ECONOMIC ANALYSIS OF IRISH POTATO (*Solanum tuberasum*) PRODUCTION UNDER IRRIGATION SYSTEM IN KATSINA METROPOLIS, KATSINA LOCAL GOVERNMENT AREA, KATSINA STATE

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ABSTRACT

A survey on economics analysis of Irish Potato (*Solanum tuberasum*) Production under irrigation system in Katsina Metropolis Katsina Local Government Area was carried out. Six communities were purposively selected due to the production of Irish potato. The communities were Kofar Sauri, Kofar Durbi, Kofar Marusa, Filin Samji, Rafukka and Yammawa. A simple random sampling was employed in selecting the farmers were by ten (10) farmers were randomly selected from each community which gave a total of sixty respondents. The data were obtained using structured questionnaire and subjected to descriptive statistics, gross margin and net farm income analysis. The research describes the socio economic characteristic of the respondents in which the respondents were within the mean age of 41 years. The result also showed hundred percent of the respondents were male, 66.6% were married, 30%, 31.6%, 33.3% and 5% had qur'anic, primary, secondary and tertiary education respectively. The result also showed that 90% of the respondents' source their initial income for production of Irish potato from personal saving and 48.3% source information from mass media. The research also described the production characteristic of the respondents were majority (51.6%) cultivate 0.2-0.4ha, 81.6% acquired their land by inheritance, 88.3% practice sole cropping and 48.3% used family labor. Net Farm Income analysis revealed that Irish potato production in the study area is profitable with Net Farm Income of N5798.83, ₦21555.35 and ₦65399.48 for 0.2-0.4ha, 0.5-0.7ha and 0.8-1ha. The result further reveals that manure and fuel contributed toward the output for 0.2-0.4ha, manure, fuel, water and labour contributed for 0.5-0.7ha and manure, water and labour for 0.8-1ha. The result also identified some constraints to Irish potato production such as inadequate fertilizer, poor storage facilities, pest and diseases, inadequate extension advice, poor canal maintenance, inadequate capital, poor cooperation, adulteration of farm input, and marketing problem. Conclusively, net farm income result shows that Irish potato production is profitable in the study area. It is recommended that research into way of improving the method of storage should be promoted.

Keywords:

INTRODUCTION

Agriculture is the foundation of human economy and the history of progress of human life is related to that of agricultural de-

velopment, which serves as the origin of any modern economy (Muhammad & Atte, 2006). The agricultural sector has continued to make modest contribution to the provision of food and livelihood to majority of Nigerian despite the overarching influence of oil sector on overall national income generation. Therefore, the contribution of agriculture to the gross domestic product, food supply and economy cannot be underestimated (Orunmuyi, 2004) Arable crop production such as legumes, cereals, roots and tubers, are important toward achieving food self sufficiency and improving peoples standard of living (Mabel, 1999).

Irish Potato botanically known as *Solanum tuberasum* belongs to the family solanaceae and originated from Latin America. The Incas who live in the Andes mountain of Peru and Bolivia, know potato as their staple food. The crop ranks fourth after rice, maize and wheat in terms of production volume (Oferi & Hahn, 1994). Potato does best in the regions with maximum temperature as high as 30^0c and minimum of about 15^0c (Akoroda & Ngere, 1998). Potato has the highest production among the tropical root crop in the world in terms of tonnage of output. However, only 18% of the world production of potato is produced in the tropic, the bulk of production is concentrated in the developed nations of the temperate world (Oferi & Hahn, 1994).

In Africa where much of the population depend on roots and tubers, available statistics of 1990 indicated that 66% of the world production of root crop (589 million tons) was produced in developing countries with Africa accounting for 20% of the world total or 29% of the developing world total (Oferi & Hahn., 1994).

Total production in Nigeria is not precisely known. However, (Okonko, Asumugha & Okoli 1991) estimated that about 0.4 million metric tons of potato were produced in 1991. In Nigeria, potato is essentially produced under the rainfall condition or in fadama (swampy area) in the dry season. Now it can be grown all year round especially with irrigation system which is capable of lengthening crop season in arid, semi arid and even moist sub-tropical land as well as providing all year round employment opportunities in agriculture (Akoroda & Hahn, 1998).

Objective of the study
The main objective of this study is to determine the economics of Irish potato production under irrigation system in the study area. While the specific objectives are to:

1. describe the socio-economic characteristics of Irish potato producers in the study area;
2. describe the production techniques of Irish potato;
3. evaluate the costs and returns to Irish potato production;
4. determine the input output relationship;
5. describe the constraints militating against Irish potato production in the study area.

METHODOLOGY
The Study Area
The study area is Katsina metropolis which is geographically located in Sudan savannah zone in the northwestern part of Nigeria between latitude 11^0 7' and 13^0 22'N and longitude 6^0 52' and 9^0 2'E. It shares border with Kaduna State to the south, Niger republic to the north, Zamfara State to the west, Kano and Jigawa States to the east. The state covers a total land area of about 23,983 sq. km

with a total population of about 5,792 578 (NPC, 2006). On the basis of weather and climatic condition of the state, the temperature ranges between 27.2 to 37^{0}c with an annual rainfall of about 100-110cm. The Harmattan period is between November to February, with a dry wind from January to April, signaling the arrival of the rainfall. Crop and livestock farming are the major occupation of the people. The main crop grown include cotton, millet, sorghum, maize, cowpea, potato, groundnut etc. while the livestock reared include cattle, sheep, goat and poultry (Katsina State House of Assembly Diary, 2006)

Sampling Technique

Six communities were purposively selected due to the concentration of Irish potato production in the metropolis. On that basis Filin Samji, Kofar Sauri, Kofar Durbi, Rafukka, Yammawa and Kofar Marusa were selected. Ten farmers were randomly selected from each community and interviewed using structured questionnaire making a total of sixty respondents.

Data Collection

The information required were collected with the help of a structured questionnaire which serve as a means of primary data collection. Data were collected on socio- economic characteristic such as age, sex, marital status, and educational level, source of income, source of information, contact with extension agent and initial capital of the respondents. Data on Production characteristics such as farm size, method of land acquisition, cropping system, laboar used, land preparation methods, source of nutrient, planting methods, methods of weed control and used of pesticide were also collected. Cost and Return information were also collected. Others include constraints

associated with Irish potato production and possible solutions.

Data Analysis

The analytical tools used to analyze the data obtained during the survey include descriptive statistic, net farm income and regression analysis.

Descriptive statistics: descriptive statistics such as mean, percentage and frequency distribution were used to analyze objective 1, 2 and 5, net farm income was used to achieve objective 3 and regression was used to achieve objective 4.

Model specification
Net farm income (NFI) can be determined by subtracting the total fixed cost (TFC) from the total gross margin (GM) of the whole farm or all the enterprises.
NFI = GM – TFC……………………… (I)

Where
NFI = Net Farm Income (₦/ha)
TFC = Total Fixed Cost: are cost incurred on fixed inputs which cannot be used up during one production process such as land, building, fences, road etc (Olukosi & Ogunbile, 1989).

GM = Gross Margin: by definition is the difference between gross income (GI) and the total variable cost (TVC).
GM = GI - TVC…………………….. (II)

Where
\\\\GM = Gross Margin (₦/ha)
GI = Gross Income also called total value of production: is the total physical product multiply by the unit price of the product.
TVC = Total Variable Costs: are cost incurred on variable inputs which can be contributed to specific enterprises and vary ac-

cording to output such as labor, fertilizer, seeds (Olukosi & Erhabor, 1989)

Regression
Multiple Regression Model: multiple regression analysis was used to achieve objective (iv). The data was also subjected to functional form such as semi-log and double log model and the lead equation among the functional form was used. Koutsoyianus, (2003) reported that the functional form which gives the best fit based on R^2 value, the number of significant independent variable, t-value, F-value and the theoretical a priori expectations would be selected as the lead equation upon which further analysis will be based. The regression model is presented as:

$$Y = \beta_1X_1+\beta_2X_2+\beta_3X_3+\beta_4X_4+\beta_5X_5+\beta_6X_6+\beta_7X_7\beta_8X_8+U$$

Where Y = yield of Irish Potato (kg)
X_1 = quantity of fertilizer (kg)
X_2 = quantity of seed (kg)
X_3 = quantity of manure (kg)
X_4 = quantity of herbicide (kg)
X_5 = quantity of pesticide (litre)
X_6 = quantity of fuel (litre)
X_7 = quantity of water (litre)
X_8 = amount of labour (man-days)
U = Stochastic term
β_1- β_7 = Regression Coefficient

RESULTS AND DISCUSSION
Socio Economic Characteristics of Potato Producers in the Area
The socio economic characteristics of Irish potato were presented in Table1.
Age: The result showed that 48.3% of the respondents fall within the age range of 34-48 years, 33.3% fall within 19-33 age range while 18.3% fall within 49-63 age range. This implies that majority of the respondents were within their active productive age. It is expected that their age may have effect on their productivity and responsibilities as reported by FAO (2004) which says that economic productive age is between 15-54 years which enable good decision making.
Gender: All the respondents (100%) were male. This has to do with the culture and religion of the people in the study areas. This agreed with the findings of (Ewa & Agu, 1998) who reported that the economic status and contribution of women is less in developing countries due to their continuous dependence on their male counterpart and the social arrangement of their society.

Marital status: Majority of the respondents (66.6%) were married while 33.3% were single. Morale (1996) noted that there is a trend for rural youth to start having responsibilities at an early age than urban youth. The tendency to marry early help in building a virile farming population which also agreed with the assertion of Morale (1990) who reported that that young people in rural areas get married earlier than their urban counterpart.

Educational level: The result reveals that 33.3% of the respondents acquired secondary education, 31.6% acquired primary education, 30% acquired quranic education and 5% acquired tertiary education. Education is an important ingredient in economic development of any society. Thus it gives awareness and better persuasion and adoption of innovation, hence better improvement in production (Adams, 1992).

Initial Source of income for production of Irish potato: Majority (90%) of the respondents source their income from personal saving, 5% source their income from friends, 3.3% from Agricultural Banks while 1.6% source from private money lenders. An individual's level of saving will determine his

level of investment (Adegeye & Dittoh, 1982).

Source of information: Mass media serve as source of information to 48.3% of the respondents, 18.3% from extension agents, and another 18.3% from neighbors while 15% from sale promoters Radio and television were most frequently identified source of awareness of information (Abubakar, Ango, & Buhari, 2009).

Contact with extension agents: majority (85%) of the respondents had no contact with the extension agent while 15% had contact with extension agent. Extension officers at any level have direct effect in the innovation of the farmers (Roger, 1998).

Initial capital: Majority of the respondents (60%) had their initial capital ranges within ₦7000 – ₦20000, 20% fall within ₦21000–₦34000, 16.6% fall within ₦35000–₦48000 while 3.3% fall within ₦49000–₦62000. Inadequate access to credit may be responsible for the low income of the farmers (Anthony & Fred, 1986).

The production characteristics are presented in table 2

Farm size devoted for the production of Irish potato: the result reveals that 51.6% devoted only 0.2–0.4ha of land for the production of Irish potato, 43.3% devoted 0.5–0.7ha and 5% devoted 0.8–1ha. Farms are generally small in most peasant economy (Igben, 1988). From the results it shows that the respondents are small scale producers.

Method of land acquisition: the result reveals that majority of the respondents (81.6%) acquired their land through inheritance, 18.3% acquired their land through borrowing. Land tenure by inheritance usually result in fragmentation of plots of land, which resulted into small scale production as a result of small farm size holding thereby preventing the farmers from benefiting from economic of scale (Bain, Athwal & Gupta, 1998).

Farming method: Sole cropping is one of the cropping systems practiced by 88.3% of the respondents, followed by 11.6% who practiced mixed cropping.

Labour used: The result indicated that 48.3% of the respondents used family labour, 40% used hired labour while 11.6% used both family and hired labour for their farming activities. Family labour is the most important component of labour in small farmer's production which is the most predominant in Nigeria and most parts of Africa (Oluyode & Lawal, 2010).

Method of land preparation: Majority (85%) of the respondents used manual method of land preparation and 15% used mechanized method of land preparation. The hand hoe is still the most common tillage implement among small scale farmers Rowland, 1993).

Number of seed planted per hole: Majority (85%) of respondents planted one pieces of seed per hole, while 15% used to plant single tuber per hole. In addition 100% of the respondents used improve varieties of seed.

Source of nutrient to the soil: majority (70%) of the respondents used manure to supply nutrient to the soil while 30% used

Table 1: Socio Economic Characteristic of Respondents

Characteristics	Frequency	Percentage (%)
Age distribution		
Class interval		
19 – 33	20	33.3
34 - 48	29	48.3
49 - 63	11	18.3
Total	60	100
Marital status		
Married	40	66.6
Single	20	33.3
Total	60	100
Educational background		
Qur'anic	18	30
Primary	19	31.6
Secondary	20	33.3
Tertiary	03	05
Total	60	100
Initial source of income for production		
Personal saving	54	90
Friends	03	05
Agricultural bank	02	3.3
Private money lenders	01	1.6
Total	60	100
Source of information		
Mass media	29	48.3
Extension agents	11	18.3
Neighbor	11	18.3
Sale promoters	09	15
Total	60	100
Contact with extension agent		
Contact with	09	15
Not contact	51	85
total	60	100
Initial capital (₦) range		
7000 – 20000	36	60
21000 −34000	12	20
35000 – 48000	10	16.6
49000 – 62000	02	3.3
Total	60	100

(chemical fertilizer as a source of nutrient to the soil. Manure is one of the nutrient sources to the peasant farmers (Frances, 1999)

Method of weed control: majority (78.3%) used manual method to control weed. In Nigeria, more than 90% of small scale farmers used manual method in controlling weed (Mutambra, Ayoola, Ejembi, Avav, Masuongo & Moyo, 2013).

Insect Pest control: the result indicated that 83.3% of the respondents do not used insecticide to control the effect of insect while 16.6% used insecticide.

Cost and Return of Irish Potato Production in the study Area

Table 3 shows the cost and return of Irish potato in the study area base on the three categories of farm size. The first category which is 0.1-0.4ha has an average total cost of N34,973.14 and gross income of N40,771.97. The net farm income was computed to be N5,798.83 and return per naira invested of N1.16 which shows that the production is profitable. The second category was 0.5-0.7ha which has an average total cost of N 63,224.03 and gross income of N84,779.38. The Net farm income was found to be N21,555.35 with a return per naira invested of N1.34 which shows that the production is profitable. The third category was 0.8- 1ha which has an average total cost of N71,551.35 and gross income of N136,950.83. The net farm income was calculated to be N 65,399.48. Though Irish potato production can be established as a profitable enterprise, because for every one naira invested in Irish potato production, a profit of 0.83 kobo is realizable (Investment Opportunity in Nigeria, 2010).

Input Output Relationship

Table 4 shows input output relationship based on the farm size. The first category which comprises of 0.1 – 0.4ha reveals that semi log model fitted the data with positive coefficient for manure and significant at p<0.01 implying that increase in unit quantity of manure will increase the output and the coefficient of fuel was found to be negative and significant at p<0.05 meaning that decrease in the unit quantity of fuel will increase the output. The second category which comprises of 0.5 – 0.7ha, shows that linear model best fitted the data with positive coefficient for manure, fuel, water and labour and significant at P<0.01, P<0.1, P<0.1 and P<0.01. This implies that increase in unit quantity of manure, fuel, water and labour will increase the output. The third category which comprises of 0.8 – 1ha reveals that semi log best fitted the model with positive coefficient for manure and labour and significant at P<0.05 and P<0.01 meaning that increase in such variable inputs will increase the output, whereas water was found to be negative and significant at P<0.05 implying that decrease in the quantity of water will increase the output.

Table 2: Production Characteristics of Irish Potato Producers

Production Characteristics	Frequency	Percentage (%)
Farm size (ha)		
0.2 – 0.4	31	51.6
0.5 – 0.7	26	43.3
0.8 – 1	03	05
Total	60	100
Method of land acquisition		
Inherited	49	81.6
Borrowed	11	18.3
Total	60	100
Cropping system		
Sole cropping	53	88.3
Mixed cropping	07	11.6
Total	60	100
Labor used		
Hired labor	24	40
Family labor	29	48.3
Both	07	11.6
Total	60	100
Method of land preparation		
Manual	51	85
Mechanized method	09	15
Total	60	100
Source of nutrient		
Chemical fertilizer	18	30
Manure	42	70
Total	60	100
Number of seed planted		
One seed	09	15
Pieces	51	85
Total	60	100
Method of weed control		
Manual	47	78.3
Herbicide	04	6.6
Both	09	15
Total	60	100
Insect pest control		
Not used of insecticide	40	83.3
Used of insecticide	20	16.6
total	60	100

Table 3: Gross Margin of Irish Potato in the Study Area

Farm size	0.2-0.4ha		0.5-0.7ha		0.8-1ha	
Items						
Variable item (A)	Cost(₦)	Percent-	Cost(₦)	Percent-	Cost(₦)	Percentage
Inorganic fertilizer	8772.57	25.00	9716.26	15.36	13500.00	18.86
Organic fertilizer	1962.51	5.60	3295.04	5.21	2685.56	3.75
Pesticide	353.70	1.00	639.92	1.01	800.00	1.11
Herbicide	3487.50	9.97	3546.12	5.61	500.00	0.69
Seed	9715.09	27.77	15823.69	25.02	23552.00	32.91
Fuel	1495.81	4.27	3037.57	4.80	4364.00	6.09
Labour	6578.32	18.80	22958.58	36.31	22990.00	32.13
Total	32365.50		59017.18		68391.56	
Fixed item (B)						
Hoe	42.76	0.12	45.23	0.07	42.63	0.05
Cutlass	39.71	0.11	31.39	0.04	15.33	0.02
Sprayer	379.30	1.08	1435.69	2.27	430.70	0.60
Irrigation pump	2145.87	6.13	2694.54	4.26	2671.13	3.73
Total (B)	2607.64		4206.85		3159.79	
Total cost (A+B)	34973.14	100	63224.03	100	71551.35	100
Gross Income	40771.97		84779.38		136950.83	
Gross Margin	8406.47		25762.20		68559.27	
Net farm income	5798.83		21555.35		65399.48	
Return per Naira	1.16		1.34		1.91	

Table 4: Input Output Relationship

Farm size	0.1 – 0.4ha			0.5 – 0.7ha			0.8 – 1ha		
Variable	B	SE	Sig	B	SE	Sig	B	SE	Sig
Constant	2.552	.209	.000	245.661	207.878	.254	2.859	.057	.000
Fertilizer (kg)	-4.063E	.000	.785	.537	.473	.272	.000	.000	.313
Seed (kg)	-3.088E	.000	.907	.097	.082	.255	2.151E	.000	.356
Manure (kg)	.001	.000***	.000	1.041	.261	.001***	.000	.000**	.002
Pesticide (litre)	-.030	.094	.753	156.753	91.359	.104	.037	.025	.162
Fuel (litre)	-.184	.074**	.022	206.386	105.495	.067*	.049	.029	.109
Herbicide (litre)	-.002	.003	.362	-.184	4.805	.970	-3.357E	.001	.980
Water (litre)	-3.342E	.000	.353	.000	.000	.060*	-8.749E	.000**	.039
Labour (man days)	-.002	.003	.552	13.550	2.742	.000***	.003	.001***	.000
R Value	.940			.939			.930		
R² Value	.884			.881			.865		
R² Adjusted	.838			.825			.801		

***1%   **5%   *10%

Constraints Associated with Irish Potato Production in the study Area

Table 5 shows the constraints militating against the production of Irish potato in the area with poor storage facilities as first problem, followed by inadequate chemical fertilizer to the fifth problem which is inadequate extension personnel.

Table 5: Constraints Associated with Irish Potato Production in the Study Area

Constraints	Frequency (n=60)	Percentage (%)	Ranking
Inadequate improve seed	2	3.3	7th
Inadequate chemical fertilizer	23	38.3	1st
Inadequate capital	6	10	5th
Poor storage facilities	11	18.3	2nd
Problem of pest and disease	8	13.3	4th
Inadequate extension workers	11	18.3	2nd
Poor canal maintenance	10	16.6	3rd
Inadequate capital	2	3.3	7th
Poor cooperation	5	8.3	6th
Adulteration of inputs	1	1.6	8th
Marketing problem	1	1.6	8th

*multiple response

CONCLUSION AND RECOMMENDATION

Base on the findings of this study it can be concluded that Irish potato production is profitable in the study area despite the fact that some of the variable inputs used in the production such as manure, fuel, water and labour were underutilized. It is recommended that other variable inputs such as water and fuel should be utilized properly for optimum production and research into way of improving the method of storing the product should be promoted.

REFERENCES

Abubakar, B.Z, Aango, A.K & Buhari, U. (2009). The Role of Mass Media in Disseminating Agricultural Information to Farmers in Birnin Kebbi Local Government Area of Kebbi State. A case study of Fadama II Development Project. *Journal of Agricultural Extension.* 13(2)

Adams, M.E. (1992). Agricultural Extension in Developing Countries. Longman Publisher. London.

Adeyege, A.J. & J.S. Dittoh (1982). Essential Agricultural Economics. Impact

Publisher Nigeria limited, Ibadan.

Akoroda, M.O. & J.M. Ngere (1998). Root crop in the 21 century Benin: International Society for Tropical Root Crop Anthony, Y & O.C. Fred (1986). Introduction to Tropical Agriculture. Longman group ltd, China

Bain K.S., D.S. Athwal & V.P. Gupta (1998). Combining ability of pearl millet in breeding in relation to genetic diversity of male sterile line. *Journal of Research, P A V. Ludhiana 4: 192*

Ewe, U. & Agu, G.A. (1998). New system economics senior secondary course. Africana Onitsha Nigeria: First Publisher Ltd. Pp. 215-219

FAO. (1994). FAOSTAT. Agricultural data. (http://app.fao.org/cojb-bin.p/?subset=agric) FAO, Rome Italy.

Frances, H. (1999). Nutrient Management Strategies of Small-holder Farmers in a short-fallow Farming System in North-East Nigeria. *The Geographical Journal.* 165(3): pp275-285

I.O.N (2010). Processing and Packaging of Potato for Profit, the Opportunities. Farriconsulting.blogspot.com/2010/09/processing and packaging of potato for profit.html

Igben, M.S. (1988). The Nigerian Farmers and Agricultural Institution. Akinole printing works, Ibadan.

Katsina State House of Assembly Diary (2006). Brief on Katsina State house of Assembly from 5th June 2003 to December, 2005.

Koutsoyiannis, A. (2003). Theory of Econometrics. Second Edition. Palgrave Limited. PP24-25

Mabel, A.O. (1999). Food from root crop and other crop. Imo Nigeria: New Africa publishing company limited

Mansur, A. (1996). Economic of Crop Production under Traditional Small Scale Irrigation. A case study of Shale Fadama Dundaye of Sokoto State. Unpublished B.sc project Department of Agricultural Economics and Extension, Usman Danfodio University Sokoto.

Mohammad, B.T & Abdulquadri, A.F (2012). Comparative Analysis of Gender Involvement in Agricultural Production in Nigeria. *Journal of Development in Agricultural Economics.* 4(8): pp. 240-244

Muhammad, L.A. and Atte, O.A. (2006). An Analysis of Agricultural Production in Nigeria. *African Journal of General Agriculture.* (2)1

Mutambara, J., Ayoola, G.B. , Ejembi, E. P. , Avav, T. , Masuongo, j.& Moyo, S. (2013). Production and Productivity of Maize Subjected to Modern and Traditional Method of Weed Control Options in Federal Capital Territory Nigeria. *Journal of Agricultural Extension and Rural Development.* 5(5): pp. 107-114

National Population Commission (2006). Human Population Figure of 2006 Census in Nigeria Federal Republic of Nigeria

Ofori, F. & S.K. Hahn (1994). Tropical root crop in a developing economy. Ghana: international society of tropical root

crop

Okonkwo, J.C, G.N. Asumugha & O.O. Okoli (1991). National Root Crop Research Institute Farm Kuru Jos Plateau Nigeria

Olukosi J.O. & A.O. Ogunbile (1989). Introduction to Agricultural Production and Economic Principle and Application. Zaria Nigeria: Agitab publishers limited

Olukosi, J.O. & P.O. Erhabor (1989). Introduction to Farm Management Economics. Zaria Nigeria: Agitab Publishers Limited

Oluyole, K.A & Lawal, J. O. (2010). Precision Farm Labour for Effective Cocoa Production in Nigeria. *Research Journal of Applied Sciences* 5, 191-194

Orunmuyi, S.K. (2004). Financing Poultry Production in Nigeria. *Journal of animal production.* Nigerian Society for Animal Production.

Roger, S.O. (1998). Agricultural Education in the Tropics. Macmillan publisher, London.

Rowland, J.R. (1993). Dry Land Farming in Africa. Macmillan

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