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ABSTRACT

This paper reports the results of a study of productivity change in Kenyan agriculture. The data span the period from Kenyan independence in 1964 to 1989. Until now, no estimates of productivity for agriculture in Kenya have been available. Both multi-factor and labour productivity measures were constructed. Laspeyres indexing procedures were used. Our results indicate that while total production and input use have grown in the sector, productivity has stagnated through the period. Recent years have witnessed declining productivity. Attempts to use Cline's model to explain variations in productivity were unsuccessful. Coefficients of research and extension expenditures, education and weather variables were found to be statistically insignificant when these variables were regressed on productivity.

Introduction

Primary agriculture is an important sector in the Kenyan economy, employing about 75% of the labour force (Sharma, 1985). In 1988, sectoral contribution to Gross Domestic Product (GDP) was 35% for Agriculture, 14% for Manufacturing and 10% for Commerce (Economic Survey, 1988). Agricultural commodities constitute nearly 70% of Kenya's total exports and earn approximately 42% of the country's foreign exchange (Government of Kenya, 1989).

Since 1964, the Kenyan agricultural sector has undergone considerable structural change. Most of these changes are in the form of institutional arrangements related to the land tenure system. Other changes are related to subdivision of land and a shift from subsistence to cash crop oriented farming by smallholder farmers. Changes related to use of intermediate factors of production such as fertilizers, seeds and machinery have also occurred.

In agriculture, productivity measurement has been used to identify sources of economic growth, as an indicator of technical change and to compare performance of different sectors within a national economy or a given sector between countries. Productivity is one of the major factors contributing to economic growth. At present, no estimates of productivity change are available for Kenyan agriculture. Institutional factors contributing to productivity growth have not been assessed empirically. It is important for policy makers to identify the general trend of agricultural productivity

and to understand factors contributing to this trend. Both multi-factor productivity and labour productivity are analyzed in the present study.

An Economic Overview of Kenyan Agriculture

Kenya straddles the Equator on the East Coast of Africa and is bordered by four countries, Lake Victoria and the Indian Ocean. The country encompasses six distinct agro-ecological zones. Kenya's annual population growth rate, estimated to be 3.9 percent, is one of the highest in the world (Government of Kenya, 1989). The population was 8.4 million in 1962 and has risen to 24 million at the present time (USDA, 1974; Government of Kenya, 1989). Most people live in rural areas where farming is the major economic activity.

Economic Growth Since Independence

During the first decade after independence (1963-1973), GDP growth averaged 7.5 percent per year. Agricultural output grew at 5.4% and manufacturing at 9.9% per year during this period. From 1974 to 1983, GDP growth slowed to about 5% and agriculture grew at 3.7 percent per annum. In 1984/85 season, there was a severe drought and real GDP was seriously affected, resulting in a mere 0.9 percent increase from the previous year.

Crop Production

Crop production is undertaken by most of the rural population and is a major source of rural income (Government of Kenya, 1986). Two types of crops are grown; cash or industrial crops like coffee, tea, pyrethrum, wheat, sisal, and sugarcane and subsistence crops such as maize, beans, sorghum, millet and potatoes. Kenya is generally self sufficient in maize, beans, potatoes, vegetables, milk, beef, meat products.

Table 1: Annual Growth Rates of Real Gross Domestic Product 1964 to 1987* (percent)

Year	Agriculture	Manufacturing	Government	Other Sectors	Gross Domestic Product	Gross Domestic Product Per Caput
1964-71**	4.2	8.2	9.8	6.9	6.5	-0.07
1972	7.6	7.3	12.8	3.6	6.8	-0.26
1973	4.4	14.4	6.3	1.0	4.1	-0.09
1974	-0.2	5.9	6.8	4.0	3.1	-0.01
1975	4.6	4.0	8.5	-0.01	3.1	0.07
1976	3.7	14.0	5.1	2.0	4.2	0.27
1977	9.5	16.0	5.1	6.1	8.2	-0.04
1978	8.9	12.5	6.4	8.4	7.9	-0.2
1979	-0.3	7.6	7.1	7.7	5.0	-0.1
1980	0.9	5.2	5.6	5.2	3.9	0.12
1981	6.1	3.6	5.3	6.9	6.0	0.08
1982	11.2	2.2	3.8	1.4	4.8	-0.15
1983	1.6	4.5	4.2	1.5	2.3	-0.07
1984	-4.0	4.3	2.9	2.7	0.9	0.19
1985	3.7	4.5	4.2	1.5	4.8	0.02
1986	4.9	5.8	6.3	5.4	5.5	-0.05
1987	3.8	5.7	5.7	4.9	4.8	-0.03

* 1964 prices were used for the years 1964 to 1971 while 1982 prices were used for 1972 onwards.

** There were extensive revisions in major series affecting GDP calculatlions in 1972. Any linkages between 1964 and 1982 based series should therefore be interpreted with these revisions in mind.

Source: Government of Kenya "National Development Plan, 1989 to 1993".

Livestock Production

Several livestock production systems are used in Kenya. These range from traditional ranching which is usually nomadic or semi-nomadic, to ranching within clearly defined and fenced borders and to livestock production on mixed farms. Natural grazing is the most common system in low to medium potential areas, while zero grazing[1] is practised in high potential areas. As the value of land increases, farmers are increasingly turning to production of fodder crops, zero grazing and use of purchased feeds. The smallholder sector is an important source of livestock production accounting for over 50 percent of total production (Government of Kenya 1979).

Input Use in Agriculture

Purchased inputs are mainly used in the production of cash crops by large scale farmers (Government of Kenya, 1986, 1989). The most commonly used purchased inputs are inorganic fertilizers, improved seeds, machinery (mainly used by large scale farmers), farm tools (used by smallholder farmers), pesticides and insecticides. Fertilizer use per hectare varies widely from one part of the country to another (Government of Kenya, 1986). Deviations from the recommended quantity and type of fertilizer for different crops has been attributed to the need for improved fertilizer availability and extension education (Government of Kenya, 1986). This shortfall is mainly found among smallholder farmers who apply only one-third of the recommended quantity on coffee and tea. Small holder maize growers use even less, about 5 percent of the recommended level (Government of Kenya, 1986).

On large farms producing maize, wheat and barley, land preparation accounts for up to 50

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[1] Zero grazing is a system of keeping animals in confinement housing or a feedlot. Fodder produced on the farm or commercial feed is then brought to the animals.

percent of the total production costs. This indicates the need for continued availability of appropriate farm machinery and equipment and the need to encourage the most economic use of this costly resource. Most farmers rely on hiring farm machinery for critical farm operations (ILO, 1986; Government of Kenya, 1989).

Land preparation is also a constraint for achieving higher yields by smallholder farmers. Reliance on hand tools makes operations lengthy and energy consuming and hence limits a family to planting 1-2 acres of annual crops. Timeliness is often a problem. Hand tools commonly used are hoes, "pangas" (machetes) and hand drawn oxen ploughs (ILO, 1986). Use of oxen reduces preparation time to less than 40 percent of that required when using hand tools alone. Thus, this markedly expands the area planted and further raises yields to both land and labour. Currently, farming by smallholder farmers is characterized by untimely operations, high energy use and drudgery (ILO, 1986). These factors also contribute to the rate at which the country is experiencing rural to urban migration.

Labour is an important input in Kenyan agriculture. Labour becomes constraining when intensive farming is practised. Labour plays an important part in overall input use in agriculture due to the large number of people engaged in agricultural activities. Due to low machinery use, especially among smallholder farmers, there is substitution among factors with labour taking the largest proportion of input costs.

Technology Used in Agriculture

Traditional agriculture is predominant in most of rural Kenya. However, modernization of agriculture is gradually taking place in the form of adoption of hybrid maize, application of fertilizer and the use of herbicides and pesticides, particularly by small holders (Government of Kenya, 1989). Technology development in Kenya has been directed towards biological innovations (Government

of Kenya, 1989). In the early 1960's, Kenyan scientists adapted high yielding hybrid maize to local conditions. Since then, improved varieties of other crops have come into use. In addition to improving the biological aspect of cultivars, better agronomic practices have also been developed. Effective use of modern technology by smallholder farmers depends on education (Schultz, 1964). The Kenyan government has tried to reduce illiteracy among rural adults by introducing adult education.

Productivity Measurement

Capalbo (1988) has argued that productivity is one of the major factors contributing to economic growth of the agricultural sector in any country. There are two main types of productivity measures; single-factor productivity and multi-factor productivity. Generally, multi-factor productivity measures are more informative because single factor productivity measures do not account for changes in the relative share of each input in the total mix, and therefore do not capture the effects of substitution among inputs.

The Laspeyres indexing procedure was chosen for the construction of both output and input indexes. The Laspeyres index has been used widely in productivity studies in the United States (Griliches, 1964; USDA, 1980) and Canada (Brinkman and Prentice, 1983). The Laspeyres quantity index measures a changing set of inputs or outputs valued in base year prices. Our multi-factor productivity calculations are based on equation (1),

$$MFP_t = (\sum P_{i0}Y_{it}/\sum P_{i0}Y_{i0}) / (\sum W_{j0}X_{jt}/\sum W_{j0}X_{j0}) \ *100 \qquad (1)$$

where

MFP_t = multi-factor productivity index in period t
Y_{it} = ith output quantity in period t
Y_{i0} = ith output quantity in base period
P_{i0} = base period price of output i
X_{jt} = jth input quantity in period t
X_{j0} = jth input quantity in base period

W_{jo} = base period price of jth input

The Laspeyres index approach attributes the change in value of total outputs and inputs results to pure quantity changes, and these changes are attributed to technological progress.

Data Sources

Data were collected from the government ministries dealing with agricultural production and related activities. These include Ministries of Agriculture, Livestock Development, Economic Planning and National Development and Ministry of Finance. Non-Kenyan sources of information include United States Department of Agriculture, which provided part of grain production and price data. FAO Production Yearbooks provided data on crop and pasture acreage. International Financial Statistics Yearbooks provided relevant financial statistics. Yearbook of Labour Statistics and United Nations documents were used to supplement national statistical abstracts for labour data. Other international sources explored included UNESCO, International Labour Organisation and IFPRI[2].

The Output Index

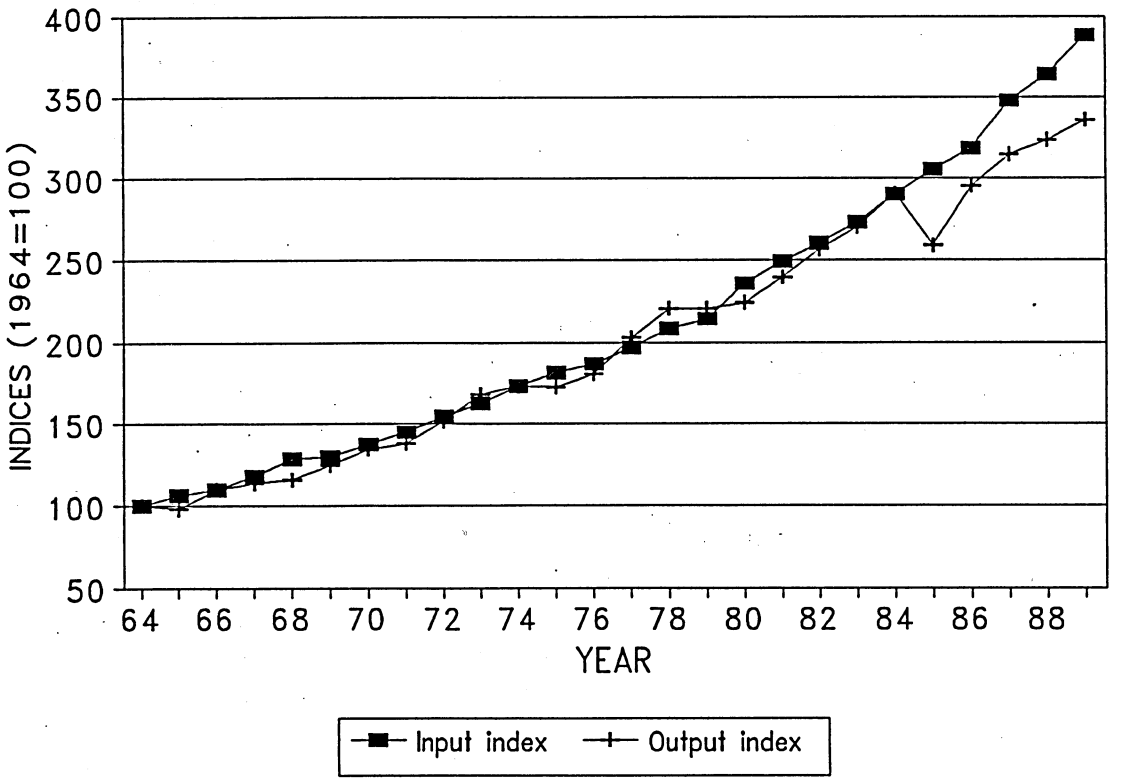
Base period prices were calculated as the average of 1964-1966. Tea, coffee, cotton, wheat, rice, sisal, cane, pyrethrum, maize, beans, sorghum, millet, milk, beef, pork and shoats were included in the output index. The aggregate output index is reported in Table 2 and in Figure 1. With the exception of 1965, the output index series shows an increasing trend up to 1985, when a much lower value is reported. This drop could be attributed to the drought the country experienced in the 1984/85 crop year. However, it is notable that the upward trend was resumed from 1986 to 1989.

[2] Data series used in the productivity calculations are available from the authors on request.

Table 2: Aggregate Output Indexes, (1964 =100)

Year	Output Index	Input Index	Labour Index
1964	100.00	100.00	100.00
1965	97.91	105.86	106.02
1966	109.72	109.92	111.24
1967	113.65	118.04	120.48
1968	115.66	128.36	131.33
1969	124.83	129.77	132.13
1970	134.61	137.12	139.36
1971	137.71	145.09	147.79
1972	151.72	154.17	155.82
1973	167.51	162.48	163.86
1974	172.62	173.01	171.89
1975	172.31	180.92	181.93
1976	180.41	186.01	187.55
1977	202.85	196.51	196.39
1978	220.69	209.02	207.63
1979	220.76	214.94	216.47
1980	224.20	236.15	238.96
1981	239.62	249.27	252.21
1982	256.81	260.42	265.86
1983	270.27	273.57	280.32
1984	291.29	290.47	294.78
1985	259.36	305.87	310.04
1986	295.51	318.58	322.09
1987	315.03	347.75	353.82
1988	323.84	363.96	371.08
1989	335.54	387.77	395.58

Figure 1: Input and Output Index Trends For Kenya, 1964-1989



Input Index

Conventional inputs used in Kenyan agriculture include land, labour, fertilizers, machinery, seeds, pesticides and other purchased inputs. Land prices and a labour quantity series were not readily available and had to be constructed for the current study. A brief explanation of their construction is explained below.

Land

Land area data used were those reported as the area under each crop and livestock commodity included in the output index. No published data are available on land prices in Kenya. The average price of arable land was calculated by taking several per acre land prices from different parts of the country. Results of a small survey were used to provide the information on land prices (Njue, 1992). It was evident from the survey that more densely populated areas recorded higher land prices (Government of Kenya, 1979)[3].

The value of land used in agriculture was calculated by taking crop area and multiplying by land rent per acre. Land rental rate was calculated as 4% of land buying price per acre.[4] Land value for all crops was summed to give aggregate land value. The shortcoming of this method is that variations in the quality of land are not accounted for.

Labour

Labour demand for farming is highly seasonal with peak demand occurring during operations like land preparation, planting and harvesting. During these times, labour may have a high marginal value. At other times of the year, labour may be in surplus.

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[3] Land prices in Kenya vary greatly from one location to another regardless of the fertility level. A possible reason is that price is influenced by population density and the cultures of different tribes rather than soil fertility per se.

[4] Based on Government of Kenya, 1979.

Labour data based on farm surveys which differentiated among farm operators, hired workers and unpaid family labour[5] and which measured seasonal fluctuations in employment would be ideal for a productivity study of this type. Sources of labour data explored were the Ministries of Labour, Agriculture and International Labour Organisation (ILO) documents. There were no labour data available in this form. Therefore, a labour quantity series for the study was developed using population census information.

Labour quantity involved in agricultural activities was calculated by using annual population estimates and the information reported as population in age groups. The participation rate was calculated as the percentage of total population that is economically active. To achieve this, all age groups under 20 years were taken to be either too young to be productive in agriculture or attending school and hence excluded, while those over 65 years were also excluded. The age groups found between the ages of 21 years and 64 years were used to compute the participation rate. This proportion of the population was then corrected for rural to urban migration using the UN population information on percent of population found in the rural areas[6]. The economically active population group was then multiplied by the percentage of population in rural areas. Then 80 percent of the resulting figure was calculated as the part of the population involved in agricultural activities. It was assumed that 20 percent of the population in rural areas are engaged in non-agricultural activities. The labour wage series was derived from the International Yearbook of Labour Statistics reported as the monthly wage rate in Kenyan shillings and includes payment in kind.

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5 Family labour accounts for the highest percentage of rural agricultural labour in Kenya (Government of Kenya, 1989).

6 Studies have shown that in most developing countries, there is a high rate of migration from rural to urban areas in search for better paying jobs, causing the ratio between rural and urban population to vary from year to year.

Other Inputs

Inputs in this group include farm machinery and depreciation, fertilizers, pesticides, herbicides, seeds, containers and other miscellaneous inputs. Farm mechanization in Kenyan agriculture is mainly concentrated among large scale farmers while small scale farmers have lagged behind in machinery application (Government of Kenya, 1989). As an alternative, most of the small scale farmers rely on draft animals and other smaller affordable farm tools. The ideal data on farm machinery should include the total number of wheel and crawler tractors used in agriculture. Capital assets used in farming depreciate and are eventually used up in the production process, hence depreciation is an important element of machinery costs in agriculture (Brinkman and Prentice, 1983). For this study, disaggregated data on the above inputs were not available. Therefore, the study used what was reported as the value of agricultural inputs.

The individual input values for land and labour were calculated by multiplying the quantity series by the base year prices. The aggregate input value was then calculated summing up these values as shown by the denominator of equation 1, all in thousand Kenyan Pounds. Input base value was calculated by adding up all 1964 values. To construct an aggregate input index, all inputs were converted into real values by dividing current values by the GDP deflator and multiplying by 100. The labour index series and the aggregate input index series for the period 1964 to 1989 are reported in Table 2. The aggregate input index shows an increasing trend throughout the period of study from 100 in 1964 to 387.77 in 1989. Figure 1 further illustrates the trend of the input index over the years. From the Figure, input use increased at a faster rate after 1979.

Labour Productivity

The formula used for construction of labour productivity is shown in equation 2,

$$LP_t = (YI_t / L_t) * 100 \qquad (2)$$

where,

LP_t = labour productivity in period *t*
YI_t = output index in period *t*
L_t = labour in period *t*

Labour productivity results are reported in Table 3 and are further illustrated in Figure 2. Labour productivity in Kenyan agriculture has been declining since 1978. The implication is that the labour force in the rural areas may start looking for employment in other sectors of the economy, which could accelerate migration to urban areas.

The output and input index series developed in an earlier section were used to construct the multi-factor productivity index using equation (1). Results of these calculations are shown in Table 3 and in Figure 3. The trend in multi-factor productivity is similar to that of labour productivity. The value of the index ranges from 86.53 in 1989 to 105.58 in 1978. The 1985 value could be attributed to the drought in the 1984/1985 crop year which severely affected yields. Overall, the multi-factor productivity index shows that the sector's performance has been stagnant over the period of study.

Sources of Productivity

Several attempts were made to use regression analysis to account for variations in productivity over the study period, using the procedure developed by Cline (1975). Productivity was regressed against expenditures on research and extension, an index of the education level of farmers and a weather index. Many alternative model specifications and lag lengths were tested. All the regression coefficients were statistically not significant. The same model has been used previously, for instance in United States, Canada and the United Kingdom (see Capalbo, 1988b, Brinkman, 1984 Hunt, 1984, Lu et al., 1979). Results reported in the literature indicate that agricultural research has contributed significantly to the advance of productivity in the primary agricultural sectors of those countries.

Table 3: Labour and Multi-factor Productivity indices for Kenyan Agriculture, 1964 to 1989.

Year	Labour Productivity	Multi-factor Productivity
1964	100.00	100.00
1965	92.32	92.49
1966	98.63	99.82
1967	94.33	96.29
1968	88.07	90.11
1969	94.48	96.20
1970	96.59	98.18
1971	93.18	94.19
1972	97.37	98.41
1973	102.24	103.10
1974	100.54	99.78
1975	94.71	95.24
1976	96.19	96.99
1977	103.29	103.22
1978	106.29	105.58
1979	101.99	102.71
1980	93.82	94.94
1981	95.01	96.13
1982	96.59	98.62
1983	96.41	98.79
1984	98.81	100.28
1985	83.65	84.79
1986	91.74	92.76
1987	89.04	90.59
1988	87.27	88.98
1989	84.82	86.53

Figure 2: Labour Productivity Index
Trend For Kenya, 1964–1989

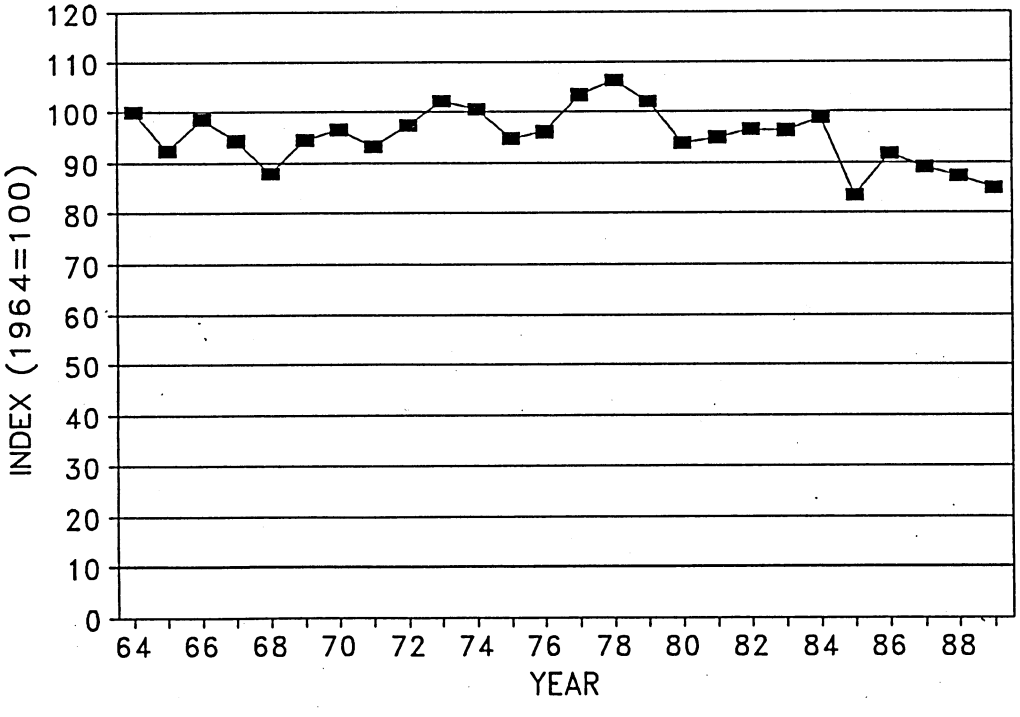
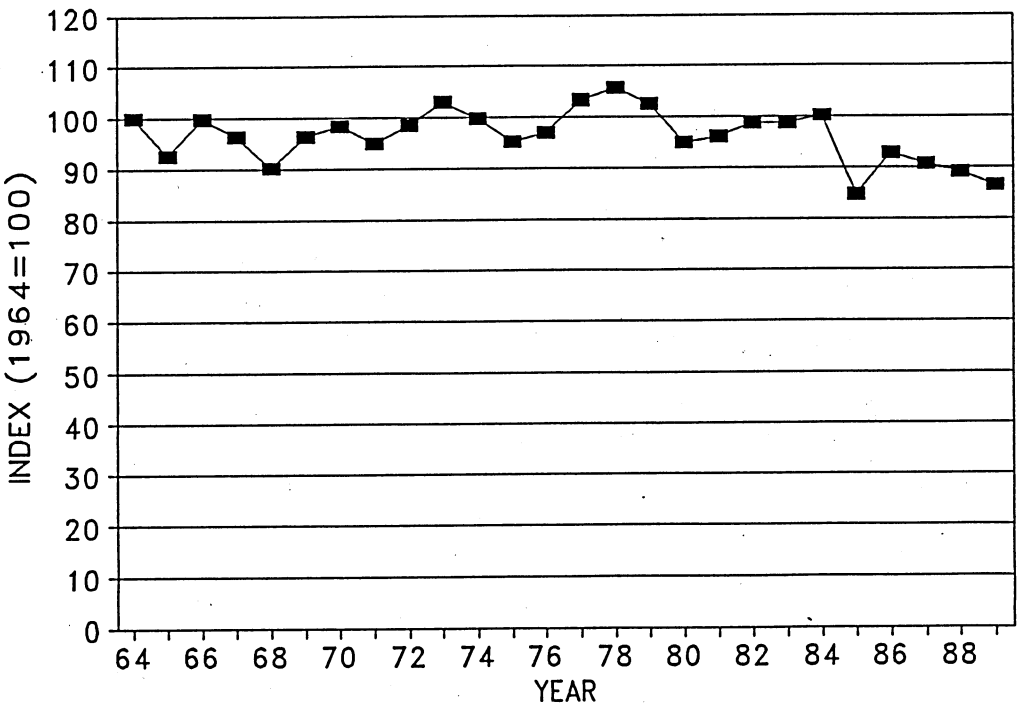


Figure 3: Multi-Factor Productivity
Trend For Kenya, 1964-1989



Further research is needed to explain the lack of correlation between these regressors and productivity in the case of Kenyan agriculture, and to better understand the reasons behind the disappointing productivity results reported above.

Conclusions

This study represents the first attempt to measure productivity change in the agricultural sector in Kenya. Given the lack of previous research in this area for Kenya, we found significant obstacles in data collection. Further refinements of particularly the land and labour input series are needed. Disaggregation of the purchased inputs category, especially the separation of durables from non-durables, could also have significant implications.

Nevertheless, with these caveats, our results indicate that productivity growth in Kenyan agriculture has been disappointing since independence. An evaluation of Kenyan agricultural policies and the management of investments in agricultural research is clearly in order. In particular, the link between government regulation of output and input prices in agriculture and the rate of technological change in the sector needs to be better understood. Improvements in technology delivery and extension education may also be needed.

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APPENDIX

Table A1: Output of Commodities Used for Aggregate Output Index 1964-1989 (metric tons)

Year	Tea	Coffee	Cotton	Wheat	Rice	Sisal	Cane
1964	20,241	44,151	8,800	128,900	13,000	67,400	600,900
1965	19,823	39,440	11,000	143,000	13,200	64,000	517,700
1966	25,419	52,133	11,400	132,200	14,100	64,000	514,600
1967	22,812	53,708	14,400	179,100	16,600	51,300	706,400
1968	29,762	39,224	12,700	238,900	15,900	50,300	947,200
1969	36,111	48,147	14,300	222,600	18,700	49,800	1,300,700
1970	40,178	54,748	17,100	215,500	22,700	43,900	1,451,200
1971	36,290	59,901	14,000	176,900	28,800	44,826	1,378,000
1972	53,322	61,189	16,800	170,300	30,000	41,210	1,062,300
1973	565,778	75,961	17,000	149,600	33,800	58,045	1,545,100
1974	53,440	73,280	16,200	137,900	36,100	85,972	1,719,100
1975	56,730	66,122	15,000	157,800	33,200	42,639	1,654,600
1976	61,984	74,596	16,100	161,900	32,100	33,555	1,652,700
1977	86,291	101,218	15,800	180,700	39,300	33,462	1,889,100
1978	93,373	84,992	16,300	165,900	41,400	31,445	2,349,200
1979	99,275	74,337	27,200	152,500	35,800	36,858	3,147,600
1980	89,893	91,692	27,600	155,100	37,500	46,911	3,172,200
1981	90,941	99,717	38,100	188,800	36,400	41,325	3,822,000
1982	96,033	87,436	25,500	150,000	38,700	50,028	3,107,700
1983	119,173	86,064	24,400	168,800	38,600	49,728	3,285,600
1984	116,172	129,625	25,800	251,300	36,600	51,438	3,611,600
1985	147,094	94,089	22,800	144,400	36,400	44,915	3,463,000
1986	143,317	114,881	38,000	201,100	39,500	41,507	3,551,600
1987	156,000	104941	27,000	254,400	21,300	37,024	3,698,000
1988	164,000	115124	31,300	160,900	30,100	38,238	3,891,300
1989	181,000	118295	32,300	189,600	41,700	37,422	4,204,600

Table A1: continued

Year	Pyrethrum Extract	MAIZE	BEANS	SORGHUM	MILLET	MILK[a]	BEEF	PORK	SHOATS
1964	0.70	229,500	54,689	218,000	125,000	836	120	2,100	20,600
1965	0.60	187,700	56,431	225,000	130,000	838	125	2,310	22,500
1966	1.20	295,700	58,764	231,000	136,000	840	126	22,520	23,800
1967	1.30	403,200	60,742	239,000	141,000	847	127	2,840	24,200
1968	1.30	511,200	59,682	220,000	130,000	838	130	2,880	24,500
1969	1.50	619,200	61,248	205,000	120,000	824	129	2,900	24,800
1970	0.80	727,200	64,237	220,000	130,000	862	132	3,000	25,500
1971	0.90	835,200	64,512	220,000	130,000	895	132	3,100	26,300
1972	0.10	943,200	86,647	230,000	135,000	960	137	3,300	25,300
1973	0.20	105,120	120,352	230,000	135,000	998	141	3,200	24,300
1974	0.20	1,159,200	125,399	219,000	128,000	1,052	143	3,300	25,400
1975	0.20	1,267,200	120,611	219,000	128,000	1,076	131	3,100	29,400
1976	0.20	1,375,200	110,188	223,000	128,000	1,054	145	3,300	32,000
1977	0.20	1,597,100	124,754	220,000	130,000	745	189	3,500	36,800
1978	0.10	1,671,400	199,247	221,000	130,000	1,081	192	3,300	43,500
1979	0.10	1,620,000	184,463	186,000	110,000	1,106	192	5,800	45,900
1980	0.10	1,606,500	166,227	200,000	80,000	1,126	193	3,800	48,100
1981	0.20	1,888,300	195,854	94,000	52,000	1,207	167	4,200	49,100
1982	0.20	2,560,000	325,102	56,000	30,000	1,221	187	4,100	51,600
1983	0.30	2,450,100	333,489	35,000	30,000	1,380	206	2,870	46,570
1984	0.10	2,214,800	308,776	98,000	10,000	1,465	236	3,130	51,740
1985	0.10	1,500,000	225,117	120,000	60,000	1,263	220	2,770	51,240
1986	0.10	2,440,300	324,613	122,000	41,000	1,329	174	2,400	45,070
1987	0.10	2,609,400	435,769	111,000	66,000	1,378	160	3,630	54,720
1988	0.10	2,732,100	355,798	144,000	72,000	1,407	253	3,270	58,410
1989	0.10	2,743,800	298,166	143,000	60,000	1,437	264	3,240	60,410

[a] Milk production is reported in million litres.

Sources: Government of Kenya, Central Bureau of Statistics. Statistical abstracts, various issues;
United States U.S. Department of Agriculture, ERS, International Section;
FAO Production Yearbooks various issues.

APPENDIX

Table 2: Input Quantities Used for Aggregate Input Index (constant 1985 Shillings)

Year	Value of Purchased Inputs[a] ('000K£)	Labour Quantity[b] (in mn man years)	Land Area (hectares)
1964	52,657	2.49	5,344,826
1965	54,631	2.64	5,126,206
1966	48,085	2.77	4,945,211
1967	44,294	3.00	5,054,994
1968	46,139	3.27	5,500,576
1969	51,291	3.29	5,636,813
1970	56,168	3.47	5,630,609
1971	56,984	3.68	5,653,203
1972	69,733	3.88	5,696,837
1973	76,060	4.08	5,796,299
1974	100,650	4.28	5,828,301
1975	89,000	4.53	5,842,397
1976	87,323	4.67	5,952,292
1977	105,475	4.89	5,979,536
1978	121,369	5.17	6,098,215
1979	102,762	5.39	6,135,097
1980	105,133	5.95	6,117,516
1981	110,447	6.28	6,169,694
1982	97,183	6.62	5,985,753
1983	94,429	6.98	6,162,863
1984	122,114	7.34	6,196,974
1985	131,499	7.72	6,151,477
1986	142,755	8.02	6,229,607
1987	140,181	8.81	6,216,933
1988	141,021	9.24	6,341,909
1989	149,685	9.85	6,331,881

a The composition of this series include fertilizers, machinery, purchased seeds, manufactured feeds, fuel and power as well as miscellaneous inputs.

b The labour force in agriculture series is constructed using census population estimates. Participation rate was calculated as the proportion of population between the ages 20 and 65 years. Rural population was then calculated as a percent of the remaining population, using the rural-urban ratios. The resulting values were further adjusted for people found in rural areas engaged in non-agricultural activities.

Sources: Government of Kenya, Central Bureau of Statistics. Statistical Abstracts, various issues. Nairobi;
United Nations, Demographic Indicators of Countries: Estimates and Projections, various issues. New York.