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A study on comparative analysis of tomato production in Karnataka state of India and Kano State of Nigeria

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Abstract
This study was aimed as a study on comparative analysis of tomato production and marketing in Karnataka state of India and Kano state of Nigeria, with specific objectives of finding and comparing the profitability of tomato production in the two study areas. A total of 120 tomato growers (60 growers from each study area) were sampled through application of appropriate statistical procedures with well-structured questionnaires. Farm budgeting and cost concept techniques as used in India were used to analyze the primary data. Secondary data were collected through thorough investigation from previously published documents and text books, bulletins and Agricultural Department Reports of the respective study areas. The study reveals an average Net Income generated for tomato production in the study area of India as Rs.159547.02/ha which is lower than that obtained in Nigeria Rs. 171729.95/ha. A sample average Benefit Cost Ratio (BCR) for the different farm groups in the study areas was revealed as; 1:3.5 in India and 1:3.6 in Nigeria. The study indicated that, tomato production is highly profitable in both study areas of India and Nigeria.

Keywords: Cost, Returns, Benefit Cost Ratio (BCR), Tomato, Karnataka, Kano, India and Nigeria

1. Introduction
Tomato is one of the world most important vegetable crops. It is an edible, often red fruit or berry. It is herbaceous annual crop scientifically known as *Lycopersicum esculentum* belonging to the nightshade family *Solanum lycopersicum*, commonly known as tomato plant. The tomato is consumed and used in diverse ways, including raw as an ingredient in the preparation of household dishes, sauces, salads, and drinks. The report of Food and Agriculture Organization (FAO, 2015) of the United Nations "State of the Food Insecurity in the World", Global hunger has continued to decline, albeit gradually, to an estimated 795 million undernourished people, or a reduction of 167 million hungry people over the last ten years. This decline has been most pronounced in developing countries, despite significant population growth. The prevalence of hunger has been reduced rapidly in Central, Eastern and South-Eastern Asia as well as in Latin America; in most countries of Northern Africa undernourishment has remained a small share of the population, below 5 percent. Other regions, including the Caribbean, Oceania and Western Asia, saw some overall progress, but at a slower pace. South America has been able to reduce the prevalence of undernourishment by more than 50 percent and has brought it below 5 percent.

2. Materials and Methods
(A) Sampling procedure
i) Selection of study areas
Purposive sampling was used in selecting the specific study areas, where two states were purposively selected i.e. one state from each of the two countries as India and Nigeria. From India Karnataka state was selected and from Nigeria Kano state was selected purposively.

ii) Selection of Villages
In total 6 villages were selected (3 from Karnataka and 3 from Nigeria) purposively for the study, the village names in Karnataka is Jathavara, Anemadugu and Manchenahalli while in Nigeria is Karfi, Kosawa and Kura.

iii) Selection of Respondents
A total of 120 tomato growers (60 growers from each study area), were selected randomly.

iv) Selection of Market Intermediaries
48 tomato marketers (12 from study area of India and 27 from study area of Nigeria) and 12 consumers (6 from each study area) were sampled through application of appropriate statistical procedures with well-structured questionnaires. The selection was done randomly.

(B) Analytical technique
Farm budgeting and financial ratios
These include detailed analysis of cost and returns of tomato production and marketing such as; Gross Farm Income, net income, family labour income, farm business income, Farm Investment income, Depreciation value, Cost - Benefit ratio and Measures of cost concepts.

3. Result and Discussion
Land use pattern
Size of holding and irrigation at sampled farms is presented in Table 4.1 below, reveals the per farm total cultivated area was observed to be 0.96 hectares, 3.0 hectare, and 8.32 hectare at small, medium and large farms, respectively along with 4.09 hectare as an overall average. The overall sample average of irrigated area is only 3.24 to the total cultivated land.

Table 1: Farm size holding under irrigation in study area of India (Ha/farm)

S. No.	Particulars	Size of Farms Group			Sample Average
		small	Medium	Large	
1	Total owned area	0.96	3	8.32	4.09
2	Total cultivated	0.85	2.31	6.57	3.24
3	Irrigated area	0.85	2.31	6.57	3.24
4	Un-irrigated area	0.11	0.69	1.75	2.55
5	Area under other crops	0.11	0.69	1.75	2.55

***Source*:** Field Survey, 2016

Likewise in the study area of Nigeria, the size of holding and irrigation at sampled farms is presented in Table 4.2; below reveals the per farm total cultivated area is observed to be 1.0 hectares, 2.86 hectares, and 8.82hectares at small, medium and large farms, respectively along with 4.23hectares as an overall sample average. The overall sample average of irrigated area is only 3.12 to the total cultivated land.

Table 2: Farm size holding under irrigation in study area of Nigeria (Ha/farm)

S. No.	Particulars	Size of Farms Group			Sample Average
		Small	Medium	Large	
1	Total owned area	1	2.86	8.82	4.23
2	Total cultivated	0.72	1.66	4.52	2.30
3	Irrigated area	1	2.86	5.5	3.12
4	Un-irrigated area	-	-	3.32	1.11
5	Area under other crops	0.38	1.2	4.3	1.96

***Source*:** Field survey, 2016

Factor wise Distribution of Cost per Hectare in Different Size Groups

All cost realized by the farmers during tomato cultivation were computed within all the different farm size groups from both study areas of the two countries and the contribution of each input used in the total cost was also computed in percentage as revealed on the Table 4.3; below that, the cost of tomato production per hectare for the small scale farmers is greater than that of the medium farmers which is also greater than that of that of the larger farmers group in the study area. The cost of cultivating tomato for small, medium and large groups of farmers was found to be Rs46010.2/ha, Rs.45477.4/ha and Rs.44993.0/ha. The sample average cost of tomato cultivation in the area was Rs.45493.5/ha.

Table 3: Distribution of tomato production cost per hectare in the study area of India

Particulars	Small	Medium	Large	Sample Average
(A) Variable cost charges				
Hired Labour	4300.4 (9.35)	4073.8 (8.96)	4934.5 (10.97)	4436.2 (9.75)
Bullock Labour	1375.3 (2.99)	1050.5 (2.31)	0.0	808.6 (1.78)
Tractor power Used in farm	3250.7 (7.07)	3478.6 (7.65)	3725.8 (8.28)	3485.0 (7.66)
Cost of Seed	7850.0 (17.06)	7937.2 (17.45)	8050.7 (17.89)	7946.0 (17.47)
Manures & Fertilizers	5850.0 (12.71)	5975.2 (13.14)	6155.8 (13.68)	5993.7 (13.17)
Irrigation charges	4250.0 (9.24)	4450.4 (9.79)	4647.5 (10.33)	4449.3 (9.78)
Plant protection	1750.0 (3.80)	1825.6 (4.01)	1978.5 (4.40)	1851.4 (4.07)
Interest on working capital (8%)	1717.6 (3.73)	1727.5 (3.80)	1769.6 (3.93)	1738.2 (3.82)
Sub-total	30344.0 (65.95)	30518.6 (67.11)	31262.3 (69.48)	30708.3 (67.50)
(B) Fixed cost				
Land revenue	120.0 (0.26)	120.0 (0.26)	120.0 (0.27)	120.0 (0.26)
Depreciation on fixed capital	420.0 (0.91)	450.0 (0.99)	520.0 (1.16)	463.3 (1.02)
Rental value of owned land	7000.0 (15.21)	7000.0 (15.39)	7000.0 (15.56)	7000.0 (15.39)
Rent paid for leased land	0.0	0.0	0.0	0.0
Interest on fixed capital (12%)	904.8 (1.97)	908.4 (2.00)	916.8 (2.04)	910.0 (2.00)
Sub-total	8444.8 (18.35)	8478.4 (18.64)	8556.8 (19.02)	8493.3 (18.67)
(C) Cost				
Family labour charges	7221.4 (15.70)	6480.3 (14.25)	5173.8 (11.50)	6291.9 (13.83)
Total cost (A+B+C)	46010.2	45477.4	44993.0	45493.5

***Source*:** Field Survey, 2016 *(Note: Figures in the parenthesis indicates percentage to the total)*

Likewise, in Nigeria all the costs were indicated in Table 4.4; below that, the cost of tomato production per hectare for the small scale farmers is greater than that of the medium farmers which is also greater than that of that of the larger farmers group. The cost of cultivating tomato for the small, medium and large groups of farmers was found to be, Rs.50471.82/ha, Rs.45975.56/ha and Rs.45868.05/ha respectively. The average cost of cultivation in the study area is Rs.47438.48/ha.

Table 4: Distribution of tomato production cost per hectare in the study area of Nigeria

Particulars	Small	Medium	Large	Sample Average
(A) Variable cost charges				
Hired Human Labour	3300.43 (6.54)	2873.75 (6.25)	2674.48 (5.83)	2949.55 (6.22)
Bullock Labour	1787.27 (3.54)	1128.89 (2.46)	591.08 (1.29)	1169.08 (2.46)
Tractor power Used in farm	4049.59 (8.02)	3097.27 (6.74)	3293.50 (7.18)	3480.12 (7.34)
Cost of Seed	6561.37 (13.00)	7217.37 (15.70)	8655.82 (18.87)	7478.19 (15.76)
Manures & Fertilizers	5508.34 (10.91)	4420.54 (9.61)	3417.41 (7.45)	4448.76 (9.38)
Irrigation charges	690 (1.37)	690 (1.50)	690 (1.50)	690 (1.45)
Plant protection	249.52 (0.49)	254.34 (0.55)	254.59 (0.56)	252.82 (0.53)
Interest on working capital (8%)	1771.72 (3.51)	1574.57 (3.42)	1566.15 (3.41)	1637.48 (3.45)
Sub-total	23918.24 (47.39)	21256.73 (46.23)	21143.03 (46.10)	22106 (46.60)
(B) Fixed cost				
Land revenue	150 (0.30)	150 (0.33)	150 (0.33)	150 (0.32)
Depreciation on fixed capital	918 (1.82)	620 (1.35)	865 (1.89)	801 (1.69)
Rental value of owned land	7650 (15.16)	7650 (16.64)	7650 (16.68)	7650 (16.13)
Rent paid for leased land	7650 (15.16)	7650 (16.64)	7720 (16.83)	7673.33 (16.18)
Interest on fixed capital (12%)	1964.16 (3.89)	1928.40 (4.19)	1966.20 (4.29)	1952.92 (4.12)
Sub-total	18332.16 (36.32)	17998.40 (39.15)	18351.20 (40.01)	18227.25 (38.42)
Cost (C)				
Family labour charges	8221.42 (16.29)	6720.43 (14.62)	6373.82 (13.90)	7105.22 (14.98)
Total cost	50471.82	45975.56	45868.05	47438.48

Note: *Values in the parentheses are percentages and all values are converted to Indian Rupees from Nigerian Naira.*

Cost Concepts of the Different Sample Farms in Different Size Groups

The result obtained on Table 4.5; below reveals that, the average costs (Cost A, Cost B and Cost C) per hectare in study area of India are, Rs.30708.33/ha, Rs.493.33/ha, and Rs.6291.86/ha respectively. These indicate that all the different components of the cost concepts are found to be higher in the small size group, followed by medium and finally the large group.

Table 5: Cost Concepts for Tomato production per hectare in study area of India (Rs.)

S. No.	Cost Concepts	Size of Farms Group			Sample Average
		Small	Medium	Large	
1	Cost A (variable costs)	30344.01	30518.64	31262.34	30708.33
3	Cost B (Fixed cost)	8444.80	8478.40	8556.80	8493.33
4	Cost C (Family labour cost)	7221.42	6480.33	5173.82	6291.86
Total Cost		46010.23	45477.37	44992.96	45493.52

***Source*:** Field Survey, 2016 *(Note: Figures in the parenthesis indicates percentage to the total)*

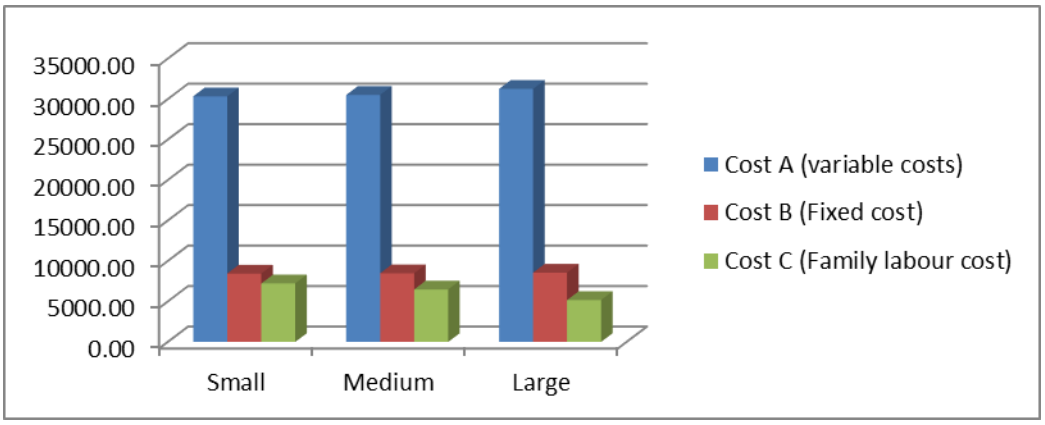

Fig 1: Distribution base on cost of production per hectare in study area of India

Likewise in the study area of Nigeria, the same method of evaluation and costing which have become conclusive in the field of farm management studies in India was adopted and used for estimating the cost concepts in Nigeria too. The result obtained on Table 4.6; and Figure 4.2; below reveals that, the average costs (Cost A, Cost B and Cost C) per hectare are, Rs.22106.00/ha, Rs.18227.25/ha, and Rs.7105.22/ha respectively. These indicate that, all the different components of the cost concepts are found to be higher in the small size group, followed by medium and finally the large group as obtained in India. The average total cost of tomato production in the area regardless of farm size group was found to be Rs.47438.48/ha.

Table 6: Cost Concepts for Tomato production per hectare in study area of Nigeria (Rs.)

S. No.	Cost Concepts	Size of Farms Group			Sample Average
		Small	Medium	Large	
1	Cost A	23918.24	21256.73	21143.03	22106.00
3	Cost B	18332.16	17998.40	18351.20	18227.25
4	Cost C	8221.42	6720.43	6373.82	7105.22
Total Cost		50471.82	45975.56	45868.05	47438.48

Note: *Values in the parentheses are percentages and all values are converted to Indian Rupees from Nigerian Naira.*

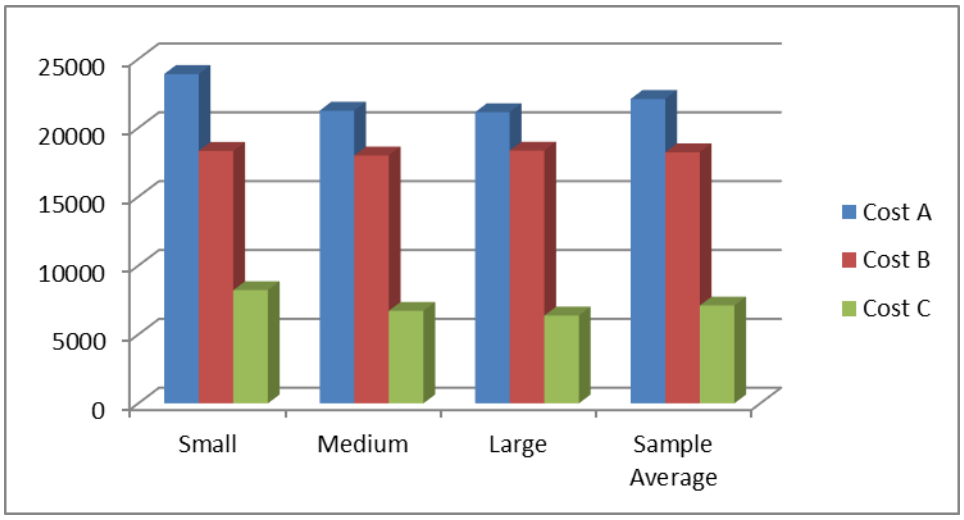

Fig 2: Distribution base on cost of production per hectare in study area of Nigeria

Measure of Farm Income

Table 4.7; below reveals that the gross income generated for tomato production per hectare is found to be higher in Small (Rs.137891.25/ha) farm size group than the Medium (Rs.156951.45/ha), and Large (Rs.183798.35/ha) groups. An average output or yield in quintals per hectare was also found to be 324.45qtls/ha, 337.53qtls/ha and 356.89qtls/ha for small, medium and the large group of farmers respectively with a total sample average yield quantity of 339.62qtls/ha for all groups. The result also reveals a total sample average Net Income, farm business income, farm investment income and family labour income as, Rs.114053.50/ha, Rs.15030.06/ha, Rs.121963.50/ha, and Rs.6291.86/ha. This also indicate that incomes are higher in the large groups of farmers than the medium and small groups and tomato production in the area is highly profitable as it indicate a benefit cost ratio of 1:3.0, 1:3.5and 1:4.1 for small, medium and the large groups respectively, with a total sample average of 1:3.5.

Table 7: Measures of farm income across different size farm groups in India study area

S. No.	Income measures	Size of Farms Group			Sample Average
		Small	Medium	Large	
1	Yield (qtls/ha)	324.45	337.53	356.89	339.62
2	Rate (Rs./qtls)	425.00	465.00	515.00	468.33
3	Gross Income (Rs/ha)	137891.25	156951.45	183798.35	159547.02
4	Net Farm Income (Rs/ha)	91881.02	111474.08	138805.39	114053.50
5	Farm Business Income (Rs/ha)	15939.01	15207.80	13943.39	15030.06
6	Farm Investment Income (Rs/ha)	99785.82	119382.48	146722.19	121963.50
7	Family Labour Income (Rs/ha)	7221.42	6480.33	5173.82	6291.86
8	Total cost	46010.23	45477.37	44992.96	45493.52
9	Cost - Benefit ratio	1:3.0	1:3.5	1:4.1	1:3.5

***Source*:** Field Survey, 2016

Likewise for the study area in Kano state of Nigeria, result on Table 4.8 below reveals that, the Gross income or revenue generated from tomato production per hectare is higher in Small (Rs.196118.3/ha) size farm group than the Medium (Rs.165618.97/ha) and Large (Rs.153452.55/ha) groups. An average output or yield in quintals per hectare was also found to be 304.05qtls/ha, 248.95qtls/ha and 237.55qtls/ha for small, medium and the large group of farmers with total sample average yield quantity of 263.52qtls/ha for all groups respectively. The result also reveals a total sample average Net Income, farm business income, farm investment income and family labour income as, Rs.124291.47/ha, Rs.16392.70/ha, Rs.133894.39/ha, and Rs.7105.22/ha. This also indicate that incomes are higher in the large groups of farmers than the medium and small groups as seen on the table and figures below.

Table 8: Measures of farm income across different size farm groups in Nigeria study area

S. No	Income measures	Small	Medium	Large	Average
1	Yield (qtls)	304.05	248.95	237.55	263.52
2	Rate(Rs./Qts)	645.02	665.27	645.98	652.09
3	Gross Income (Rs)	196118.3	165618.97	153452.55	171729.95
4	Net Farm Income (Rs/ha)	145646.5	119643.40	107584.50	124291.47
5	Farm Business Income (Rs/ha)	17643.14	15945.00	15589.97	16392.70
6	Farm Investment Income(Rs/ha)	155260.67	129221.80	117200.70	133894.39
7	Family Labour Income (Rs/ha)	8221.42	6720.43	6373.82	7105.22
8	Cost of Cultivation/ha	50471.82	45975.56	45868.05	47438.48
9	Cost - Benefit ratio	1:3.9	1:3.6	1:3.3	1:3.6

Sourced: *Field survey, 2016*

4. Conclusion

It can be concluded that the profitability of tomato is higher in the study area of Nigeria as it had the highest Gross income and Net return (Rs.171729.95/ha and Rs.124291.47/ha) to tomato production than in the study area of India (Rs.159547.02/ha and Rs.114053.50/ha)on an average. Hence, we can also see that there is a decrease in cost of production along the farm size groups from small, medium to the large group.

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