

## Original Research Article

### **Profitability of Melon Production Diversification Strategy: Evidence from smallholder farmers in Taraba State, Nigeria**

#### **ABSTRACT**

The profitability of a melon production diversification plan for smallholder farmers in Taraba State, Nigeria, was investigated in this study. During the 2021 farming season, data for the study was collected from 355 randomly selected farms. Farm budgeting approach was utilized to assess the data. The budgeting technique estimated ₦ 143618.11 gross margin and ₦ 135051.13 net farm income. The return on the owner's labour and management is ₦ 87801.13 and the return on investment is 127.58%. This demonstrates that the melon crop diversification strategies in the research area are profitable. A melon and cowpea combination was discovered to be more profitable than other firms. Because of this, it is suggested that a large amount of land be set aside for growing this crop.

**Key Words:** Profitability; Melon; Production; Diversification; Strategy

#### **1. INTRODUCTION**

Watermelon (*Citrullus Lonatus*) is a tropical fruit that is grown all over the world for its nutritional value [1]. Watermelon has 46 percent calories, 20 percent vitamin C and 17 percent vitamin A, as well as more lycopene than tomato [2]. Vitamins A, B, C, carotenoids, and antioxidants are all found in watermelon [3]. As a result of its nutritional profile and allied health benefit its consumption has increased. Cancer, cardiovascular disease, diabetes, blood pressure, and obesity can all be reduced by eating watermelon [4]. As a result, the commodity's use has grown dramatically in recent years affecting people from all walks of life and socioeconomic classes.

The production of valuable crops particularly watermelon is insufficient to meet the demands of Nigeria's teeming population [5]. Watermelon production is dominated by small-scale farming households with a heavy reliance on the agricultural labour market, with little or no savings, and very intensive agricultural practice [6]. Furthermore, due to the numerous environmental, production, marketing, and other risks and uncertainties that have afflicted the small-scale agricultural production, farmers are desperately seeking sustainable production practices as a hedge to ensure their households food security and income stability. Crop diversification is recognized as a key method for increasing revenue, reducing poverty and food security, and improving the nutritional status of the rural people [7]. Crop diversification refers to a variety of farming practices rather than a transition from one business to another [8]. Farmers allocate their resources to varied sub-units of production regions for sustainable food supply, enhanced food security, and poverty reduction among farm families making it a veritable approach for managing risks in small-scale subsistence agriculture [9, 10]. Crop diversification allows for a greater variety of crops to be grown on a given area of land hence increasing family food output and related agricultural activities.

Melon is grown throughout the world, in tropical, subtropical, and temperate climates. It is consumed in many parts of Nigeria and is used by small-scale farmers

as a source of employment and revenue. Melon is produced in combination with other crops such as cassava, maize, yam, and pepper to maximize land usage and boost the return generated by the production system which may be accounts for the rise in the land area dedicated to its production [11]. The choice of inputs, as well as the marketing channel for the output are influenced by the availability of a guaranteed market. The transaction cost of market exchange can be constant or variable. Given that agriculture is a prominent industry in most African economies, particularly in rural areas where farming is the primary vocation, commercialization of the sector demands strengthening small-holder farmers' ability to engage in the market. Small-scale farmers would be interested in participating in the market if they knew whether they are making a profit or not. It is based on this backdrop that this study analysed the profitability of melon diversification strategy in Taraba State, Nigeria

## 2. MATERIALS AND METHODS

### 2.1 Study Area

The study was conducted in Taraba State; the State is located in North-east part of Nigeria. The state lies between Latitudes  $6^{\circ} 30'N$  and  $10^{\circ} 36'N$  of the equator and Longitude  $9^{\circ} 10'$  and  $11^{\circ} 50'E$  of the Greenwich Meridian [12]. The state has a land area of about fifty-nine thousand four hundred square kilometres ( $59,400\text{km}^2$ ) with the population of two million and three hundred thousand (2,300,000) people [13]. The state shares boundaries with Bauchi and Gombe states in the North, Adamawa state in the East, Cameroun Republic in the South, Nasarawa, Plateau and Benue States in the Southwest. The state has a tropical wet-dry climate, well-drained alluvial soils, and has both savannah and rain forest vegetation. The rainfall ranges between 1000mm to 2500mm per annum in the South and between 1000mm to 1850mm per annum in the North with a maximum temperature of  $32^{\circ}\text{C}$  particularly from March to April which is the hottest period in the state. The minimum temperature is about  $18^{\circ}\text{C}$  experienced between December and January each year. The relative humidity is extremely low (13%) between January and February [12]. The state is predominantly agrarian, with about 80% of its inhabitants depending on subsistence agriculture. The climate, soil, and hydrology of the area are conducive for the cultivation of food crops, grazing of animals, fishing and forestry. Due to the varieties of cultures, different farming systems are practiced in the state [12].

### 2.2 Sampling Procedure and Sample Size

The respondents were chosen using multistage sampling approaches. Based on their predominance in the production of melon, three agricultural Zones and three blocks from each of the 3 Zones were purposively chosen, totalling of 9 blocks. Three farming communities were randomly chosen from each of the 9 blocks totalling of 27 farming communities. The list of all melon farming households in the 27 communities was obtained from Taraba State Agricultural Development Programme (TADP).

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Following [14], simple random sampling in proportion to the relative population of each farming community was used to get the representative sample (355) for the study.

### 2.3 Method of Data Analysis

Farm budget analyses was the analytical method employed to achieve the research objective. The method for determining the farmers labour and management returns is as follows: the total output was multiply by market prices of the output presented in Naira to obtain the output gross value. Total Variable Cost (TVC) of production includes the costs of seeds/seedlings, fertilizer, agrochemicals, sacks, transportation, storage, hired labour and family labour. The amount that the farmer would have spent if they did not own the land make up the Total Fixed Cost (TFC) which is made up of land-related expenses. Depreciation charges for items like hoes and cutlasses were computed using a straight line method with no consideration for salvage value. The estimated cost of family labour for each farmer was calculated in man-days. The current wage rate in the study field is taken as the opportunity cost of family labour at the time.

The farm budget techniques are specified as;

$$\text{Gross Margin (GM)} = \sum_j^n = Q_y P_y - \sum_j^n = j X_i P_{xi} \dots \dots \dots (1)$$

Where;

GM = Gross Margin (₦/ha)

$Q_y$  = Quantity of output (Kilogram melon equivalent)

$P_y$  = Unit price of output (₦/Kg)

$Q_y P_y$  = Total farm revenue generated (₦/ha)

$X_i$  = Quantity of  $i^{\text{th}}$  variable input (₦)

$\sum_j^n = j X_i P_{xi}$  = Total variable cost associated with all the  $i^{\text{th}}$  inputs consumed per hectare (₦)

Producing the melon

$\sum$  = Summation

$$NFI = GI - TC \dots \dots \dots (2)$$

Where;

NFI = Net Farm Income

GI = The Gross Income

TC = Total Cost

The net revenue less the aforementioned projected cost of family labour is used to calculate the farmer's labour and management returns. This is the primary finding of the cost and return analysis. The rate of returns (ROR) which is a measure of economic success of each farm in terms of income and capital invested was calculated and expressed as a percentage as follows:

$$ROR = \frac{TR - TVC}{TVC} \times 100 \dots \dots \dots (3)$$

### 3. RESULTS AND DISCUSSION

#### 3.1 Costs and Returns Analysis

Any production process involves outlays for raw materials and returns from the sales of the finished product. Average expenses and returns of the respondents in the research area are summarized in Table 1 and are indicated in ₦/ha. Table 1 shows that the average production costs that all of the respondents are expected to pay is ₦ 121,141.29 per hectare. Most of the inputs were not bought, so the costs have to be estimated. Variable and fixed costs both contribute to the overall cost of production. This result is the same as what [16,18] found, which was that variable costs made up 86.96% and 92.20%, respectively, of the total cost of production. Fixed costs accounted for only 7.07 percent of the area's average total cost. This shows that there is not a lot of money being put into fixed items for diversifying melon production in the study area. In fact, buying hoes, cutlasses, and sometimes watering cans is the only way to invest in capital goods. To figure out the fixed cost, the costs of the goods were depreciated using the straight-line method and an assumed zero end value. The labour input, which accounted for 60.41 percent of the ATC, was responsible for a sizable portion of the variable costs. This reveals labour as the research area's most expensive input by far. Since farming tasks like clearing land, levelling it, planting, weeding, and, in some cases, watering and harvesting are done by hand, this is not an unusual situation. Agrochemicals, fertilizer, and seed all had comparatively inexpensive prices. The estimated cost of unpaid family labour accounted for 64.6 percent (₦ 47,250) of the total labour cost. Even though the farmers did not pay for family labour directly, it was thought that if they had not worked on the farmer's farm, they might have hired out their services to other farmers. So, the average age group and gender of the people living in the research area were used to figure out how much family labour costs. One-day of family work was therefore given the same weight as one man-day of non-family work. But this need not be the case [19]. If a majority of farmers decide against growing melon, they might not be able to find lucrative employment elsewhere or on other people's farms. As a result, it is possible that the opportunity costs of family labour are not as high as those of non-family labour. However, it is presumed to be the same in this study for consistency's sake.

For all respondents in the study area, average gross margin (AGM), average net farm income (ANFI), average returns to farmers' land, labour and management (ARLLM), average returns to farmers' labour and management (ARLM), and average rate of returns to investment (AROR) in ₦/ha were also calculated as shown in table

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1. The study area's average gross revenue for all respondents was ₦ 256,192.42/ha, while the AGM was ₦ 143,618.11/ha. The table also shows that the farmers' ANFI, was ₦ 135,051.13/ha. The rent value of the farmer's land (also known as the opportunity cost of the farmer's land) was deducted from the ANFI to arrive at the ARLLM, which came to ₦ 128,600.90/ha. The returns to farmers' labour and management, which is the ANFI less the opportunity cost of family labour in the study area, was ₦ 87,801.13/ha. Including the cost of family labour, the average annual rate of total investment was 127.58 percent. This means that for every Naira put into diversifying melon production in the study area, an average profit of ₦1.27 was made, which means that, on average, the investment is very profitable. The result is consistent with [18].

**Table 1: Average Costs and Returns of Melon Production Diversification Strategy**

Cost and returns	Costs (₦ /ha)	Percentage
<b>Variable costs (VC):</b>		
Seed/seedlings	10,116.25	8.35
Fertilizer	6,898.37	5.69
Agrochemicals	11,732.17	9.68
Sacks	1,695.92	1.40
Transportation	7,758.02	6.40
Storage	1,183.11	1.00
Hired labour	25,940.47	21.41
Family labour (Opportunity cost)	47,250.00	39.00
<b>Total Variable Cost (TVC)</b>	<b>112,574.31</b>	<b>92.93</b>
<b>Fixed cost (FC)</b>		
Imputed rent value of land	6,450.23	5.32
Depreciation on farm tools	2,116.75	1.75
<b>Total fixed cost (TFC)</b>	<b>8,566.98</b>	<b>7.07</b>
<b>Total cost of production (TC)</b>	<b>121,141.29</b>	<b>100</b>
Gross returns (GR)	256,192.42	
Gross margin (GM)	143,618.11	
Net farm income (NFI)	135,051.13	
Average returns to land labour and management (ARLLM)	128,600.90	
Average returns to labour and management (ARLM)	87,801.13	
Average rate of returns to investment	1.2758	127.58

**Source:** Field survey, 2021

The average expenditure and revenues by each enterprise per hectare are summarized in Table 2. The majority (31.3%) of the respondents produced only melon, 22 percent blended melons and cowpeas, and 0.3 percent combined melons, millet and cowpeas (Table2). The table also showed that on per hectare basis, blended melon and cowpea has the highest ATVC (₦ 144,377.0) and ATC (₦ 144,789.6), while solitary melon has the least ATVC (₦ 57,416.9) and ATC (₦ 58,121.4) respectively. On the other hand, melon and cassava had the highest AFC (₦ 8031.0), while melon and sorghum had the least AFC (₦ 77.2). The table further

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showed that all the businesses engaged in the diversification plan for melon production experienced favourable AGM, ANFI, ARLLM, ARLM, and AROR (₦/ha). This demonstrated financial success of each of the twelve businesses. The study also demonstrated that the highest AGM, ANFI, ARLLM, and ARLM/ha are found in melon and cowpea mixture. The second-best crop in terms of AGR, ANFI, ARLLM and ARLM/ha was a mixture of melon and Bambara-nuts. However, Solitary Melon (SM) has the least AGR/ha.

**Table 2: Summary of average costs and returns by enterprise per hectare (₦)**

Ente.	F	AGR	ATVC	AFC	ATC	AGM	ANFI	ARLLM	ARLM	ARO I
SM	11	113523.0	57416.9	704.5	58121.4	56106.1	55401.6	54757.0	25757.0	97
M/C	78	551223.0	144377.0	412.6	144789.6	406845.9	406433.4	406148.2	356148.2	282
M/M	31	195415.5	128723.6	573.3	129296.9	66691.9	66118.6	65638.6	25638.6	51
M/M/C	31	256512.5	114687.8	487.0	119558.3	141824.7	136954.2	132126.9	76126.9	119
M/S	27	186394.3	121020.8	77.2	121098.0	65373.5	65296.2	63296.2	18,296.2	54
M/G	18	138702.8	98374.2	2094.3	100468.5	40328.8	38234.2	36234.2	5234.2	39
M/MI	16	178241.6	101623.8	1101.0	102724.8	76617.8	75516.8	74506.4	46506.4	74
M/M/S	19	177232.4	124332.9	574.1	124907.0	52899.5	52325.5	52374.3	374.3	42
M/B	16	405467.0	112401.3	1705.5	114106.8	293065.7	291360.2	289708.1	240708.1	259
M/CA	03	265151.3	131043.9	8031.9	139075.8	134107.5	126075.5	118139.5	48139.5	96
M/MI/C	01	298000.0	86380.5	505.1	86885.6	211619.5	211114.5	207114.5	159114.5	244
M/M/Y	04	308446.0	137356.3	4157	141513.3	171089.8	166932.8	162890.8	93890.8	122

Source: Field Survey, 2021

**Key:** (a) Enterprises: SM = Sole Melon; M/C = Melon/Cowpea; M/M = Melon/Maize; M/M/C = Melon/Maize/Cowpea; M/S = Melon/Sorghum; M/G = Melon/Groundnut; M/MI = Melon/Millet; M/M/S = Melon/Maize/Sorghum; M/B = Melon/Bambara-nut; M/CA = Melon/Cassava; M/MI/C = Melon/Millet/Cowpea; M/M/Y = Melon/Millet/Yam;

(b) Ratios: AGR = average gross return ₦/ha. ATVC = Average Total Variable Cost ₦/ha; AFC = Average Fixed Cost ₦/ha; ATC = Average Total Cost ₦/ha; AGM = Average Gross Margin ₦/ha; ANFI = Average Net Farm Income ₦/ha; ARLLM = average return on labour land and management ₦/ha; ARLM = average return to labour and management ₦/ha; AROI = Average Returns on Naira Invested ₦/ha.

#### 4. CONCLUSION AND RECOMMENDATIONS

The study used partial budget analysis to assess the profitability of melon production diversification strategy in Taraba State, Nigeria. The gross return was ₦ 256192.42. The farmers in the research area also generated an average gross margin and net farm income of ₦ 143,618.11 and ₦ 135051.13, respectively. In the research area, ₦ 128600.90 is the rate of returns to labour, land, and management, while ₦ 87801.90

Comment [User5]: add the total average at each parameter

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is the rate of returns to the owner's labour and management. The overall return on investment is 127.6 percent. This demonstrated that melon production diversification plans in the research area are quite profitable. According to the analysis, some crop combinations are more profitable than others. Melon and cowpea mixture has the highest AGR, AGM, ANFI, ARLLM, and ARLM/ha. Therefore, it is advised that quite a significant piece of land be set aside for the growth of this crop.

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