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A Survey of Tillage Mechanization Level of Small Scale Farmers in Gombe State of Nigeria

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Abstract - Tillage is considered one of the biggest farm operations as it requires the most energy on the farm. The farm size of farmers has not increase over the years due to readily available relevant mechanized tillage implements. The study surveyed the level of tillage mechanization in Gombe State, Nigeria. Random sampling was employed in arriving at 150 small scale farmers from five local government of the state. Data were obtain through interview and structured questionnaire and analyzed using frequency distribution, percentage and mechanization tool level (MTL) equation. The study reveal that 81.33% of the farmers in the area are male, with 87.33% having a farm size ranging between 1 to 5 ha and 57.33% with farming experience above 20 years. Family labour was reveal to be the most source of farm labour as 48.67% of the farmers house hold size ranges between 6 to 10 and 38.67% with no any form of education..The most available tillage implement in the area are plough (42%), and hoe (24.67%) which cost between #2000/ha to #4000/ha, for which 83.33% is through hire. The mechanization tool level (MTL) of tillage operation in the area includes, ploughing (16.67%), Harrowing (25.33%), Ridging (8%) and Hoeing (2.67%). These results show that the level of tillage mechanization in the study area is still very low while the bulk of food production in the area remains with the small farm holders. Hence, it is recommended that Government at all level should set up agricultural machinery and implement industries which should develop or purchase and lease or hire out to farmers at affordable rate to increase the level of tillage mechanization in the state.

Key Words: Tillage, Implements, Mechanization Tool Level, Farm Size, Mould Board Plough and Small scale.

1. Introduction

Agricultural mechanization is one of the greatest contributions of technological advancements to agricultural production in Nigeria [1]. Government at all levels considered acquisition and subsequent distribution of farming equipment especially tractor as a significant action that improves agricultural production, yet no commensurable attention has been

devoted to performance management of these equipments with respect to adequacy, appropriateness, economic efficiency and sustainability [2]. Due to the global demand for food items, the increase cost of mechanization on the farm and the current disposition of financial institutions towards agricultural credits, it becomes very critical for existing farmers, farm managers, and agricultural investors to make informed decision based on figures, and improve the management of mechanization operation. The cost of operating farm tractors can be reduced if the right tractor and implements are used for the right operation as well as operating at manufacturers recommended annual use [3].

The application of machines to agriculture has been one of the outstanding developments in Agriculture [4]. According to [5], some of the increased production that has been realized must be accredited to more essentially the increased utilization of non human energy and more effective machines and implements. The wide mechanization of agriculture in the more developed countries during the 20th century has been widely recognized as a key element producing a high standard of living [6]. For the economic stability of developing countries , more attention must be paid to small holdings farmers who are a majority [7], [4].it is a well known fact that the bulk of agricultural production in developing countries is in the hands of small scale farmers who depend very much on tools with very low mechanical advantage. Most of these farmers, at different ecosystems and with their resultant cultural practices, are aware of the biotechnologies and farming systems that are most suitable for their respective agricultural environments [8]. To apply these technologies at some economic levels, the farmers would need the assistance of some mechanical devices in the form of appropriate farm tools and machines.

Tillage is considered one of the biggest farm operations as it requires the most energy on the farm [1]. [9] Defines tillage as the process of creating a desirable soil condition for seed germination and growth. Tillage provides good weed control with low herbicides cost, allows the control of disease and insects by destroying them through burying of crop residues. Three things are involved in soil tillage, these includes; the power source, the soil and the implement [10]. In convectional crop production systems, tillage accounts for over 50% of the energy expended from land clearing to harvesting. Irrespective of the techniques, the overriding concern in tillage operation that could culminate in the destruction of soil structure and the operation of soil with the attended problems that would impedes crop growth and reduce yield. [11] States that tillage has becomes more important as conservation measures covering a variety of activities from simple soil tillage to complex soil preparation techniques. Small scale farmers are estimated to account for the cultivation of about 90% of the total cultivated land area producing nearly 90% of agricultural output [12]. These farmers still depend on manual labour to carry out the various farming operation, tillage inclusive. [13] Asserted that manual labour pre-dominates Nigerian agriculture; he added that for meaningful agricultural development, there is need to mechanize farming (Tillage) operation.

The facts remain that agricultural mechanization in Nigeria was introduced at a level of 4 – wheel tractors where insignificant number of farmers who

need the machine can afford it. The Nigerian policy makers have perceived agricultural mechanization on a narrow concept over a long period of time and equated agricultural mechanization to tractorization [14]. The immediate mechanization required by small scale farmers is yet to reach them. The absence of the type of equipment needed by this level of farmers has continued to encourage drudgery and low productivity with its attended poverty of most of the local peasant farmers [7], [15] . However, the aim of this study is to identify the availability of tillage implements, determine the major source of acquiring tillage implements and determine the mechanization tool level (MTL) of tillage in the study area.

2. Materials and methods

2.1 *Area of study:*

The study was conducted in Gombe state Nigeria. The state is located in the north eastern part of Nigeria and specifically lies between latitude 9^o 30' and 12^o 30' N and longitude 8^o 5' and 11^o 45' E. the state is bordered in the west by Bauchi state, to the south by Adamawa state and some parts of Taraba state [16]. Gombe state has a land area of 20,265Km2 with a population of 2,657,246 [17].The state has eleven local government areas these includes Akko, Balanga, Billiri, Dukku, Funakaye, Gombe, Kwami, Nafada, Kaltungo, Shongom and Yamaltu/Deba local government areas respectively [16]. The people of this zone are predominantly small scale farmers who engage mostly in arable farming and domestic animal rearing [18].

2.2. *Sampling and data collection:*

Random sampling techniques was followed to arrived at 150 arable farmers from five local government areas of the state, which were purposely selected due to their high farming activities. They are Balanga, Billiri, Kaltungo, Shongom and Yamaltu Deba. Structured questionnaire were used to source primary information from the farmers. For illiterate farmers, assistance was used to interpret and filled the questionnaire for them. Basic information requested includes farm size, mechanization implement, farming experience, sources of tillage implement, cost of operating tillage implement and household sizes.

2.3. *Method of data analyses:*

The data were analyzed by the use of descriptive statistics which includes percentages, frequency distribution and also Mechanization Tool Level (MTL).The latter is specified in [19] as:

$$MTL = N_{mc} / (N_{mc} + N_{ht}) \quad \ldots\ldots\ldots\ldots (1)$$

3. Results and Discussion

Table 1: Results of Socio-economic and other Mechanization Components

S/N	PARAMETERS/INDICES	COMPONENTS	Frequency	%
1.	Gender	a. Male	122	81.33
		b. Female	28	18.67
		Total	**150**	
2.	Farm Size (ha)	a. 1 – 5	131	87.33
		b. 6 – 10	19	12.67
		Total	**150**	
3.	Farming Experience (years)	a. 1 – 5	6	4
		b. 6 – 10	9	6
		c. 11 – 15	15	10
		d. 16 – 20	34	22.67
		e. Above 20	86	57.33
		Total	**150**	
4.	Household Size	a. < 5	22	14.67
		b. 6 – 10	73	48.67
		c. 11 – 15	32	21.67
		d. 16 – 20	15	10
		e. Above 20	8	5.23
		Total	**150**	
5.	Educational level	a. Adult Education	45	30
		b. Primary Educ.	20	13.33
		c. Secondary Educ.	15	10.00
		d. Tertiary Educ.	12	8
		e. No Educ.	58	38.67
		Total	**150**	
6.	Available Tillage Implements	a. Plough	27	18
		b. Harrow	18	12
		c. Mould board	63	42
		d. Hoe	37	24.67
		e. Cutlass	5	3.33
		Total	**150**	
7.	Sources of Tillage Implement	a. Purchase	6	4
		b. Hire	125	83.33
		c. Loan/Lease	9	6
		d. Govt. Agency	10	6.67
		Total	**150**	
8.	Cost of Tillage Operation (₦/ha)	a. < 2000	23	15.33
		b. 2000 – 4000	62	41.33
		c. 5000 – 7000	36	24
		d. 8000 – 10,000	29	19.33
		Total	**150**	

Table 1 shows the results of the socio economic and other mechanization component of the farmers in the study area. 81.33% of the respondents are male with 87.33% having a farm size ranging between 1- 5 ha, while 57.33% have above 20 years farming experience with 38.67% having no education of any level. Though 48.67% have a sizeable number of household (6 - 10), which indicates that family labour, plays a vital role in the farming operation of the family. These results affirm [5] report that some of the increased production that has been realized is accredited to more essentially the increase utilization

of non human energy. Since the economic stability of any developing country depend on small holdings farming who are majority as reported by [7], [4], conform to the 87.33% of farmers in the study area with small farm holdings.

The results of the availability and source of tillage implement in the study area indicates that 42% of the available tillage implements are mould board plough and mostly powered through draught animal, while hoe takes 24.67%. these results agree with [20] report that agricultural mechanization in Nigeria was introduced at a level of 4 wheel tractors, most of which is why the farmer who produces the food are yet to benefit from the proceeds of mechanization. However, the major (83.33%) source of tillage implement was through hiring, which goes to support the claim by [21] that, there appears to be consensus that a tractor hiring unit (THUs) provides a viable strategy for promoting mechanization in developing countries, yet these countries are yet to receive meaningful mechanization even with the establishment of THUs in northern Nigeria in 1956.

The cost of tillage operation was also identified as a constrain to tillage mechanization in the study area, with 41.33% of the farmers paying between #2000 to #4000/ha, while 24% are paying between #5000 to #7000/ha which mostly involves the use of draught animal and in rare cases machine powered implements. However, the result is similar to the report of [22] , which state the average cost of soil tillage (Animal Traction) as #5000/ha in Katsina state, while it cost as low as #1200/ha in Jigawa state. Hence, the rate and level of animal traction technology may account for the variation in cost of tillage.

Table 2: Mechanization Tool Level of Tillage Operation.

Tillage Operation	Equipment Used						MTL (%)
	Plough	Harrow	Mould Board	Hoe	Cutlass	Draught Animal	
Ploughing	25	-	-	30	-	95	16.67
Harrowing	5	33	-	9	-	101	25.33
Ridging	12	-	-	84	-	54	8
Hoeing	2	-	2	115	-	31	2.67

Mechanization tool level (MTL) which differs from mechanization level of the equipment used in the study area for tillage is indicated in table 2. The MTL for plough is

16.67%, 25.33% for harrowing,8% for ridging and 2.67% for hoeing respectively. It is clear from these results that most farmers still carry out their tillage operation manually across farmers of various experience, farm size and household sizes. The result also indicates that mechanization of tillage operation in the study area is far from the actual tillage operation on the field. [19] reported similar result for middle Belt of Nigeria that the mechanization tool level for tillage operation was 24.62%, with 93.85% of farm size ranges between 1 – 5 ha. This suggests that the mechanization process being emphasized in Nigeria is still beyond the scope of the small scale

farmers who produce the bulk of the foods we consume.

4. Conclusions

A study on the level of tillage mechanization of small scale farmers, who dominate the agriculture of Gombe state, was conducted and it is believed that the farming activities in the study area reflect those of the entire state. However, it was observed that the major constrains of farmers with respect to mechanizing tillage operation was the availability, sources and cost of tillage operation, which tends to make farmers resort to manual operation. It goes to show that mechanization is very far from the farmers who are the major food producers. Tillage is the most fundamental operation in the process of food /crop production and invariably the most energy consuming. Government have been putting too much emphasis on the present level of western mechanization, which make our farmers alien to the process because they do not have the capacity to attain the level. Government should set up agricultural machinery and implement industries which will develop or purchase and hire out to farmers at subsidize rate, as well, revitalizing the Tractor Hiring Units (THU) across the states in the country.

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