International Journal of Science and Research Archive
eISSN: 2582-8185
Cross Ref DOI: 10.30574/ijsra
Journal homepage: https://ijsra.net/

(RESEARCH ARTICLE)

Roles of value-chain actors in quality seed delivery in Nigeria

Sakiru Oladele Akinbode [1,*], Esther Afor Ibrahim [2], Folarin Sunday Okelola [3] and Solomon Olufemi Afuape [4]

[1] *Department of Economics, Federal University of Agriculture, Abeokuta, Nigeria.*
[2] *AGRA, Nigeria Office.*
[3] *Plant Variety Protection Office, National Agricultural Seeds Council (NASC) Abuja, Nigeria.*
[4] *Sweet Potato Programme, National Root Crop Research Institute (NRCRI), Umudike, Nigeria.*

International Journal of Science and Research Archive, 2025, 16(02), 1572-1584

Publication history: Received on 15 July 2025; revised on 25 Augusth; accepted on 28 August 2025

Article DOI: https://doi.org/10.30574/ijsra.2025.16.2.2460

Abstract

The Nigerian government established the National Agricultural Seeds Council (NASC) saddled with the responsibility of regulating the seed industry in the country among others. The study assessed the roles of different actors along the seed system value-chain towards the delivery of quality seed in Nigeria. Data were collected from breeders, out-growers, seed companies, agro-dearlers and farmers. The data were analyzed using descriptive statistics and Logit regression model. Forty percent of the breeders had license agreement with seed companies for seed production. There were no seed testing laboratories close to 40% of the breeders. All the selected seed companies were registered with NASC. About 45% of the seed companies reported that their fields were visited during all the stages of production and 50% sell their left over seeds as grains. Some former out-growers independently produce seeds for farmers as certified seeds. This may be a source of poor quality seeds. Seed companies most times fail to buy all seeds produced by out-growers and delayed payment was also reported. Some out-growers store both crop seeds and agro-chemicals together. About half of the crop farmers plant from previous year harvest with implications on seed quality. Logit estimation revealed that education and extension contact significantly determined the use of NASC seedcodex label for seed authentication by farmers. The needs for adequate funding of breeding activities; governments to buy off left-over seeds from out-growers; enlightenment for other seed value chain actors on safe handling of seeds and the need to plant certified seeds were recommended.

Keywords: Seed Quality; Crops; Farmers; Nigeria

1. Introduction

Seed is the most important input in crop farming. Other inputs such as fertilizer, pesticide, and irrigation-water cannot contribute to increased productivity unless farmers plant quality seed [1]. There will be low yield when farmers plant low quality seeds despite the adequacy of other growth enabling factors. This has multiple implications on food self-sufficiency and impedes the sustainable development goal (SDG) target of eradicating hunger everywhere in the world, at the target date.

There are several advantages of planting quality seeds in agriculture which include being genetically pure; having high return per unit area; fast emergence, maturity and better yield, and above all, giving rise to produce with high market values. Meanwhile, [2] reported that a large proportion of arable crop farmers in Nigeria still plant grains in place of seeds as they mostly plant from previous year's harvest (re-cycled seeds). Such grains being planted by this category of farmers have been described as having low viability; never satisfied minimum seed certification standard and not treated with required chemicals. In the same vein, [3], reported that majority of maize farmers in Tanzania were still

* Corresponding author: Sakiru Oladele Akinbode

using recycled seeds. It was observed that although supply of quality seeds has improved in the country farmers lack purchasing powers.

In recognition of the importance of quality seed in crop farming, a number of developing countries have started organizing their agricultural seed sector to meet the demand of crop farmers, and to enhance food security. For instance, [4] reported that the government of Nepal, through its National Seed Vision, has directed private seed companies to make five hybrids of maize available to farmers by 2025. This was aimed at meeting the country's demand for hybrid maize varieties.

Many other countries, especially in Sub-Saharan Africa such as Ghana, Mozambique, Tanzania, Ethiopia and Kenya have stepped up activities to ensure quality seed supply. The Nigerian government established the National Agricultural Seeds Council (NASC) which is saddled with the responsibility of regulating seed production, marketing, as well as implement national seed policy and regulations in the country. The NASC was established in 2007 as an agency under the Federal Ministry of Agriculture in line with the provisions of National Agricultural Seeds Act No. 72 of 1992 as amended and passed as Seed Act No. 21 ([5] & [6]). The foregoing notwithstanding, equally important are the roles played by different actors in the seed value chain who are expected to drive activities from production to delivery and utilization. Therefore, the present study aimed at examining the roles played by key actors along the seed value chain with the objectives of identifying major challenges and proffering relevant solutions. The rest of the paper consists of sections on literature review which examined some past related studies, methodology which describes the approach to achieve the study objectives, results and discussions, and the summary and conclusion.

2. Literature review

One of the major development priorities of most governments and international donors is the objective of raising agricultural productivity in developing countries especially among small scale farmers ([7]). This is partly due to the roles smallholder farmers play in food security and the common need to improve productivity, reduce farming household vulnerability and incidence of poverty. One key area of productivity gain is the supply of quality seeds to farmers. There have been some studies aimed at understanding the roles played by various actors in the seed value chain in a number of developing countries and inferences can be aggregated.

[8] assessed the sorghum and pearl millet improved seed value chains in Zambia with a view to identifying their characteristics, key roles, competitiveness, challenges and opportunities for smallholder farmers. It was reported that most seed value chain actors play multiple roles, ranging from varietal development, inspection and certification, seed production, processing, marketing, and provision of extension services. Low yield was prominent and farmers depended too much on saved seeds for the succeeding year planting, with seed replacement rate of about 14 years compared with the three years recommended by experts. [9] assessed the delivery system of maize seed within the value-chain framework focusing on the Bihar state in India where different systems of maize delivery co-exist in an area popular for maize production year-round. The need for integration of different stakeholders in the seed value chain was brought to the fore and it was recommended that government support policies be tailored towards enhancing efficiency in seed delivery.

[1] analyzed the rice seed value chain in Bangladesh and the study identified a number of challenges in the chain and made attempts to unravel their causes. The study further highlighted the pivotal points of influence on the key actors at various stages of the value chain. A number of policy constraints were also found to be hindering the growth of the sector in the country. [10] carried out a survey of the value chain of the maize and legume seed sectors in Tanzania. It was revealed that most of the maize farmers in the districts covered were still using recycled seed despite the liberalization of t the seed sector alongside increased private sector participation.

[11] examined the buying habits and identified reasons for growing certified maize and rice seeds in Ekiti and Ondo states Nigeria. It was reported that higher yield per hectare, early maturity, resistant to diseases, better consumer preference and taste were main reasons for growing certified seeds. Some were reportedly buying little quantities of certified seeds and supplementing with traditional seeds while some buy quantities needed in one season and plant the progenies for subsequent season and buy certified seeds in the third year. [4] carried out an assessment of the value chains for cereal seeds in Nepal under the Nepal Seed and Fertilizer (NSAF) implemented by CIMMYT. The aim was to provide evidence-based recommendations for the development of Nepal's formal cereal seed sector focusing on maize and rice. Key issues in the cereal seed value chain in the country such as the actors, functions, volumes, gross margins, inter-firm relations, service providers and facilitators, and their activities were identified.

[12] assessed the factors that influence farmers' decisions to purchase certified seeds and the quantity of certified seeds purchased by tef and wheat farmers in Ethiopia in which data collected were analyzed within a double-hurdle framework to accommodate separate factors determining participation and purchase quantity. It was suggested that farmers' seed producer cooperatives and private seed suppliers should be encouraged to increase their involvement in producing certified self-pollinated seeds. The view available and accessed literatures on the subject matter of the present study covered Zambia, Ethiopia, India, Bangladesh, Tanzania and Nepal. Common issues identified were lack of access to input markets, non-availability of desired varieties, lack of coordination of government efforts at various levels, low integration of different stakeholders involved in the value-chain, lack of modern infrastructure and the inadequacy of trained workforce. However, there is dearth of such studies in Nigeria and the need to do this is compelling.

3. Methodology

3.1. Sampling Techniques and sample size

The target respondents were actors in the seed value-chain namely breeders, seed company operators, seed out-growers, agro-dealers, transporters and farmers. Multi-stage sampling procedure was employed to select respondents for the study. Four relevant agro-ecological zones from a total of six (rainforest, southern guinea savanna, northern guinea savanna and sudan savanna zones) were selected for the study. Two states were randomly selected from each ecological zones. Ogun and Osun states were randomly selected from the rain forest zone. Niger and Kwara states were selected in the Southern Guinea Savana zone. Nassarawa and Kaduna states were selected in the Northern Guinea Savana, while Adamawa and Yobe were selected in the Sudan Savana zone. A total of 411 arable crop farmers were selected. In addition, 40 agro-dealers, 31 seed companies, 34 breeder farmers (out-grower) and 10 breeders were selected for the study. Relevant questions were asked and recorded using personal interview with the aid of pre-tested questionnaires.

3.2. Analytical Procedure

(a) Basic findings among breeders, out-grower farmers, seed companies, agro-dealers and farmers are presented using frequencies and percentages while Logit regression was estimated to determine factors affecting demand for certified seeds by farmers as follows:

(b) Logit Regression – The binary Logit regression model was estimated to determine socioeconomic factors affecting demand for certified seeds among crop farmers sampled. The general form of the estimated model is stated thus:

$$L_i = \left(\frac{P_i}{1-P_i}\right) = \beta_0 + \beta_i X_i \quad \text{(Eq. 1)}$$

Where P_i =1 if a farmer demand for certified seeds and 0 if otherwise. The X_i is the vector of explanatory variables and i in the explanatory variable ranges from 1 to m where m represents the number of explanatory variables in the model. For the purpose of this estimation the explanatory variables included were: X_1 = age, X_2 = gender (dummy variable where male=1, otherwise 0), X_3 = membership of farmers' association (member= 1, otherwise 0), X_4 = education (years spent in school), crop farming experience (in years) and X_6 = extension contact (contact with extension agent =1 and 0 if otherwise).

4. Results and Discussions

4.1. Breeders and Breeding Activities

Breeders are the watershed of the seed industry. They work and release varieties after series of protocols and standards have been observed. The study specifically went for market facing breeders who have released crop varieties. It should be noted that this class of people were extremely difficult to get, hence, the fewness of their number in the present study.

Table 1 presents the summary of the background information about the sampled breeders and their breeding activities. The average of years of breeding experience was 21. Only 40% of the selected breeders have license agreement for the production of breeder or foundation seed with companies. All the breeders are usually visited by certification officers, and this implies that there are efforts aimed at monitoring seed quality from the starting point of the value-chain. Majority (70%) of the breeders have service laboratory nearby for the evaluation of breeder/foundation seeds. The lack of readily available laboratory for some breeders may affect seed quality assurance. Funding, lack of irrigation facilities

to produce year-round, frequent invasion and destruction of experimental/production plots by cattle and lack of the willingness to pay for breeder seeds or complaints of high prices by seed companies were the major constraints listed by the breeders.

Table 1 Summary of Breeders' Information

Description	Freq	%		Description	Freq	%
Education				Visit by certification officers		
PhD	10	100.0		Once a year	4	40.0
Total	10	100.0		Twice a year	4	40.0
				Thrice a year	2	20.0
Have you released variety(ies)?				Total	10	100.0
Yes	10	100.0				
No	-	-		Do you have service laboratory nearby for breeder/foundation seed quality evaluation?		
Total	10	100.0		Yes	7	70.0
				No	3	30.0
Produce Breeder Seeds for Companies?				Total	10	100.0
Yes	10	100.0				
No	-	-		Suggestions to maintain quality		
Total	10	100.0		Use of codex tagging always	6	60.0
				Ban of open sales of seeds	4	40.0
Possession of licence agreement for production of breeder/ foundation seed with seed companies?				Create agro-dealers depot close to farmers	1	10.0
Yes	4	40.0				
No	6	60.0		Constraints to breeding activities		
Total	10	100.0		Funding	10	100.0
				Lack of irrigation facilities	6	60.0
				Cattles destroying breeding plots	5	50.0
				Unwillingness to pay	4	40.0

Source: Field Survey Data, 2023

4.2. Seed Companies Activities

A total of 31 seed company operators were interviewed. All the selected seed companies were registered with the NASC, therefore, traceback, training and flow of other information should be easy (Table 2). Only about 45% of the seed companies reported that their seed crop fields were visited during all the stages of production namely site selection stage, growing stage and harvesting stage. The perceived inconsistent nature of the inspection visits by NASC certification officers may create room for violation of seed production protocols and an impetus for the production of low quality seeds. A few of the companies (3.2%) have experienced situation where their fields were downgraded which was due to pest infestation of rice seed farms. Only about one-third of the seed companies claimed to re-test their seeds if it was not sold after a period of time. This low level of re-test of stale seeds may result in situations where seeds that have lost their viability are sold out and may be one of the sources of low quality seeds in Nigeria. Almost half of the seed companies sell the remaining seeds as grains while about a quarter sell to animal feed producers and few others

reported burying or burning the remnants. The manner seed remnants are disposed off is of importance in seed management. Majority (83.9%) of the seed company operators were aware of the new seed certification system seedcodex introduced by NASC in 2019. The allusion to non-awareness by as high as 16% of the seed companies should be a source of worry as seed companies are at the centre of the seedcodex system. Major challenges facing seed companies were low patronage/awareness by farmers (41.9%), lack of finance (38.5%) and high cost of production (35.5%) among others (Table 2).

4.3. Seed Out-growers Roles

The out-growers are very important in the seed value chain as they most times plant the breeder or foundation seeds to produce foundation or certified seeds respectively or to produce more of the same class of seeds. Their level of compliance to protocols and precautionary measures are key to maintaining genetic purity and the sanctity of the entire seed system. Among the farmers planting maize 35.3% claimed they received the seed they planted from seed companies while 2.9% claimed the seeds were from research centres among others. Similar trend was observed for other crop seed (Table 3). One of the rice out-grower was previously multiplying for a seed company but now produce rice seeds reported that he plants year in and year out from recycled seeds since he stopped producing for seed companies. This is a major source of poor quality/fake seeds. In fact, the incidence of poor quality/fake seeds is perceived to frequently emanate from out-grower farmers who usually claimed to have learnt the science of seed production being a former out-grower for seed companies. Noncompliance with standard isolation distance was observed among cowpea out-growers. This may cause genetic impurity among others negative implications.

Table 2 Summary of Information Relating to Seed Companies

Description	**Freq**	**%**
Registration with NASC		
Registered	31	100
Not Registered	-	-
Total	31	100.0
Class of Seeds Produced		
Breeder	1	3.2
Foundation	8	25.8
Certified	22	71.0
Total	31	100.0
Crop Seeds Produced		
Maize	27	87.1
Rice	24	77.4
Cowpea	6	19.4
Soybean	11	35.5
Field Downgrading Experience		
Yes	1	3.2
No	30	96.8
Total	31	100.0
Reason for downgrading		
Pest infestation	1	3.2

Description	**Freq**	**%**
Methods of Remnant Disposal		
Burning	3	9.7
Burying	5	16.1
Sold as grains	15	48.4
Sol]d to animal feed producers	8	25.8
Total	31	100.0
Awareness of Seedcodex Label System		
Aware	26	83.9
Not aware	5	16.1
Total	31	100.0
Seed Packaging Materials		
Fibre	5	16.1
Polythene	17	54.8
Plastic	1	3.2
Others	9	29.0
Major Challenges of Seed Companies		
Low patronage/awareness by farmers	13	41.9
Lack of finance	12	38.7
High cost of production	11	35.5
Poor communication from NASC	9	29.0

Not Applicable	30	96.8	Marketing problem	7	22.6
Routine test on seed lots?			Not enough breeder seeds	3	9.7
Yes	15	48.4	Mobility for site inspection for NASC certification officers	5	16.1
No	16	51.6			
Re-test of seeds after some periods in store/on the shelf					
Yes	11	35.5			
No	20	64.5			

Source: Field Survey Data, 2023

Table 3 Seed Planted, Isolation Distances, Inspection and General Farm Management by out-growers

Description	**Freq**	**%**	**Description**	**Freq**	**%**
Seed Crops Planted			Classes of Soybean Planted		
Maize	13	38.2	Foundation seed	9	26.5
Rice	34	100.0	Certified	2	5.9
Soybean	11	32.4	Not Applicable (Not Planted)	23	67.7
Cowpea	5	14.7	Total	34	100.0
			Classes of Cowpea Planted		
Sources of Maize Planted			Foundation seed	4	11.8
Seed Companies	12	35.3	Certified	1	2.9
Research Centres/Institutes	1	2.9	Not Applicable (Not Planted)	29	85.3
Not Applicable (Not Planted)	21	61.8	Total	34	100.0
Total	34	100.0			
Sources of Rice Planted			Isolation Distance (Maize)		
Seed Companies	27	79.4	100 metres	1	2.9
Research Centres/Institutes	6	17.6	200 metres	10	29.4
Previous Season Harvest	1	2.9	300 metres	2	5.9
Total	34	100.0	Not Applicable (Not Planted)	21	61.8
Sources of Soybean Planted			Average observed = 208m		
Seed Companies	9	26.5	Recommended for maize = 200m		
Research Centres/Institutes	2	5.9			
Not Applicable (not Planted)	23	67.6	Isolation Distance (Rice)		
Total	34	100.0	200 metres	8	23.5
Sources of Cowpea Planted			300 metres	7	20.6
Seed Companies	4	11.8	500 metres	19	55.9
Research Centres/Institutes	1	2.9	Average observed=388m		
Not Applicable (not Planted)	29	85.3	Recommended = 100m		
Total	34	100			

Classes of Maize Planted		
Foundation seed	10	29.4
Certified	3	8.8
Not Applicable (Not Planted)	21	61.8
Total		
Classes of Rice Planted		
Foundation seed	26	76.5
Certified	7	20.6
None	1	2.9
Total	34	100.0

Isolation Distance (Soybean)		
5 metres	6	17.6
10 metres	2	5.9
15 metres	2	5.9
20 metres	1	2.1
Average = 9.1m (Rcmd) = 3m		
Isolation Distance (Cowpea)		
3 metres	3	8.8
5 metres	2	5.9
Average Isolation = 3.8m		
Recommended = 50-100m		

Source: Field Survey Data, 2023 *(Rcmd implies recommended)*

4.4. Inspection and Farm Management Practices

Field Inspection: Majority of the out-grower farmers (73.5%) claimed that their fields were inspected by NASC officials once during site selection while 8.8% claimed that their farms were never inspected during site selection. This may mark the beginning of production of seeds which are likely to be adulterated or genetically contaminated. Few farmers (5.9%) claimed they never received feedback about their inspected seed crop field. The lack of feedback for farmers whose fields were inspected may reduce the impact of the inspection (Table 4)

4.5. Post Harvest Practices, Training and Challenges of out-grower farmers

Majority (64.7%) of the out-grower farmers claimed they did not have threshing machine (Table 5). The implication is that this category of farmers is expected to take their harvest to commercial thresher operators and this may be a source of adulteration to the seed being multiplied. Same applies to possession of drying floors. Non possession of stores by some farmers implies that seeds may be stored in places where the integrity of the seeds is compromised (Table 5). Some out-growers (14.7%) sell seeds directly to farmers in their communities. This category of out-growers may likely be source]s of adulterated seeds in the country.

High cost of inputs (88.2%), companies not picking all seeds (50%), delay in buying and payment (67.6%) were major challenges confronting the out-grower farmers. Situations where companies fail to buy-off all the seeds produced by out-growers usually leave room for self-administered sales of seeds. Such farmers eventually become independent and unguided seed multipliers and sellers in the community which has implication on the quality of seeds available to crop farmers who are the end users (Table 5).

Table 4 Inspection and Farm Management Practices

Type of seeds Multiplied	**Freq**	**%**
Certified	22	64.7
Foundation	12	35.3
Total	34	100.0
Site Selection Inspection		
None	3	8.8
Once	25	73.5
Twice	4	11.8
Thrice	2	5.9
Total	34	100.0

Inspection during harvesting	**Freq.**	**%**
Once	27	79.4
Twice	7	20.6
Total	34	100
Field Downgrading Experience?		
Yes	4	11.8
No	30	88.2
Total	34	100
Do you received inspection feedback		
Yes	28	82.4

Average = 1.1 times		
Site Selection Inspection		
None	3	8.8
Once	25	73.5
Twice	4	11.8
Thrice	2	5.9
Total	34	100.0
Inspection at growth stage		
None	2	5.9
Once	8	23.5
Twice	16	47.1
Thrice	8	23.5
Total	34	100.0
Average =1.9 times		

No	2	5.9
Not Applicable (not inspected)	4	11.8
Who usually inspect you seed farm?		
NASC Officials	30	88.2
Not Applicable (not inspected)	4	11.8
Total	34	100
Reasons for Field Downgrading	Freq	%
Presence of too many off-types	4	11.8
Violation of isolation distance	3	8.8
Not Applica (never downgraded)	30	88.2

Source: Field Survey Data, 2023

Table 5 Post-Harvest Practices, Training and Challenges faced by out-growers

Description	**Freq**	**%**
Possess Threshing Machine		
Yes	12	35.3
No	22	64.7
Total	34	100.0
Do you have drying floor?		
No	19	55.9
Yes	15	44.1
Total	34	100.0
Do you have a seed store?		
No	17	50
Yes	17	50
Total	34	100
Seed Storage Method		
Direct delivery to companies	25	73.5
Fibre bags placed on pallet in rooms/store	9	26.5
Total	34	100.0
Who buys your Seeds		

Description	**Freq**	**%**
Training in seed production?		
Yes	29	85.3
No	5	14.7
Total	34	100
Who organized training?		
NASC	13	38.2
Research Institutes	11	32.4
Universities	1	2.9
Ministry of Agriculture	1	2.9
International Organization	1	2.9
Others	2	5.9
Not Applicable (Not trained)	5	14.7
Total	34	100
Methods of Training		
Demonstration Workshop	23	67.6
Field Day	6	17.6
Not Applicable (Not trained)	5	14.7
Total	34	100

Farmers	5	14.7	Major Challenges		
Intermediate users (e.g. agro-dealers	1	2.9	High cost of inputs	30	88.2
Seed Companies	28	82.4	Companies not buying all harvested seeds	17	50.0
Total	34	100	Delay in buying and payment by seed companies	23	67.6
			What do you do with remaining seed		
Types of support received from seed buyers			Kept till next season	34	100
Agro-inputs (e.g. seeds, fertilizer and chemicals)	30	88.2	Sold to local farmers	34	100
Money	4	11.8	Consumed at home	15	44.1

Source: Field Survey Data, 2023

4.6. Agro-input dealers' results

Agro-Input Dealers (AID) play a significant role in the seed value chain as they are the last link to the farmers who are the end users. While majority of AID obtain their stock directly from seed companies, a number of them buy from bigger AIDs who may be referred to as wholesalers. Results presented in Table 6 shows that 38.7% of the AIDs were educated up to a minimum of First Degree. These suggest that people who are involved in agro-input business and by extension the sale of seeds in the country are educated enough to comprehend the need to acquire and distribute quality seeds. The average years of agro-input sales experience was 17.4 years. Table 6 show that majority (87.1%) of the AIDs obtain their seeds from seed companies. Some obtain from other AIDs while few obtain the seeds they sell from out-grower farmers. The practice where AIDs obtain seeds from out-grower farmers is part of the practices promoting the production and sales of poor quality/fake seeds in the country. Some out-growers were in the habit of not declaring all their farm outputs to the companies they work for.

Table 6 Summary of background information on Agro Input Dealers

Description	**Freq**	**%**	**Description**	**Freq**	**%**
Educational Level			Means of Transporting Seeds		
No Formal Education	1	3.2	Vehicles	27	87.7
Primary School	3	9.7	Motorcycles	7	22.6
Senior Secondary School	7	22.8			
OND/NCE	6	19.4	Where seeds are stored before selling		
HND/BSc	12	38.7	At the Shop	29	93.5
MSc/M. Phil	2	6.5	At Home	1	3.2
Total	31	100	In small silos	1	3.2
			In special stores	4	12.9
Agro-inputs Sale Experience					
Mean = 17.4 years			Use of same or different stores for storage of chemicals and seeds?		
Agro-inputs sold			Different Stores	20	64.5
Arable Crop Seeds	31	100	Same Stores	11	35.5
Vegetable seeds	20	64.5	Total	31	100.0

Agro-chemical	31	100.		Type of materials agro-dealers keep seeds		
Fertilizer	25	80.6		Polythene Bags	25	80.6
Farm/Hand tools	11	35.5		Plastic container	6	19.4
Sprayers	25	80.6		Metallic containers	7	22.6
Others	3	9.7		Jute Bags	5	16.1
Sources of Seeds Sold				Where seed packs are placed during storage?		
Seed Companies	27	87.1		Cemented floor	1	3.2
Out-Grower Farmers	1	3.2		Wooden Shelves	12	38.7
Seed Wholesalers	7	22.6		Raised Pallets	24	77.4

Source: Field Survey, 2023

4.7. Farmers' Activities in the value-chain

Table 7 summarizes the socio-economic characteristics of the sampled farmers. It revealed that farmers average age was about 45 years with about 24 years of farming experience. Only about 21% of the famers had no formal education.

Seed Label Awareness and Use: About 63% of the selected farmers claimed that the seeds they buy do not have labels. Non use or non-consciousness of seed pack labels seems as lack of concern for quality. Only about one-third of the farmers claimed that they usually buy seeds with labels (Table 8). The affixation of labels or certification tags containing the seedcodex is what distinguishes between fake and certified seeds. Majority of the farmers (83.9%) claimed they were not aware of the National Agricultural Seed Council's agro-certification system (seedcodex). The system was invented to stamp out fake seeds from agricultural seed markets in Nigeria but the low level of awareness among the end users of the policy calls for urgent intervention.

Table 7 Socioeconomic characteristics of farmers

Description	**Freq**	**%**		**Description**	**Freq**	**%**
Age of Farmers				Cooperative Membership		
Mean Age=45.1yrs				Members	172	41.8
				Non-members	239	58.2
Farming Experience				Total	411	100.0
Mean = 23.9 years						
				Extension Contact		
Gender of Farmers				Yes	201	48.9
Female	70	17.0		No	210	51.1
Male	341	83.0		Total	411	100.0
Total	411	100.0				
				Access to credit		
Educational Level				No	274	66.7
No formal education	89	21.7		Yes	137	33.3
Primary School	98	23.8		Total	411	100.0
Junior Secondary School	24	5.8				
Senior Sch completed	78	19.0		Seed Sources (General Response)		

OND/NCE	63	15.3		Seed Companies	77	18.7
HND/BSc	51	12.4		Agro-Dealers	181	44.0
MSc/MPhil	6	1.5		Fellow Farmers	105	25.5
PhD	2	0.5		Previous Harvest	236	57.4
Total	411	100.0		Produce Buyer	12	2.9
				Agric Dev Programmes	12	2.9
Farmers' Association				Open Market	14	3.4
Members	186	45.3				
Non-members	225	54.7				
Total	411	100.0				

Sources: Field Survey Data, 2023

Table 8 Seed Quality Issues

Descriptions	**Freq**	**%**		**Description**	**Freq**	**%**
Observed Problems				Do you usually scratch open the code		
Low Pest Resistance	164	39.9		No	34	8.3
Poor Disease Resistance	151	36.7		Yes	9	2.2
Stunted Growth	69	16.8		No Response or Not Applicable	368	368
Poor Germination Rate	48	11.7		Total	411	100.0
Low Shelf life	14	3.4				
				Do you use the all the time?		
Always buy labelled seeds?				Yes (All the time)	4	1.0
No	260	63.3		Occasionally	11	2.7
Yes	136	33.1		Rarely	6	1.5
No Response or Not Applicable	15	3.6		Not at all	27	6.6
				Total	363	88.3
Always insist on labelled seeds?						
No	328	79.8		Reasons for not using seed codes		
Yes	70	17.0		Presence of the code suffices	7	1.7
No Response or Not Applicable	13	3.2		Seeing the silver seal is enough	14	3.4
				Code has no implication	272	66.2
Seedcodex certification awareness?				Others (e.g germination is key)	57	13.9
No	345	83.9		Total	411	100.0
Yes	48	11.7				
No Response or Not Applicable	18	4.4				
Total	411	100				

4.8. Determinants of Demand for Certified Seeds among Farmers

Table 9 presents the Logit regression model results to determine socioeconomic factors affecting demand for certified seeds among arable crop farmers in Nigeria. Here, the dependent variable is binary where farmers who buy certified seeds were scored 1 and otherwise 0. The model results revealed that education (P<0.05) and extension contact (P<0.01) significantly determined demand for certified seed among farmers. Coefficients of both variables were positive suggesting increases in both variables increased the likelihood of demand for certified seeds. The marginal effect of 0.0127 implied that increase in educational level of farmers by one year of schooling increased the probability of purchasing certified seeds by 0.013 percentage point. In the same vein, farmers who have extension contact are 0.42 percentage point more probable to purchase certified seeds. Results of this estimation is of great importance for policy intervention to stimulate the adoption of certified seeds among crop farmers in the country. Increase in public enlightenment and extension service coverage to educate farmers on the importance of buying and planting only certified seeds are imperative.

Table 9 Results of the Logit Regression Model to identify determinants of Demand for Certified Seeds among farmers

Dependent variable = use of label code

Variables	Symbol	Coefficient	Std Error	t-values	Marginal effects
Constant	B_o	-0.7898	0.5303	-1.4892	__
Age	X_1	0.0089	0.0122	0.7250	0.0022
Gender	X_2	-0.3175	0.3004	-1.0568	-0.0784
Farmers' Association member	X_3	-0.3950	0.2622	-1.5065	-0.0975
Education	X_4	0.0516*	0.0205	2.5114	0.0127
Farming Experience	X_5	-0.0097	0.0116	-0.8354	0.0024
Extension Contact	X_6	1.6981**	0.2674	6.3496	0.4195

Source: Computed from Field Survey Data 2023. * &** imply significance at 5%&1% respectively

5. Conclusion

There are no seed testing laboratories close to some of the breeders and this may affect their assertions about the quality of seeds they produce. Funding was the most popular constraints stated by breeders. Only about 45% of the seed companies reported that their fields were visited during all stages of production. The perceived inadequate inspection visits by NASC certification officers may create room for violation of seed production protocols. Remnant seeds were not properly disposed off. The proper management of remnant seeds must be enforced at every level of agricultural seed value chain in the country. There are situations where out-grower farmers who were previously multiplying seed for seed companies thereafter produce seeds on their own and distribute same to farmers in the community as certified seeds thereby increasing the likelihood fake seed. A few agro-input dealers obtain the seeds they sell directly from out-grower farmers with implication on seed quality. Some agro-input dealers stock both crop seeds and agro-chemicals in the same shop and some on the same shelves. Close to half of the selected arable crop farmers plant from previous year harvest which has implication on quality attributes such as germination and output.

Based of the findings, it is recommended that adequate supports (funding, irrigation etc) be provided for market facing breeders. Seed companies should be encouraged to up-take all seeds produced by the out-grower famers, or government through NASC should play the role of buyer of last resort to safeguard the seed system. Seed companies should be encouraged to produce smaller packs of seeds to avoid situation where agro-input dealers buy in bulk and sell in small measures in polythene or nylon bags to local farmers which has implication on the integrity of the 8seeds. Adequate attention should be paid to out-grower farmers as poor quality/fake seeds mostly emanate from their end. AIDs should be trained on the proper seed handling. Farmers should be educated on the need to plant quality/labelled seeds.

Compliance with ethical standards

Acknowledgments

Authors acknowledge AGRA for sponsoring the data collection exercise. The efforts of various enumerators and research assistants are also appreciated.

Disclosure of conflict of interest

No conflict of interest to be disclosed.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

References

[1] Tulachan PM, Bashar K, Islam R, Chanda D, Portal C. Value chain analysis of rice seeds in Bangladesh: A case of three southern districts (Jessore, Khulna, and Barisal). SRSPDS Project under CSISA-Bangladesh International Rice Research Institute, Bangladesh Office, Dhaka. Technical Bulletin. 2013; No. 17

[2] Okelola F, Akinbode SO, Uteh A, Onwuka C, Oladeji S. Impact of the new agro-certification system (Seedcodex) on Nigerian seed industry and crop farming. Western Balkan Journal of Agricultural Economics and Rural Development. (2023); 1:29-55.

[3] Mwanishi G, Msuya DG. Assessment of farmers knowledge and awareness on proper management of farm-saved maize (Zea mays L.) seeds in Lake Zone, Tanzania. International Journal of Agriculture, Environment and Bioresearch. 2023; 8(3):169-181. https://doi.org/10.35410/IJAEB.2023.5837

[4] Choudhary D, Khanal N, Pradhan B, Shrestha HK, Donovan J. Cereal Seed Value Chains in Nepal: Current functions, changing context, and opportunities for upgrading. Kathmandu: CIMMYT, 2022

[5] FAO (Food and Agriculture Organization of the United Nations). Seed Security Assessment in North Eastern States of Nigeria Report. 2016, 64p

[6] NASC. Annual Report, National Agricultural Seeds Council, Federal Ministry of Agriculture and Rural Development, Abuja, Nigeria. 2017; Available at https://seedcouncil.gov.ng/statistics/.

[7] Donovan J, Rutsaert P, Mausch K, et al. 'Strengthening seed value chains: Persistent challenges and ways forward'. Slide deck prepared as input for the One-CGIAR Strategy on Seed Systems Development. 2021 Available at: https://pimcgiarorg/cgiar-coe-seed-systems-development/references-and-outputs/

[8] Hamukwala P, Tembo G, Larson D, Erbaugh M. Sorghum and Pearl Millet Improved Seed Value Chains in Zambia: Challenges and Opportunities for Smallholder Farmers. INTSORMIL Scientific Publications, 2010; 3, https://digitalcommons.unl.edu/intsormilpubs/3

[9] Kumar R, Alam K, Krishna VV, Srinivas K. (2012). Value chain analysis of maize seed delivery system in public and private sectors in Bihar. Agricultural Economics Research Review. 2012; 25, 387-398.

[10] Madulu RB, Gregory T, Mpabila S, Marenya P. Seed Value Chains to Support Sustainable Intensification in Tanzania. 2016; https://repository.cimmyt.org › bitstream › handle

[11] Osundare F. Buying Habits and Cross Price Elasticity of Demand for Certified Maize and Rice Seeds in Ondo and Ekiti States, Nigeria. International Journal of Agriculture Innovations and Research. 2018; 6(5), 174-179.