

*Full Length Research Paper*

# Seed handling system and its implications on seed quality in South western Nigeria

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There are several operations between seed production and distribution. This study analysed the prevailing situation surrounding seed business and considered its implication on seed quality in Southwestern Nigeria. Surveys were conducted in 2009 on seed marketers and public Institutions handling seeds within the zone using structured questionnaires. Data were collected on socio-economics, seed procurement, handling and distribution activities of marketers, as well as seed production, storage and distribution activities of seed producing institutions. Well packaged clean seeds of maize and cowpea, kept among the seed lot of seed dealers and public institutions for six months were evaluated. Level of deterioration during storage was determined. Data analysed by means of descriptive statistics of simple proportion and percentages showed that plant breeding and seed production activities are concentrated within the Research Institutes while Agricultural Development Programmes (ADPs) are limited to seed multiplication and marketing. Private individuals handling seed are educated and experienced in the business but majority cannot afford the provision of conducive seed storage environment; hence seed deteriorate faster in their hand and ADPS than when with the NARIs. Periodic training, notably on seed storage methods to empower the seed handlers in coping with the challenges of efficient seed delivery is recommended.

**Key words:** Seed deterioration, seed handling, seed inspection, seed quality.

## INTRODUCTION

Seed is the core of the "Technology package" needed to achieve the much desired increased agricultural production. The use of good quality seed is important to increase food production and agricultural productivity. Therefore, timely availability of good seeds of improved varieties to farmers should be a priority in farming system because quality of seed determines the crop response to other inputs. Seed supply system is broadly divided into formal and informal sector. Formal seed system is characterized by organized public and private sector participating in seed industry and has been able to supply only 4% of the seed sown by farmers in most of the

African countries while the remaining 96% originate from informal sector which is largely unorganized traditional seed supply system (Anon, 2001). Marketing of field crop seed may be simple or complex with one or more contributive functions (Kelly, 1988). Seed of agricultural crop whether produced by farmers or seed companies in special areas follows many paths from the producer to the consumers (farmers). Seed is required to be moved from where it is produced to where it is processed and stored before finally moving from warehouse to farms. Adetumbi and Olakojo (2010) have reported that seed deterioration is inevitable but rate can be reduced when utmost attention is paid to storage temperature and moisture. Durtschi (1999) also reported that some seed store better in air, while others store better in nitrogen and others do better in a vacuum, carbon dioxide or organ. These indicate that seed moisture content and

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storage temperature are the two (2) major factors affecting seed during storage. Ability of seed to maintain a high germination percentage and vigour both at harvest until its return into the soil is the desired primary aim of seed handlers. Desai et al. (1997) stated that seed that failed to germinate or give a healthy and vigorous crop stand upon planting are worthless. Since the quality and value of seed mostly cannot be assessed only by sight, smell or touch, farmers therefore have to put a great deal of trust in the supplier and the dealer, however, Daniel and Adetumbi (2004) has reported that the dynamics of seed system for production of seed is not well understood in South Western Nigeria at small holders level that dominates farming activities. Seeds are vulnerable to damage by temperature, moisture, chemical and biotic factors during transport and storage and since a great deal of several operations is involved between seed production and seed sales, it therefore becomes very important to study and analyse the prevailing situation surrounding seed handling in terms of personnel handling seed marketing activities and available materials for seed storage and consider its implication on seed quality. Therefore the objectives of this study are to (1) study the Socio-economic characteristics of seed sellers; (2) identify different seed storage facilities and equipment available to the seed sellers; (3) determine the rate of seed deterioration at the different marketing outlets, and (4) identify other activities involved in seed marketing.

## MATERIALS AND METHODS

Data for this study was generated from two set of field surveys conducted on seed marketers and public institutions dealing with seed distribution selected from Southwest Agro-ecological zone. The respondents for the survey on marketers were selected by multi-stage sampling technique. Southwest Agro-ecological zones comprises of eight States namely Delta, Edo, Ekiti, Lagos, Ogun, Ondo, Osun and Oyo. The first stage of the sampling involved the selection of 4 States (Ekiti, Ogun, Osun and Oyo) randomly from the list of States that makes up the zone. Secondly, each of the selected States were stratified into the existing ADP zones with two zones selected randomly from the list of existing ADP zones in each of the States. Finally, twenty seed marketers located in different towns (Figure 1) were selected from the list of seed marketers obtained from each of the State ADPs for a total of 80 respondents but 76 questionnaires were found suitable for analysis. The second set of survey was conducted on six (6) public institutions involved in seed distribution comprising of two research institutes, three ADPs and the National Seed Agency that has the National mandate for seed releases and distribution in Nigeria. Data were collected on socio-economic and seed procurement, storage materials and equipment available to seed handlers, handling and distribution activities of the marketers and the institutions using structured questionnaire and were subjected to descriptive statistics. 0.5 kg each of clean good seed samples of maize and cowpea were packaged in closed polyethylene bag and kept among the seeds of the seed dealers and seed store of the public Institutions for 6 months to evaluate level of seed deterioration during storage in each place. The seed samples was tested for seed viability before storage and after storage using International Seed Testing Association (ISTA) procedure of planting 100 seeds in soil substrate in four replicates. Germinated seeds were counted after

seven days and percentage viability was evaluated by using the formula:

$$V(\%) = \frac{N_{germ}}{N_{pltd}} \cdot 100 \quad (1)$$

Where  $V(\%)$  = percentage viability;  $N_{germ}$  = Number of seeds that germinated after 7 days of planting in the soil substrate, and  $N_{pltd}$  = Number of seeds planted in the soil substrate (ISTA1985).

Stored seed was also evaluated for percentage seed damaged. Percentage seed damaged and percentage seed viability loss are given by Equations 2 and 3, respectively. The equations were developed by personal consultations on mathematical procedure. The percentage seed damage is given as:

$$S_{dmg} (\%) = \frac{N_{dmg}}{N_{strd}} \times 100 \quad (2)$$

Where:  $S_{dmg} (\%)$  = percentage of seed damaged after retrieval;  $N_{dmg}$  = Number of seed damaged after retrieval, and  $N_{strd}$  = Initial number of seed stored.

$$V_{loss} (\%) = \frac{V_{init} - V_{final}}{V_{init}} \times 100 \quad (3)$$

Where:  $V_{loss} (\%)$  = viability loss percentage;  $V_{init}$  = Initial viability percentage before storage;  $V_{final}$  = Final viability percentage after retrieval from storage

## RESULTS AND DISCUSSION

### Demographic characteristics of seed marketers

The distribution of the respondents by their socio-economic characteristics (Table 1) indicated that seed marketing is male dominated with about 91% of the marketers been male while female constituted about 9%. Majority of the respondents (82.90%) aged between 41 and 60 years while 17.10% were between 21 to 40 years of age with an average age of 49.8 years. All the seed marketers are educated with majority (72.40%) having read up to tertiary level of formal education. However, majority of the seed marketers engaged in seed marketing as a secondary source of income with average years of experience in the trade estimated as 13.55 years. The distribution of the respondents implies that the population of seed marketers in the zone is dominated by men who were not only within the productive age but possessed adequate level of education and years of experience that could enhance their managerial capabilities in coping with the most technical aspect of seed handling.

In addition, the study also revealed that about 82% of the marketers have attended training in seed handling

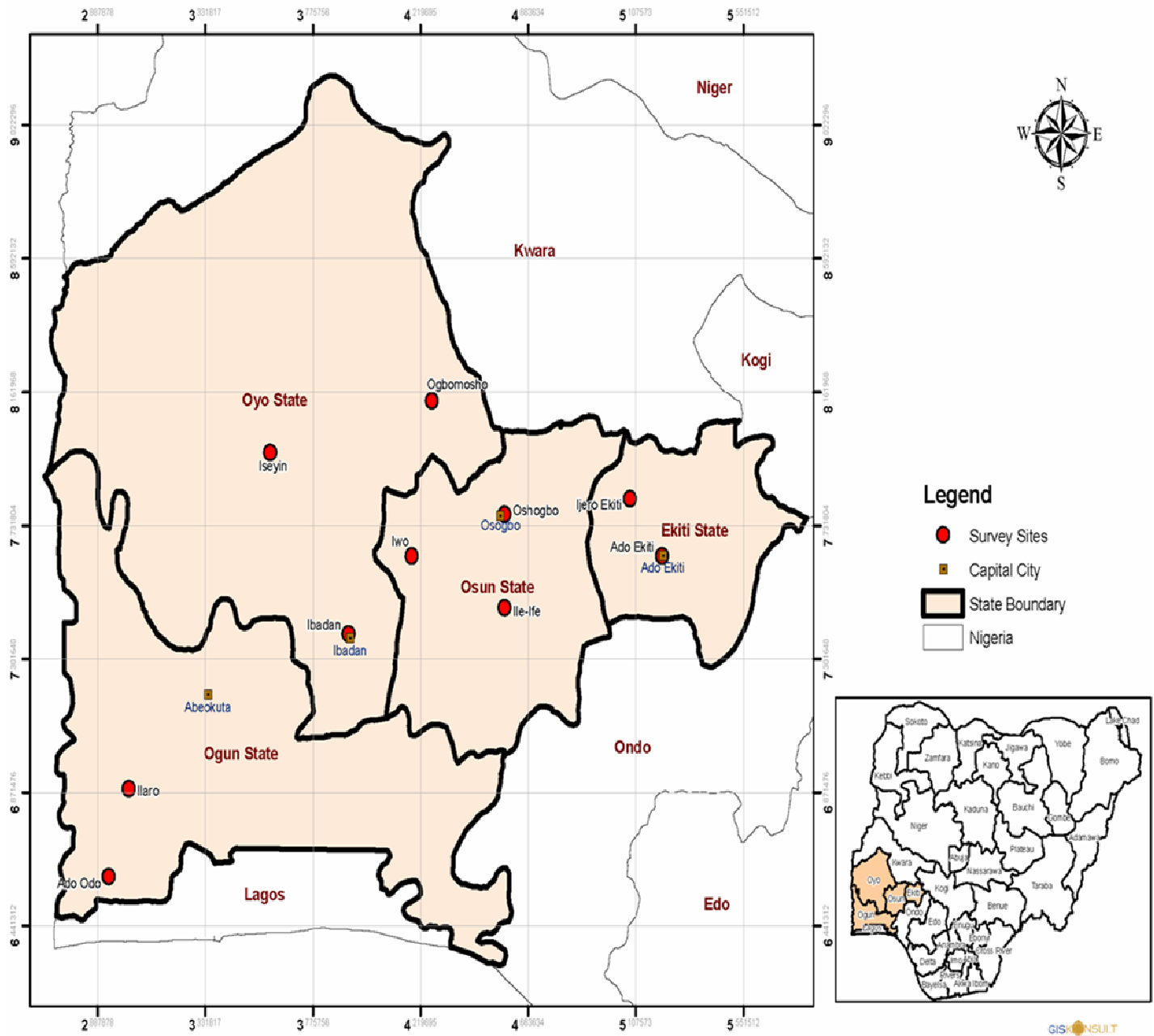


Figure 1. Map showing the study sites and states.

organized by both governmental and non-governmental agencies (Table 2). A greater percentage of these training were organized by governmental agencies like Agricultural Development Programmes (ADPs) (27.60%), and non-governmental agencies like IFDC (18.40%), private seed firms (17.11%). However, the training was attended mostly not later than 6 years ago by about 54% of the seed marketers. These implies that most seed handlers needs to be trained more regularly on techniques of seed handling operations that will reduce rate of seed deterioration.

**Seed handling activities**

One of the major factors affecting seed quality at the down-stream is the sources and quality of the storage method used along the distribution channels. Sourcing seed from certified sources has for decades being a prominent recommendation to farmers towards ensuring that healthy seeds are planted for improved productivity. Considering the importance of seed marketers in the distribution channels, getting supply from certified sources becomes an important ingredient in ensuring that

**Table 1.** Socio-economic characteristics of seed dealers in South western Nigeria.

<b>Characteristics</b>	<b>Frequency</b>	<b>(%)</b>
<b>Sex</b>		
Male	69	90.80
Female	07	9.20
<b>Age group</b>		
< 20 years	0	0
21 - 40 years	13	17.10
41 - 60 years	63	82.90
Mean	49.8 (11.33)	
<b>Educational level</b>		
Primary education	14	18.40
Secondary education	07	9.20
OND/NCE/HND/University	55	72.40
<b>Major occupation</b>		
Seed marketing	35	46.10
Others	41	53.90
<b>Seed business experience</b>		
< 5 years	14	18.40
6 - 10 years	20	26.30
> 10 years	42	55.30
Mean	13.55 (6.38)	

Figures in parentheses are standard errors.

**Table 2.** Training in seed technology for seed dealers.

<b>Training</b>	<b>Frequency</b>	<b>(%)</b>
<b>Attendance</b>		
Attended	62	81.60
Not attended	14	18.40
<b>Training organizers</b>		
IFDC	14	18.40
State government/ADPs	21	27.60
University	07	9.20
NASC	07	9.20
Private seed firm	13	17.11
<b>Year of training</b>		
5 years and less	21	27.63
Between 6 - 10 years	14	18.42
Above 10 years ago	27	35.53

seed are sourced from certified sources and properly handle to guarantee the supply of healthy seeds to

farmers. The distribution of the crop species whose seed were marketed by the respondents is shown in Table 3.

**Table 3.** Crop seed handled by seed dealers and sources of such seed.

<b>Crop seed handled</b>	<b>Frequency</b>		<b>Percentage</b>	
Maize	76		100.00	
Cowpea	63		82.89	
Soybean	21		27.63	
Vegetables	63		82.89	

<b>Sources of seed</b>	<b>Maize</b>		<b>Cowpea</b>		<b>Soybean</b>		<b>Vegetables</b>	
	<b>Frequency</b>	<b>(%)</b>	<b>Frequency</b>	<b>(%)</b>	<b>Frequency</b>	<b>(%)</b>	<b>Frequency</b>	<b>(%)</b>
Research Institutes	56	73.68	35	46.05	21	27.63	14	18.42
ADPs	35	46.05	14	18.42	07	9.21	0	0
Private Firm	35	46.05	14	18.42	07	9.21	28	36.24
Out growers	14	18.42	07	9.21	0	0	07	9.21
Open Market	9	27.63	14	18.42	0	0	21	27.63
Personal farms	24	53.95	21	27.63	0	0	28	36.24

**Table 4.** Type of Storage method and Materials available to seed handlers.

	<b>Seed dealers</b>	<b>NARIs</b>	<b>Agency</b>	<b>ADPs</b>
<b>Storage method</b>				
Natural(ambient)	69 (90.79)	0 (0)	100 (1)	100 (3)
Air conditioned	07 (9.21)	100 (2)	0 (0)	0 (0)
<b>Materials and equipment available</b>				
Sampling probes	35 (46.05)	50 (1)	100 (1)	100 (3)
Trolley	21(27.63)	100 (2)	100 (1)	100 (3)
Pallets	48 (63.16)	100 (2)	100 (1)	100 (3)
Bag closer	69 (90.79)	100 (2)	100 (1)	100 (3)
Sprayer	76(100.00)	100 (2)	100 (1)	100 (3)
Thermometer	32 (42.11)	100 (2)	0 (0)	66 (2)
Hygrometer	08 (10.53)	50 (1)	0 (0)	0 (0)

Figures in parenthesis are percentages of respondents.

The distribution indicated that all the respondents (100%) handled maize while 82.9% each were involved in marketing of cowpea and vegetable seeds. Only 27.3% of the respondents were selling soybean seeds owing to greater sensitivity and fragility of soybean seeds to storage environment. However, prominent sources of seed offered for sale differs by crop species. While seeds of food crops were mostly sourced from research institutes (maize 73.68%, cowpea 46.05%, soybean 27.63%), seed of vegetables were mainly sourced from private seed firms and personal farms of the seed marketers (36.24%) thereby depicting the low level of attention given by government seed agencies to this category of crop. In addition, maize seeds were also sourced from personal farms of the seed marketers (53.95%), ADPs (46.05%), private seed firms (46.05%) and open market (27.63%). Similar results were observed for cowpea.

The study showed that seed are prominently stored under ambient condition by dealers (90.90%), Seed Agency and ADPs (Table 4). Only a few (9.10%) of the dealers and all the Research Institutes (100%) stored their seed stock under air-conditioned environment. This can however be attributed to the demand of air-conditioned environment in terms of cost of energy and maintenance of the facilities especially considering the additional constraint constituted by the current epileptic power supply. The study also showed that of all the equipments required for effective management of seed stocks, spraying pump (100%) and bag closer (90.79%) were prominent among the dealers while 46.05, 42.11 and 10.53% possesses sampling probe, thermometer and hygrometer respectively. Similarly, about 28 and 63% of the dealers possess trolleys and pallets, respectively. It is obvious from this study that the dealers were in least possession of equipments that are relevant

**Table 5.** Supportive services rendered by seed agents.

Supportive services	Frequency	Percentage
Information Dissemination	69	90.80
Seed Dressing	62	81.60
Credit Facility	07	9.20
Pest Management Service	41	53.90

**Table 6.** Seed quality assessment.

	Maize		Cowpea	
	Mean % seed damaged	Mean % viability loss	Mean % seed damaged	Mean % viability loss
Seed dealers	46.89	27	22.14	37
NARIs	2.15	2	12.25	21
Seed agency	5.00	10	16.50	23
ADPs	10.42	13	17.58	25
Mean	16.12	13	17.12	26.5
SD	32.85	17.70	22.14	3.55

in monitoring the condition within the immediate environment of the stored seed and this is capable of making quality management or assurance on stored seeds difficult. However, all the governmental agencies saddled with handling of larger quantity of seed were found to possess these equipments with the exception of hygrometer which were not available with the ADPs and corporate seed agencies.

### Supportive services rendered by seed marketers

The study (Table 5) showed that in addition to seed marketing, majority of the seed marketers (90.80%) were also involved in information dissemination, seed dressing (81.60%) and pest management practices to clients. However, only a few of the seed agents (9.20%) offer credit facilities to clients. Such services when efficiently delivered are capable of further strengthening the delivery system through enhanced patronage of certified seed channels rather than farmers resorting to buying seeds from the local (grain) market.

### Seed quality test

In order to appraise the effectiveness of the handling methods by each categories of seed agent/agency, a viability test was carried out on sample of seed stored with each category of seed handlers to determine the viability loss. The result of the test (Table 6) showed that seed damage for maize was highest for seed stored with the seed marketers (46.89%) followed by the ADPs

(10.42%), Seed Agency (5.00%) and NARIs (2.15%). Similarly, average cowpea seed damage was highest for seed dealers 22,14%, followed by ADPs (17.58%), Seed Agency (16.50%) and NARIs (12.25%). Consequently, the seed damage was found to have resulted in maize seed viability loss amounting to 27.00, 13.00, 10.00 and 2.00% for seed stored with seed marketers, ADPs, Seed Agency and NARIs respectively. In the same vein, cowpea seed viability loss was highest for seed marketers (37.00%) followed by ADPs (25.00%), Seed Agency (23.00%) and NARIs (21.00%) respectively. This result suggest that seed handling methods adopted by NARIs were more effective in minimizing damage and maintaining viability than the methods adopted by Seed agencies, ADPs, and marketers. Tekrony (2002) has earlier stated that the rate of seed deterioration depends majorly on the storage environment and physiological quality of the seed.

### Seed inspection

One of the quality control mechanism instituted by the National Seed System is Regular Seed Inspection whereby inspectors are required to pay routine inspection to handlers at the different stratum of the distribution channels. However, an assessment of the visit of the Seed Inspectors to the handlers showed that inspection was not popular among the dealers who represent the final and largest outlet to farmers. Table 7 shows that seed inspection was not prominent among seed dealers with about (11%) claiming to have been visited by the inspectors in addition to the fact that the visit was made

**Table 7.** Seed inspections activities.

	Seed dealers	NARIs	Agency	ADPs
<b>Seed inspectors visit</b>				
Yes	08(10.53)	50 (1)	100 (1)	100 (3)
No	68(89.47)	50(1)	0 (0)	0 (0)
<b>Frequency of visit</b>				
Monthly	0 (0)	0 (0)	0 (0)	0 (0)
Quarterly	0(0)	50 (1)	100 (1)	0 (0)
Yearly	8(10.53)	0 (0)	0 (0)	100 (3)

Figures in parenthesis are the percentage of respondent.

**Table 8.** Training need of the commercial seed agents.

Training needs	Frequency	Percentage
None	28	36.80
All aspects	06	7.9
Seed production	07	9.2
Seed storage	21	27.6
Variety Identification	07	9.2
Seed production and storage	07	9.2

once in a year. However, quarterly visit were made to the NARIs and other seed agencies while it was once in a year for the ADPs. The level of visit was found to be lower and inadequate both in coverage and frequency to be able to carry out expected duties as stated in the National seed rules and regulations of Nigeria. The rules permits routine and uninterrupted visits and control in terms of labeling, tagging and drawing of samples for test at all time to ensure minimum standard are met throughout the year (Federal Ministry of Agriculture and Rural Development, 1994).

### Training needs

Although the study has shown that majority of the farmers have attended training programmes on seed handling, Table 8 shows that majority of the respondents (27.6%) indicated that they needed additional training in seed storage methods while 9.2% each required training on seed production and variety identification respectively. Similarly about 8% required training in virtually all aspect of seed handling while 9.2% required training in seed production and storage. However, 36.80% of the respondents did not require training in any aspect of seed handling. The results have evidently shown the importance that the seed marketers attach to storage methods and as such, majority display it to acquire more skills in this respect.

### Conclusion

This study has shown that the populations of seed agents in the study area are educated and could be described as having adequate orientation in seed handling by virtue of their education and experience. Although, majority of the marketers had attended trainings in seed handling, the fact that only few attended such trainings in recent years could undermine their opportunity of dealing effectively with newly emerging challenges in seed handling. It is obvious from this study that majority of those involved in seed business store their seed under ambient conditions that is considered less conducive for maintaining the viability of seed, hence seed deteriorate faster in the stores of the commercial seed agents and the ADPS than with the NARIs. The study has also shown that seed inspection has grossly been inadequate to facilitate effective monitoring of the distribution channels and this is capable of undermining the effectiveness of the delivery system in guaranteeing quality seed delivery to farmers as end users.

It is hereby recommended that the system be further strengthened to accommodate effective monitoring through registration of all seed handlers with regulatory agency at the grass root. This will allow formal interaction and linkages of private and public seed handlers, which has been identified by Mutlu (2000) to be the most effective and most sustainable way to secure the supply of adequate quality seed of all crops to small and large scale farmers in addition to facilitating virile forum for

updating the skills of the agents in the identified and other areas of training need.

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