

Application of Design Theories and Principles for Improving Local Agricultural Products and Packaging Design Aesthetics for Optimized Economic Value

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Abstract

The Nigerian government is attempting to shift the Nigerian economy from petroleum products dependency to agro-product dependency. Although may meet user needs, many local agricultural products lack acceptable aesthetics mostly due to lack or laxity in the application of basic design theories and principles in the creation of agro-product packages which often reduce their economic values, impacting negatively on their economic sustainability. This study therefore examined the impact of the application of design principles and theories on fostering agricultural product development and packaging in Nigeria. Adopting a descriptive approach, 400 respondents, taken in selected cities in Nigeria, were sampled. The study showed a significant relationship between the application of relevant design theories/principles and the achievement of relevant aesthetic values in agro-product packaging and packing. The study also established a significant relationship between aesthetic values of packaged agro-products and consumers' preferences. A combined analysis of the results obtained eventually indicated a significant relationship between the application of relevant design theories and the economic values of local agricultural products. These therefore established the significance of the application of relevant design theories in the packaging and packing of local agricultural products for optimized economic value.

Keywords: Aesthetics; Agro-product; Packaging; Graphic design theory; Agribusiness; Economic diversification

1. Introduction

Although, true and holistic agricultural or economic sustainability spans beyond mere economic sustenance (Ikerd, 2011), the economic sustainability of agricultural investments is majorly what keeps the local agribusinesses alive. Agriculture is very important to the world economy especially Nigeria and other developing countries of Africa (Ikporah, 2012). It is a vital developmental tool which has features that make it a unique instrument for economic and sustainable development (Ikporah, 2012). Agri-business has been a major part of the Nigerian economy especially in terms of consumables, raw materials and agro-science and technology. Immediately after independence, the Nigerian economy was hinged mainly on agricultural activities which brought a lot of involvement in the operation of this sector of the economy and growth (Akindele, 2011). Although the preference for white-collar jobs has since caused especially many of the Nigerian youths to look away from agriculture, the sector has experienced growth in production, post-harvest activities such as preservation techniques and processing technology. This has given rise to the development and distribution of various indigenous and exportable agricultural and agro-allied products ranging from unprocessed or minutely processed agricultural products like garri, hardwood, sorghum, smoked catfish, groundnut and yam-flour to processed products such as hardwood charcoal, palm oil, sorghum malt, bread and groundnut oil among others. However, this development has not efficiently translated into viable economic sustainability in the sector judging from the poor economic situation in the country. One major cause of this is the manner in which the products are packaged and packed or displayed for sale, which is at the same time one of the major weaknesses of the Nigerian agro-industry. Many of the Nigerian agro-products are either merely displayed for sale with no proper packaging or are questionably packaged. This same trend is noticeable in some other West Africa countries like Ghana, Benin Republic and Togo to mention a few.

Packaging is basic and fundamental to food processing and preservation (Badejo and Aderinola, 2013). It can be defined as the container which is necessary to convey a product to the ultimate consumer, as contrasted with packing (cartons or crates among others) that is required for bulk shipment or public display (Borishade, Ogunnaike, Dirisu and Onochie, 2015). Unfortunately, many Nigerian producers shabbily pack, rather than properly package, their agro-products for sale and distribution which may not necessarily favour the products' economic success. Although such poorly packaged agricultural products may be sold out, it is worthy of note that they are usually sold at below their full possible economic value. Research shows that consumers make majority of their buying decisions at the point of sale (Platt, 2012). This means that the majority of the consumers' or buyers' purchase decisions, which ultimately results in the eventual success or failure of a product, is made based on what the consumers 'see' at the market place. Therefore, one may surmise that wrongly or poorly packaging or not packaging products at all may lower the chances of success of agro-products. Packaging is therefore the 'ultimate or final' statement of persuasion that a farmer, other agro-entrepreneurs or an advertiser makes just before the eventual buying preference of a consumer is finalized at the point of purchase. It is the silent salesman in the store (Pilditch, 1973; Borishade et al, 2015).

Nigeria has the ambition of diversifying her economy from crude petroleum dependency into sectors such as Agriculture and product manufacturing (Nwajiuba, 2013; Peace, 2015; Adams 2016; Shitu, 2017). Agro-business fosters the achievement of this objective. The country also faces a looming food security crisis with a growing population that is increasingly dependent on, or has strong preference for, imported foods (Nwajiuba, 2013). The question then would be: How can the economic values of local agro-products be improved so that they can compete favourably with the imported ones? This paper, therefore, proposes proper and aesthetically sensible packaging as a major ingredient for

improving the economic competitiveness of local agro-products, with the application of appropriate design theories and principles.

Robertson (2012) presents a detailed and accessible discussion of food packaging principles and their applications integrating concepts from chemistry, microbiology and engineering, obviously excluding the industrial design field. However, this study seeks to integrate theories and principles of graphic design, a major section of industrial design, into the drive for improved indigenous agro-product development and packaging in a bid to improve the development and sustainability of local content production by improving the aesthetics and acceptability of agro-products. This paper is based on a thesis that more aesthetically sensible agro-products may enjoy greater acceptability and consumer loyalty which may translate into increased economic sustainability.

1.1 Importance of Proper and Aesthetically Sensible Packaging of Agro-products

Aside from its roles in processing and preservation, product packages also perform important roles in consumers' purchase decisions which may be very strong determining factor in the success or failure of products (Poturak, 2014) and agro-products are not exempted. According to Wyrwa and Barska, (2016) and Oladumiye (2018), product packaging performs the following important functions: Aesthetic presentation of product, containment, protection [that is, from damage, contamination and deterioration], convenience of handling, facilitate transportation, preservation, communication (providing information on product) and, most importantly, sales (including motivation or persuasion).

Consumers increasingly rely on the information or details contained on packaging, which shows a specific combination of quality attributes determining the expected quality, while taking decisions on products (Wyrwa and Barska, 2017). Modern and eye-catching packaging "makes a product more attractive and has a positive impact on potential buyers encouraging them to purchase" (Wyrwa et al, 2017). According to Alice (2006), the best packaging imprints the good image of the product in the mind of the consumer. Given this, the answer to what a shabby, aesthetically lax or irritating package imprints in the mind of the local consumer is not far-fetched.

1.2 The Place of Design Theories and Principles in Creating Aesthetically Sensible Agro-Products

Generally, a package must communicate with or to the potential buyer, attract, protect or preserve the product and, most significantly, be aesthetically sensible. An aesthetically insensible agro-package will most likely repel rather than attract and when repulsion outweighs attraction in persuasion, then a negative buying response or behaviour is eminent. Of course, necessity or urgent need of a buyer may cause the buyer to purchase a product, whether aesthetically attractive or not. However, the same may not be said for such products when and if attractive substitute brands or product alternatives to choose from do exist (Häubl & Trifts, 1999).

The success of other functions of agro-product packages is dependent on the success of the aesthetic function of the same product packages. For example, the whole essence of preserving an agro-product is to keep its usefulness intact until it is bought by the end user or consumer, before its expiry date. This means that the whole purpose of creating a perfect protective package is totally defeated if the product is not sold out before its expiry date or before it deteriorates beyond healthy level. In a similar vein, a product package can only communicate if it succeeds in attracting the attention of the consumer to itself. It is should

be noted that attraction is dependent on the aesthetic quality of the product or product-package. In other words, the communication function of agro-product packages will fail or diminish if and when the aesthetics function fails. Hence, the aesthetic quality of agro-product packages can be assumed to be vital to the success of agricultural products.

This paper posits that an agricultural product package should be aesthetically sensible especially for optimum economic benefits to the producers or farmers. However, there is more to agricultural product packaging than just aesthetics. Packaging is a multi-disciplinary process that involves professionals from various fields including graphic design (Oladumiye, 2018). According to Schueneman and Tolletee (2010) and Oladumiye (2018), skills needed in product packaging include:

1. **Mechanical Engineering skills:** Professionals are needed to design and fabricate package lines and package fabricating equipment.
2. **Electrical Engineering skills:** Skillful workers are required for the control of package manufacturing equipment filling lines as well as for other electro-mechanical functions.
3. **Packaging Engineering skills:** There are professionals who design and specify package systems, testing protocols and other requirements for the package.
4. **Industrial Engineering skill:** This is needed to optimize material flow, logistics, and similar warehousing functions.
5. **Chemical Engineering skills:** This is necessary to design and help formulate new polymers and co-polymer systems for more effective barrier properties on flexible package systems. For instance, in a research conducted by Allahvaisi, Pourmirza and Safaralizade (2009), in which pest penetration rate of various packaging materials were tested; the results showed a significant difference in permeability with 16.5 μ m thick cellophane testing highest while polypropylene packages with 29 μ m thickness tested lowest in pest permeability. Hence, chemical engineers can help create better agricultural product packages dwelling on the results of researches such as Allahvaisi et al (2009).
6. **Marketing Skills:** This is required to present the product in the best possible light through the package and appropriate persuasive system.
7. **Medical Skills** are also needed to help design and test package systems especially the ones related to medical and pharmaceuticals products or by-products. And most importantly,
8. **The skills of the designer** needed in creating attractive and effectively-communicative product packages with emphasis on the proper application of design theories and principles which has already been discussed considerably in previous studies (e.g. Odji, 2018; Oladumiye, 2018 & Odji, 2019).

A major purpose of design is to create products, documents, illustrations, publications and, most importantly, product packages that possess strong visual impact and hold the attention of consumers or users, so as to positively influence their buying behaviour (Oladumiye, 2018). Thus, this paper posits that packaging and packing of local agricultural products for optimized economic value, is best achieved with appropriate application of design principles and theories. Principles of design include proximity, balance, alignment, contrast, repetition and white space (Tomita, 2015). Some theories of design include the

functionalism theory, symbolic interaction theory, change theory, the place identity theory and, more commonly, the colour theory. These principles and theories are applied in the use of the elements adopted for the creation of any given design in any field, including agriculture, if aesthetics is considered a vital factor for achieving aesthetics. Therefore, it is safe to state then that if aesthetics is vital to the success of any design, product or product package, then the application of design theories and principles is a necessity. But, how necessary is aesthetics in the packaging of agro-products? Does the aesthetic quality of agro-products influence consumers' brand loyalty and purchase preferences? Will the application of design theories and principles improve the aesthetic quality of agro-product packaging? Can design-theories-guided packaging improve the economic value of agro-product in any significant way?

2. Method

The study focused on the offline agricultural product market setting since the distribution of local Nigerian agro-products is still done majorly in the open traditional market. It adopted the descriptive survey research method. Primary data were obtained through structured questionnaire. Secondary data include information obtained from the research work of other scholars through journals, books and other offline and online scholarly sources.

Considering the consumers' opinion, needs or preferences in the design and packaging of agro-products is very vital. For example, according to Tirpude, Alam, & Saha (2018), the preferences and opinion of the consumers ought to be considered in the packaging of edible oil. Therefore, the target population of this study is the consumers or users of agro-products. Randomly selected consumers of agricultural products living in selected south-western states namely: Ondo, Oyo, and Lagos states, Nigeria were sampled. The Yamane (1970) formula with +/-5% precision level for large sample (>100,000) was applied for the purpose of determining the sample size:

$$n = \frac{N}{1 + N(e)^2}$$

Where n = the sample size (=398 after calculation)

N = the size of the population which, according to the National Bureau of Statistics (2011) is greater 100,000

e = the level of significance (or limit of tolerable error) i.e. 0.05

1 = Unit

The sample size of 398 respondents obtained from the applied formulae was considered suitable for the study. However, for the purpose of increasing credibility and accuracy, the number of respondents sampled was increased to 500 with only an 83% return rate. However, only 400 returned questionnaire were analyzed as 3% of the returned tools were invalid. Random direct observation of some of the respondents was done to weigh their responses against their actions for the purpose of validity.

Frequencies and percentages were used in analyzing the collected data. Chi-square was adopted for the testing of the proposed hypotheses. The decision rule was to reject H_0 (Null hypothesis) if significance level (p-value) is less than alpha, the predetermined significance level ($\alpha=0.05$). A dichotomous analysis procedure, as adopted by Odji, Oladumiye and Adelabu (2016) in which responses were collapsed into only two options-Yes and No, was adopted for the purpose of testing the three proposed hypotheses.

$$X^2 = \sum \left[\frac{(f_o - f_e)^2}{f_e} \right]$$

Where $X^2 =$ Chi-square,

$f_o =$ Observed frequency,

$f_e =$ expected frequency.

3. Results and Discussion

The significance of aesthetics as a factor that influences consumers' local agro-product preferences was investigated. Respondents indicated whether or not they consider product attractiveness when making purchase decisions and their responses are as recorded in table 1.

Table 1. Relationship between the aesthetic quality of agro-product packages and consumer preferences

Do you consider attractiveness in your purchase preferences of agricultural products?		
	Frequency	Percentage (%)
Yes	265	66.25
No	135	33.75
Total	400	100

Source: Researchers' fieldwork, 2018.

Approximately 66% of the respondents indicated that product aesthetics influence their agro-product preferences (table 1). This can, perhaps, account for their strong preferences for foreign agro-product alternatives which may not necessarily scale any higher than their local counterparts on the performance evaluation scale. From direct observation of some of the respondents while carrying out offline market purchases, majority of the respondents who claim aesthetics play no role in their purchase decisions, approximately 34%, merely sort to satisfy their needs with packaging and product aesthetics playing little or no noticeable role in their purchase decisions.

Table 2. Aesthetic effect of the application of Graphic Design theories and principles on the design and production of agro-product packages

Do you think the application of Design theories and principles to the design and production of agro-product packages will improve the agro-products' attractiveness?	
Frequency	Percentage (%)

Yes	285	71.25
No	115	28.75
Total	400	100

Source: Researchers' fieldwork, 2018.

As recorded in table 2, the majority of the respondents, 71.25%, opined that the application of graphic design principles and theories in the design, packaging and packing of agro-products will enhance the attractiveness of the products. However, from direct observation, some of the respondents, who disagreed (28.75%), had little or no interest whatsoever in either the aesthetics of agro-products or in the application of graphic design theories and principles for the optimization of product aesthetics. Need-satisfaction was their primary motivation and apparent sole influence.

3.1 Hypotheses Testing and Results

Hypothesis 1:

H_{01} : There is no significant relationship between the aesthetics of agro-product packages and consumer preferences.

H_{A1} : There is a significant relationship between the aesthetics of agro-product packages and consumer preferences.

Table 3. Hypothesis 1 contingency table

Variable	Observed N	Expected N	Residual
Design theory application	265	200	65
Non-Design theory application	135	200	-65
Total	400	400	

N	DF	Chi-Square	Significant	Decision
398	1	21.698	< 0.00001	Reject H_{01}

Source: Researchers' fieldwork, 2018.

From table 3, since the p-value obtained from the Chi-square score [21.698] derived is < 0.00001 which is less than the predetermined significance level ($\alpha=0.01$), the result is significant at $p<0.01$. Hence, the null hypothesis is strongly rejected and the alternate hypothesis, which establishes a significant relationship between the aesthetic quality of agro-product packages and consumer preferences, is thereby accepted.

Hypothesis 2:

H_{02} : Design theories have no significant effect on the aesthetic values of agro-product packaging.

H_{A2} : Design theories have significant effect on the aesthetic values agro-product packaging.

Table 4. Hypothesis 2 contingency table

Variable	Observed N	Expected N	Residual
More Aesthetic Packages	285	200	85
Less Aesthetic Packages	115	200	-85
Total	400	400	

N	DF	Chi-Square	Significant	Decision
398	1	37.8334	< 0.00001	RejectH ₀₂

Source: Researchers' fieldwork, 2018.

As observable in table 4, since the p-value obtained from the Chi-square score [37.8334] derived is < 0.00001 which is far less than the predetermined significance level ($\alpha=0.01$), the result is significant at $p<0.01$. Hence, the second null hypothesis is strongly rejected and the alternate hypothesis, which establishes a significant relationship between the design theories and principles application and the aesthetic quality of agro-product packages, is thereby accepted.

Hypothesis 3:

H₀₃: Design theories and principles application in the creation of agro-product packaging has no significant effect on the economic value of agro-products.

H_{A3}: Design theories and principles application in the creation of agro-product packaging has significant effect on the economic value of agro-products.

Table 5. Hypothesis 3 contingency table

Variable	Positive Economic effect N	Negative or no Economic effect N	Residual
Theory Application	265	135	130
Less or No Theory Application	115	285	-170
Total	380	420	

N	DF	Chi-Square	Significant	Decision
398	1	112.782	< 0.00001	RejectH ₀₃

Source: Researchers' fieldwork, 2018.

Since the p-value obtained from the Chi-square score derived is < 0.00001 (table 5) which is far less than the predetermined significance level ($\alpha=0.01$), the result is significant at $p<0.01$. Hence, the third null hypothesis is also strongly rejected and, the alternate hypothesis which establishes a significant relationship between the application of design theories/principles and improved economic value of agricultural products and by-products is thereby accepted.

4. Summary of Findings

Although, there are consumers who claim that aesthetics had little or no effect on their agro-products buying preferences which they claimed were influenced majorly by needs and urgency, results presented in table 1 confirm the significant impact aesthetics has on the buying behaviour of most consumers or users of agricultural products where 66.25% of the respondents agreed that the attractive or aesthetic quality of agro-product packages influences their consumption preferences. Therefore, if the economic values of local agro-products must be improved, aesthetics is a very vital factor to be considered and improved upon. This was validated in table 3 with the hypothesis 1 test.

Achieving sensible aesthetics in packaging designs is not accidental. Therefore, achieving significant aesthetic sense or value in agro-product package design production requires the appropriate application of relevant design theories and principles. This was validated in the hypothesis test 2 presented in table 4.

Hypothesis 3 test results validate the significance of the application of design theories and principles in the designing and production of agricultural product packages and packs. This agrees with the combined results presented in tables 1 and 2. This means that many consumers are willing to pay more for a more aesthetically sensible product than they relatively would pay for a product with less aesthetic value or quality even though the function or satisfaction they derive from such product alternatives/substitutes may not differ much.

5. Conclusion

At times, the only separating factor between the economic values of two or more packed or packaged agricultural products is the aesthetics of the packaging. Results derived and presented in this study established the relevance of the application of graphics or design theories and principles in the proper designing of agricultural product packages. Packaged agricultural products with higher aesthetic values possess relatively higher economic values, even though they may not necessarily perform any better in use than the less aesthetically sensible alternatives. Therefore, if farmers and other agro-entrepreneurs are to make the best of their investments, which will encourage more participation in agriculture, fostering the so called 'diversification of the local economy', then there is the need to apply more design skills, principles and theories necessary to achieve better packaging of local agricultural products. This is in concordance with previous studies such as Oladumiye (2018) and Odji (2018) which proposed the applications of various graphic design principles and theories for improved aesthetics.

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