

# The Present Status of Agricultural Mechanization in Kwara State, Nigeria: A focus on Tractorization

OGUNJIRIN, O. A.<sup>1</sup>, OGUNJIRIN O. C.<sup>2</sup>, SUNMONU, S. E.<sup>3</sup>, KOSEMANI BABAJIDE<sup>4</sup>,  
SULUGAMBARI U. S.<sup>5</sup>, TAJUDEEN K.O<sup>6</sup>, JIMOH W.<sup>7</sup>, ABDULLAHI H.<sup>8</sup>

<sup>1,3,5,6,7,8</sup>National Centre for Agricultural Mechanization (NCAM), Ilorin, Nigeria.

<sup>2</sup>Department of Postharvest Engineering Research, Nigerian Stored Products Research Institute, Ilorin, Nigeria

<sup>4</sup>Olabisi Onabanjo University, Ibadan, Ogun State, Nigeria.

**Abstract-** This research critical assess the level of agricultural mechanization in Kwara State, Nigeria, focusing specifically on tractorization. Combining data from primary surveys and existing literature, the research examines ownership levels and intensity of usage of tractors, as well as gender participation and the distribution of this technology. Key findings were: ownership levels for tractors is extremely low, with usage predominantly (97.99%) hired services, signifying strong structural limitations to ownership; that gender imbalance persists, with female share less than 3%; and that there was a concentration on relatively low horse-power tractors in the range of 51-75hp which indicates suitability to the small holder nature of farms. Constraints identified include: prohibitively high costs of acquiring tractors, lack of access to credit, poor maintenance support structures and poorly developed rural infrastructure. The research recommends policy induced mechanization models such as, custom hire services, a comprehensive credit and financial strategy as well as a capacity building framework. The implications of the findings enhance ongoing discussion about low-energy agriculture in Sub-Saharan Africa.

**Keywords:** Agricultural Mechanization, Tractorization, Agriculture, Tractor.

## I. INTRODUCTION

Kwara state, which is one of the first 12 states established in Nigeria after the merging of the Western, Eastern, Southern and Mid-western regions in Nigeria, is one of the leading agricultural producing states in the North Central zone of the six geopolitical zones of the country with vast arable land. It consists of three senatorial districts which are the Kwara Central, Kwara North and Kwara South.

The greatest economic potential of Kwara state lies in agriculture. Agriculture employs at least 70 percent of the state's labour force in the rural area, while government employs the largest portion of labour in the formal sector. The state is blessed with favourable climate and large expanse of fertile land (NCAM, 2024). It is known for the cultivation of maize, rice, millet, sorghum, cashew, cocoa, oil palm, tomatoes, pepper, onions, leafy greens, yam, cassava, sweet potatoes among others. The state is also involved in animal husbandry and fish production. The state is divided in to sixteen Local Government Areas for easy administration and Agro-processing plants could be found across these Local Government Areas (LGAs) of the state. The practice of irrigation farming during the dry season is also in place especially the riverine areas.



Figure 1.0 The Map of Nigeria showing the location of Kwara state.

### 1.1 Agricultural Mechanization

Agricultural mechanization refers to the use of machinery and technology in agricultural production, processing, and marketing to improve efficiency, productivity, and sustainability. It involves the

application of engineering principles and technologies to optimize agricultural practices, reduce labor intensity, and enhance decision-making. The areas of Agricultural mechanization encompass various farm operations including: Land preparation, crop planting, weed control, harvesting, water management systems, livestock production and management technologies, post-harvest processing and storage solutions, supply chain management and logistics optimization, decision support systems and data analytics. Additionally, mechanization is increasingly extending to smart logistics, digital supply chain management and market integration platforms, which indicate a shift towards fully mechanized and digitalized agri-food systems (Zhang et al., 2024).

The goals of agricultural mechanization include: increased productivity and efficiency, improved crop yields and quality, reduced labor costs and drudgery, enhanced sustainability and environmental safety, improved food security and safety, increased competitiveness and market access (national and international) empowerment of smallholder farmers and rural communities.

Recent research recognizes that sustainable agricultural mechanization (SAM) needs to be technically appropriate, affordable, economically viable, socially inclusive and environmentally friendly. Agriculture mechanization has emerged as one of the key drivers of agricultural transformation, rural development, poverty alleviation and inclusive growth in developing countries and especially in Sub-Saharan Africa in which institutional support, financing mechanisms and capacity building system are appropriately put in place (Diao, 2021).

#### 1.2 Federal Government Agricultural Establishments in Kwara State.

The success recorded in various agricultural operations in Kwara State has attracted the establishment of key agricultural parastatals and agencies in the state (NCAM, 2024). These include the Nigerian Stored Products Research Institute (NSPRI), the Agricultural Rural and Management Training Institute (ARMTI), and the National Center for Agricultural Mechanization (NCAM) focusing on

different mandates which varies from the preservation of agricultural produce and reduction of post-harvest losses as well as the provision of adequate training and re-training of stakeholders in the field of agriculture to the development and certification of agricultural machines.

#### 1.3 Tractorization

This is the adoption of the use of tractors in carrying out farm operations (Takeshima et al., 2013). A farm tractor is a multi-purpose farm vehicle which is referred to as the most essential of all farm machinery and central to Agricultural mechanization. Farm tractors are used in collaboration with a variety of farm equipment in order to carry out various farm operations. Tractors increase farm productivity per agricultural worker; they make farm work more attractive.

The use of tractors on the farm improves agricultural development. Tractors provide rotary force from the power take off point (PTO) at the rear, hydraulic pull, push effect and electrical power used for some farm operations. Tractors was primarily designed to be used as a substitute for man and animal power but at present it is designed for multiple uses. Traction power, belt power, power take-off drivers, mounted tools, and hydraulic remote-control units, climate-controlled cabs and power steering, all serve to extend the usefulness and efficiency of the modern tractor. Tractors are used with various implements and equipment for several farm tasks from land preparation, planting to harvesting, processing and storage.

Generally, the adoption of tractors in Nigeria as a whole has increased in recent years, with the support of government initiatives, private sector investments, and donor interventions. However, the use of tractors per hectare of arable land (7 tractors per 100km<sup>2</sup> according to Ozumba et al., 2019) remains inadequate compared to global averages.

##### 1.4.1 Tractor usage in kwara state: Ownership vs Hiring

The use of tractor in kwara State is predominantly on hire basis by individual farmers and group of farmers. It makes up 97.99% of the total usage. The hiring of

tractors rather than ownership of tractors is affecting the sustainability of agricultural development of the state. The results suggest a limited market for farmers or groups who intended to own tractors. This could be as a result of financial incapability of farmers, thereby making individual farmers or organizations often found it more comfortable to hire tractors rather than purchasing them. (NCAM,2024)

The hiring service could be a reasonable farming strategy that farmers would rather hire the equipment only when they need it, rather than owning them and leaving them unused for extended periods. There seems to be a salient demand for tractors, indicating potential for growth in sales or leasing businesses. Entrepreneurs and investors could explore this avenue, looking to fill the gap and meet the demand for tractors for farming in the state.

Lastly, the results from the combined literature review and primary data underscore the need for improved infrastructure and support mechanisms for tractor business and tractor usage in Kwara State. Whether through training programs to enhance tractor operation skills, maintenance services to keep the machinery in optimal condition, or financial assistance to facilitate tractor ownership, there is a clear opportunity to bolster the agricultural sector in Kwara State through mechanization. This insight is valuable for stakeholders, policymakers, and entrepreneurs in their efforts to develop strategies that can support and elevate the level of tractorization in Kwara State.

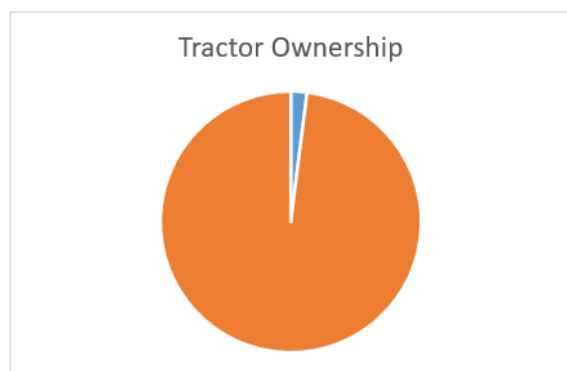


Figure 2.1: Tractor Usage in Kwara State.

#### 1.4.2 Gender Distribution of Tractors users in Kwara State

There is great gender disparity among tractor users with the male users making up the majority at 97.13%, while the remaining percentage of 2.87% represent the female users. This could be as a result of cultural believe the operation of heavy machinery like tractors are traditionally been viewed as male activities. Meanwhile women often find themselves in farming operations such as tending to crops, crop processing (winnowing) or managing household responsibilities.

Another factor contributing to this great disparity is access to resources. The male users could have better access to financial resources, and educational opportunities focused on tractor operation. In contrast, the female users could face barriers related to limited access to credit, land ownership, or specialized training, which could hinder their engagement with mechanized farming practices. Cultural beliefs and societal expectations is not factor that worsen this gender gap. Although, female farmers have contributed immensely to agricultural development in the state, they have limited access to tractors and mechanized farming equipment. These showed that limited access to tractors is affecting their productivity and efficiency of the total agricultural contribution to national and state GDP.

In summary, the gender distribution among tractor users and stakeholders in Kwara State leans heavily toward males, reflecting a combination of traditional gender roles, limited access to resources, and societal norms.

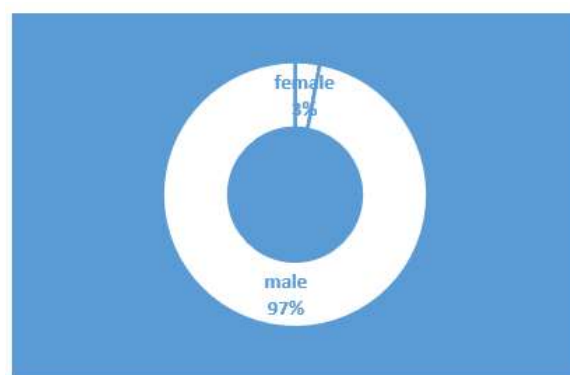


Figure 2.2: Gender distribution of tractor usage.

#### 1.4.3 Imported tractor Models

Tractor models imported into Kwara State is more than a hundred. The first 10 leading models (Figure 3.2) in order of preference were: MF 375, V-1350G, 605 DI, FT-130, TT75, 80-65, MF 375, MF 275, FIAT 80-66 and TL 70.

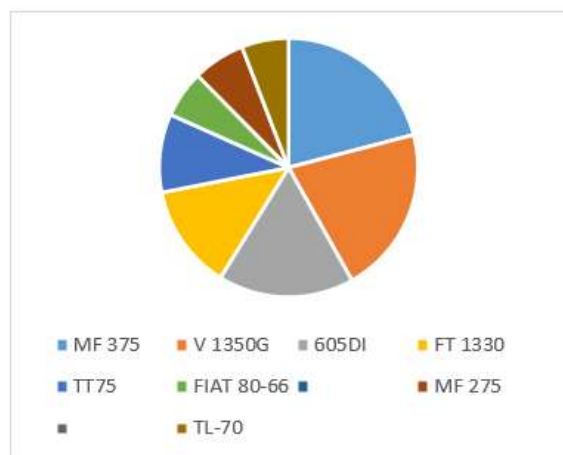


Figure 3.2: Imported Tractor Models

These results indicate that most of the basic tractor capacity needs of the farmers falls within the 51-75Hp while some special needs remain outside this specification.

#### 1.4.3 Tractor Capacity

Figure 3.3 shows the various tractor capacity in use in Kwara State. Majority (71.4%) of the tractors' capacity (horse-power) is between 51 and 75 followed by 76-100 Hp (12.55%), <25Hp (11.96%), 25-50Hp (2.75%), 101-125Hp (1.18%) while just 0.2% was that of 176 - 200 Hp.

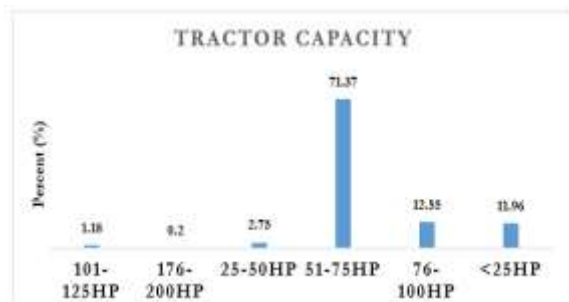


Figure 3.3: Distribution of tractor capacity

#### 1.4.4 Tractor Duration under Usage

The range of the duration for tractor usage was from less than 77 months to above 465 months (Figure 3.7). Most of the available tractors (60.4%) recorded less than 77 months under usage followed by 77-154 months (26.1%), 155 – 231 (8.6%), 232 – 309 months (2.8%), 310 – 387 months (0.8%), 388 – 465 months (0.6%) and lastly above 465months (0.8%).

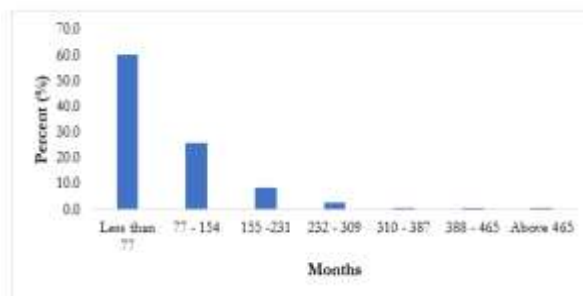


Figure 3.7: Duration of tractor under usage

## II. THE ROLE OF NATIONAL CENTRE FOR AGRICULTURAL MECHANIZATION (NCAM) IN TRACTORIZATION IN NIGERIA.

The National Centre for Agricultural Mechanization (NCAM) plays a pivotal role in advancing sustainable agricultural development by promoting and facilitating the adoption of mechanized farming practices across Nigeria. The NCAM's key roles and contributions towards mechanizing Nigeria agriculture include: Technology Development and Adaptation, Capacity Building and Training, Promotion of Sustainable Agriculture, and Policy Advocacy and Support. Plate 1 shows some of the Technological development by NCAM.



Plate 1: 1st Nigerian made four-wheel tractor and triketor by NCAM.

### III. CHALLENGES

The high cost of agricultural machinery, including tractors and equipment, poses a barrier to adoption of tractors by farmers who have limited financial resources and access to credit. The challenges in maintenance, repair services, and availability of spare parts for tractor hinder sustainable tractorization practices, leading to downtime and reduced operational efficiency. Inadequate rural infrastructure, such as roads and storage facilities, limits the transportation and distribution of machinery and inputs to farming communities.

### IV. CONCLUSIONS

As Nigeria navigates its development trajectory, engineering will remain a cornerstone of sustainable growth, security enhancement, and agricultural transformation. Engineering holds immense potential to propel Nigeria towards a sustainable, secure, and prosperous future. Through strategic investments, collaborative partnerships, and a commitment to innovation, Nigeria can harness engineering's transformative power to address societal challenges and achieve sustainable development goals. The journey ahead requires concerted efforts from all stakeholders to leverage engineering solutions effectively and ensure a resilient path towards national prosperity.

### V. RECOMMENDATIONS

Future research should prioritize interdisciplinary approaches that integrate engineering with social, economic, and environmental considerations. Collaborations across sectors can accelerate the deployment of innovative solutions and ensure their alignment with national development priorities. Additionally, promoting STEM education and fostering a skilled engineering workforce are essential for sustaining progress and driving future advancements.

### VI. ACKNOWLEDGEMENT

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