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Farmers' Awareness and Readiness for Black Plum (*Vitex doniana*) Seed Value Addition in Edo State, Nigeria

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ABSTRACT
Vitex doniana, commonly referred to as black plum, is a tree species that is widespread throughout the forest and savanna zone of Nigeria, but is poorly formalized in Edo State, where it is found growing naturally and as crops of little significance. The fleshy pulp of the fruit is edible and sometimes used as syrup and juice; also the seed which, although documented to contain oil, protein and mineral, is largely discarded. The study examined the awareness and preparedness of farmers in Edo State in value adding black plum seed, with one hundred and eighty farmers from seven Local Government Areas of Edo State, sampled using a structured questionnaire for primary data collection. Descriptive statistics, chi square tests and Pearson correlation were used to analyse the data. Less than half (45.6 per cent) of the respondents were aware that this seed had any value addition potential; awareness showed a positive but statistically non-significant relationship with contact from agricultural extension services and with the respondent's level of formal education ($p > 0.05$ in both cases). Based on five indicators of adoption capacity, a composite readiness index was calculated (score range 5 to 25, grouped as low readiness for scores of 12 or below, moderate readiness for 13 to 18, and high readiness for 19 or above), with the majority of farmers being in the low readiness category (sixty four point four percent), and none in the high readiness category. The most common factors were insufficient processing technology/equipment, and insufficient awareness or training, as well as insufficient capital or credit access. Awareness level was positively and significantly associated with readiness category. The study calls for extension programmes to be geared towards the value addition of the black plum seed in Edo State and recommends for training black plum farmers on their seed processing techniques and also providing some support to small scale processing machines as a way of unlocking the value addition potential of the black plum seed in Edo State.

Keywords: Black Plum, Vitex Doniana, Seed Value Addition, Farmer Awareness, Readiness Assessment, Edo State, Nigeria

INTRODUCTION

The underutilized species of fruit trees are still gaining policy and research interest worldwide in sub-Saharan Africa, due to their role in providing nutrition, livelihoods and adaptation to extreme growing environments for households. A significant number of these species are well adapted to production under conditions of low external inputs and grow successfully under low input agricultural systems where access to fertilizer, irrigation and better planting material is restricted for smallholders. One such species is black plum (*Vitex doniana*). A deciduous tree, which usually stands 4-8 metres high, sometimes up to 15 metres under good conditions and is indigenous throughout a wide ecological zone from Senegal to Ethiopia and south to South Africa, including much of Nigeria.

Black plum has been an integral part of indigenous food and medicinal systems in Nigeria with several local names such as oori-nla (Yoruba), uchakoro (Igbo) and dinya (Hausa). Georeferenced occurrence records showed that the species has a relatively high occurrence density across Delta, Oyo and Taraba states, but with a good tolerance for both savanna and forest ecological zones (Babatunde *et al.*, 2025). The agroecological characteristics and significant presence of black plum in the forest reserves and farmlands of Edo State make the state similar to these.

Black plum fruit has been studied and used more than its seed and has gathered more attention from consumers. The fruit collected from Uromi in Esan North East LGA of Edo State was found to be highly nutritious study conducted on the fruit in Edo State showed that it is rich in carbohydrate and safe for consumption as result of the acute toxicity test conducted on the fruit (Imoisi *et al.*, 2021). Proximate analysis studies carried out in Tanzania also showed that the fleshy mesocarp and exocarp are consumed which is followed by the seed which is generally discarded during processing (Charles and Mgina, 2023). This disregard of the seed continues, despite laboratory finding that black plum seed is rich in fat content, about 29g/100g on a dry weight basis, and a nutritional profile of monounsaturated and polyunsaturated fatty acids that is similar to other indigenous oil seed species across West Africa (Adome, 2022).

In addition to the oil, black plum seed and other parts of the plant have demonstrated potential as supplements to livestock feeds. Trials conducted using the diets of Sahel bucks supplemented with black plum plant parts showed positive growth performance and production economics (Audu *et al.*, 2023), while leaf meal was added to broiler diets, there were positive effects on blood parameters and growth (Chidi *et al.*, 2024). The results suggest potential uses of black plum seeds such as extraction of edible oil, formulation of livestock feed,

and cosmetic and/or industrial products, but little indication that the farmers who could provide these seeds are aware of these possibilities or interested in engaging in a value chain that uses the seed.

This has become significant in the Nigerian agricultural sector because value addition is widely recognised as a means of boosting farm household income and minimising post harvest losses. Agricultural exports have increased significantly nationally during the period 2015-2023 and the contribution of processed and semi-processed agricultural products to exports has also been rising (Bature *et al.*, 2024). Similarly, the results of the study on the value addition of plantain in Kwara State reveal that credit facilities, plantain extension, education and literacy level of the farmer have influence on the involvement of farmers in processing activities, and this influence is likely to be felt in an underutilised product like black plum seed. Even at the local level, in Edo State, rural households still rely on a diverse assortment of non-timber forest products for their subsistence and livelihoods, thereby highlighting the importance of forest and farm tree products for the rural dwellers of Edo State (Fadoyin *et al.*, 2026).

This background is against which the present study was conducted. The study aimed to evaluate the level of awareness of the farmers in Edo state to the value addition potential of black plum seed, determine their readiness for value addition from the black plum seed, determine the factors militating against the adoption of value addition by the farmers and examine the relationship between the farmer characteristics, awareness and farmers readiness. The specific objectives of the study are to describe the socioeconomic characteristics of farmers and gatherers of black plums in the study area, to assess the awareness of farmers and gatherers of the value addition opportunities of black plum, to assess the readiness of the farmers and gatherers to adopt value addition using a composite index, to identify the major constraints facing value addition to black plum and to test for the statistical relationship between farmers' and gatherers' awareness, extension contact and education, and their readiness for value addition of the black plums.

Literature Review

Botanical and Nutritional Profile of Black Plum

Black plum is a member of the Lamiaceae family, and it is known to grow in savanna woodland, riparian forest and cultivated farmland. It is sweet pulp, but bitter leaves that have given it diverse culinary and medicinal applications in its growing areas. The fruit pulp obtained from various Nigerian locations have been analysed consistently and found to contain high carbohydrate and moderate protein and appreciable mineral levels, such as potassium, calcium and iron. According to seed oil studies, black plum is among the indigenous species of oil seeds produced in West Africa, and is considered a renewable source of dietary fat, having as high as eighty seven percent total unsaturated fatty acid content depending on the region of cultivation and the extraction process (Adome, 2022). A recent ethnobotanical survey carried out in Uganda reported other uses of black plum beyond fresh consumption such as making jams and drinks. It also noted that the seed continues to be used in traditional medicine, even in the absence of formal value chains for the seed (Jimmy *et al.*, 2025).

Value Addition in Agricultural Produce

Value addition is the series of activities which converts raw agricultural produce into a product that fetches a higher price, has a longer shelf life or a wider scope of use. Value addition has been introduced as a core approach to enhance the foreign exchange earnings and household income contribution from agriculture in the Nigerian context and processed agricultural products have recorded steady growth over the period between 2015 and 2023 (Bature *et al.*, 2024). On the smallholder side, plantain processing in Kwara State suggested that smallholders who processed their plantain into flour had higher level of formal education and greater access to plantain processing information than those who sold their plantain in raw form (Falola *et al.*, 2024). This indicates that value addition is not only dependent upon raw material but also farmers' level factors like education, awareness, access to right technology and credit.

Farmer Awareness and Readiness for Agricultural Technology Adoption

In the agricultural literature, awareness of a farmer is generally considered critical to the successful adoption of a new practice or technology, and readiness represents how well a farmer has the resources, skills and willingness to take action on their awareness. A review of agroforestry literature in northwestern Ethiopia showed that the perception of the benefits of tree based practices, which in part depended on the farmer's exposure to agroforestry extension and agroforestry farmer peer groups, was one of the key drivers of the continued adoption of agroforestry in that context. Likewise, the cultivated and processed value of neglected and underutilized crop species in Nigeria and other African countries has found that one of the key factors affecting their larger cultivation and processing is the lack of awareness among both farmers and consumers, which is not due to any intrinsic lack of nutritional or economic value (Ojuederie *et al.*, 2024). This mirrors a wider pattern across Nigeria, where a recent review of non-timber forest products found that value addition and commercialisation of these products remain underprioritised relative to their income potential, a gap the review linked partly to limited awareness among both producers and consumers (Adaaja *et al.*, 2024).

Non-Timber Forest Products and Agroforestry in Edo State

Despite the fact that Edo State is beginning to lose its forest cover to urbanization and population growth, the state still has significant forest cover compared with many other states in the South of Nigeria; and rural households all over the three senatorial zones in Edo State continue to rely on forest gathering for some of their livelihood. The study on non-timber forest product gathering practices of rural households in the state revealed that gathering of fuelwood, wild vegetables and medicinal plants were the most common products with some variation in the gathering practices among the Edo South, Edo Central and Edo North zones (Fadoyin *et al.*, 2026). There is existing forest resource dependence from which the possibility of introducing a value addition principle on the seed of black plum is plausible, as the farmers already interact with the forest resource (the fruit) and have not yet extended the interaction to the seed.

Gap in Literature

The literature shows that black plum fruit and its seed have nutritional and economic potentials which are not fully harnessed and that both knowledge and preparedness of the farmers are identified as determinants of value addition adoption in other commodity systems in Nigeria. But, to date, no direct study has been conducted that will quantify farmer awareness and readiness in Edo State in relation to value addition for their black plums. This is a gap that the present study aims to fill.

MATERIALS AND METHODS

Study Area

The study was carried out in Edo State which is in the south-south geopolitical zone of Nigeria. The state is divided into three senatorial zones namely Edo South, Edo Central and Edo North, and also has a mixture of tropical rainforest in the South and derived savanna towards the North which supports the natural distribution of black plum. Seven Local Government Areas (LGAs) were chosen for the study based on available evidence of black plum tree populations and active farmer/forest gathering activities in the area; these include Akoko-Edo, Owan East, Owan West, Etsako East, Etsako West, Esan North-East and Ovia North-East.

Research Design

The study had a cross sectional survey design. Primary data were obtained from the farmers and forest product gatherers by using structured questionnaire which was administered by trained enumerators in March - May, 2026. The assessment of awareness and readiness reported in this paper was no secondary or previously published data but was based on the primary survey.

Population and Sampling Procedure

Farming households in the seven selected local government areas, who are involved in the collection, cultivation or trade of black plum fruits, estimated in the range of 850 farming households as reported by the local agricultural extension office were the target population. A multistage sampling process was followed. The first stage of sampling involved purposive sampling of the seven local government areas where it was known that black plum trees are abundant. In stage two, three communities were randomly drawn in each local government area. In the third step, simple random sampling was employed to select individual respondents in the household lists. The minimum sample size was calculated by the Yamane formula for finite populations, which is

$$n = \frac{N}{1 + Ne^2}$$

Where:

n = minimum required sample size

N = estimated target population = 850

e = acceptable margin of error = 0.07 (7 percent)

$$n = \frac{850}{1 + 850\,(0.07)^2}$$

$$n = \frac{850}{1 + 850\,(0.0049)}$$

$$n = \frac{850}{1 + 4.165}$$

$$n = \frac{850}{5.165}$$

n = 164.5 = 165 respondents (minimum)

The final achieved sample of 180 respondents was distributed across the seven local government areas as shown in Table 1 (ranging from 18 respondents in Owan West to 44 in Akoko-Edo) and exceeded the calculated minimum of 165. A total of 200 households were approached across the sampled communities, of whom 180 completed the questionnaire, giving a survey response rate of 90%; the 20 households not included were either unavailable at the time of the visit or declined to participate.

Instrument for Data Collection

Data were collected using a structured questionnaire divided into four sections. Section one captured socioeconomic characteristics, including gender, age group, level of education, farming experience, household size and local government area of residence. Section two assessed awareness of black plum seed value addition potential using a screening question followed by a three level awareness scale of low, moderate and high, alongside questions on the main source of awareness and the primary benefit perceived by the respondent. Section three measured readiness for adoption using five items rated on a five point scale, covering willingness to adopt seed processing, access to capital, access to processing equipment, willingness to undergo training and access to market information. Section four captured the major constraint perceived by each respondent from a list of six commonly cited barriers. The instrument was reviewed by subject matter specialists prior to administration and pretested on a small group of farmers outside the final sample to check clarity and cultural appropriateness of the wording.

Respondent anonymity was maintained throughout the survey, which included no personally identifying information being recorded and each completed questionnaire being based upon an anonymous respondent identifier. The instrument was pretested in a local government area with a similar black plum farming profile to the seven local government areas in the main study but outside these local government areas, with 18 farmers (about ten per cent of the calculated minimum sample) to test the clarity and cultural appropriateness of the wording of the readiness items without contaminating the final sample, minor wording changes were made to the readiness items after the pretest. For the whole sample (n = 180) the Cronbach alpha coefficient was 0.47 and item-total correlation ranged from 0.12 (access to processing equipment) to 0.34 (willingness for training). This is below the conventional cutoff point of 0.70 for a unidimensional scale, as the five items were meant to measure five different aspects of readiness (attitudinal willingness, access to capital, equipment, training and market information) and not a single latent construct, and as such is noted here as a limitation of the composite index.

Research Ethics

All respondents gave informed consent before they participated. The respondents were told the purpose of the study, their right to confidentiality and anonymity of their responses and that there was nothing that would affect them if they declined or withdrew at any point. The survey did not include a respondent under 18. The study was carried out with the aid of the research protocol of the Value Added Research Department of the Cocoa Research Institute of Nigeria which reviewed and approved the survey instrument as a minimal risk socioeconomic study before data collection.

Method of Data Analysis

Data were analyzed descriptively, based on the frequency, percentages and means, to summarize the socioeconomic characteristics, level of awareness, sources of awareness, perceived benefits and perceived constraints. A composite readiness score was created by adding responses to the five readiness items, resulting in a total possible score range of five to twenty five and then categorizing scores into three levels: low readiness (scores 12 or less), moderate readiness (scores 13 – 18), and high readiness (scores 19 or higher). The five readiness items were treated as equally weighted in the composite score, in the absence of an established a priori weighting scheme for this context; the cut-off points followed a simple equal-interval division of the five-to-twenty-five score range into three bands. Association with categorical variables (education and awareness, extension contact and awareness, and awareness level and readiness category) was examined using chi square tests of independence. For the Pearson correlation analysis, the ordinal education and awareness categories were treated as ordered numeric scores.

Pearson correlation coefficients were calculated to assess the degree of linear association among the education level, awareness level and continuous readiness score. Significance level for all tests was set to 5% significance level. Data was analyzed using the Python programming environment and the pandas and scipy libraries of statistics.

RESULTS AND DISCUSSION

Socioeconomic Characteristics of Respondents

The 180 farmers that were interviewed were analysed according to their socioeconomic profile and the results are summarised in Table 1. The male respondents constituted 53.3 per cent of the respondents while the female respondents accounted for 46.7 per cent of the respondents where there was a fairly balanced participation of both genders in the black plum related farming and gathering activity in the study area. The age distribution revealed that the bulk of respondents were in the 31 to 50 age group; and most respondents had attained at least primary level education, with the dominant being secondary education. The average farming age was slightly over fifteen years, and the average house size was just over six persons, reflecting that the farmers had a significant amount of accumulated knowledge of what trees they could grow, and what resources they had available to them.

Table 1: Socioeconomic Characteristics of Respondents (n = 180)

Characteristic	Category	Frequency	Percent
Gender	Male	96	53.3
	Female	84	46.7
Age group	20 to 30 years	33	18.3
	31 to 40 years	33	18.3
	41 to 50 years	42	23.3
	51 to 60 years	39	21.7
	Above 60 years	33	18.3
Education	No formal education	29	16.1
	Primary	59	32.8
	Secondary	65	36.1
	Tertiary	27	15.0
Local government area	Akoko-Edo	44	24.4
	Owan East	33	18.3
	Etsako East	23	12.8
	Esan North-East	23	12.8
	Ovia North-East	20	11.1
	Etsako West	19	10.6
	Owan West	18	10.0
Farming experience	Mean = 15.2 years	Standard deviation = 7.8	-
Household size	Mean = 6.3 persons	Standard deviation = 1.9	-

Awareness of Black Plum Seed Value Addition Potential

The first screening question asked respondents if they knew that black plum seed has any value addition potential beyond being discarded after pulp eating. 45.6% (82) responded yes, and 54.4% (98) responded no, I had no previous awareness. Table 2 and Figure 1 show the degree of awareness of the eighty two farmers that confirmed awareness, this was further broken down into low, moderate and high awareness. The highest proportions of farmers were in the moderate awareness group, indicating that even those who are aware of the benefits of the use of the seed are only moderately so, and often simply aware that the seed can be used, but don't necessarily know what that means in terms of processing, for example oil extraction or feed composition.

Table 2: Distribution of Awareness Levels Among Respondents

Awareness Level	Frequency	Percent
Not aware	98	54.4
Low awareness	23	12.8
Moderate awareness	44	24.4
High awareness	15	8.3
Total	180	100.0

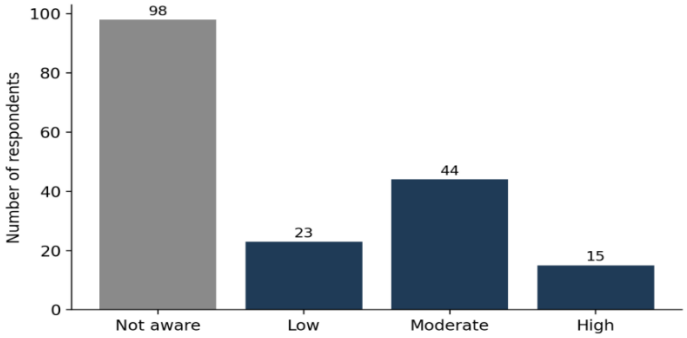

Figure 1: Awareness Level of Black Plum Seed Value Addition Potential

The overall awareness level of less than half of those surveyed is similar to what has been observed in other parts of Nigeria for neglected and underutilized crops, where there is awareness of the crop but not necessarily because of its value (Ojuederie *et al.*, 2024). It is also similar to the situation of non-timber forest product collectors in the state of Edo where the knowledge of a specific NTFP does not necessarily imply knowledge of its various uses (Fadoyin *et al.*, 2026).

Source of Awareness and Perceived Benefits

As illustrated in Figure 2, the most common source of awareness among the 82 farmers who were aware of the issues was fellow farmers, followed by the Cocoa Research Institute of Nigeria and other research institutes, TV, radio broadcast, social media and least frequently, direct contact with agricultural extension officers. These patterns indicate that farmers-to-farmers communication is currently more effective than formal extension communication channels in raising awareness on the value addition of black plum seeds, highlighting an opportunity for extension to further reach farmers on this topic.

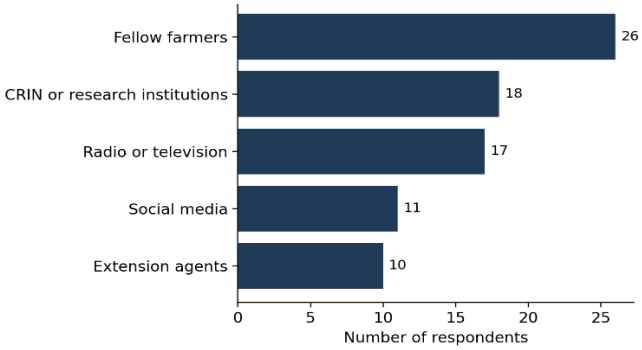

Figure 2: Main Source of Awareness Among Informed Farmers

Table 3 presents the answers to the question regarding main benefit of added value to black plum seed, showing that additional income was the greatest number of answers given by the respondents who were aware of the value addition, followed by nutrition and health value, reduction of post-harvest losses, use as livestock feed and, least frequently, oil extraction potential. It is noteworthy that despite the well documented scientific value of producing seed oil as one of the value addition streams for the species (Adome, 2022), farmer awareness is still lagging behind scientific findings on this product.

Table 3: Perceived Primary Benefit of Black Plum Seed Value Addition Among Aware Respondents

Perceived Primary Benefit	Frequency	Percent of Aware Respondents
Additional household income	27	32.9
Nutrition and health value	22	26.8
Reduction of post-harvest waste	16	19.5
Livestock feed formulation	13	15.9
Oil extraction potential	4	4.9
Total	82	100.0

Awareness Across Local Government Areas

Awareness levels broken down by local government area are shown in Figure 3. Expressed as a share of respondents sampled within each local government area, awareness was highest in Esan North-East (69.6%, 16 of 23) and lowest in Etsako East (26.1%, 6 of 23), with Akoko-Edo (50.0%), Owan East (48.5%), Etsako West (47.4%), Owan West (33.3%) and Ovia North-East (35.0%) falling in between. This shows that the raw counts in Figure 3 understate awareness in the smaller local government areas and overstate it in Akoko-Edo and Owan East, which had the largest samples; there is a clear geographical difference, implying that there is a lack of uniformity in the extent to which awareness creation has been done across the state, rather than a complete absence.

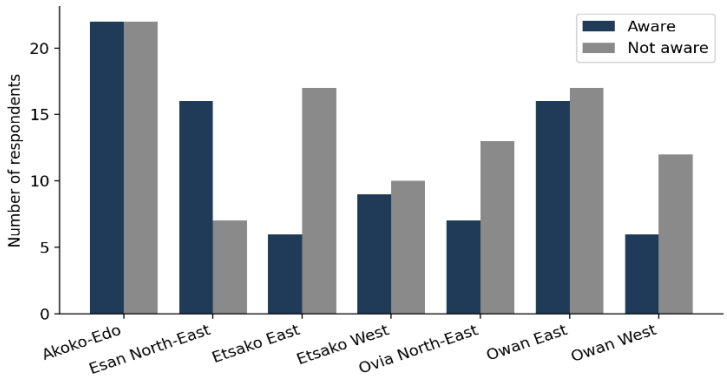

Figure 3: Awareness of Seed Value Addition by Local Government Area

Readiness of Farmers for Value Addition Adoption

The indicators of readiness included willingness to adopt seed processing, access to capital, access to seed processing equipment, willingness to take training and access to market information, and were rated on a five-point scale and added up to give a composite score on a scale of 5 - 25. The sample had a mean composite readiness score of 11.8, and a standard deviation of 2.6, which means that the average individual scored in the lower half of the range. Table 4 show that 64.4 percent of respondents were in the low readiness category, 35.6 percent were in the moderate readiness category and no respondents were in the high readiness category.

Table 4: Distribution of Readiness Categories Among Respondents

Readiness Category	Score Range	Frequency	Percent
Low readiness	5 to 12	116	64.4
Moderate readiness	13 to 18	64	35.6
High readiness	19 to 25	0	0.0
Total	-	180	100.0

The lack of any respondent in the high readiness category and the high proportion of scores in the low readiness band suggests that, even if there is awareness, farmers in the study area are not currently ready to take action based on that awareness due to a lack of the necessary capital, access to equipment, and exposure to training. At item level (each rated 1 to 5), mean scores were lowest for access to processing equipment (mean 1.78, SD 0.73) and access to capital (mean 2.09, SD 0.84), and highest for willingness for training (mean 2.88, SD 1.00) and willingness to adopt (mean 2.71, SD 1.03), with access to market information in between (mean 2.31, SD 0.89). This shows that farmers' low readiness scores were driven mainly by limited access to equipment and capital rather than by a lack of willingness, which was comparatively the highest-scoring dimension. This is in tandem with the findings of Falola *et al.*, (2024) conducted in Kwara State in plantain value addition research, which showed that access to credit in addition to awareness was a distinguishing factor between value adders and non-value adders.

Constraints to Black Plum Seed Value Addition

The respondents were asked to name the one most important constraint, which hindered them in black plum seed value addition. Table 5 indicate that inadequate awareness or training and lack of capital and/or credit access were also frequently reported constraints, closely followed by lack of processing technology/equipment. A significant proportion of respondents also mentioned poor extension service and lack of market access, and the labour intensive process of seed extraction was the least mentioned of the other factors. Lack of processing technology or equipment was the single most frequently cited constraint, reported by 23.3% of respondents, but training, finance, extension coverage and market access together accounted for a considerably larger share of responses when combined, indicating that value addition is held back by several interacting constraints rather than by equipment access alone.

Table 5: Major Constraints to Black Plum Seed Value Addition

Constraint	Frequency	Percent
Lack of processing technology or equipment	42	23.3
Inadequate awareness or training	39	21.7
Lack of capital or credit access	33	18.3
Poor extension service coverage	28	15.6
Limited market access	27	15.0
Labour intensive seed extraction process	11	6.1
Total	180	100.0

Relationship Between Awareness, Extension Contact, Education and Readiness

Chi square tests of independence were used to investigate the association between important categorical variables. There was no significant association between education level and awareness with a chi square value of 5.13 and a p-value of 0.163 at the 5% level in this sample of farmers. The relationship between extension contact and awareness

returned a chi square value of 1.85 and a p-value of 0.174, which were also not statistically significant, but extension contact was associated with a positive relationship in that those farmers who claimed extension contact experienced a higher proportion of awareness as compared to those who did not claim extension contact.

Contingency table counts (aware / not aware) were 11/18 for no formal education, 23/36 for primary, 31/34 for secondary and 17/10 for tertiary education; and 34/30 for farmers with extension contact against 48/68 without. Minimum expected cell frequencies were 12.3 for the education by awareness table and 29.2 for the extension contact by awareness table, both comfortably above the conventional threshold of 5, so the chi-square approximation is valid for both tests. For awareness level by readiness category, the minimum expected cell frequency was 5.3, also above the threshold.

In contrast, the relationship between awareness level and readiness category was highly significant, with chi square = 76.05 and p-value <0.001 showing that the awareness level of farmers was significantly associated with the moderate readiness category, and the low readiness category was overwhelmingly dominated by farmers with no awareness level. This is supported by the Pearson correlation of awareness level score with composite readiness score which gave a high positive correlation coefficient of 0.69, significant at less than 1% level. There was also a positive correlation of 0.29, significant at < 1%, between education and readiness score, indicating that education helps to readiness, beyond the awareness dimension, in the general ability to access capital and/or the ability to interpret training material.

Table 6: Summary of Statistical Tests of Association

Test	Statistic	Value	p-value	Result
Education by Awareness	Chi square (df = 3)	5.13	0.163	Not significant
Extension contact by Awareness	Chi square (df = 1)	1.85	0.174	Not significant
Awareness level by Readiness category	Chi square (df = 3)	76.05	< 0.001	Significant
Education score with Readiness score	Pearson r	0.29	< 0.001	Significant
Awareness level score with Readiness score	Pearson r	0.69	< 0.001	Significant

The general findings indicate that awareness had a stronger positive association with readiness than either education or extension contact when considered individually; a multivariable model was not fitted in this study, so these results describe separate bivariate associations rather than the joint or relative predictive contribution of the three variables. This suggests that interventions that will specifically bring out awareness among farmers about the value addition of black plum seeds and provide practical readiness like live demonstration on processing techniques may be more effective than mere educational campaign.

These results should be interpreted with some caution. The composite readiness score combines willingness to adopt with access to capital, equipment, training and market information, so it may partly overlap with awareness rather than measuring a fully separate construct; responses were self-reported and may be subject to social desirability or recall bias; the seven local government areas were purposively selected for known black plum tree populations rather than randomly drawn from all of Edo State, which limits how far the findings can be generalised across the state; and, as a cross-sectional study, the survey can establish association but not causation between awareness, education, extension contact and readiness. A longitudinal or intervention-based design would be needed to test whether raising awareness actually causes readiness to improve.

CONCLUSION

The study identified farmer awareness and readiness for black plum seed value addition in Edo State with the use of primary data obtained from 180 farmers in the seven LGAs. The results show that 45.6% of surveyed farmers were aware that the seed, which is mostly discarded after use for pulp, has value addition potential, that 64.4% of respondents fell into the low readiness category, and that awareness level was positively and significantly associated with readiness. Willingness to act on that awareness was limited among the majority of respondents, mostly due to the lack of processing technology and training, and the lack of capital. The positive association between awareness and readiness suggests, though it does not prove, that building awareness could be a useful starting point for improving readiness for broader value addition adoption; the cross-sectional design of this study cannot establish that raising awareness would cause readiness to increase. Actual uptake of processing, profitability, product safety and market demand for value-added black plum products were outside the scope of this study and were not measured.

Based on these findings, the following recommendations are made, as responses to the needs reported by respondents rather than as interventions already shown to improve adoption: First, awareness building on value addition of black plum seeds should be developed and disseminated in the targeted groups through trusted farmer to farmer networks, community gatherings, in addition to formal extension visits. Second, agricultural extension services working in Edo State should design specific modules of black plum seed processing (oil extraction and feed formulation) to their outreach programmes as extension contact demonstrated a positive trend, though not statistically significant relationship with the awareness in this sample. Third, government and research institutions should provide assistance in the development and demonstration of small scale, low-cost-processing equipment which would be appropriate for smallholder conditions; deficiencies in processing technology were most commonly reported as a constraint. Fourth, strengthen or create farmer cooperative structures specifically for black plum seed value addition, to enhance access of farmers to capital, training and market information. Lastly, a follow-up intervention study is recommended to test whether a structured extension programme (for example, training plus equipment access) actually changes farmers' readiness and processing uptake, and primary data collection should be expanded to other local government areas and neighbouring states to provide a regional picture of black plum seed value addition potential.

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