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# Marketing and Utilization of *Dacryodes edulis* (G. Don) H.J. Lam) in Makurdi Local Government Area of Benue State, Nigeria

**Leoskali Nguuma Sambe[1*], Nguemo Anita Aondoana[2], Lucia Nkiru Nsiogu[3]**

*[1,3] Department of Social and Environmental Forestry, Joseph Sarwuan Tarka University, Makurdi, Benue State*

*[2]Ministry of Environment and Water Resources, Department of Forestry, Benue State*

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*Corresponding author:
Leoskali Nguuma Sambe
E-mail: leoflondon@gmail.com

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**ABSTRACT**

The study was conducted to determine the marketing and utilization of *Dacryodes edulis* in Makurdi metropolis, Benue State, Nigeria. Purposive sampling and simple random sampling techniques were used to elicit data from respondents. A semi-structured questionnaire was used to collect relevant information from marketers of *Dacryodes edulis* fruit. Descriptive statistics, Gross margin, and Gini coefficient were used to analyze the result. The study established that the basic uses of *Dacryodes edulis* fruit in Makurdi metropolis are as a source of food, medicine, and income. The majority of the marketers (61.5%) do not belong to any association while 38.5% indicated they belong to one association or another. The marketing of *Dacryodes edulis* is a profitable business venture that is mostly dominated by a female. Weekly profits made from the marketing of *Dacryodes edulis* in the three markets sample (Wurukum Market, Modern Market, and Wadata Market) are ₦ 29,842, ₦ 29,727, and ₦ 27,830 respectively. Marketing of *Dacryodes edulis* is faced with the challenges of perishability, poor transportation facilities, and lack of capital. To address the problem of capital, marketers of *Dacryodes edulis* should form co-operatives as this would increase their opportunities in accessing loans from financial organizations.

## INTRODUCTION

The African pear tree (*Dacryodes edulis* (G.Don) H.J.Lam; Burseraceae) is a tropical oleiferous fruit tree that possesses enormous potential in Africa (Kengué, 1990). It is a non-timber forest product (NTFP) that has in many areas made a transition from the forest to the farm and it is commonly cultivated in agroforestry systems as a shade provider and secondary crop in cocoa and coffee farms



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(Okafor *et al.,* 2002). The fruits are edible, and the bark; leaves, stems, and roots are employed for a variety of purposes (Waruhiu et al. 2004). The fruit pulp may be cooked (softened) or eaten raw. The cooked flesh of the fruit has a texture similar to butter (Enujiugha, and Ayodele, 2005). *Dacryodes edulis* is a delicacy among the people of Nigeria where it is consumed as an accompaniment with fresh maize (Onuegbu, 2000; Agbogidi and Eshenbeyi, 2006), while the fruits are sold in local markets and, to some level, have attracted international trade (Ajibesin, 2011). The scientific researches on *Dacryodes edulis* on the nutritive value of its pulp and its oil (Ajayi et al., 2006), and the oil extraction processes (Kapseu, 2009) have revealed excellent nutritional qualities of fruit pulp and interesting food processing properties of the oils extracted from the pulp and kernel of *Dacryodes edulis* (Poligui et al., 2013). The pulp, the only edible part of the fruit is particularly rich in lipids, indicating that *D. edulis* could be an important source of oil (Ondo-Azi et al., 2013). Besides lipids, the pulp contains substantial amounts of many other nutrients including proteins, carbohydrates, minerals, vitamins, and fibers (Poligui et al., 2013).

The wood of *Dacryodes edulis* has general use for carpentry, tool handles, and occasionally for construction, the stem exudates serve as glue and cosmetic components while the plant improves soil quality and contributes greatly to traditional medicines (Ajibesin, 2011). The gathering of the fruits of *Dacryodes edulis* serves as a veritable source of employment and income for the rural populace (Agbogidi and Eshegbeyi, 2006). *Dacryodes edulis* fruits like most fruits are highly perishable due to the ease of spoilage by microorganisms resulting in a short shelf-life of about 3-5 days (Onuorah et al., 2001). This has led to huge losses and market glut during harvest as noticed by large heaps of unsold rotten fruits in the refuge dumps or sites of villages and urban markets when the supply of a good or service far exceeds its demand, usually resulting in a substantial fall in its price in the market (Nwanekezi, 2007). This problem of perishability has an effect on the marketing efficiency of the fruit because marketers are often compelled to sell their fruits at a very low price to avoid huge wastage or total loss (Awono et al., 2002).

The Marketing of Non-Timber Forest Products (NTFPs) is reported to be characterized by an inefficient marketing system. The problems of poor marketing facilities, transportation cost, seasonality of products, crude storage and processing, supply and demand constraints, consumer preferences, and inefficient pricing systems have characterized the trade (Awono *et al*., (2002); Busari Ahmed et al., (2015); Fon Dorothy and Mbondji Ntombe (2018); Meinhold and Darr (2019). An efficient marketing system is vital to sustain profitability and promote the provision of jobs and income and thus drastically reduce poverty. According to Pandey *et al*., (2016) and Nzeh et al., (2015), the market of NTFP is extremely imperfect, unstructured with complex value chains and multiple stages and actors involved in the process of getting a product from forest to consumer. They are also dynamic and change over time and as such information about the quantity and quality of the product, price and market are very important.

With increasing population pressure, the upsurge of demand and commercial value for this multipurpose forest fruit tree species, as well as the seasonality of fruit production and the inability of the fruits to store well for a long period of time (Onuegbu, 2000, Shackleton and Pandey, 2014), it is important to study the socioeconomic benefits derivable from the tree species. According to Ingram and Bongers (2009) the contribution of NTFPs to the subsistence economy and to food security, to the national economy as a source of employment and for trade and exports, is missing in forestry and economic statistics. The paucity of information on NTFPs is reflected in the lack of policy attention, conflicting regulatory and policy frameworks, and a lack of support for trade in



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these products (Tahir et al., 2004; Belcher, 2005; Ingram and Bongers, 2009).

Therefore, adequate knowledge and information regarding the capacity of *Dacryodes edulis* to contribute significantly to the improvement of the economic status local population and providing a safety net can important for food security. This study specifically identified the various uses and marketing channels of *Dacryodes edulis*, determined the market structure and performance and income accrued in the marketing of *Dacryodes edulis,* and identified the challenges of its marketing system Makurdi Local Government Area.

## MATERIALS AND METHODS

*Study area*

The study was carried out in Makurdi Local Government Area, one of the twenty-three Local Government Areas in the Benue State of Nigeria. Makurdi Local Government Area is the headquarters of Benue State, Nigeria. It lies between longitude $8^0$ and $9^0$ East and between latitude $7^0 \, and \, 8^0$ North in the middle belt region of Nigeria. The climate of Makurdi town is the tropical wet and dry type, Koppen's Aw classification, with double maxima (Ayoade, 1983). The rainy season lasts from April to October, with 5 months of the dry season (November to March). Annual rainfall in Makurdi town is consistently high, with an average annual total of approximately 1173 mm (Abah, 2012). The temperature in Makurdi is, however, generally high throughout the year, with February and March as the hottest months. The temperature in Makurdi varies from a daily of 40 °C and a maximum of 22.5 °C (Ologunorisa and Tor, 2006). The vegetation of Makurdi town is the guinea savannah type. This vegetation type has been adversely affected by human activities leading to the clear-cutting of tree cover in many parts of the town. Due to this, artificial vegetation has replaced natural secondary vegetation. Makurdi town is inhabited by many tribes with a population of 297,398 to 157,295 males and 140,103 females (FGN, 2007). These tribes include the Tivs, Idomas, Etilos, Jukuns, Egede, Hausas, Yorubas, and Ibos. The Tivs are the dominant tribe. Makurdi town is made up largely of people who engage in civil service duties, commercial activities, and agrarian peasantry. Makurdi town is a built-up area with the highest concentration of people in high level and Wadata. A dense population also exists in some low-lying parts of the town such as Wurukum.

*Population and sampling procedure*

The population is comprised of marketers of *Dacryodes edulis* within Makurdi Metropolis. The study was carried out in three markets purposively selected based on the availability of *Dacryodes edulis* in such markets. The purposively selected markets were; Wurukum Market, Wadata Market, and Modern Market respectively. Thus, 57 marketers from Wurukum Market, 53 marketers from Wadata Market, and 33 marketers from Modern Market were sampled making a total of 143 marketers using the Taro-Yamane formula. The formula is shown below:

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

Where:

n=corrected sampled size,

N= population size,

e = marginal of error (10%)

*Data collection*

Data for this research project were collected through oral interviews and the administration of a semi-structured questionnaire. An oral interview was conducted with selected marketers of *Dacryodes edulis* in each of the three markets selected. A structured questionnaire was administered to one hundred and forty-three (143) marketers of *Dacryodes edulis* in the three selected markets. It was administered



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to fifty-seven respondents in the Wurukum market, fifty-three respondents in the Wadata market, and thirty-three respondents in Modern market areas of Makurdi Local Government Area of Benue State.

*Data analysis*

The data collected was analyzed using descriptive statistics such as frequency, percentages and mean, and tables. SPSS Statistics Version 20 was used to analyze the data. The Gross Margin analysis was applied to determine the profitability of *Dacryodes edulis* marketing. Gini – coefficient was used to determine the total quantity of *Dacryodes edulis* sold in the markets.

*Determination of gross margin*

Gross margin is determined mathematically using the formula:

GM = GI – TVC

Where:

GM = Gross Margin

GI = Gross Income

TVC = Total Variable Cost

*Determination of market concentration*

Gini – Coefficient is determined by the formula:

G = 1 - ∑XY ……. 1

Where:

G = Gini-coefficient

X = Cumulative percentage of sellers

Y = Cumulative percentage of sales

NOTE: G has a value ranging from 0-1 expressing the extent to which the market is concentrated. When G = 0, there is perfect equality in the size of the distribution of sellers, but when G = 1, there is inequality in the size of sellers.

## RESULTS

*Socio-economic characteristics of respondents in the study area*

The result revealed that the majority of the marketers (80.4%) were female and only 19.6% were male. Most respondents in the study area were between 41-50 years (50%), only 7% were less than 20 years, 16% were between 21-30 years, 27% were between 31-40 years and 14% were less than 50 years (Table 1). In terms of marital status as a greater proportion (68.5%) of the result were married while 31.3% were single. In terms of educational level, the majority of the respondents (37.8%) of the respondents had informal education, this is by followed primary education (32.9%), secondary education (26.6%) while only 2.8% had tertiary education. Based on years of experience of the respondents, a greater proportion of the respondents (32.9%) had between 5-10 years of experience in *Dacryodes edulis* marketing, 31.5% had 10-15 years of experience, 16.1% had less than 5, 12.6% had 15-20 years, while 7.0% had marketing experience greater than 20 years.

*Various uses of Dacryodes edulis*

From Table 2 it is revealed that a higher proportion (72.7%) uses it for food, 23.78% use it for medicine while only 3.5% indicated that they use it for oil extraction.

**Table 1. Socio-economic characteristics of respondents.**

| Socio-economic characteristics | Frequency | Percentage (%) |
|---|---|---|
| **Gender** | | |
| Male | 28 | 19.6 |
| Female | 115 | 80.4 |
| **Total** | **143** | **100.0** |
| **Age** | | |



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| | | |
|---|---|---|
| >20 | 10 | 7.0 |
| 21-30 | 24 | 16.8 |
| 31-40 | 39 | 27.3 |
| 41-50 | 50 | 35.0 |
| <50 | 20 | 14.0 |
| **Total** | **143** | **100.0** |
| **Marital Status** | | |
| Single | 45 | 31.5 |
| Married | 98 | 68.5 |
| **Total** | **143** | **100.0** |
| **Edu. Status** | | |
| Primary | 47 | 32.9 |
| Secondary | 38 | 26.6 |
| Tertiary | 4 | 2.8 |
| Informal | 54 | 37.8 |
| **Total** | **143** | **100.0** |

**Table 2. Various uses of *Dacryodes edulis***

| Variables | Frequency | Percentage (%) |
|---|---|---|
| **Food (fruit)** | 104 | 72.7 |
| **Medicine (leaves and bark)** | 34 | 23.78 |
| **Oil extraction (seed)** | 5 | 3.5 |
| **Total** | **143** | **100** |

*Membership of the market association*

The result from Table 3 indicated that the majority (61.5%) of the traders do not belong to the association while only 38.5% are members of the association.

**Table 3. Respondents' membership in the association**

| Membership in Association | Frequency | Percentage (%) |
|---|---|---|
| **Yes** | 55 | 38.5 |
| **No** | 88 | 61.5 |
| **Total** | **143** | **100.0** |

*Nature of business*

Table 4 shows that 51.0% of the marketers of *Dacryodes edulis* are involved in a retail business, 30.8% are involved in Wholesale while only 18.2% are into both wholesale and retail business.

**Table 4. Nature of business of *Dacryodes edulis* marketers in Makurdi LG**

| Nature of Business | Frequency | Percentage |
|---|---|---|
| **Retail** | 73 | 51.0 |
| **Wholesale** | 44 | 30.8 |
| **Wholesale and Retail** | 20 | 18.2 |



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*Sales and supply period*

The highest period (62.2%) of *Dacryodes edulis* supply is obtained between January and March followed by April to June (26.6%) while the least supply period (11.2%) is from July to September (Table 5).

**Table 5. Sales and supply period of *Dacryodes edulis***

| Variables | Frequency | Percentage (%) |
|---|---|---|
| **Period supplied most** | | |
| **Jan – March** | 80 | 55.9 |
| **April – June** | 59 | 41.3 |
| **July – Sept** | 4 | 2.8 |
| **Total** | **143** | **100.0** |
| **Period sold most** | | |
| **Jan – March** | 89 | 62.2 |
| **April – June** | 38 | 26.6 |
| **July – Sept** | 16 | 11.2 |
| **Total** | **143** | **100.0** |

*Market concentration in Dacryodes edulis marketing in Makurdi LGA*

Table 6 shows the result of the market concentration of *Dacryodes edulis* in the study area. The result indicates that the highest proportion of sellers 30.1% accounted for 30.1% of sales, this was followed by 25.9% sellers of accounting for 27.4% of sales, 23% of sellers accounted for 21.4% sales while the least proportion of sellers (5.6%) possessed 7.3% of sales at the market weekly.

**Table 6. Gini-coefficient analysis of *Dacryodes edulis* sales in Makurdi LGA**

| Sales | Frequency | Percentage of Sellers X | Cumulative % of Sellers | Total Sales | Percentage of Sales | Cumulative % of Sales Y | XY |
|---|---|---|---|---|---|---|---|
| **200001.00-400000.00** | 37 | 25.9 | 25.9 | 999000 | 27.4 | 27.4 | 0.0709 |
| **400001.00-600000.00** | 43 | 30.1 | 55.9 | 1100000 | 30.1 | 57.5 | 0.1715 |
| **600001.00-800000.00** | 22 | 15.4 | 71.3 | 503500 | 13.8 | 71.3 | 0.1090 |
| **800001.00-1000000.00** | 33 | 23.1 | 94.4 | 783000 | 21.4 | 92.7 | 0.2141 |
| **1000001.00+** | 8 | 5.6 | 100.0 | 265000 | 7.3 | 100.0 | 0.0560 |
| **Total** | **100.0** | **100.0** | | **3650500** | **100.0** | | **0.6223** |

**GC = 1 - ∑XY = 1 – 0.6223 = 0.3777**

*Marketing channels of Dacryodes edulis in Makurdi LGA*

As shown in Table 7, the majority of the respondents (38.5%) indicated that the channel used in the acquisition of the fruit is through farms gate middlemen, 30.1% 0f the



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respondents indicated that they get the product through wholesales, 21.7% indicated that they obtain *Dacryodes edulis* directly from the farmers while only 9.8% of the respondents indicated that they get their product from neighboring states.

**Table 7. Marketing channels of *Dacryodes edulis* marketing in Makurdi LGA**

| Variables | Frequency | Percentage (%) |
|---|---|---|
| Farmers | 31 | 21.7 |
| Farmgate middlemen | 55 | 38.5 |
| Wholesalers | 43 | 30.1 |
| Neighboring state | 14 | 9.8 |
| **Total** | **143** | **100.0** |

Source: Field Survey, (2019)

*Profitability of Dacryodes edulis marketing*

At the end of each week, traders in Wurukum Market go home with ₦29, 842.11; similarly, the traders in Modern Market go home with ₦ 29,727.27 while those of Wadata Market go home with ₦ 27,830.19 (Table 8).

**Table 8. Weekly profitability of *Dacryodes edulis* marketing in Makurdi LGA**

| Markets<br>A | No. of Traders<br>B | C.P (100kg)<br>C<br>(₦) | S.P (100kg)<br>D<br>(₦) | WQS<br>E | WVC<br>F<br>(₦) | Total C.P<br>G (C x E)<br>(₦) | Total S.P<br>H (D x E)<br>(₦) | TVC<br>I (F + G)<br>(₦) | GM<br>J (H – I)<br>(₦) | GM/Trader<br>K(J/B)<br>(₦) |
|---|---|---|---|---|---|---|---|---|---|---|
| **Wurukum** | 57 | 23,500 | 26,500 | 570 | 9000 | 13,395,000 | 15,105,000 | 13,404,000 | 1,701,000 | 29,842.11 |
| **Modern** | 33 | 24,000 | 27,000 | 330 | 9000 | 7,920,00 | 8,910,000 | 7,929,000 | 981,000 | 29,727.27 |
| **Wadata** | 53 | 24,000 | 26,800 | 530 | 9000 | 12,720,000 | 14,204,000 | 12,729,000 | 1,475,000 | 27,830.19 |

**NOTE:** C.P = Cost Price, S.P = Selling Price, WQS = Weekly Quantity Sold, WVC = Weekly Variable Cost (Government Collection 5000 + Transportation 4000 = 9000), TVC = Total Variable Cost, GM = Gross Margin

*T-Test analysis of gross margin of Dacryodes edulis marketing*

Tables 9 and 10 show the T-Test analysis of *Dacryodes edulis* marketing in Makurdi Metropolis. The analysis indicated that the overall gross margin was significant but with no significant differences in the profit generated across the 3 markets.



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**Table 9. T-Test Analysis of Gross margin *Dacryodes edulis* marketing in Makurdi LGA**

| | T | Df | Sig. (2-tailed) | Mean Difference | 95% Confidence Interval of the Difference | |
|---|---|---|---|---|---|---|
| | | | | | Lower | Upper |
| GM | 23.656 | 142 | 0.000* | 38758.74126 | 35519.8782 | 41997.6043 |

*Significant at 5% level of probability

**Table 10. T-Test for the three markets of *Dacryodes edulis* marketing sampled in Makurdi LGA**

| Market | | T | Df | Sig. (2-tailed) | Mean Difference | 95% Confidence Interval of the Difference |
|---|---|---|---|---|---|---|
| | | | | | | Lower |
| Wurukum Market | GM | 14.416 | 56 | 0.000* | 40163.15789 | 34582.2712 |
| Modern Market | GM | 10.451 | 32 | 0.000* | 40284.84848 | 32433.0559 |
| Wadata Market | GM | 16.379 | 52 | 0.000* | 36298.11321 | 31851.1963 |

*Challenges in the marketing of Dacryodes edulis*

Table 11 the lack of storage facilities (23.1%) has the major constraint facing the marketing of *Dacryodes edulis.* This was followed by Transportation (21.7%), lack of capital (21.0%), seasonal fluctuations (9.1%), high cost of tax (7%), sources of supply (14.0%) while the least challenge indicated was government policies (4.2).

**Table 11. Challenges in *Dacryodes edulis* marketing**

| Variables | Frequency | Percentage (%) |
|---|---|---|
| **Lack of storage facilities** | 33 | 23.1 |
| **Transportation** | 31 | 21.7 |
| **Lack of capital** | 30 | 21.0 |
| **Supply sources** | 20 | 14.0 |
| **Market price instability** | 13 | 9.1 |
| **Tax** | 10 | 7.0 |
| **Government policies** | 6 | 4.2 |
| **Total** | **143** | **100.0** |

Source: Field Survey, (2019)

## DISCUSSION

The predominance of the female gender in the marketing of *Dadryodes edulis* could be because retailing requires a certain level of patience and it takes one or more days to finish the stock and also that most urban retailers are mostly women with stalls in the market or roadside sellers Nzeh et al. (2018). Awono et al. (2002). According to Velde (2006), the dominance of women reason is that it requires few capital inputs for trading and also it tends to have low returns per unit and such reasonable incomes can usually only be achieved based on high volumes traded, for which capital to buy, store and transport products is needed.



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The majority of the respondents being above 21 years of age implies that those most engaged in the marketing of *Dacryodes edulis* were adults and their involvement in the trade sustains their livelihood. This finding is in line with the submission of Okumadewa *et al.* (2000) that traders in this age group are productive and energetic with greater potential for better performance and to explore opportunities in their existing trade business. The greater number of respondents being married implies that *Dacryodes edulis* marketing serves as a source of income to marketers as marriage confers responsibility and thus helps them cater for their family needs (Akinbile, 2007).

The fact that the majority of the respondents have formal education defines their effectiveness towards their livelihood activities. Based on the years of experience of the respondents, a greater proportion of the respondents have long years of experience in the trade of *Dacryodes edulis* which means that most traders are involved in the marketing of *Dacryodes edulis* have been in the business for long and are quite experienced in the trade.

The use *Dacryodes edulis* mostly for food according to Onuegbu and Ihebiohanma (2008) is due to the important role it plays in the nutrition of the people. Dimelu and Odo (2013); Omonihinmin (2014); and Kadji et al. (2016) also reported that *Dacryodes edulis* is used for many purposes such as medicine, food, fed to livestock, vegetable oil, and fruit pulp.

The fact that the majority of the marketers are members of market associations implies that access to the market must be granted by the officials. The individual intending to become a trader follows a procedure by meeting with the officials to seek recognition as a member of the market.

The dominance of retailers in the trade can be explained by the fact that women are involved more in retailing generally because the work is usually within their area of residence while men are more concentrated in the wholesale trade (Awono et al., 2002, Fon Dorothy and Mbondji Ntombe 2018). Wholesalers buy products directly from producers in rural areas to resell in the wholesale markets in urban areas either directly to retailers or to sedentary wholesalers who are sometimes between wholesalers and retailers. The same people could play the role of wholesalers and retailers.

The reason most of the traders indicated that that supply is mostly between January to March implies that the supply and the selling period are within the same period and this is because *Dacryodes edulis* is a seasonal fruit and cannot be stored for a long time to sell it at a convenient time. The is in line with the finding of Agbonkolo *et al*. (2016).

The Gini-correlation of *Dacryodes edulis* marketing obtained in the study area was 0.3777. According to Tedro (1981) for relatively equitable distribution, the Gini-coefficient value should be between 0.20 and 0.35. UNDP reported that Gini-coefficient with high inequality typically lies between 0.5 and 0.7. This implies that Dacryodes *edulis* marketers were not able to control large proportions of supply or sales in the study area. As such, none could influence supplies by increasing or decreasing the quantity supplied. There is no formal setting to guide the determination of the price of *Dacryodes edulis* which means individual marketers can sell their products at the price they feel is fit provided the buyers agree to buy at that rate. Therefore, the marketing of *Dacryodes edulis* is determined and controlled by the forces of demand and supply. The high perishability of the fruit also makes it difficult to place a fixed price on the product. Each of the participant outputs was an insignificant part of the volume of trade in the market such that it could not affect market price. The overall structure of *D. edulis* market indicates that there are many small-scale traders such that



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none could control the market. The individual dealers have little influence on the market price. Sambe (2015) and Enete (2008) made a similar observation with Timber Trade Analysis in Benue State, Nigeria, and Charcoal in Abia State, Nigeria.

There are mainly four marketing channels of *Dacryides edulis* in the study area. A farmer may sell his produce through farm gate meddle men for further distribution to wholesalers or sale directly to wholesalers. *Dacrydes edulis* can also be gotten from neighboring states like Enugu but this happens in rare cases. Mostly, *Dacryodes edulis is* obtained from Vandeikya and Kwande Local Government Areas of Benue State which presently stands as the dominant producers of the fruit in the State. The distribution channel from forest collector to urban wholesaler consists of middlemen that sell it to local traders which in turn sell it to the urban center and finally reach consumers.

The amount generated per trader in each of the markets suggests that the business is profitable since it is higher than the minimum wage presently in Nigeria. Agbokolor *et al*. (2016) reported a positive marketing efficiency greater than one in Imo State Nigeria while Ibeagwa et al. (2020) reported a profitability index of 0.43 (43%) and a Benefit-Cost Ratio (BCR) of 2.31 of NTFPs which all indicate moderate profitability and viability in Edo State respectively. He posited that this could be due to fluctuations in supply due to the seasonality of the products as well their high perishability and also because the demand for agricultural produce including NTFPs in many developing countries is inelastic and this affects the price and ultimately profitability.

This implies that lack of storage facilities, poor and high transportation network and cost and lack of capital are the major problems in the marketing of the products. This finding is in line with that of Ndubueze et al. (2018) that poor transportation network and perishability are the basic challenges in seasonal fruits marketing.

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