	1.1

**MR-Multiple responses*

Other Factors Affecting Business Negatively

Access to finance was the major factor that affected success of businesses as stated by 50% of the respondents while cost of electricity and market access were the second highest at 41.5%. Low purchasing power of buyers was stated by 27.7% and import regulations, costs of finance and access to skilled staff was by 25.5%, 22.3% and 20.2%, respectively (Table 45).

Table 45: Other factors

	Nairobi	Kisumu	Nakuru	Kiambu	Total
	%	%	%	%	%
Access to finance	48.8	45.5	70.0	22.2	50.0
Costs of electricity	44.2	13.6	75.0	22.2	41.5
Market access	39.5	45.5	50.0	22.2	41.5
Low purchasing power of buyers	23.3	4.5	50.0	55.6	27.7
Import regulations	25.6	4.5	35.0	55.6	25.5
Costs of finance	20.9	18.2	35.0	11.1	22.3
Access to skilled staff	11.6	18.2	45.0	11.1	20.2
Access to machinery/equipment	16.3	13.6	20.0	11.1	16.0
Access/reliability to electricity	2.3	13.6	40.0	0.0	12.8
Model piracy	7.0	9.1	0.0	66.7	11.7
Access to production factors	20.9	4.5	0.0	0.0	10.6
Personal injury due to lack of suitable work tools	18.6	4.5	5.0	0.0	10.6
Access to land	2.3	4.5	35.0	0.0	9.6
Lack of resources for advertising	4.7	4.5	15.0	33.3	9.6
Peace and stability	7.0	0.0	25.0	0.0	8.5
Costs of land	0.0	0.0	35.0	0.0	7.4
Non-repayment of credit sales	7.0	13.6	0.0	0.0	6.4
Lack of standards and certification	2.3	4.5	5.0	0.0	3.2
Capacity building	7.0	0.0	0.0	0.0	3.2
Others	16.3	18.2	0.0	11.1	12.8
Total					

**MR-Multiple responses*

Impact of COVID-19 on local manufacturing business COVID 19 regulations and curfew restrictions

COVID-19 regulations and curfew restrictions were stated by 4.2% of respondents as a factor that restricted success of business followed by others shown in Table 46. High taxation and government intervention were county specific where both formal and informal charges were preferred on businesses by the area administration representatives during the COVID-19 period. The issue of informal taxation was also raised as a concern by the key informants (KIIs of all study counties, 2021)

Table 46: COVID-19 regulations and curfew

	Nairobi	Kisumu	Nakuru	Kiambu	Total
	%	%	%	%	%
COVID-19 regulations and curfew restrictions	9.3	0.0	0.0	0.0	4.2
Theft from workers, lack of collaterals	0.0	4.5	0.0	0.0	1.1
Taxes	2.3	0.0	0.0	11.1	2.2
Overdependence	0.0	4.5	0.0	0.0	1.1
Government intervention	0.0	4.5	0.0	0.0	1.1
Government bureaucracy	0.0	4.5	0.0	0.0	1.1
Competition	2.3	0.0	0.0	0.0	1.1

**MR-Multiple responses*

Business Environment Before and After COVID-19

Business was perceived to have been good by 51.1% of respondents while 35.1% perceived it to have been fair or okay. The status of business during the pandemic was perceived to have been somewhat bad, fair/okay or bad/ very bad by 24.5%, 23.4% and 19.1%, respectively, of the respondents (Fig 5).

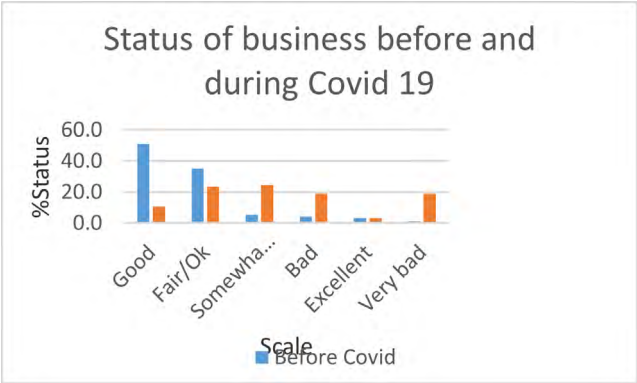


Figure 5: Status of business before and during COVID-19

Compared to 3 years earlier, 31% respondents felt it was a little worse, 23% felt business improved a little, while 19.1% and 18.1% felt it stagnated and much worse respectively (Table 47).

Table 47: Business before and after COVID-19

How has the business environment changed compared to three years ago?	Little worse	27.9	27.3	50.0	11.1	30.9
	Improved little	23.3	45.5	5.0	11.1	23.4
	Stagnated	7.0	13.6	45.0	33.3	19.1
	Much worse	27.9	9.1	0.0	33.3	18.1
	Improved much	14.0	4.5	0.0	11.1	8.5
	Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Conclusions and Recommendations

The study revealed that local manufacturers in Kenya were mainly privately and locally owned and the founders were predominantly male with a low level of funding for their businesses. They faced various challenges that impeded their operations and consequently development as revealed by the interviews and focus group discussions. Key challenges included low level of business training, competition from imports, low level of collaboration with educational institutions besides low affiliation to associations, and lack of capital. Another challenge was the low level of research and development funding which was estimated to be 14%. This could be a limitation on the diversity of products manufactured. The on-demand model that the majority adopted was an indication that the businesses/manufacturers dealt in same type of products. Across the counties, it was found that 30% of the businesses were certified by KEBs and 11% conducted their own testing while 7% conducted their testing through the association. This portended inadequate certification, a situation that denied them a huge market from customers who may have required certification as a condition for the purchase. Lack of certification may explain the reason why the products from local manufacturers lacked national and global competitiveness. An area of further concern was the mode of advertisement where word of mouth, social media, showroom display, and exhibitions were the dominant modes in the four counties which probably ended up only reaching the local clientele leaving out the rest of the country.

Any vibrant manufacturing entity would require a mechanism that reaches out to its potential customers through effective advertisements since it is known from literature that advertising influences consumer behavior and emotion. As observed in this current study, only 22% of the manufacturers served customers from outside the county and the remaining 78% served local customers and predominantly small scale customers which implies that there is need for more market research and advertisement to increase the customer base.

The manufacturers also seemed not to have clear staff development plans as illustrated by the informal staff and parents' request for training. This may mean that probably, if requests were not made, there would have been no training and in the absence of training, local manufacturing sector would not have thrived. Collaboration with educational institutions is a hallmark of technology transfer and, very little collaboration was witnessed and in some cases none at all. This is rather unfortunate considering that all the four counties have universities and other training institutions within their reach, which the local manufacturers could collaborate with. As this study has shown, lack of interest in loans by some manufacturers was due to strict repayment schedules

by commercial banks and this was a challenge to manufacturing. The other challenges mentioned included high cost of electricity, poor market access, high taxes, policies and regulations such as import regulations and environmental regulations. In addition, COVID-19 regulations which restricted movement and imposed other requirements was a hindrance to business. These were obstacles to the proliferation of local manufacturing in Kenya. Identification of these challenges in this study provides an opportunity for improvement through lobbying for policies that would reverse the desperate situation that manufacturers find themselves in. In conclusion, the local manufacturing sector has a lot of potential to contribute towards employment creation and poverty reduction if only the current challenges could be addressed. The government as well as the private sector ought to play a proactive role towards elevation of this important sector.

Policy Recommendations:

1. There is a need to increase research and development efforts through increased awareness and funding to avoid a business-as-usual kind of operation.
2. Certification ought to be an important ingredient in the operations of the manufacturers and this will increase their national and even out of country markets.
3. There is a need to regulate imports by introducing a levy for machinery/equipment which are imported and yet the same are being locally produced. This will boost local manufacturing and hence increase contribution to the national economy.
4. Financing of manufacturing sector would spur the growth of local manufacturing and this could be through loans and credit with favorable terms.
5. There is need for reduction in electricity tariffs imposed by the power company as well as the high taxation that local manufacturers are subjected to. Use of solar power could be encouraged and the excess power could be offloaded to the national grid.

References

Binswanger, H. (1986). Agricultural mechanization: A comparative historical perspective: World Research Observer.

Chege, J., Ngui, D. and Kimunyu, P. (2014). Scoping paper on Kenyan manufacturing, WIDER Working Paper, No 2014/136, ISBN 978-92-9230-857-5. The United Nations University World Institute for Development Economic Research (UNU-WIDER), Helsinki

Chukwu, B. A., Kanu, E. C. and Ezeabogu A. N. (2019). The Impact of Advertising on Consumers' Buying Behaviour. International Journal of Arts and Commerce, 8(1): 1-15

Daum, T. and Birner, R. (2017). The neglected governance challenges of agricultural mechanization in Africa – insights from Ghana Food Security Springer publications

Deshpande, M., Rokade, Y. and Singh, P. (2019) The Impact of Advertisement on Consumer Buying Behavior in Electronic Industry. International Journal of Scientific Development and Research (IJSDR) Volume 4, Issue 12

Government of Kenya (GOK) (2016). Economic Survey, Kenya National Bureau of Statistics

Government of Kenya (GOK) (2016). The Kenya National Bureau of Statistics MSME National Survey 2016

Government of Kenya (GOK) (2017). 'The big Four' Immediate priorities and actions

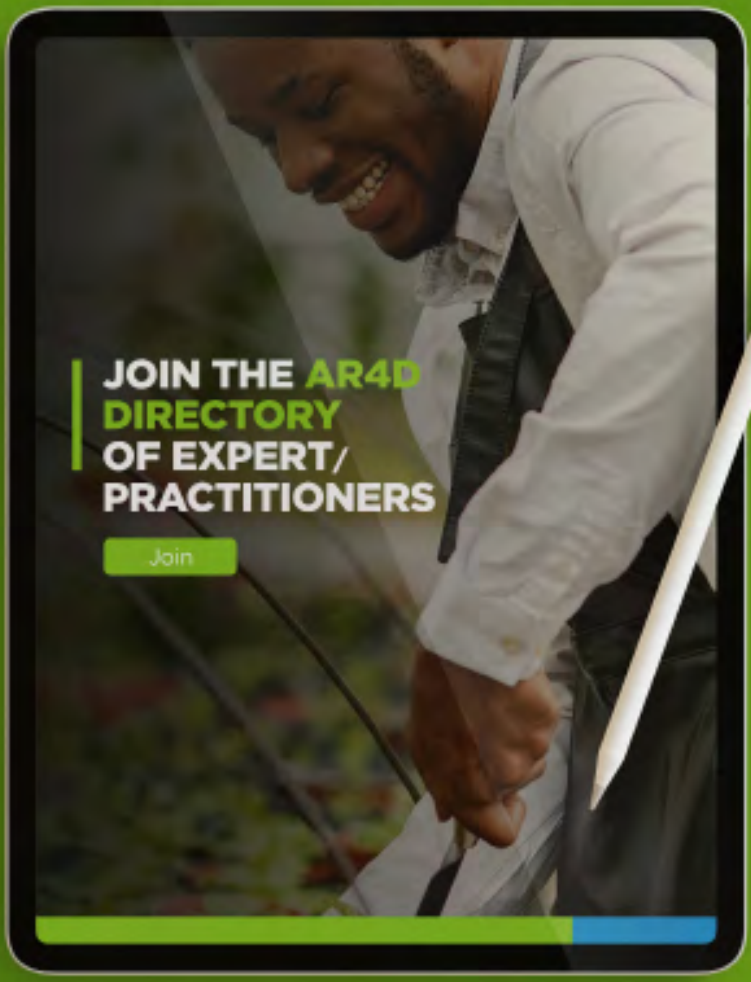
Government of Kenya (GOK) (2017). Buy Kenyan, Build Kenya. Ministry of Trade and Industrialization

International Labour Organization (ILO) (1972) Employment, Incomes and Equality: A strategy for increasing productive employment in Kenya Geneva: ILO

Kenya Association of Manufacturing (2017). A sector deep-dive report

Kenya Climate Innovation Center (2020). Kenya Industrial SMEs mapping Report.

Kimuyu, P. (2010). Do small firms in developing countries ever transform? Regional Development Studies, 14: 11-28



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