



PERFORMANCE OF WATER MELON FARMERS IN YOBE STATE,  
NORTH EAST NIGERIA: A FARM BUDGET ANALYSIS

<sup>1</sup>Umar, S. M., <sup>1</sup>Galadima, M., <sup>2</sup>Makama, S. A. and <sup>2</sup>Isah, M. A.

<sup>1</sup> Department of Agricultural Economics and Extension, Federal University Gashua, Yobe State

<sup>2</sup>National Agricultural Extension and Research Liaison Services (NAERLS), ABU Zaria

\*Corresponding author's Email: [safiyanuumarmaiadua@gmail.com](mailto:safiyanuumarmaiadua@gmail.com) GSM:+2347063115278

ABSTRACT

The study investigated the performance of water melon farmers in Yobe state, Nigeria. Using multistage sampling procedure, a total of 274 respondents were sampled from three major water melon producing LGAs during 2021/2022 cropping season. Data elicited from questionnaires and interviews were analyzed using farm budgeting techniques and regression analysis. The findings of the study revealed that, a total variable costs of ₦ 163,700/ha and a profit of ₦ 598,510/ha of water melon whose output was determined as 15,280 Kg/ha. Operating and gross ratios which measures financial success and financial position of the business were less than 1. The study further discovered that, age of the respondents, experience in water melon production, farm size, yield per ha, irrigation fee and price per kg of water melon were the significant variables influencing farmer's profit. Major constraints hindering water melon in the state were inadequate formal and informal funding, reduction in yield due to insects/pest and lack of storage/preservation technology. The study therefore suggests adequate funding through cooperative farming and formal credit arrangements as this would create more opportunity for land expansion and technologically advanced water melon production in the study area.

**Keyword:** Analysis, Budget, Farm, Melon and Water

INTRODUCTION

Watermelon (*Citrullus lanatus*) is a plant species under the family cucurbitecae. It is a vine like flowering plant originally from Africa and widely cultivated crop in the world. Global production stands at 101 million tonnes in 2021 from 21.1 million tonnes in 1972, thus growing at an average rate of 34.2% (FAOSTAT, 2022). China is the world's leading producer of watermelon as at 2021 with production of 61 million tonnes that account for almost 60% of the world's production followed by Turkey, India, and Brazil. Algeria is the Africa's leading producer with estimated quantity of 2.08 million tonnes in 2021.

There are over 1,200 varieties of watermelon worldwide and quite a number of these varieties are also cultivated in Africa (Zohary and Hopf, 2000). The yield per hectare basis differs from region to region and depends on climatic condition of the area, soil type and good agricultural practices. Good commercial yield under irrigation ranges between 25-30 kg/ha (FAO, 2022). The global consumption of the crops is greater than that of any other cucurbits. Watermelon fruit has nutrients and minerals such as vitamin A, B, C, E and other trace elements like calcium, magnesium, iron and phosphorus. Over the past years, nutritionist and medical professional have taken an interest to find out more about watermelon's health benefit. It was apparent that fruits are largely made of water (more than 90%), major nutritious parts of the fruit are starch (6.4 g/100 g), vitamin A (590 IU), and lycopene (4,100µg/100g, an anti-carcinogenic compound found in red tissue watermelon which is nearly 40% higher than tomato (Romdhane *et al.*, 2017: in Din *et al.*, 2022). Water melon production is steadily increasing in Nigeria and consumption of the commodity witnessed a surge as its demand cuts across different socio-economic classes.

Production of the crop in Nigeria largely comes from the northern parts due to favourable factors including topography, soil, rainfall, temperature etc. similarly, was found to be a profitable economic activity because of the readymade market outlets within producing and non-producing areas of the country. (Ndanitsa *et al.*, 2021; Mairabo, 2021; Adeoye *et al.*, 2020; Afolabi, 2019) Yobe state is among the water melon producing states in Nigeria and farmers derived source of livelihood from crop. Recent reports indicated that fruits such as watermelon production generate higher profit and provide more employment and income to the farmers than that of other vegetables (Yusuf *et al.*, 2016 in Oladoja *et al.*, 2022). In spite of these opportunities, production is constrained by low level of technology, post-harvest losses and glut thus, impacting on prices and perhaps also reduced profit in the long run. In view of the above, this study seeks to determine the performance of water melon producers in terms of costs and associated returns, efficiency with respect to performance and factors influencing profit in Yobe state. The study would fill this gap especially under the current situation which can assist in policy formulation, generate information that will serve as a database for prospective watermelon producers and serve as a basis for further research work.

## **MATERIALS AND METHOD**

### **The Area of the Study**

The study was conducted in Yobe State located in the North- East, Nigeria. The state lies on latitude 11° N and longitude 13.5° E. It is located in the Sudano-Sahelian vegetation zone which is characterized by a hot and dry climate for most of the year (FAO and IITA, 2019). It shares common boundaries with Borno State to the east and southeast, Jigawa State to the northwest, Bauchi and Gombe States to the southwest. Annual average rainfall and temperature ranges between 423.3 mm and 34° C respectively, hottest months in the state are March-May with temperatures of between 39°C - 44°C (Ambrose *et al.*, 2018; Acresal, 2023). Yobe state has a total land area of 47 153 square kilometers of which 70 percent of the land area (33 007.1 square kilometer) is classified as arable land for agriculture (Abdullahi *et al.*, 2016). The population of the state according to head count in 2006 was about 2.6 million and projected to be 3.65 million in 2022. Agriculture is the main stay of the economy employing about 80% of the population (NBS, 2019). Millet, sorghum, cowpea and maize are the major food crops. The cash crops that are commonly grown in the state include groundnut, gum Arabic and sesame seed.

### **Sampling techniques and Sample Size**

A multistage procedure was employed in arriving at the sample size. Purposive sampling of three Local Government areas (LGAs) in the state (Jakusko, Machina and Bursari LGAs) was done due to high concentration of production. Purposive selection of two wards prominent for water melon cultivation from each LGAs was done. A total of 1,370 water melon farmers were identified (Jakusko-410, Bursari-585, Machina-375) and a proportion of 20% from each local government was selected using simple random sampling. The study used a total of 274 respondents. (Jakusko – 82, Bursari – 117 and Machina – 75)

### **Analytical Tools**

Farm budgeting (Gross margin, net farm income and ratios), Multiple linear regression model and ratios were used to determine the farmer's costs and returns and the factors influencing profit. Gross Margin Analysis (GM) by definition is the difference between the gross income (GI) and the total variable cost (TVC) that is,

$$GM = \sum GI - \sum TVC \quad \dots(1)$$

$$GM = \sum PiQi - \sum PjQj \quad \dots(2)$$

GI = value of output plus gift and home consumption,  $PiQi$  is price and quantity of  $i$ th output,  $PjQj$  is price and quantity of  $j$ th input

GM= Gross margin in Naira ₦, GI= Gross income per season, TVC= Total variable costs

$NFI = GM - TFC$ , Where; NFI= net farm income, TFC= total fixed cost of production,

**Multiple Regression Model** – It is the simultaneous combination of multiple factors to assess their influence on profitability expressed as;

$$Y = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \beta_5X_5 + \beta_6X_6 + \beta_7X_7 + \beta_8X_8 + \beta_9X_9 + \varepsilon \quad \dots(3)$$

Where; Y = Output of watermelon (kg), proxy to profitability,  $X_1$  = Age,  $X_2$  = Experience in farm business,  $X_3$  = farm size (ha),  $X_4$  = Yield of water melon (Kg/ha),  $X_5$  = fertilizer (Kg),  $X_6$  = Seeds (Kg)  $X_7$  = Labour (man-day/hour),  $X_8$  = Irrigation (days),  $X_9$  = Price/kg of watermelon (N) and  $\varepsilon$  = error term.  $\beta_0$  = constant or intercept,  $\beta_1$ -  $\beta_9$  are unknown parameters to be estimated (coefficient of independent variables)

**Ratios** – these measure the financial position and success of the business they include; Operating ratio (OR), Gross ratio (GR) and Benefit- Cost ratio or Return on Investment (ROI).

$OR = TOC/GI$ ,  $GR = TFE/GI$ ,  $ROI = TR/TC$ . Where; TOC = total operating costs, TFE = total fixed expenses, GI = gross income/total revenue and TC = total costs.

## RESULTS AND DISCUSSION

### Socio-Economic Variable

Table 1 presents the descriptive statistics of some socio-economic variables in the generated data set. Mean age of the respondents was found to be 46 years and a minimum of 18 years, implying that, most respondents were within their productive age. Maximum household size in the study area was 30 with mean size of 9 indicating that, respondents have dependents to cater and to supply family labour. A priori expectation is that household size will have a positive relationship with output. Years in farming and experience in watermelon production had mean years of 19 and 11 respectively. Adequate experience guarantee choice of favourable decision making and efficient utilization of resources, hence it is expected that those variables would have a positive inclination with profit.

**Table 1. Descriptive statistics of some variables**

Variables	Min	Max	Mean	Standard Deviation	Kurtosis	Skewness
Age	18	75	46	11.2	0.08	0.38
Household size	0.0	30	9	5.13	1.07	2.72
Farming experience	5.0	51	19	9.35	1.05	1.68
Experience in watermelon production	3.0	26	11	4.8	0.64	0.59

Source: Field Survey 2021

### Profitability Analysis

Costs and returns analysis is an indicator of profitability but not a substitute for efficiency in production as this is best captured by vigorous production function analysis. Table 2 revealed the results of gross margin and net farm income analysis, those tools indicate to a larger extent the profitability and how well a business is run. The results showed that, the variable costs component

constitutes 91.2% of the total production costs of water melon in the study area, while the fixed cost was only 8.8% of the total costs. This indicated that, water melon production is practiced on a small scale nature using virtually zero mechanization. Haji *et al.* (2020) also reported similar findings from Indonesia where variable cost constitutes 98.74% of the total costs, while fixed costs were 1.26% of the total costs. Cost of fuel for irrigation, chemical insecticides and land preparation were the largest operating costs constituting 17.5%, 14.9% and 11.4% respectively. From the study, total variable costs (TVC) was N 163,700/ha while depreciation on tools as the fixed cost (TFC) was 15,800 justifying the used of gross margin analysis.

**Table 2. Results of Profitability Analysis**

Variable	Description	Average Amount/ha (N)	%	% of total cost
Variable Costs	Seeds	6,500	3.9	
	Chemical fertilizer	24,500	14.9	
	Manure	15,000	9.2	
	Pesticides	13,500	8.2	
	Fuel	28,800	17.5	
	Land preparation	18,600	11.4	
	Cost of planting	4,800	2.9	
	Weeding (1 and 2)	16,000	9.7	
	Fertilizer application	4,500	2.7	
	Pesticides application	8,500	5.2	
	Harvesting	10,400	6.3	
	Transportation cost	12,600	7.7	
	Total variable costs (TVC)	163,700	100	91.2
Fixed Costs	Depreciation on farm tools	15,800		8.8
	Total fixed costs (TFC)	15,800		100
Total Costs	TVC + TFC	179,500		
Revenue Comp	Output/ per ha in kg	15,280		
	Price/kg	49.50		
	Value of output	756,360		
	Home consumption/gift	5,850		
	Total Revenue/Gross Income	762,210		
Gross Margin	GI –TVC	598,510		
Net farm Income	GM –TFC	582,710		
Operating ratio	TOC/GI	0.22		
Gross ratio	TFE/GI	0.01		
ROI	NFI/TC	3.25		

Source: Field survey 2021

Table 2 above further revealed an output of 15,280 kg/ha, while the price per kg during the study period was ₦ 49.50/kg. The gross margin and net farm income per hectare were found to be ₦ 598,510 and ₦ 582,710 thus indicating that water melon production is profitable in the study area. Ndanitsa *et al.*, 2021 found gross and net margins of ₦ 534,747.50/ha and ₦ 459,769.56/ha in Niger State. Whereas, Toluwas and Oweye (2017): Otumaiyo and Adedeji (2014) obtained a lower

gross margins of ₦ 75,114.68/ha and ₦ 25,574.24/ha in Ekiti and Ogun States respectively, though periods of study differ, geographical location might also be the reasons why results vary significantly. Return on Naira invested was found to be ₦3.25, meaning that for every Naira invested there was a return of three Naira twenty-five kobo. The gross ratio was 0.01 while the operating ratio was 0.22. A less than 1 ratio is desirable, implying good utilization of resources and the financial success of the farmer

### **Determinants of profitability**

Table 3 showed the results of Multiple Regression analysis which revealed the relationship between profit and its determinants. The model was found to be good and devoid of auto correlation,  $R^2$  value was 73% implying that, 73% of the variation in the dependent variable was as a result of the determinants (independent variables) captured in the model. The F statistics which shows joint significance of the independent variables was also significant at 1% probability level. From the results, age of the respondents, experience in water melon production, farm size, yield per ha, irrigation and price per kg of water melon were the significant variables influencing farmer's profit. Age of the respondents and number of times of irrigation negatively affects profit, 1% increase in age and irrigation reduces profit by 6% and 2% respectively, this is not contrary to a priori expectation, as farmer's age increase productivity decreases likewise increase in irrigation adds production cost. Onyemekonwu *et al.* (2019) reported a positive relationship between age, level of education and household size with income derived from melon production in Delta State. Farm size and yield were positively significant at 1% probability level, an increase in farm size and yield by 1% increases profit by 5% and 10% respectively. Aisha (2018) and Toluwas and Owioye, (2017) in a similar study found that farm size and seeds to be significant variables affecting output and profit of water melon in Kano and Ekiti States respectively. The study further revealed that, fertilizer and labour per man days were the variables found statistically not significant (though positive) in influencing profit in the study area, this is not contrary to expectation as the demand for these factors by the crop is relatively low.

**Table 3. Factors that determine profitability of water melon production**

Variable	Coefficient	Std. Error	T –Statistics	Probability
Constant	2.3591	0.9035	2.6219	0.000***
Age	-0.6794	0.3281	-2.0692	0.000***
Exp in farm business	0.7973	0.4157	1.9179	0.024**
Farm size	0.5649	0.2318	2.4363	0.000***
Yield	1.0582	0.3446	3.0708	0.000***
Fertilizer	0.4267	0.6987	0.6107	1.248 <sup>NS</sup>
Seeds	-0.3392	0.2483	-1.5661	0.062*
Irrigation	-0.2948	0.1765	1.6702	0.034**
Labour per man days	0.4321	0.5211	0.8292	1.835 <sup>NS</sup>
Price of watermelon	0.6482	0.4106	1.5787	0.071*
$R^2$	0.730			
Adjusted $R^2$	0.680			
F- statistic	17.455			

\*, \*\*,\*\*\* and NS denotes statistically significant at 10%, 5%, 1% probability level



### Constraints to Watermelon Production

Table 4 presented the problems associated with water melon production in the study area. Majority of the respondents (43%) were of the opinion that inadequate capital was the major problem hindering production as increase in farm size, production inputs and transportation all depends on capital. Pest infestation and storage or preservation of water melon after harvest were the next other constraints limiting production constituting 19.2% and 16.7% respectively. Poor prices in times of glut posed problem according to some farmers (12.5%) as water melon could not be stored for a longer period when prices crash down due to excess supply amidst lower demand. The least voted constraint (8.5%) was inadequate extension agents. Farmers are of the opinion that production could be improved if new technology, hybrid seeds, improved management practices were disseminated by extension agents.

**Table 4. Distribution according to constraints to watermelon production**

Variable	Frequency	Percentage %	Rank
Inadequate capital/funding	115	42.59	1 <sup>st</sup>
Pests infestation	61	22.59	2 <sup>nd</sup>
Inadequate extension agents	17	6.29	5 <sup>th</sup>
Poor price in times of glut	45	16.67	3 <sup>rd</sup>
Storage/preservation	32	11.85	4 <sup>th</sup>
<b>Total</b>	<b>270</b>	<b>100</b>	

Source: Field survey, 2021

### CONCLUSION AND RECOMMENDATIONS

The study examined the profitability of water melon production in Bade local government area, Yobe State North east. Primary data on costs, returns and factors affecting profitability were drawn from one hundred and twenty respondents using structured questionnaires during 2021/2022 farming season. Farm budgeting techniques, Regression analysis and Descriptive statistics was employed in achieving the objectives of the study. The results implied that, production of water melon in the study area is profitable and that farmers were efficient in the utilization of their scarce resources as indicated by a gross margin of N 598,510 per ha, gross ratio of 0.01 and return on investment of 4.25. Significant factors that positively influenced profitability include farm size, yield per hectare, experience in farm business and price per kg of water melon. Age and number of times of irrigation on the other hand limits profit while, fertilizer consumption and labour remain insignificant variables. Major constraints hindering water melon in the study area were inadequate formal and informal funding, reduction in yield due to insect/pest infestation and lack of storage/preservation technology. The study therefore suggests adequate funding through cooperative farming and formal credit arrangements as this would create more opportunity for land expansion and technologically advanced water melon production in the state.

### REFERENCES

- Abdullahi, H. G., Fullen, M. A. and Oloke, D. (2016). A review of Socio-economic effects of Drought in the Semi-arid Sahel. *International Journal of Advances in Engineering and Technology*. 1, 95-99.
- AcReSal, (2023). [www.acresal.gov.ng](http://www.acresal.gov.ng). Yobe- Agro-Climatic resilience in Semi-Arid landscapes



- Ambrose, A. Z., Umar, Y. and Binbol, N. L. (2018). Climatic information as evidence of Desertification processes in Northern Yobe State, Nigeria: Implications for Agriculture and Ecosystem. *Global Journal of pure Applied Sciences*, **4**(24):117-124. DOI: <https://dx.doi.org/10.4314/gjpas.v24i1.14>
- Din, N. S. (2022). Development of Pastilles from Flesh and Rind of Watermelon *Food Research*, **6**(3):288-297
- FAO, (2022) FAOSTAT Production data base [www.fao.org](http://www.fao.org)
- FAO and ICRISAT. (2019). Climate-Smart Agriculture in the Yobe State of Nigeria. CSA Country Profiles for Africa Series. International Center for Tropical Agriculture (CIAT); International Crops Research Institute for the Semi-Arid Tropics (ICRISAT); Food and Agriculture Organization of the United Nations (FAO). Rome, Italy. 22p
- Haji, S. (2020). Comparative Profitability of Melon and Watermelon production in South Konawe District, Indonesia. *WSEAS Transaction on Business and Economics* DOI: 10.37394/2520/2020-17.91
- Knoema, (2022) [www.knoema.com](http://www.knoema.com) Data-Agriculture in the world
- NBS. (2019). Nigerian Bureau of Statistics. Demographic statistics Bulletin, 26p
- Ndanitsa, M. A., Sallawu, H., Bako, R. U., Oseghale, A. I., Jibrin, S., Mohammed, D. and Ndako, N. (2021). Analysis and technical Efficiency of watermelon production in Niger State. *Journal of Agripreneurship and Sustainable Development*, **4**(4):64-80.
- Oladoja, M. A., Mufutau, R. A., Ilori, A. R., Osunmakinde, M. A. and Taiwo, A. M. (2022) Contributions of Watermelon Production to Welfare Status of Rural Farming Households in Oyo State, Nigeria. *Nigerian Journal of Agriculture and Agricultural Technology* **2**(2):54-68.
- Onyemekonwu, R. C., Belonu, E. N. and Ehiwaran, F.A. (2019). Analysis of small scale farmer's income in Melon production in Delta States, Nigeria. *Journal of Agripreneurship and Sustainable Development*, **2**(2):147-155.
- Romdhane, M. B., Haddar, A., Ghazala, I., Jeddou, K. B., Helbert, C. B. and Ellouz-Chaabouni, S. (2017). Optimization of polysaccharides extraction from watermelon rinds: Structure, functional and biological activities. *Food Chemistry*, **216**, 355-364. <https://doi.org/10.1016/j.foodchem.2016.08.056>
- Toluwasa, S. O. W. and Owoeye, R. S. (2017). Cost-Benefit Analysis of watermelon Production in Ekiti State, Nigeria. *Research Journal of Agriculture S (RJOAS)*, **6**(66):307-314. DOI <https://doi.org/10.18551/rjoas.2017-06.36>
- Otunaiye, A. O. and Adedeji, I. A. (2014). Technical efficiency of Watermelon production in Ogun State Nigeria. *International Journal of Applied Agricultural and Apicultural Research*, **10**(1and2):44-53
- Umar, S. M., Suleiman, A., Aminu, A. and Sadiq, M. S. (2015). Value Chain Analysis of Hides and Skin in Daura area of Katsina State, Nigeria. *Journal of Agricultural Economics, Extension and Rural Development*, **3**(3):263-270,
- Yusuf, O., Sanni, S. A., Ojuekaiye, E. O. and Ugbabe, O. O. (2016). Profitability of Watermelon Production under Sole and Mixed Cropping Systems in Kogi State of Nigeria. *Journal of Agriculture and Biological Science*, **3**(2):14-18.



# JOURNAL OF AGRIPRENEURSHIP AND SUSTAINABLE DEVELOPMENT (JASD)

Volume 6, Number 4, December, 2023

**ISSN (Print): 2651-6144; ISSN (Online): 2651-6365 Website: <http://www.jasd.dae.atbu.edu.ng>**



Zohary, D. and Hopf, M. (2000). *Domestication of plants in the Old World: The origin and spread of cultivated plants in West Asia, Europe and the Nile Valley* (No. Ed. 3). Oxford University Press.