Mechanization Practices of Medium Scale Farmers' in Ibaji Local Government Area of Kogi State Nigeria

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ABSTRACT

There exist constraints to farm mechanization practices in Ibaji local government area of Kogi State which poses a significant threat to food security to the people. Some these include fragmentation of farmlands or small landholdings due to problems of land tenure system, poor capital base, scarcity of farm machinery and equipment, insufficient farm inputs, poor infrastructural facilities, land degradation, poor social and economic structures. This research study investigated the status, challenges and effects of mechanization on Ten (10) individual farm lands in the local government area. Personal investigations, observations, oral interviews, past records and two hundred and fifty (250) questionnaires were used to collate data from the various farm settlements visited. Mechanization Index (MI) and productivity levels were used as indicators in assessing the level and impacts of mechanization. Findings revealed that farmers in the area are predominantly medium scale farmers with their major source of power being human beings resulting in low patronage of mechanical power input of about 69.9KWh/ha and MI of 25.53%. Underutilization of available mechanical power, an average literacy level and high reliability on human power on most farm lands contributed to low production efficiency. It was in this view this research work evaluated the index of agricultural mechanization practices and its productivity prospects in 10 major farming communities of Ibaji Local government Area of Kogi state, Nigeria.

KEYWORDS: Agricultural, Ibaji, Mechanization, Power and Productivity.

1. INTRODUCTION

Mechanization of agriculture is recognized as one of the greatest engineering achievements of the 20th century. It involves the selection, operation, utilization, and maintenance of mechanical devices and systems in agricultural operations; and their management in crop production for the utmost benefits of man (Almasi et al., 2005, Olaoye et al., 2010).

Research findings by Manta et al. (2013) revealed that, agricultural mechanization is the application of engineering technology into the field of agriculture, in order to improve agricultural output, as well as deliberate conscious departure from the peasant and subsistence agriculture into a commercial agriculture. This process also involves the development and management of machines for field production, water control, material handling as well as post-harvest operation.

However, it must be noted that mechanization does not involve only machining of agricultural operations; rather it involves every effective factor in energy utilization, economic management and sustainability of farming systems.

According to Dauda et al. (2012), tractor application in farming activities was introduced in the 1950's through farm settlement scheme in the western region of the country to enhance productivity level before spreading to other parts of the nation. But in recent years, tractor power has become a substitute to the use of animal draught and human power in some part of Nigeria.

Manuwa, (1996); Usman and Umar (2003) shared the same view that, the available farm tractors are being under-utilized in some parts of Nigeria; this was attributed to limited seasonal application of farm tractors and lack of technical and managerial competence to handle, use and maintain farm machinery.

To some, agricultural mechanization is synonymous with tractorization while others take it to mean increase in production per farmer per hectare of land cultivated. The high cost of ownership of farm tractors in Nigeria presently militates against the use of tractors by majority of the farmers (Rahman and Mijinyawa, 2001).

The importance of agriculture, apart from oil sector revenue in the Nigerian economy cannot be overemphasized especially in the rural areas. It is with no doubt that Nigeria has over 80% of its rural populace engaged in agricultural activities from where the people derive their means of livelihood either directly or indirectly.

Iheanacho et al., (2003) stated that the machines used for agricultural production in Nigeria include: hand tools, animal drawn implements, two wheel and four-wheel drive tractors, motorized or mechanically driven post-harvest handling and processing machines, crop storage equipment and pumps for irrigation.

Thus, agricultural mechanization in Nigeria can be divided into three levels of technology; hand tools technology, draught-animal technology and engine powered technology, Oudman, (1993). According to the national survey conducted by the Federal Ministry Agriculture, it assessed the quality and quantity of food production in Nigeria between 1973 and 1985. The general conclusion from the document was the problem of modernization of agriculture through the dissemination of modern technologies for agricultural production Olukosi et al., (2006). This brought about the investment in mechanical technology programs through public delivery system such as Agricultural Development Agencies like (ADPs) and other agricultural development institutions.

1.1 Challenges of Mechanization in Nigeria

The agrarian structure of Nigerian agriculture has failed to make adequate contributions to the nation's economic development due to the absence of appropriate level of mechanization (Mrema and Odigboh, 1993). Anozodo (1985) observed that the application of human, animal and mechanical equipment in agriculture with reference to technical, socio-economic and cultural constraints of farm can be acknowledged in the continuing official promotion of primitive hand tool technology characterized by low productivity. According to Odigboh, (1991), in comparing human power, animal power and engine power ratio with the world outlook on agricultural production in Latin America, Africa and Nigeria, Latin America has 59%, 89%, 90%, Africa has 89%, 70%, 10% and Nigeria 90%, 80%, 20% respectively. From the foregoing, it is clear that the extent of mechanization in Nigeria is still very low; 86% human power, 4% draught animal power and 10% mechanical (engine) power. Human power remains all the time high in Nigeria while engine power remains significantly lower than the Latin America. The current level and practice of agriculture is characterized by low level of acquisition, distribution and utilization of farm machinery and associated implements for farm operations.

Until lately (about year 2009), Nigeria has not been able to define the economic role of sustainable agricultural mechanization that can transform the experimental phase presently existing in the farm settlement schemes and pilot projects to a sound commercial production mechanism. The main objective of this research work is to evaluate the index of agricultural mechanization practices and its productivity prospects in 10 major farming communities of Ibaji Local government Area of Kogi state, Nigeria.

2. RESEARCH METHODOLOGY

The study area and geographical description of Ibaji Local Government Area of Kogi state, Nigeria located in the south-eastern part of the state on coordinates 6°52'N 6°48'E and 6.867°N 6.800°E. It is a wet climate zone with a mean annual rainfall of (1523mm-1,625mm) per annum, temperature range of 20°C-35.3°C and high relative humility of 87%. Topographically, it is having an elevation area between 300m to 490m above the sea level (wikipedia.org).

Ten (10) study areas (communities) representing major wards of the local government selected are: Akpanyo, Analo, Ayah, Ejule, Iyano, Odeke, Ojila, Onyedega, Ujeh, and Unale. The majorly grown crops include rice, yam, sweet potato and vegetables. The animals reared include goat, cow, fishery and poultry. Non-agricultural activities in the areas are petty trading, salons, auto-mechanical works and civil service.

2.2 Data Collection and Sampling Method

Data were collected through primary and secondary sources. Primary data was collected by field visiting and interaction with cluster-based farmers. Two hundred and Fifty (250) questionnaires which covered general background information on selected farm settlement operations such as: land preparation, tillage operation, planting, crop protection, harvesting and post-harvest operations were distributed; while two hundred (200) were returned completed. Secondary data was principally collected from the local council agro-service centers responsible for agricultural development projects. Various indices of measuring agricultural mechanization productivity were outlined for the purpose of this investigation. Other secondary data was based on results of published works in journals, seminar papers, conference paper etc. Random sampling technique was used within the study centers for the selection of two hundred (200) farmers; twenty (20) from each of the ten (10) communities.

2.3 Method of Data Analysis

The collated data was analyzed using descriptive statistics and budgetary techniques to investigate the involvement, impact and prospects of agricultural mechanization on the productivity output in ten (10) communities in Ibaji LGA. Also, descriptive statistics such as percentages and frequencies were used to describe the socio-economic characteristics of the respondents, identify the different levels of technology and identify the constraints to mechanization practices. The level of mechanization was established using established relationship between the various source of farm power and the level of human involvement.

2.4 Determination of Mechanization Index

Agricultural mechanization index, (MI) based on the use of human and mechanical energy inputs, was represented as the percentage of total works of human and that of the machinery and is calculated using the following relations in equation 1 below. This index presents the measure of the assessment and grading of the different levels of mechanization practiced in a particular area.

$$MI = \frac{M_p}{H_{p+}\ M_p} \times 100 \qquad (1)$$

Where:

Mp = Energy from mechanical operation (kWhr/ha)

Hp = Energy from human operation (kWhr/ha)

By implication, E_H parameter is determined based on the exact response of the average farmers in the surveyed areas on the estimated resting period in minute per hour of work on each manual operation. Bello, (2012).

2.5 Measurement of Labour Productivity (Machine and Human)

The productivity of machine and human labour can be determined based on the principle of production schedule which represent the maximum amount of output that can be produced from any specific set of inputs given for the existing technology. The productivity of labour, machine and total productivity were expressed mathematically by Ortiz-Canavate and Salvador, (1980) as presented in the following equations:

$$T_{Mp} = \sum Mp \quad (2)$$

$$T_{Hp} = \sum Hp \quad (3)$$

$$P_T = \frac{1}{M_p} + \frac{1}{H_p} \quad (4)$$

Where:

A_M = Productivity of machines, defined as the work carried out as a function of the machinery employed

A_H = Productivity of labour, defined as the work carried out as a function of labour employed

P_T = Total productivity and all other terms as defined previously.

The level of labour productivity for each farm settlement was determined as an inverse of the work outlay of the explicit factors involved in production function (capital or machine and labour).

3. RESULTS AND DISCUSSION

Majority of the farmers in the study area were individual farm owners rather than farm scheme settlers with basic formal education according to Figure 2.

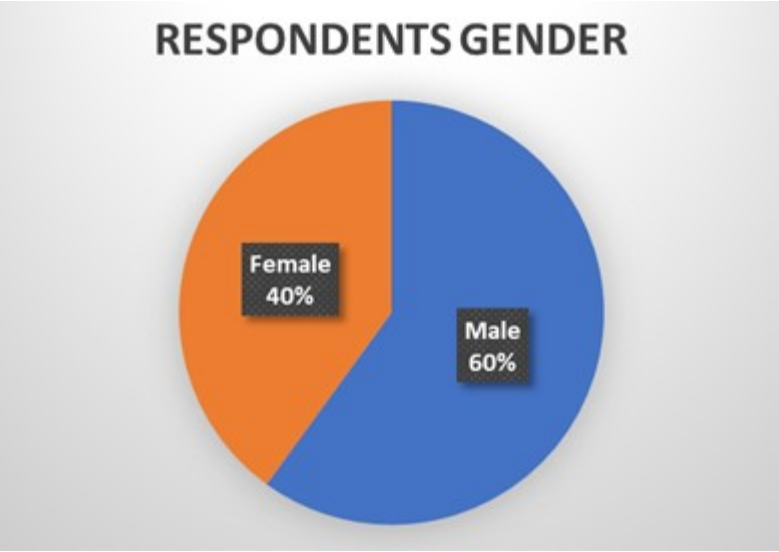

Fig. 1: Source Field survey, 2019

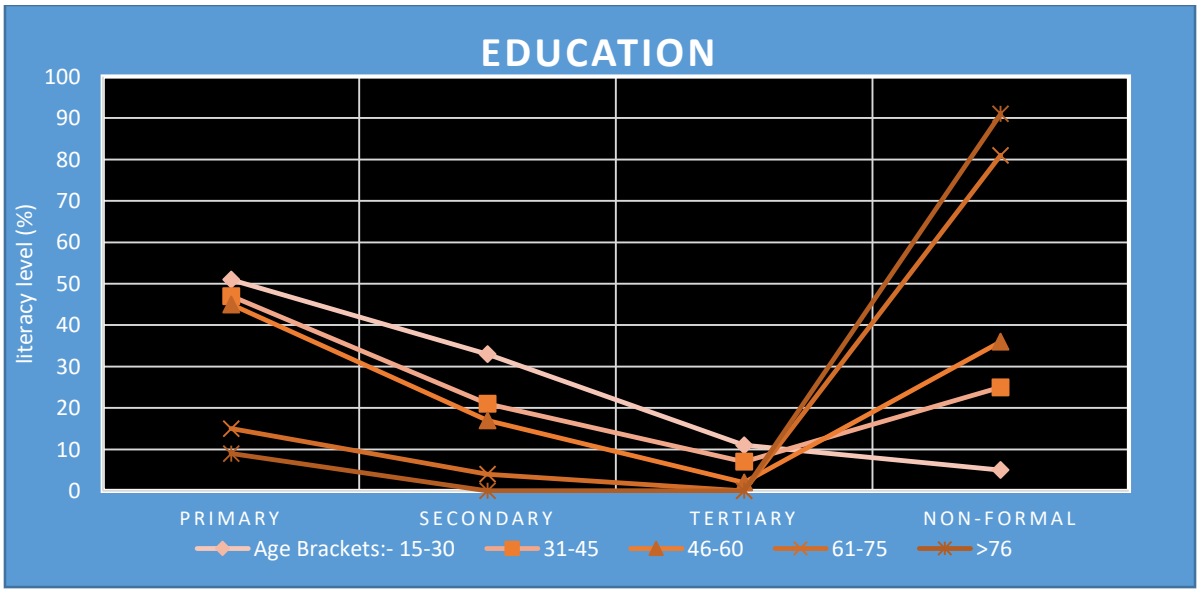

Fig. 2: Respondents Literacy Level

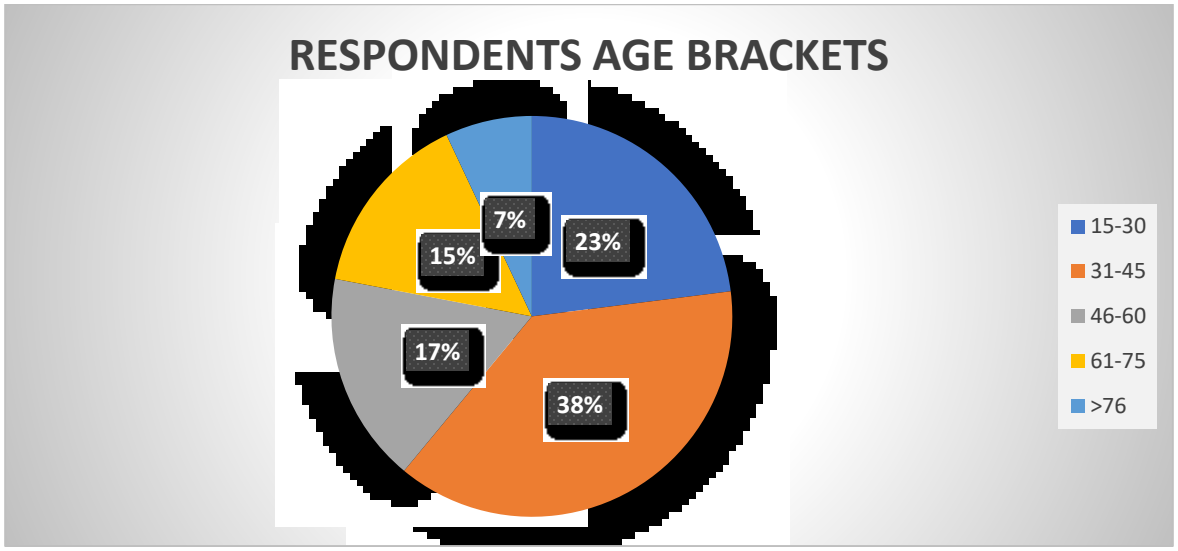

Fig. 3: Respondents Age Demography

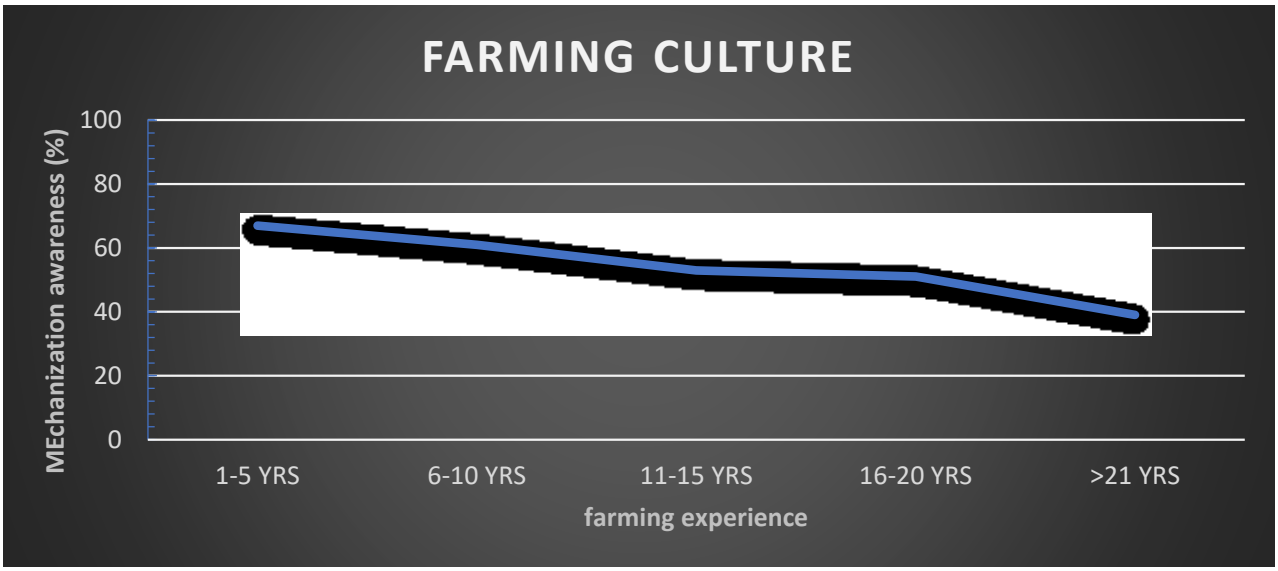

Fig. 4: Respondent Mechanization Farming Culture

Out of the 250 questionnaires administered, only 200 were returned completed and these were used for the purpose of data analysis. The respondents age bracket according to Figure 3 represent major farming population lies between 31-45 years with a majority of male gender representation of 60% of the total population in the local government area as shown in Figure 1. This figure represented the required man-power which possesses an average literacy level, hence a little above average farming culture of 67% as recorded.

3.1 Power Utilization Outlay

The level of mechanization was determined as shown in Table 1:

Table 1: Levels of mechanization practices

Community	Ta (ha)	T_{Mp} (kW/ha)	T_{Hp} (kW/ha)	ΣMp (kWhr/ha)	ΣHp (kWhr/ha)	ΣP_T (kWhr/ha)	MI (%)
Akpanyo	90	61.92	180.53	17.2	50.15	0.0781	25.54
Ejule	125	58.93	201.42	16.37	55.95	0.079	22.64
Ojila	111	64.9	203.66	18.03	56.57	0.0731	24.17
Odeke	119	68.63	194.71	19.06	54.09	0.071	26.06
Onyedega	130	170.83	161.14	47.45	44.76	0.0434	51.46
Ujeh	147	63.41	201.42	17.61	55.95	0.0747	23.94
Unale	141	45.51	224.55	12.64	62.38	0.0952	16.85
Ayah	97	58.19	199.18	16.16	55.33	0.08	22.61
Analo	107	55.95	193.21	15.54	53.67	0.083	22.46
Iyano	139	50.73	207.39	14.09	57.61	0.0883	19.65
Total average	120.6	69.9	196.721	19.415	54.646	0.06828	25.538

Where:

Ta= Total area of land cultivated (ha)

T_{Mp}= Total Mechanical power (kW/ha)

T_{Hp}= Total Human power (kW/ha)

ΣMp= Sum of mechanical operation (kWhr/ha)

ΣHp= Sum of human operation (kWhr/ha)

ΣP_T= Sum of all human + mechanical operation (kWhr/ha)

MI= Index of mechanization

Note: 1Hp = 0.746Kw and FAO recommendation of 70Hp:28ha (for a tractor).

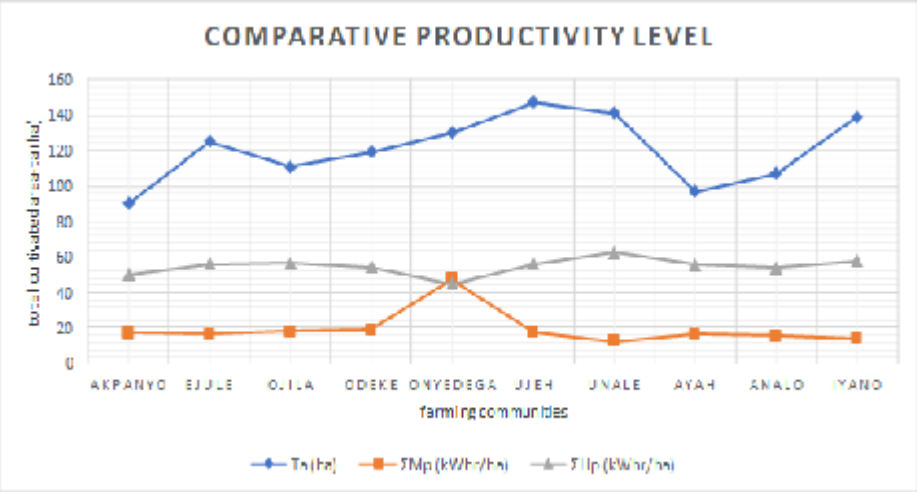

Fig. 5: Productivity Levels for Farming Communities

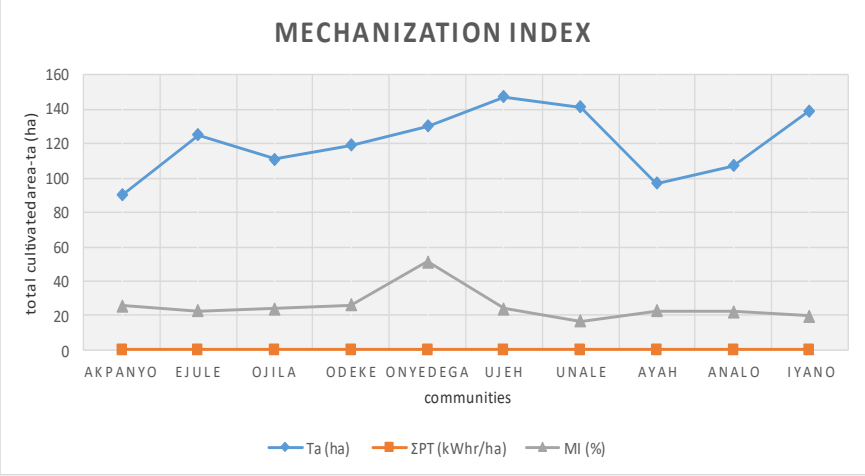

Fig. 6: Agricultural Mechanization Index

The results for MI for each community were determined using equation 1 presented above. Result findings shows highest MI of 51.46% was recorded for Onyedega and least MI of 16.85% was recorded for Unale. The low MI average value of 25.538 is a function of the low level of Machine power (tractor) utilization of 69.9Hp for each farming operations chasing 120.6ha of land as against Food and Agriculture Organization (FAO, 2008) recommendation ratio of one tractor of 70Hp to 28ha; the MI for the local government is low and falls below requirement recommendation of 50%.

According to graph 2, the energy and time inputs per agricultural land area under survey in hectares by human power is greater than the energy input of machine (tractor). Drudgery and low patronage of mechanical power such as tractor and implements were explicit factors, resulting to low production efficiencies of the farmers.

4. CONCLUSION

Results of the analysis and interpretation of data carried out on mechanization practices of medium scale farmers' in Ibaji local government area of Kogi state Nigeria, where most of the farmers are small farm holders with most of their land fragmented, and most of their labour coming from manual source revealed that: low production efficiency, high drudgery, underutilization of mechanical power; all contributed to low level of mechanization with the highest level of 55.31% for Echeno and least level of 23.73% for Odeke and an average MI in the LGA was 96.59%.

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