IOSR Journal of Agriculture and Veterinary Science (IOSR-JAVS)
e-ISSN: 2319-2380, p-ISSN: 2319-2372. Volume 9, Issue 6 Ver. II (Jun. 2016), PP 34-39
www.iosrjournals.org

An Inventory of Animal and Tractor Drawn Seed- Fertilizer Applicators Available in Kano State of Nigeria

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Abstract: *This study earned out an inventory of existing planting equipment available in Kano State. The inventory was conducted by visits to relevant agricultural research institute i.e Sankara Nigerian Limited, International Institutes for Tropical Agriculture(IITA), Kano State Agricultural and Rural Development Authority(KNARDA),Ministry of Agriculture kano,Kano State. and some selected local governments in Kano state. The Local governments selected include Kura, Minjibir and Bunkure Local government areas of Kano State. Questionnaires were used in obtaining the necessary information from the farmers in the selected Local Government. The adoption criteria used in the determination of the adoptability of seed-fertilizer applicators obtained by the inventory are: cost of Implement, ease of operation by the farmers, spare parts, fabrication facilities of local manufacturers and durability of the Implement. Adoption indices were then assigned to the available implement in order to rank their adoptability. Both tractor and animal drawn seed-fertilizer applicators were found in the survey areas. Majority of the implements are available in the institutions/organizations but not to the farmers. All the seed-fertilizer applicators captured have adoptability index above 45%, indicating that they can be easily adopted. It is recommended that the implements be made available to our farmers. Also implements availability should be made known to the farmers through agricultural development programs (ADP)and extension services.*

Keywords: *Animal drawn seed-fertilizer applicator, Tractor drawn seed-fertilizer applicator, Planting, Adoption Index, Adoption Criteria*.

I. Introduction

Planting is one of the principles of production in agriculture. It is the process of placing of seeds, tubers with fertilizer at required depth in the soil and covers it back completely or partially for it to germinate. The planting depth depends on the size of the seed, the larger the seed, *the* deeper is the placement depth. There are some smaller seeds that do not required planting and applying fertilizer due to their size (Federal Department of Agriculture 1980), and are scattered on the soil surface (broadcast) e.g. grasses, rice etc.

Seeders represent the highest technical demands of all the implements in the survey in the area of animal traction to date (Oni 2009). They required precision in manufacturing and assembly, since many parts need to be milled and shaped. The experience gained can reveal information on the further developments of draft-animal technology. In principles, seeding can be done by three methods namely: broadcasting, dibbling and drilling. Seeders that can simultaneously spread fertilizer are generally longer and heavier, whereby the machine then becomes clumsier to handle (Akeredolu-Ale 1975). Fertilizer application occurs through an auger or stirrer and dispenser. Separate depositing of seed and fertilizer is important, so that the seed does not burn as has been reported from Zambia (scheidtweiter 1999).

It is necessary to place the seed with fertilizer into the soil just to a depth that is enough to keep it moist and not too deep to delay or prevent emergence ((Federal Department of Agriculture 1980). The essence of planting is to ensure an even distribution of seeds with maximum protection from risk of being earned out by birds, insects and ensure proper plant spacing within the row spacing of plant and row-row spacing of various crops to ensure the recommended plant density ((Federal Department of Agriculture 1980). The types of planters are: manual planters, tractor-powered planters etc.

Similar works have been conducted in the Department of Agricultural Engineering of Bayero University Kano (e.g., (Nura 2008), (Sulaiman 2010), (Ibrahim 2011), (Yar'adua 2011)). These works however were on post-harvest machinery. This project is thus intended to carryout survey of the available seed-fertilizer applicators in Kano State with the view of providing a comprehensive literature therefore which may be useful to inventors, researchers and farmers.

II. Methodology

Field survey was conducted in relevant agricultural research institutes as well as government ministries of agriculture's within Kano state i.e. Sankara Nigerian Limited, International Institutes for Tropical Agriculture (IITA), Ministry of Agriculture, Kano, Kano State Agricultural and Rural Development Authority (KNARDA). Local governments visited include Kura, Minjibir and Bunkure local government areas. The organizations were selected because they are most relevant organizations that provide agricultural implements to the farmers. The local governments were selected based on advice from the Kano State Agricultural and Rural Development (KNARDA).

The field survey was first conducted at KNARDA (Kano State Agricultural and Rural Development Authority). Questions were asked verbally and all the necessary information was obtained from the engineering section.

The second field survey was conducted at ministry of agriculture Kano state. The equipment available in the ministry were physically identified and their specification and operational procedure was fully explained by the head of mechanization, in which long time experience was shared together with the engineers at the Engineering section. The third field survey was conducted at international institutes for tropical agriculture. The institutes' farm, located in Minjibir local government area of Kano state, was visited. Also all necessary information was recorded. The fourth field survey was conducted at Sankara Nigerian limited Kano state in which the company has all necessary farm implements used in the farming operation/activities. Also questions were a asked verbally and necessary information was recorded.

The last field survey was conducted at Kura, Bunkure and Minjibir local Government areas of Kano State. At the agricultural engineering section, a lot of questionnaires were administered for adoption and availability of the implement.

For each survey area, seed-fertilizer applicators were identified. The seed-fertilizer applicators available in the organization were physically identified; operational procedure was explained; and available literature was taken. Pictures/operational procedure of their usage were captured using digital camera.

Determination of Specifications and the Performance Parameters of the Seed- Fertilizer Applicators Obtained.

In order to achieve the specific objective of this work, the literatures of the seed-fertilizer applicators available found in various private organizations were also analyzed from the literature provided by the manufacturers.

Determination of the Adoptability of Seed-Fertilizer Applicators Captured.

The adoption criteria used in the determination of the adoptability of seed-fertilizer applicators obtained by the inventory are: - Spare parts, cost of the implement, and ease of operation by the farmers, fabrication facilities of local manufacturers and durability of the implement

Assessment of the Adoption Criteria

A statistical analysis based on the Nigerian university system of GPA calculation is used to determine the adoptability of each of the seed-fertilizer applicator obtained, where each course is assigned a weight or credit unit as the case may be. The grades scores are also assigned weight i.e. A = 5, B = 4, C = 3, D = 2, E = 1 and F = 0. To find the GPA, the summation of the course weights and the grade weights are divided by the total number of credits or units registered for each of the semester. In this study the adoption criteria represents the course offered by a student, the seed-fertilizer applicators performance in relation to the adoption criteria represents the grades scored by the student as shown below in the table 1 and table 2.

Table 1: Adoption criteria and their weight (Source: Yar'adua 2011)

Adoption criteria		**Weight of each criteria**
Cl	Cost	5
C2	Ease of operation	4
C3	Spare parts	4
C4	Simplicity	3
C5	Durability and versatility	3
TOTAL		19

Table 2: Cost criteria and its weights

Scale for scoring cost criterion*	**Degree of affordability**
< N50,000	5
N50,000 - N60,000	4
N60,000 - N70,000	3
N70,000- 80,0000	2
N80,000-90,000	1
> N90,000	0

*Unstructured interview with the farmers.

Table 3 : Scale for scoring other criteria and their weights (Source: Abba Ibrahim 2011)

Scale for scoring other criteria	
Very high	5
High	4
Moderate	3
Low	2
Very low	1
Poor	0

In determining the adoption index of each seed-fertilizer applicator, a value of 0 - 5 is given to each of the 5 criterion above. Each of the criterions is then divided by its total value of 5 and then multiplied by its respective weight. The sum of all the products of the criterion and their weights is then divided by the total sum of weights of the adoption criterion, hence the adoption Index (AI) of the seed-fertilizer applicators. This is expressed mathematically
below: (Yar'adua2011).

Weighted scores

$WSC1$ = 0.8 x 5 = 4, $WSC2$ = 0.8 x 4 = 3.2, $WSC3$ = 1.0 x 4 = 4, $WSC4$ = 0.8 x 4 = 3.2,

$WSC5 = \frac{3}{5}$ = 0.6x3=1.8, TWS = 4+3.2+4+3.2+1.8 = 16.2,

A1=TWS/TOTAL =16.2/19 0.8526x100% = 85%

Where, C= Criterion, SC=Score for Criterion, WSC=Weighted Score for Criterion

III. Results and discussions

Field survey was conducted in relevant agricultural research institutes as well as government ministries of agriculture within Kano state i.e. Sankara Nigerian limited, International Institutes for Tropical Agriculture (IITA), Farm center (Ministry of Agriculture Kano and Kano State Agricultural and Rural Development (KNARDA).

In Sankara Nigerian limited, two tractor-drawn seed fertilizer applicators were found and one animal-drawn seed fertilizer applicator was also found. In IITA none of the implements were found i.e. animal-drawn and tractor-drawn seed fertilizer applicators. Also in the ministry of agriculture Kano state, one tractor drawn seed fertilizer applicator was found. While in KNARDA two animal-drawn seed fertilizer planters were found.

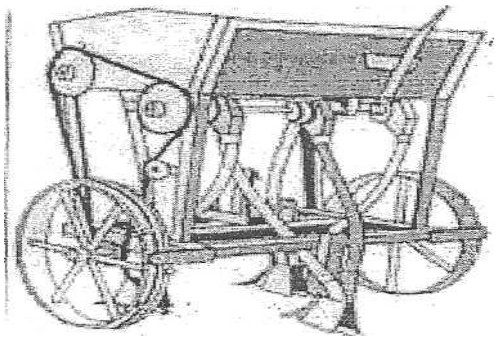

Figure 1: Animal-drawn seed-fertilizer applicator (KN06)

Table 4: Summary for KN06 specifications

Furrow opener	shovel type, shoe
Seed and fertilizer metering mechanism	Fluted
Row to Row spacing (mm)	Adjustable, 150-300
Depth of placement (mm)	50-150
Length x Width x Height (mm)	10^3 - 1200 X 900 - 10^3 X 40 - 80
Weight (kg)	850 - 900
Capacity (ha./h)	0.1 -0.3
Number of furrow openers	2-51
Seed hopper capacity (kg)	10-15
Fertilizer hopper capacity (kg)	10
Cost	N80, 000

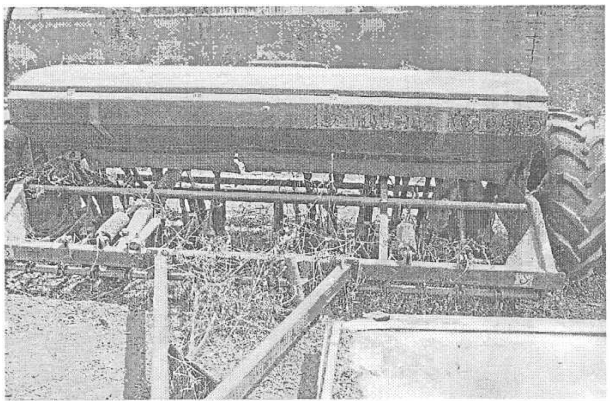

Figure 2: Tractor-drawn seed fertilizer applicator(KN05)

Table5: Summary for KNO5 specifications

Name	multi crop planter for controlled tractor traffic
Model	NZTD - C1T
Rows	currently available in 6 rows
Row - Row spacing	7" standard (max.) & adjustable
Plant - Plant spacing	6" standard & Adjustable
Fertilizer metering	Agitator & sliding orifice type
Seed dropping	vertical rotating disc with cells on its periphery
Cost	N800. 000

Seed fertilizer applicators Adoptability from statistical Analysis

Table 6: Summary of the adoption index

S/N	Seed fertilizer planters	C1	C2	C3	C4	C5	AI
1	KN01	55	33	44	33	33	72%
2	KN02	55	44	44	33	33	79%
3	KN03	00	44	44	33	33	53%
4	KN04	00	44	44	33	33	53%
5	KN05	00	55	44	33	33	62%
6	KN06	11	33	44	33	33	46%

From table it shows that based on the scale for scoring criteria and scale for ranking cost criteria implies that the degree of affordability of the implements were cheap only that farmers lack awareness of the implements as seen from the table above.

Table 7: Summary of the analysis for the adoption of all seed-fertilizer applicators.

S/N	REF.NO	AI	REMARK
1.	KNOl	72%	can be easily adopted by the farmers without any intervention
2.	KN02	79%	can be easily adopted by the farmers without any intervention
3.	KN03	53%	can be easily adopted by the farmers without any intervention
4.	KN04	53%	can be easily adopted by the farmers without any intervention
5.	KN05	62%	can be easily adopted by the farmers without any intervention
6.	KN06	46%	can be easily adopted by the farmers without any intervention

Table 8: Adoption Index Interpretation

Adoptability Index	Interpretation
>0.45	Can be easily adopted by the farmers without intervention
0.30-0.45	Recommended for adoption but requires a level of technical invention and fabrication needs to be upgraded before introduction to the farmers
< 0.30	Not recommended

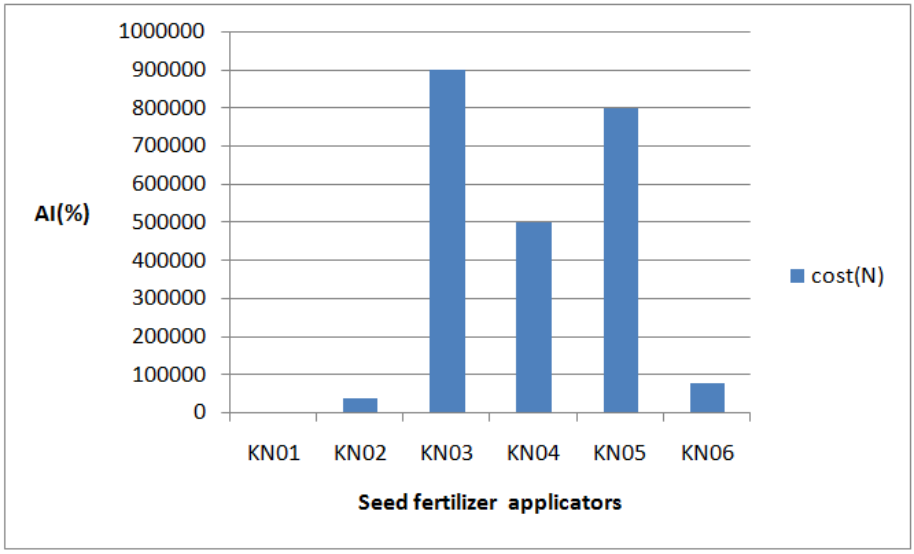

Figure 3 Comparison of Adoption Index of Seed Fertilizer Applicators

From the above chart its shows that KNO_2 has the highest (A1) because of its lowest cost and ease of maintenance while KNO_3 and KNO_4 were the least because of its high maintenance and high cost which may not be affordable by the farmers.

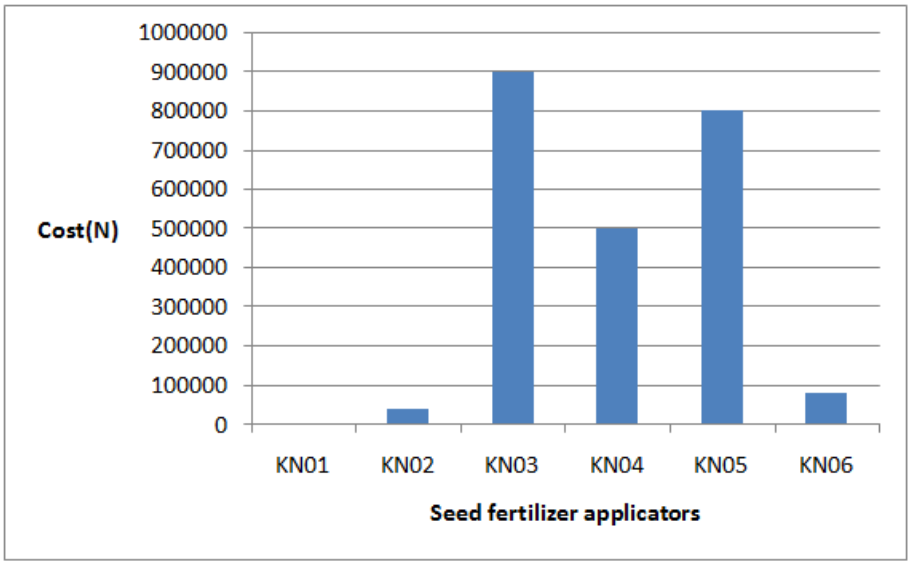

Figure 4: Cost Comparison of Seed Fertilizer Applicators.

From the above chart its shows that KNO_5 Planter had the highest cost followed by the planters KNO3, KNO4, KNO6 and KNO2. And KNO1 had the least cost. Planters such as KNO1, KNO2 and KNO6 have the least maintenance and easy to operate by the farmers hence the farmers can afford to purchase the implement.

IV. Conclusion

If this kind of information were available, the innovators would have engaged their efforts in doing something better. A lot of similarities concerning mode of operation, design and crops planted exist between the seed-fertilizer planters in the inventory. A lot of planting equipment attachments and accessories are available that could significantly improve the productivity of farmers in Kano state. However, most of the farmers are not aware of their existence. All the planting devices reported here could easily be adopted in Kano state.

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