AGENCY FOR INTERNATIONAL DEVELOPMENT
WASHINGTON, D. C. 20523
BIBLIOGRAPHIC INPUT SHEET

FOR AID USE ONLY
BATCH 42

1. SUBJECT CLASSIFICATION	A. PRIMARY Food production and nutrition	AE10-0000-G140
	B. SECONDARY Agricultural economics--Kenya	

2. TITLE AND SUBTITLE
Demographic pressure and economic change: the case of Kenyan land reforms

3. AUTHOR(S)
Herz,B.K.

4. DOCUMENT DATE	5. NUMBER OF PAGES	6. ARC NUMBER
1974	338p.	ARC KE301.35.H582

7. REFERENCE ORGANIZATION NAME AND ADDRESS
AID/PPC/PDA

8. SUPPLEMENTARY NOTES *(Sponsoring Organization, Publishers, Availability)*
(Diss.--Yale)

9. ABSTRACT
An historical analysis of Kenya's population and land reform problems. As public health measures in Kenya lowered infant and maternal mortality rates, population growth outstripped economic growth. In many tribal areas, the land rapidly became overcrowded, but the crowding failed generally to induce the traditional culture to change. Evolutionary technical changes in agricultural and pastoral production could not keep up. The resulting Mau Mau rebellion brought land reforms--the Swynnerton reforms and the Million Acre Scheme (involving return of land owned by Europeans). The Swynnerton reforms, involving creation of new African farms with a high ratio of labor to land, have been high yielding and successful. Their success demonstrates that a developing nation can establish efficient small farms through land reform with only limited resources. If Kenya's experience is any guide, labor-intensive crops and labor-intensive technology are a key. But the land reform has warded off the Malthusian spectre only for a time. Kenya had a population of more than ten million in 1969. It is growing at a rate of 3.5% a year, so the current population already exceeds thirteen million, and could reach 25 million by the year 2,000--an increase of ten-fold in a century. Where are the new landless to go? A possible answer is to the vast, underused land of the Masai. But much of this land is reserved for Kenya's national treasure--its game parks. To plow under these lands would endanger a major Kenyan foreign exchange asset. Reliance on technical change as the panacea seems increasingly chancy. The implications are that the long-term solution is to couple improved technology with educational and technical efforts to achieve significant reductions in the birth rate. The aim of development, after all, is to raise the marginal product of labor, not just to keep it from collapsing.

10. CONTROL NUMBER	11. PRICE OF DOCUMENT
PN-AAC-823	

12. DESCRIPTORS

Farms,small	Land titles
Government policies	Population growth
Kenya	Productivity
Land reform	Resettlement

13. PROJECT NUMBER

14. CONTRACT NUMBER
AID/PPC/PDA

15. TYPE OF DOCUMENT

AID 590-1 (4-74)

AID/PPC/PDA
PN-AAC-823

DEMOGRAPHIC PRESSURE AND ECONOMIC CHANGE: THE CASE OF KENYAN LAND REFORMS

Office of Policy Development and Analysis
Agency for International Development
Washington, D.C. 20523
December 1974

DEMOGRAPHIC PRESSURE AND ECONOMIC CHANGE:

THE CASE OF KENYAN LAND REFORMS

Prepared as a Dissertation in Candidacy
for the Degree of Doctor of Philosophy
from Yale University

by
Barbara Knapp Herz
December, 1974

Preface

Barbara Herz's excellent dissertation on Kenya addresses a critical problem facing many of today's developing countries: how can an essentially agricultural economy sustain an increasing population when supplies of other essential productive factors are limited either by nature or by policies difficult to overturn? Kenya's experience provides valuable insights for other countries striving to improve the lot of their poor rural populations through programs involving the active participation of those who stand to benefit, and for foreign assistance donors seeking to support such efforts.

The dissertation traces the adverse impact on a traditional economy of sudden and rapid population growth; it shows that instead of adjusting satisfactorily to such demographic pressure, a traditional economy may simply give way.

But the dissertation also goes on to show that agrarian reforms designed to expand production on small holdings can indeed work -- with luck, favorable politics, and appropriate economic policies. Dr. Herz credits much of Kenya's successful experience to the willingness and ability of small holders to adhere to the demanding labor-intensive technolgies appropriate in Kenya's circumstances. While Kenya's reforms have reached only a fraction of her small holders, experience to date seems convincing that the process can work more broadly.

In conclusion, however, Dr. Herz stresses that the gains of a promising land reform can erode quickly without a slow-down in population growth, indicating the critical complementary role of family planning programs such as Kenya has undertaken. I recommend this dissertation to all those engaged in furthering the development of economies like Kenya's.

Robert J. Muscat
Chief Economist
Agency for International Development

ACKNOWLEDGMENTS

I cannot begin to thank all those who have helped with this dissertation, but a few deserve special mention. Among my colleagues at the Agency for International Development, I am especially grateful to Paul Isenman, Robert Muscat, E. B. Rice, and Michael Roemer; among my associates at the International Bank for Reconstruction and Development, Graham Donaldson, Peter Hall, C. P. R. Nottige, and, particularly, Alexander Storrar; in the Government of Kenya, A. T. Brough and Dawson Mlamba and their staffs; at the Institute for Development Studies of Nairobi University, Judith Heyer; and at Yale, my advisers, Lloyd Reynolds, Marsha Goldfarb, and, particularly, Robert Evenson.

I would also like to thank my friends Frank Levy for his encouragement and Lucy Waletzky for all her help. I am grateful to Paula Brenneman for a masterful typing job. Last, I must thank my husband, Charles Herz, and my daughters, Amy and Katherine, for their patience and support.

Any errors of fact or interpretation are, of course, mine.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF TABLES (contd.)

LIST OF TABLES (contd.)

LIST OF TABLES (contd.)

INTRODUCTION

This dissertation addresses the role of demographic pressure in the recent economic history of one developing country, particularly in its efforts through land reform and agricultural modernization to raise living standards.

In the past seventy years or so, Kenya has grown from a collection of tribes of primitive cultivators and pastoral nomads to a nation-state resting on a reasonably productive agricultural economy and run by a strong central government which, despite blemishes, seems determined to improve living standards by applying modern economic concepts. Until 1963 Kenya lay under the colonial rule of Great Britain, and a few thousand British farmers controlled the politics, economy and society of the country. Racial jealousy inevitably ensued, and to the resulting dramatic conflicts much of Kenya's recent political and economic changes have been ascribed. But beneath the surface tensions, Kenya's historical and recent problem has been how to raise living standards for ever increasing numbers of people undoubtedly destined to spend their lives on the land, farming or herding. If Kenyans are to prosper, their leaders must fully understand the role of demographic pressure in both recent economic history and the current economic situation.

The traditional economic and social systems of the tribes from which Kenya was constructed were subjected in the first half of this century to the pressure of rapidly rising populations. Though neither the colonial regime nor contemporary demographers realized it fully, Kenya had entered the demographic transition; as death rates fell, the population growth rate climbed. Labor/land ratios built up to the point where several systems, including that of the dominant Kikuyu tribe, could no longer adjust and gave way. Resulting economic stagnation was so serious that only a complete transformation of the traditional systems would suffice to forestall and reverse the decline.

Such a transformation has been under way in Kenya for some time now. It took the guise of two major programs for land reform and agricultural modernization:

---- the "Swynnerton" reforms were designed to raise living standards and restore and preserve the arable land by providing Africans with clear title to their own small holdings, instituting better methods for raising crops and livestock for home use, and introducing cash-cropping and dairying.[1/]

---- the "Million Acre Scheme" was designed to seize and purchase a third of the prime European-held land, parcel it out in small or moderate sized holdings largely to landless and ill educated Africans, teach better farming methods, and introduce cash-cropping and dairying.

1/ The Swynnerton reforms also included measures for pastoral areas, but this dissertation limits its focus to the farming areas.

Analysis of sample surveys of the two reforms suggests that the Million Acre Scheme succeeded modestly while the Swynnerton reforms achieved truly encouraging results, in good part through scrupulous practice of labor-intensive technology appropriate in face of Kenya's rising population density and scarcity of other resources.2/ But though attention to the characteristics and proportions of productive factors, application of advanced farming techniques and luck can combine to stimulate agricultural output, resulting improvements in smallholders' living standards seem likely to endure a surprisingly short time without attention to the underlying population problem.

2/ The pastoral tribes' ampler land supplies are not available to the bulk of Kenyans.

Chapter 1. OVERCROWDING THE LAND

Beneath the surface tensions of racial jealousy that culminated in Kenya's notorious Mau Mau Rebellion lay the accelerating growth of Kenya's African population. The colonial regime's chronic underestimation of both the level of the population and its rate of natural increase delayed comprehension of its adverse economic impact on primitive African agricultural systems.

The official view of Kenya's African population between 1900 and 1945 long was that the population had declined well into the twentieth century, growing only slowly thereafter.[1/] In fact, the chief demographic chronicler of the period, R. R. Kuczynski, actually concluded that population probably stagnated.[2/]

But recent censuses and hindsight on earlier evidence make apparent that the population must have been growing, and at an accelerating rate, as colonization led to improved health and reduced mortality, particularly among infants and young children, and to a weakening of tribal

---

1/ See, e.g., East Africa Royal Commission 1953-1955 Report, Great Britain, Cmd. 9475, London H.M.S.O., 1955, pp. 31-32, and Appendix VII (by J. E. Goldthorpe), pp. 462-482. See also Martin, C. J., "Estimates of Population Growth in East Africa," Barbour, K. M., and R. M. Prothero, eds., Essays on African Population, Frederick A. Praeger, New York, 1962, p. 53.

2/ Kuczynski, R. R., Demographic Survey of the British Colonial Empire, Oxford University Press, London, 1949, Vol. II, pp. 120, 124-125.

customs that had regulated births.[3/] As their numbers rapidly expanded, Africans overcrowded the land left to them. Their traditional fallow-field agricultural systems generally had only limited capacity to adjust to rapidly rising labor/land ratios and by 1945 were giving way in major areas of the country. In some areas living standards declined close to bare subsistence. Tensions mounted. The newsworthy turmoil of the Mau Mau Rebellion that resulted in good part from this situation also masked it. Had the real situation been understood by the colonials, the pace of reform might have been stepped up; considerable bloodshed and chaos might have been avoided.

The story has considerable relevance for economists, in view particularly of Ester Boserup's thesis[4/] that increasing population pressure on primitive agricultural economies tends to encourage the development and adoption of increasingly labor-intensive technologies that may actually stave off diminishing returns to labor and resulting declines in living standards by promoting specialization of labor and development of improved fertilizers, tools, and techniques. In Kenya that did not happen. Demographic

---

3/ See, *e.g.*, Leakey, L. S. B., *Mau Mau*, Methuen & Co. Ltd., London, 1952, pp. 19-21, 72. See also statement of Canon H. B. Leakey in *Report of the Kenya Land Commission*, Cmd. 4556, London H.M.S.O., 1934, *Evidence and Memoranda*, Vol. I, p. 676.

4/ Boserup, Ester, *The Conditions of Agricultural Growth*, Aldine Publishing Co., Chicago, 1965, *passim*.

change was so swift and resulting population pressure so strong that in major areas of the country the traditional economy collapsed.

KENYA'S POPULATION: THE DEMOGRAPHIC TRANSITION

Official data and semi-official commentary indicate that Kenya's population declined for a period extending well into the twentieth century, and thereafter grew quite slowly until the mid-1940's. As late as 1961 Kenya's former chief statistician, C. J. Martin, wrote that between 1920 and 1948 "the increase in East Africa of the African population was from not more than 1/2 percent rising to 1 1/2 percent per annum."[5/] Though he makes contradictory statements, R. R. Kuczynski concluded that there was no reason to think the population was any larger in 1948 than it had been fifty years before.[6/]

But careful examination of the available evidence suggests otherwise. It is impossible to make any precise

---

5/ Martin, *op. cit.*, p. 53. See also, *e.g.*, *Annual Report for the Colony and Protectorate of Kenya*, 1953, Great Britain Colonial Office, London H.M.S.O., 1954, pp. 12-13. See also *East Africa Royal Comm. Rep.*, App. VII (Goldthorpe). See also Lury, D. A., "Population Data of East Africa," Caldwell, J. D., and C. Okonjo, eds., *The Population of Tropical Africa*, Longmans, Green & Co. Ltd., London, 1968, pp. 44-47.

6/ Kuczynski, *op. cit.*, Vol. II, p. 156. See also Kuczynski's statement:

> "I am inclined to believe that there was a small natural increase amounting to . . . .5% yearly . . . [but] there is no reason to assume that the total population in 1940 was any larger than in 1895."

Id. at pp. 124-125.

estimates of Kenya's population during the early Colonial era, as no reliable demographic data were collected, but such data as were collected, together with more trustworthy data obtained in the 1948 and later censuses, suggest strongly that both Kuczynski and the officials estimating population before the 1948 Census basically underestimated both the population level and its rate of natural increase. (Appendix 1 discusses this problem more fully.)

The 1948 Census reports an African population of about 5.2 million, over 20 percent higher than earlier estimates.[7/] If we accept that figure as roughly correct, then we are faced with reconciling (a) the population estimates of roughly 2.5 million in the early 1920's, and (b) the official view that the population grew in that time by much less than 2 percent, to say nothing of Kuczynski's view that it did not grow at all. In fact, they are irreconcilable. Either the 1920's population estimates were grotesquely low (by 50 percent or so) or the Martin-Kuczynski growth rates are low, or both.

Kuczynski never faced this dilemma because he died just before the 1948 Census. Martin has never attempted to reconcile fully the inconsistency between the 1948 Census,

---

7/ African Population of Kenya Colony and Protectorate (1948), Colony and Protectorate of Kenya, East African Statistical Department, Nairobi, 1950, *passim*.

which he supervised and analyzed, with the earlier population data.[8/]

The most likely explanation is that the population was modestly underestimated in the early twenties and was growing considerably faster than most anyone realized. This unrecognized acceleration in population growth apparently resulted partly from a modest rise in the birth rate as colonial culture undermined antinatalist African taboos, but primarily from rapid declines in mortality rates, particularly for infants and young children, as basic ideas on hygiene and simple health measures spread among the African populace.[9/] For want of firm data this assertion cannot be proved, but it is completely consistent with what is known of what was going on in Kenya and it accords with the pattern of incomplete "demographic transition" common to developing countries in the twentieth century:[10/] from a base of high birth rates and death rates that net to a relatively stable population, death rates (particularly of infants and young children) fall rapidly as health improves;

8/ See, *e.g.*, Martin, *op. cit.*, *passim*. See also Martin, C. J., "The East African Population Census 1948: Planning and Enumeration," *Population Studies*, Vol. III, No. 3, 1949, *passim*. See also Martin, C. J., "Some Estimates of the General Distribution, Fertility and Rate of Natural Increase of the African Population of British East Africa," *Population Studies*, Vol. VII, No. 2, 1953, *passim*.

9/ And despite a decline in nutrition as crowding undermined traditional agricultural systems. (See below.)

10/ See, *e.g.*, *Demographic Transition in Tropical Africa*, O.E.C.D., Paris, 1967, *passim*.

birth rates fall only slowly, if at all, as economic and social development gradually encourages lower "desired family size"; and the result is rapid population growth.

Basically, Martin and Kuczynski thought the African population could not have been growing faster than 1 or 1.5 percent, because death rates "had to be" high (allegedly up to 500 per thousand infants in Kuczynski's account) in face of a raft of endemic diseases and occasional poor harvests, and because birth rates "had to be" only moderate as marriage-delaying customs, polygamy, and lengthy lactation kept fertility down and as widespread venereal disease had allegedly resulted in considerable infertility.[11/] Kuczynski and Martin were, of course, only making "best guesses" on population growth rates and underlying birth and death rates. But looking at valuable historical information and the later census results, it is possible to improve on their guesses.

An alternative series of population estimates over 1900-1948 is presented below. There is no precision here,

---

11/ Kuczynski states:

> "There is no evidence that population decreased essentially in the decades preceding the advent of the British. But mortality was no doubt high owing to famines, epidemics (smallpox), unsanitary conditions, and intertribal wars, and since there is no reason to assume that fertility was very high, . . . it is quite possible that the population did not hold its own."

Kuczynski, *op. cit.*, Vol. II, p. 122. See also *id.* at pp. 114-124 and pp. 188-190.

only a rough and smoothed out indication of what must have happened that reasonably accords with the more reliable demographic and historical evidence.

KENYA POPULATION ESTIMATES
(millions)

OFFICIAL ESTIMATES	1900	1905	1910	1915	1920	1925	1930	1935	1940	1945	Census of 1948
Colonial Reports 12/	4.00	4.00	4.00	2.83	2.48	2.55	2.95	3.01	3.40	3.92	5,251,120
				(2.7)	(0.5)	(3.0)	(.4)	(2.7)	(2.6)	(2.6)	(2.6)
					[Growth rate 1920-1945 = 1.7% annually]						
Martin (Population estimates are those implied by growth rates)					4.07	4.17	4.28	4.50	4.73	5.09	5,251,120
(Growth Rate) 13/					(.5)	(0.5)	(1.0)	(1.0)	(1.5)	(2.0)	(2.0)
					[Growth rate 1920-1945 = 1.1% annually]						
REVISED ESTIMATES											
Population	2.43	2.52	2.61	2.74	2.91	3.13	3.43	3.78	4.24	4.82	5,251.120
Growth Rate (%)	(0.7)	(0.7)	(1.0)	(1.2)	(1.5)	(1.8)	(2.0)	(2.3)	(2.6)	(2.9)	(3.0)
Birth Rate (per 1,000 population)	45	45	46	46	48	49	50	50	51	51	51
Death Rate (per 1,000 population)	38	38	36	34	33	31	30	27	25	22	21
Infant Mortality (per 1,000 births)	300	300	280	250	230	200	180	170	160	150	140
					[Growth rate 1920-1948 = 2.2%]						

12/ *Annual Report on the East Africa Protectorate* 1915/1916-1919/1920; *Annual Report on the Colony and Protectorate of Kenya* 1920-1938, 1946-1948. Great Britain Colonial Office, London H.M.S.O., *passim.*

13/ Martin, C. J., "Estimates of Population Growth in East Africa," in Barbour, K. M., and R. M. Prothero, eds., *Essays on African Population*, Frederick A. Praeger, New York, 1962, p. 53.

KENYA'S TRADITIONAL ECONOMY

Kenya, roughly the size of France, lies along the Equator between Lake Victoria on the west and the Indian Ocean on the east.[14/] Northern Kenya is hot, dry, and barren. Moving south across the Equator toward Nairobi, the land rises to mile-high altitudes and the climate moderates. Beyond Nairobi the land falls away again, south to Savannah along the Tanzania border, east to semi-arid desert and coastal lowlands along the Indian Ocean, and west to swamps around the Lake. The Great Rift Escarpment cleaves Western Kenya north to south, its steep, cool sides abutting a wide and fertile valley cradling many of East Africa's larger lakes and rivers.

These extremes of altitude and geology limit the agricultural uses of the land. Of 220,000 square miles, only 38,000 square miles -- barely 18 percent -- are arable. Most arable land lies in the Highlands, the hilly country spreading northwest of Nairobi across the wide Rift Valley to western plateaus, where the deep volcanic soils are fertile and where altitudes are high enough (5,500 - 7,500 feet) to bring reliable rainfall (at least 35 inches per year) needed to support a wide range of temperate-agriculture crops and

---

14/ For a general view of the land and people, see Ominde, S. H., Land and Population Movements in Kenya, Northwestern University Press, Evanston, 1968, *passim*. See also MacPhee, A. Marshall, Kenya, Frederick A. Praeger, New York, 1968, *passim*.

livestock.[15/] But within this range, variation in altitude still sharply limits the land's uses.[16/]

Kenya's African tribes traditionally looked to the land for a living, hunting wild game, herding livestock or cultivating a few crops.[17/] In this primitive agricultural economy, each household or clan produced what it needed to subsist -- vegetables and perhaps fruit, plus cattle and goats that gave milk, blood, and meat for food and skins for clothing.[18/] Standards of consumption remained near

---

15/ Most of the highlands, where adequate rainfall occurs, lie east of the Rift in Kikuyu country or west of the Rift on upland plateaus. But the Rift Valley floor in the Nakuru-Naivasha area rises to over 6,000 feet, enough to bring adequate rainfall. The land can generally support forest, crops, and "Kikuyu" grass (Pennisetum clandestinum). But the higher reaches (in some areas over 6,500 feet, in others higher) often have cold climate or thin soil that inhibit agriculture. Ominde, *op. cit.*, pp. 18-20, 40-42.

16/ Another 20,000 square miles, with lower altitudes and less rainfall (25-35 inches per year), lie scattered in the lower levels of the Rift Valley floor and in the East, some of it sufficiently arable to produce grain and livestock. The land can support vegetation characterized as "Scattered Tree Grassland," or Acacia themeda. But some is infested with tsetse flies, carrying human and bovine sleeping sickness. The rest of the land -- 75 percent of the total -- is semi-arid desert-grass or bush country, supporting only a few zebu cattle and some of Kenya's famous game. Kenya lacks most other natural resources, especially the minerals and fuels that would provide an industrial base. See, *e.g.*, *Kenya African Agricultural Sample Census, 1960/61*, Colony and Protectorate of Kenya, Government Printer, Nairobi, 1961, p. 2.

17/ Kenya generally lacks the minerals and fuels that would provide an industrial base. Her famous game does, however, provide tremendous potential for tourism while it survives.

18/ See, *e.g.*, Leakey, *op. cit.*, pp. 23-25. See also Leakey, L.S.B., *The Stone Age Races of Kenya*, Oxford University Press, London, 1935, *passim*. See also MacPhee, *op. cit.*, pp. 23-25.

subsistence from year to year, for barring drought or unusual disease, traditional technology yielded about the same output year after year.[19/] Shifting cultivation was practiced; some land was left fallow to regenerate.

There was little unemployment, for everyone had a "job" by right, though by modern standards many were under-employed. Men were generally warriors or herders and undertook particularly arduous tasks, such as raising huts or tents. Otherwise they spent long hours in the shade of Acacia trees sipping millet beer and waiting for the next battle.[20/] Within the confines of the system, nonetheless, all were assured some share of the "wealth"; all had access to the land.

Beyond these general similarities, the lifestyles and occupations of Kenya's tribes varied generally though imperfectly to fit the land on which they lived.

In the arid North roamed Hamitic and Turkana nomads.

Around tropical Lake Victoria the populous Nilotic tribes -- chiefly the Luo -- tended crops and livestock.

19/ See, *e.g.*, Leakey, L.S.B., *Mau Mau*, pp. 23-25. Generally simple meals sufficed, but there were numerous feasts requiring the slaughter of animals. For example, the visit of a mother-in-law demanded an ox.

20/ See, *e.g.*, deWilde, John C., *Experiences with Agricultural Development in Tropical Africa*, I.B.R.D., Johns Hopkins Press, Baltimore, 1967, *passim*. See also note 16, *supra*.

In and near the Central and Western Rift lived the Kalenjin tribes, bound by similar languages, but differing strongly in occupation. Of special interest here among the Kalenjins are the Nandi, a comparatively settled tribe of notorious warriors, who primarily tended cattle but who also did some cultivation in the fertile uplands west of the Rift and north of Lake Victoria, and the Elgeyo, also a settled tribe who cultivated crops and kept a variety of livestock on the Western Escarpment of the Rift.

In the central Rift Valley and southern plains lived the fierce Masai, semi-nomadic warriors who commanded a vast territory, herding cattle and preying on whoever ventured too near. The Masai have been slow to modernize and still hold huge tracts of fertile land that could be farmed far more intensively but for their strong attachment to their pastoral way of life.[21/]

Scattered about central Kenya, but concentrated around Nairobi lived the Bantu tribes -- chiefly the Abaluhya, the Kamba, the Meru and Embu, and the Kikuyu -- which comprised around two-thirds of all African Kenyans. The Bantu tribes were probably Kenya's most skilled cultivators, though they also kept some livestock.

The Kikuyu, Kenya's biggest single tribe from which came leaders of the Mau Mau Rebellion and the now independent Kenyan government, demand special attention.

21/ On the other hand, some of the Masai land has been organized into Game Parks.

Seven or eight hundred years ago, the Kikuyu wandered south from somewhere in northern Africa and arrived in Kenya.[22/] There the Kikuyu apparently prospered and certainly multiplied. Since they depended on an agricultural system where output was generally proportional to land and innovations few, land supplies had to grow with population. By the mid-1500's, the tribe needed more land. Some pushed north toward Mount Kenya, and found almost no one. But south, in Kiambu, the Kikuyu met the Wanderobo, from whom they purchased considerable land according to their traditional laws.[23/] Generally a Kikuyu elder purchased a large tract of land -- a <u>githaka</u> -- paying anywhere from 30 to 300 goats depending on the size of the tract. The Kikuyu planned ahead; most <u>ithaka</u>[24/] were large enough to provide smaller plots for cultivation -- <u>shambas</u> -- and grazing land for several generations. By 1600 the Kikuyu <u>ithaka</u> were widespread in Kiambu. For the next several hundred years, as Kikuyu population expanded, they similarly augmented their supplies of land. But by the late 19th century, they had about run out of room -- especially to the south, where they had come face to face with the Masai.[25/]

22/ Leakey, <u>Mau Mau</u>, pp. 1-2.

23/ <u>Id</u>. at pp. 3-5.

24/ "<u>Ithaka</u>" is the plural of "<u>githaka</u>."

25/ <u>Id</u>. at p. 7. The Kikuyu maintained a forest belt between themselves and the Masai, and by this time it had worn thin.

But not all the land was cultivated at once. In Kiambu, by 1900, it is reported that only 1/13 of the Kikuyu land was under cultivation during normal times, and in more densely populated Kikuyu districts, only 1/8 was under cultivation.[26/]

There were two reasons for the low cultivation ratio. First, the Kikuyu preserved large sections of forest for fuel and for religious ceremonies, and they reserved even larger areas of bush -- not grassland -- for their sheep and goats to browse. The famous East African archaeologist, L.S.B. Leakey, notes that they had to have enough goats and sheep to use in over 100 ceremonies of life, so that the bush required for grazing was substantial.[27/] Second, the Kikuyu -- like other tribes -- practiced primitive fallow-field cultivation, wandering off tired "shambas" to better land within the githaka.

The shifting cultivation, combined with the occasional arrival and departure of tenants, gave a misleading picture of mass confusion, unorganized tenure, and under-use of land, but by Kikuyu standards the land was fully occupied, fully owned, and fully used. It was the basis for the Kikuyu's current subsistence and it offered security to future generations who would also take their living from the land.

26/ *Id.* at p. 12.

27/ *Ibid.*

Then the Europeans came. The remainder of this chapter details the demographic and economic patterns of Kenya's development from the arrival of the Europeans in the late 19th Century to the first Kenyan census in 1948. Four rough periods are described: the years between 1895-1920 during which the colonial Protectorate and a dual economy were established; the "gilded years" of 1920-1930 when colonists thrived and Africans did reasonably well; the years between 1930 and 1940 when world-wide depression brought hard times for the Europeans and demographic pressure began to threaten the Africans; and the years between 1940-1948 when the demographic pressure seriously eroded both African living standards and the African land so obviously as to prompt incipient efforts at land reforms. The land reforms themselves are described in Chapters 2 and 3.

1895-1920: ESTABLISHING DUALISM

In the 19th Century a few hardy English missionaries came to Kenya, followed by pioneer merchants of the British East India Company determined to build a mercantile colony that would provide Britain with African treasure and, eventually, with foodstuffs. Efforts to protect the missionaries and secure the merchants soon fostered full-scale colonization, and the British government established a Protectorate over Uganda and Kenya in 1895.

From about 1895 until the first World War ended, a few thousand British colonists seized about 3 million acres of African land, staked out large farms, and introduced new crops and livestock that could find a market in Britain. The African population around 1900 had been decimated by unusual famines and epidemics. Needing Africans to tend crops and herd livestock and finding too few willing, the colonists complained of labor shortages. Though the population began to recover during this turn of the century period, population pressure on the land did not yet become significant. The result was that Africans could go on living much as they had, and few seemed much interested in manning Europeans' farms. In face of this frustration, and in view of the primitive and unhealthy conditions in which many Africans lived, few of the colonials could believe the African population was growing at all.

Colonization began with penetration of the land. To carry colonists in and ship goods out, the British government constructed the Uganda railway from Mombasa to Lake Victoria, at a cost of several million pounds. It began operating in 1904.

Unfortunately, the railway found no ready goods to carry. The "lunatic line" led to no fabulous mines or stores of riches, but to the "shores of a big lake fringed with papyrus swamps and rotten with sleeping sickness."28/

28/ Huxley, Elspeth, White Man's Country: Lord Delamere and the Making of Kenya, MacMillan and Co. Ltd., London, 1935, Vol. I, p. 33.

To make the railway pay, the government had to develop an export sector that could produce raw materials or agricultural commodities British consumers or British industry would buy. As early searches for minerals failed to pan out, the best prospects were in agriculture. If British farmers could be persuaded to settle in Kenya, they could provide the technology and venture capital required to develop an agricultural enclave. All they needed was land and labor, and that, the government believed, Kenya had in abundance. As the British enclave developed, saving and investment would spill over into the African sector. Thus was it determined that Kenya's economy would develop not primarily from its traditional economic base, but dualistically, with the British enclave at the hub. This early decision to import foreign agriculture and make it the keystone of the economy would prove critical to Kenya's later development.

To early travelers, railway engineers, and settlers, the land certainly looked empty enough to accommodate many colonial farmers without injuring native Africans.[29/] Was there spare land? Or did low cultivation ratios associated with traditional African agriculture only make the

---

29/ Huxley, op. cit., Vol. I, pp. 71-73 and 114-115. See also E. Afr. Royal Comm. Rep., p. 19. See also MacPhee, op. cit., p. 50. Alexander Storrar, former Director of Settlement, recalled in a conversation in August, 1970, in Washington, D. C., that "when you first traveled upcountry in Kikuyuland you wondered where the Africans were."

land seem underused? The answer lies partly in the British failure to appreciate the fallow-field requirements of traditional systems; but also partly in the demographic situation around 1900.

Demographic Patterns, 1895-1920

The size of Kenya's population in the early 20th Century is something of a mystery, as are the rate and direction of population change. There was no census. Following guesses of early explorers who arrived in the late 1800's, the British Official Statistical Tables and the Colonial Office Lists place the 1905-1914 African population at about 4 million.[30/] Medical Reports put the 1911-1921 population at 3 million.[31/] The Blue Book[32/] and the Colonial Reports,[33/] reflecting Native Commissioners' lower and probably more accurate estimates, put the population in the early 1920's

---

30/ Kuczynski, op. cit., Vol. II, p. 144, summary. See also, e.g., Colonial Office List, 1916, Waterlow & Sons Ltd., London, p. 177.

31/ Kuczynski, op. cit., Vol. II, p. 144, summary. See, e.g., Medical Report for the Colony and Protectorate of Kenya, 1921, Great Britain, London H.M.S.O., p. 103.

32/ Kuczynski, op. cit., Vol. II, p. 143, summary. See also Statistical Tables, British Colonies, Great Britain, London H.M.S.O., passim.

33/ Kuczynski, op. cit., Vol. II, p. 145, summary. See also Annual Rep. on East Afr. Prot., 1916-1917, p. 25; 1917-1918, p. 27; 1919-1920, p. 27; Annual Rep. on the Col. and Prot. of Kenya, 1920-1921, p. 29; 1921, p. 7; 1922, p. 6.

at plus or minus 2.5 million. By the mid-1920's all sources use estimates closer to the Native Commissioners' and therefore show an apparent population decline since 1900.

The Native Commissioners' counts were based on tax rolls for the "Hut Tax" that all African males were required to pay. 34/ (In pastoral areas, a poll tax was substituted.) 35/ The theory was that the size of the family, or at least the number of adults, could be recorded when the tax was paid by the Hut owner. No one attempted to record births and deaths, so nothing is known of birth rates, death rates, fertility rates, or other basic population parameters.

The rolls were allegedly prepared carefully, under the supervision of colonial officers. 36/ But there were

---

34/ Hut tax rolls were to include "the name of every owner of a hut, the number of huts owned by each hut owner, and the number of wives of each hut owner." Kuczynski, *op. cit.*, Vol. II, p. 133.

35/ Poll tax rolls were to include "the name and father's name of each every native liable." *Ibid.*

36/ Kikuyuland's District Commissioner, S. H. Fazan, better known for his later role as Secretary of the Kenyaland Commission, argues that counts were fairly comprehensive:

> "It is pretty obvious that the amount of error is detected. In a series of years you spot the location which is wrong.
>
> "Hut counters generally are people who have done the job for upwards of ten years. Certainly the senior hut counters are . . . . In the course of 20 years of collection I have detected frauds on various occasions, and sometimes rather clever frauds, but all told they have been of small account in any effect they might have on the figures."

Rep. of Kenya Land Comm., Ev. and Mem., Vol. I, p. 962. See also Kuczynski, *op. cit.*, Vol. II, pp. 134-139.

sources of inaccuracy.[37/] It was difficult to be sure all huts were counted. Estimates of the number of wives in the huts were rough at best. And children were estimated not at all, or as a flat 37 percent of the population.[38/] Nonetheless, the Hut Tax counts were the best data then available. And the obvious implication of those counts and other early official estimates of population taken together was that population was falling during this early period.[39/]

37/ For example, the District Commissioner of Emru reports:

> "In 1913-1914 the only counting was of huts and was done by tribal retainers. The District officer remarks on the lack of accuracy. Population figures were estimated by assuming an average of three persons per hut, and entering a round figure which approximated to the result obtained. No attempt at estimation of the sexes or of adults and children was made."

Rep. of Kenya Land Comm., Ev. and Mem., Vol. I, p. 557. See also Kuczynski, op. cit., Vol. II, pp. 134-140. And:

> "In normal years the statistics of the native population are largely a matter of conjecture and the difficulty . . . for this year (1918) is greatly increased by the famine and the influenza epidemic."

Rep. of Kenya Land Comm., Ev. and Mem., Vol. I, p. 556.

38/ Kuczynski, op. cit., Vol. II, pp. 136-137.

39/ The Medical Report from 1925 concludes of early population changes:

> "The period 1904 to 1924 was one during which a number of strains were being experienced by the native population . . . . Increases of population between the years 1904 and 1924 could hardly have been expected."

Medical Report for the Colony and Protectorate of Kenya, 1925, p. 15. And in 1924 Kenya's Chief Medical Officer, Dr. Norman Leys, remarked:

> "This writer believes that there has been a steady and rapid fall in the African population in the past twenty-five years, amounting altogether in that time to a third of the former inhabitants."

Kuczynski, op. cit., Vol. II, p. 217. See also id. at p. 123.

Kuczynski also doubts that the population was rising. He carefully presents all the available information on Kenya's early population and then adopts a know-nothing position, stating that there is no reason to think that population had either increased or decreased in East Africa since around 1880.[40/]

It is easy to sympathize with Kuczynski's skepticism. It is also possible to sympathize with the government officials, who viewed the raft of diseases prevalent or endemic in Kenya, including pneumonia, malaria, yaws, bilharzia, dysentary, and encephalitis, among others, and concluded that birth rates could not possibly have compensated.

But the truth apparently is that much of the large "decline" from huge early estimates of African population was statistical, not natural. In haste to assure potential settlers that cheap labor was abundant, the home government had grossly exaggerated the African population, but as early Hut Tax counts trickled in, the estimates had to be revised downward.

The absence of census data compels resort to contemporary descriptions and historical accounts for indirect evidence on population size and change. So far from explaining why the population might have been declining in the

---

40/ *Id.* at p. 125.

early 20th Century, such sources suggest that it was in fact rising during that period.

Before the turn of the century a series of catastrophes did decimate the African population. In 1884 the rains failed, and a dreadful famine ensued.41/ A plague of rinderpest followed, felling the cattle of the Kikuyu, the Masai, and other tribes and creating another famine among the pastoral peoples.42/ Famine struck yet again in 1898-99

41/ Sir Arthur Hardinge stated in 1897:

> "I have heard it said . . . that the great famine reduced the inhabitants of the present province of Seyyidich to about half their present number. Whether this be so or not, it is certain that the memory of this famine is more deeply graven than any other occurrence . . .."

Id. at pp. 194-195.

42/ Lord Lugard wrote:

> "Not for thirty years had a plague like this been known in the country, and even then it was not to be compared in virulence to the present one. Never before in the memory of man, or by the voice of tradition, have the cattle died in such vast numbers . . .. In the case of the Bantu tribes, the loss, though a terrible one, did not, as a rule, involve starvation and death to the people, since, being agricultural, they possess large crops as a resource. But to the pastoral races the loss of their cattle meant death."

Lugard, F. D., *The Rise of Our East African Empire*, Blackwood & Sons, London, 1893, Vol. I, pp. 525-527. See also Kuczynski, *op. cit.*, Vol. II, pp. 196-197.

with another drought, compounded by a plague of locusts and accompanied by an epidemic of smallpox.[43/]

The death toll from these famines, plagues, and pestilences, according to the accounts of contemporary European settlers, was enormous, in Kikuyu areas in particular,[44/] amounting to perhaps a quarter of the population. Kuczynski discounts these contemporary accounts as "unscientific,"[45/] but they are the best evidence available, and virtually unanimous in their thrust. Taken as a whole they suggest strongly that the impact on African population was severe. It makes better sense to accept that general

---

43/ Commissioner Eliot reported:

> "In 1899-1900 the failure of the usual periodical rains brought about a widespread famine, which was most acute in Ukamba. Every effort was made, both by the Administration and the missionaries, to relieve the starving population, but the mortality was considerable."

Ibid.

44/ Id. at pp. 197-198. See also Rep. of Kenya Land Comm., Ev. and Mem., Vol. I, p. 847, Vol. III, p. 3369. The representative of the Kikuyu testifying before the Kenya Land Commission estimated 30-40 percent mortality in the famines; and missionaries to the Kikuyu estimated about one-third of the people died.

45/ Kuczynski states "there is no reason to believe" the population in the 1880's exceeded that around 1900. Kuczynski, op. cit., Vol. II, pp. 124-125. See also id. at pp. 198-203. Kuczynski recounts the historical evidence on the early droughts, famines and epidemics, but concludes that mortality was generally very high, and that the earlier studies were simply too unscientific to credit; he is particularly hard on the reports of the missionaries.

conclusion and the corollary that the African population around 1900 was most probably unusually low.46/

After that, the historical evidence suggests, the population probably began to recover. From 1900 until 1918 there was only one real epidemic -- the influenza epidemic o. 1918 -- and there was no serious famine, except briefly in the same year. In the absence of such disasters, the population most probably began to recover.

But Kuczynski and contemporaries cite some counter-evidence in which they place considerable confidence.47/ Venereal disease came with the Europeans, and apparently spread particularly among Africans working for Europeans. But mortality rates from venereal diseases are unlikely to match those from an epidemic of smallpox or plague affecting an entire unprotected population or those from acute famine. Many of the 200,000 askaris (Kenyan troops) who served in World War I died. But they, too, were a relatively small part of the

---

46/ Leakey states:

> "Had the start of white settlement in Kenya come at this particular time (188), instead of later, very little (if any) land in Kiambu, Kabete, and Limuru would have been alienated to white farmers, for the land was carrying a big native population and no government would have tried to displace them."

Leakey, *op. cit.*, p. 21

47/ See, e.g., Kuczynski, *op. cit.*, Vol. II, pp. 202-208. See also *Med. Rep. for the Col. and Prot. of Kenya*, 1925, p. 15.

population.[48/] Endemic diseases continued.[49/] But they had always been prevalent, and if anything were probably less deadly as medicine began to spread, however slowly. It is unlikely that they would have produced a sudden drop in the population.

On balance, it seems reasonable to suggest that death rates were somewhat lower by 1920 than they had been at the turn of the century, that birth rates may have been creeping upward as traditional antinatalist taboos were weakened, and that the population was therefore growing slowly. Proving this contention would require sample studies made at the time in Kenya's critical districts. Naturally there are none. There is one study, though, that is supportive. District Commissioner Fazan argued that the Kikuyu population was increasing in the early 1900's at about 1.2 percent a year.[50/] Unfortunately, only secondary and incomplete information on that study has survived.

Economic Developments, 1895-1920

At first European settlement had only modest impact on African living conditions or African agriculture, despite

---

48/ Kuczynski, *op. cit.*, Vol. II, p. 202.

49/ *Ibid.* Only smallpox and yaws were controlled; malaria, dysentery, sleeping sickness, tuberculosis, and pneumonia were still rampant.

50/ Before the Kenya Land (Carter) Commission, he cited a memorandum in which he argued that in Kikuyuland, "population was increasing in normal years (1902-1909) at about 1.2 percent a year." *Rep. of Kenya Land Comm.*, Ev. and Mem., Vol. I, p. 966.

Europeans' seizure of some 3 million acres of African land by the 1920's. European agriculture had, to put it mildly, a rough start, which was exacerbated by a persistent shortage of African labor, hardly likely had African population density been high.

The British government enthusiastically propounded settlement in the "White Man's Country" of Kenya and in 1902 passed a Crown Lands Ordinance permitting Europeans to alienate land.[51/] The settlers came, mostly to homesteads of 640 acres or other holdings of moderate size.[52/] They staked out claims in fertile highlands in a number of areas of central and western Kenya.[53/] By 1910 there were 2,000 Europeans who had claimed around 2,700,000 acres.[54/]

They found the going rough. Though soil was fertile and the highlands' rainfall generally adequate, European crops and exotic livestock often wasted away. A crucial pioneer role was played by one of Kenya's first settlers -- and long her most vigorous European proponent -- Lord Delamere, who was granted a 99-year lease on 100,000 acres

---

51/ Huxley, *op. cit.*, Vol. I, pp. 78-79.

52/ *Id.* at p. 85.

53/ Settlers came to Kikuyuland north of Nairobi, to Kamba country south of Nairobi, to the Mau and the Laikipia plains in the Rift, to Nandi and the Uasin Gishu plateau in the west. And to the Uasin Gishu also came a band of Boers who had made the trek from South Africa after the Boer War, and whose descendants remain today.

54/ *Annual Rep. on East Afr. Prot.*, 1910-1915, *passim*.

on the Western Rift near Njoro.[55/] He was practically the only "man of substance," the only one willing and able to finance large-scale experiments to see if European and Australian agricultural technologies could be transplanted to East Africa. In the early 1900's on his Njoro farm and later elsewhere in the Rift Valley, Delamere invested over £ 100,000, mostly through loans, to prove that higher yielding strains of wheat, maize, sheep and cattle could be developed to thrive in Kenya. Other early experiments were started with cotton, sisal, coffee, and tea.[56/]

Besides coping with unknown diseases that plagued the new crops and livestock breeds, the Europeans' chief difficulty seemed to be finding enough labor to man the farms. In 1907 the Commissioner, Sir James Hayes-Sadler, brought the "labor problem" to a head. "Old Flannelfoot" traveled through the reserves urging Africans not to work for Europeans unless they really wanted to -- and the Europeans were furious.[57/] To "encourage" African labor

---

55/ Delamere promised to pay an annual rent of £ 200 and to spend £ 5,000 over five years to develop his land. So large a holding in Kenya's fertile Rift Valley represents wealth today, but in 1905 Delamere's chances of earning £ 200 seemed slim, and he was considered adventurous to the point of foolhardiness. Huxley, *op. cit.*, Vol. I, pp. 95-98.

56/ See, *e.g.*, *Annual Rep. on East Afr. Prot.*, 1917-1918, pp. 8-16. See also Huxley, *op. cit.*, Vol. II, pp. 89-91.

57/ *Id.* at Vol. I, pp. 226-228. See also MacPhee, *op. cit.*, pp. 52-53, where MacPhee recounts the pressures brought to bear on the colonial regime in Nairobi by the European settlers, and by newly appointed African chiefs.

they fought successfully to have the Hut Tax established, though at a low level.58/ This episode shows clearly that neither the European land grab nor any African population growth had as yet caused serious enough pressure on African agriculture to result in substantial incentive to leave the remaining land.59/

World War I interrupted in 1914. The King's African Rifles stood down the Kaiser's men in the wilds of the border between British and German East Africa, but at high cost; farms left in the hands of harassed wives and a few African laborers inevitably ran down, and commerce suffered.60/

At the war's end, nearly one thousand farms stood on about 3 million acres. Repairing these farms and restarting production would require considerable African labor. Moreover, in 1919 the government invited some 1,500 veterans to seek their fortunes in Kenya, and they too demanded labor. If African labor proved inadequate, the cash economy would

---

58/ Huxley, *op. cit.*, Vol. I, pp. 230-237.

59/ The Colonial Office, disappointed at the slow development of European agriculture in Kenya, worked to improve the attractiveness of land settlement terms and supported the request for a Hut Tax.

60/ Elspeth Huxley reported:

> "Ploughed land was covered with couch grass, once flourishing young coffee trees smothered in a jungle of weeds . . . implements were rusted or stolen . . . often it meant a new start."

Huxley, *op. cit.*, Vol. II, p. 50. See also MacPhee, *op. cit.*, pp. 58-59.

surely collapse. Thus the colonists renewed their complaints of a "labor shortage."61/ Arguing that bidding up wages would dangerously reduce their own profits that were needed to finance investment as well as consumption, the colonists once more sought government assistance in "encouraging" more Africans to hire out to them. The British colonial regime responded again, and in 1919 Governor Sir Edward Northey authorized his Chief Native Commissioner, Mr. John Ainsworth, to publish a circular espousing something close to a forced labor policy.62/

61/ See, e.g., Kenya Legislative Council Debates 1926, London H.M.S.O., Vol. I, p. 328, pp. 424-428, and p. 434.

62/ The Ainsworth Circular stated:

> "His excellency trusts that those officers who are in charge of what are termed labor-supplying districts are doing what they can to induce an augmentation of the supply of labor for the various farms and plantations in the Protectorate; and he feels assured that all officers will agree with him that the larger and more continuous the flow of labor from the reserves, the more satisfactory will be the relations as between the native peoples and the settlers and between the latter and the government.
>
> "The necessity for an increased supply of labor cannot be brought too infrequently before the various native authorities, nor can they be too often reminded that it is in their own interests to see that their young men become wage-earners and do not remain idle for the greater part of the year."

Huxley, op. cit., Vol. II, pp. 60-61. See also id. at pp. 62-74. See also MacPhee, op. cit., pp. 68-70.

The Ainsworth Circular was accompanied by measures to assure benefits for Africans.[63/] Still, it caused a tremendous outcry in Britain because of the obvious exploitation of the Africans.[64/] And it provided a focus for incipient African discontent with the colonial economy. Africans, particularly the Kikuyu, increased their protests against working for Europeans sometimes under poor conditions and always on land that had previously been theirs. For as their population had begun to recover from the disasters of the turn of the century, Africans had begun trying to return to their homes. The Kikuyu, for example, came back to land they had left in the Kiambu district, only to be told to their amazement that European settlers now "owned" the land.[65/] This is one of the first indications that in at least a few areas the African population had recovered sufficiently so that population density on remaining tribal land, which had been sufficient for the post-epidemic

---

63/ Ostensibly to protect African laborers, inspectors were hired to assure proper administration of a "Masters' and Servants' Ordinance," and although they started slowly, they soon covered half the European farms a year -- though what they aimed to or in fact did accomplish is far from clear. *Ibid*. See also MacPhee, *op. cit.*, p. 69. See also *Kenya Legislative Council Debates*, 1925, (1), p. 53.

64/ Ultimately the dispute was put to rest by none other than Winston Churchill, who in Cmd. 1509 of 1921 urged settlers to "inculcate habits of industry" in the reserves, but "do no direct recruiting." MacPhee, *op. cit.*, p. 70. See also Huxley, *op. cit.*, Vol. II, p. 70.

65/ Leakey, *op. cit.*, pp. 64-65.

population, was causing Africans significant concern and encouraging some, at least, to go to work for Europeans.[66/]

But in this early period generally no great demographic pressure on traditional African agricultural economy had yet appeared.

1920-1930: THE "GILDED YEARS"

As the war slowed in East Africa, colonists and Africans returned to repair their neglected holdings, resume production of foodstuffs and materials needed in Europe, and get on with the business of developing Kenya, which became a colony in 1920.[67/] With the post-war expansion of world trade, British farms sprang up, and they began to prosper.[68/] Despite their increase in numbers, British farmers had less and less difficulty finding enough African laborers to man their farms -- partly, no doubt, because of the "pull" of

---

66/ In general, it appears that the Africans would have preferred having their own land back to working for Europeans. European wages and fringe benefits were not so attractive as to appeal tremendously to Africans, particularly when accepting them meant giving up the land to which traditional ties were strong. The extent of African employment on the European farms is therefore some indication of the degree of population pressure on the remaining African lands.

67/ Elspeth Huxley wrote:

> "The labour supply was badly depleted and native production in the reserves at a standstill . . . . There was a shortage of everything that was most needed."

Huxley, *op. cit.*, Vol. II, p. 51.

68/ See, *e.g.*, *Kenya Legislative Council Debates*, 1925, p. 376. There were, however, severe problems including an exchange crisis, fiscal deficits, and difficulties in expanding infrastructure. See below and see, *e.g.*, Huxley, *op. cit.*, Vol. II, pp. 70-85.

improved wages and benefits, but also because of the "push" of incipient population pressure on the land. For notwithstanding the official view,[69/] the African population was most likely already at the three-million mark, and expanding at close to 2 percent annually.[70/] Perhaps one-sixth of the adult male African population now worked for Europeans, earning increasing real wages, growing increasingly politically aware and resentful, and taking back to their reserves knowledge of new crops and livestock that became the seeds of the later agricultural reforms.

Demographic Patterns, 1920-1930

The evidence on population levels and growth in the 1920's is stronger than that for the early period, but still fragmentary. Official statistics now indicate growth, though probably at a slower rate than the actual. They apply that rate to what is almost surely an underestimate of the 1920 population and so underestimate the 1930 population even more.

The official population estimates still rely primarily on Hut Tax counts. Most authorities agree the Hut Tax

---

69/ See Annual Rep. on the Col. and Prot. of Kenya, 1920-21, p. 29; 1921, p. 7; 1922, p. 6; 1923, p. 9; 1924, p. 7; 1925, p. 7; 1926, p. 11; 1927, p. 20; 1928, p. 20; 1930, p. 9.

70/ It might appear that the Europeans' increased seizures of land might have caused the rise in population density, but that is unlikely as much of the land had already been set aside in any case; by 1930 Europeans held over 80 percent of what land they would ever hold.

counts continued to improve as more enumerators were hired and as they gained experience. The data seem to bear this out.71/ Population is said to have risen from around 2.48 million in 1920 to 2.95 million in 1930, at an annual rate of 1.7 percent.72/

Several small-scale studies of particular geographic areas support the view that the population growth rate was close to 2 percent in the 1920's and early 1930's. S. H. Fazan, Kikuyuland's District Commissioner, Dr. Leakey, and other authorities contended that a growth rate of up to 2 percent was not unlikely, though little is known of what evidence underlay their contention.73/ Studies of Hut Tax rolls and head counts in South Kavirondo (in the densely populated region near Lake Victoria) suggest a growth rate for the adult population of about 1.5 percent.74/ Similar

---

71/ Except for an obvious and predictable break in 1925 when Jubaland was ceded to Italy and a three-year decline during the Depression when tax collectors had more than usual difficulty locating huts, no major break mars the trend of demographic data into the mid-thirties. See Kuczynski, op. cit., Vol. II, pp. 135-137.

72/ What the relationship was between better counting and natural increase cannot be determined.

73/ Rep. of Kenya Land Comm. Ev. and Mem., Vol. I, pp. 676, 968. But see Kuczynski, op. cit., Vol. II, pp. 222-224.

74/ South Kavirondo's District Commissioner, Major C. E. B. Buxton, tried a count of married women over 1927-1932, which suggested a growth rate of 2.2 percent, a Hut count which suggested 1.1 percent, and Hut Tax rolls which suggested 1.5 percent. Kenya Land Comm. Rep., Ev. and Mem., Vol. III, pp. 2348-2350.

studies in Central Kavirondo suggest a rate of about 1 percent.75/ And other studies of North Kavirondo suggest a rate of closer to 1.5 percent.76/ Since these studies are based on tallies of only the adult population, they reflect birth rates and infant mortality rates of much earlier years. As a result they very probably underestimate contemporaneous population growth rates. These studies are discussed more fully in Appendix 1.

Ideally one would check the growth rate implied by total population data by estimating it indirectly through birth and death rates. Unfortunately, there is little information on births and deaths.77/ But there are indications that birth rates remained high and even rose slightly, despite popular belief to the contrary among Europeans whose memories of "labor shortages" were fresh. And there are indications that death rates were falling, though still high. Kenya had entered the demographic transition.

75/ Central Kavirondo's District Commissioner, R. P. Armitage, estimated married women and huts, and concluded that the growth rate of population in Central and North Kavirondo was probably between 0.5 and 1.2 percent. *Id*. at Vol. III, pp. 2261-2262.

76/ North Kavirondo's District Commissioner, C. B. Thompson, concluded the growth rate lay between 1.0 and 1.5 percent. *Id*. at Vol. III, p. 2268.

77/ A bill requiring registration of births and deaths was introduced in the Legislative Council in 1927 and passed in June of 1929, but it was obviously difficult to implement, given the difficulties of travel in upland Kenya. *Kenya Legislative Council Debates*, 1927, (1), p. 637. See also *Kenya Legislative Council Debates*, 1929, (1), p. 144.

Deaths were as yet unreported except in cities where authorities heard of perhaps 16-18 deaths per thousand population. There were undoubtedly many more, however, for Africans tended to return to their homelands to die.[78/] In 1928 the Chief Registrar of Native Affairs estimated the African mortality rate at 20 per thousand for the whole population.[79/] That was the rate assumed by the Kenya government through 1936. From what we know of Kenya's death rates in later years (the overall death rate in the 1960's is put at 18-20 per thousand), it is clear that this estimate is too low for the 1920's. Disease remained rampant.[80/]

But death rates had most likely come down from the 35-40 range often found in primitive tropical societies and probably prevailing in Kenya at the turn of the century. The eradication of smallpox and yaws was significant; smallpox epidemics, in particular, had taken a heavy toll in earlier years. And as European notions of hygiene spread,

---

78/ Kuczynski, *op. cit.*, Vol. II, pp. 184-186.

79/ He estimated mortality at 5 per thousand at age 16, rising to 30 per thousand at age 45. *Id.* at p. 141.

80/ In 1924 Dr. Leys, Chief Medical Officer, wrote:

> "Two diseases (small pox and yaws) are under control. None of the other preventable diseases are, except to some extent in the towns. Of those, malaria and dysentery nearly everywhere and anchylostomiasis on the coast are as prevalent as ever . . .. Of the diseases recently introduced the chief are tuberculosis and venereal diseases."

Leys, Norman, *Kenya*, London, 1924, pp. 283-284.

particularly among the substantial fraction of the population employed on European farms, the general incidence of diseases declined, particularly the virulent diarrheal diseases that severely affect tropical populations.[81/] Moreover, famines were less frequent, for weather had been fairly good,[82/] and with the spread of roads and railway into the Western Rift[83/] the government was better able to compensate for poor harvests that did occur.[84/] The *Pax Brittanica* had reduced tribal warfare. And though Africans working on European farms in those years lived under conditions that were often poor, they probably lived a little longer than in the reserves, as some medical facilities were available.

Perhaps most important, the British worked to undo African customs that had kept death rates high, particularly among children, which were perhaps an unconscious mechanism for fitting the population to the land.[85/] Archaeologist Leakey emphasizes the population-suppressing effect of Kikuyu

---

81/ *Kenya Legislative Council Debates*, 1926, (2), p. 43.

82/ When locust plagues struck in 1929 and 1930, the government financed programs to kill the insects and imported at least some needed food -- in contrast to the earlier plagues of around 1900 when nothing at all could be done.

83/ The railway had been expanded in the early 1920's particularly toward the Uasin Gishu in the west and in other areas. Roads had also been built, so that the transportation network was considerably improved. See, *e.g.*, Huxley, Elspeth, *op. cit.*, Vol. II, pp. 70-71, 95-98. See also Ominde, *op. cit.*, p. 25.

84/ See, *e.g.*, *Kenya Legislative Council Debates*, 1929, (2), p. 366.

85/ *Rep. of Kenya Land Comm.*, Ev. and Mem., Vol. I, p. 676.

customs of childrearing.[86/] The Kikuyu believed the soul of a dying man or child could only "escape" if death occurred outdoors. A mother with a sniffley baby would therefore leave it outside to sleep, and in the chilly Highland nights the baby often contracted pneumonia or other serious illness. In the early 1900's up to half of the Kikuyu children are said to have died before they were two.[87/]

Death rates for women may also have fallen with suppression of the practice of female circumcision which left scars that markedly increased the hazards of childbirth.

On the other side, birth rates may have begun to increase, if slowly, as African customs regulating age at marriage, premarital sex, and abstinence from sex during lactation gave way.[88/] Thus, by 1925, we find the Nominated Official Member of the Legislative Council stating:

> "Now we find amongst the educated natives today that there are families that have four, five, six, seven or eight children; whereas before there were only two children."[89/]

86/ Leakey, *op. cit.*, pp. 20-24.

87/ *Ibid*; see also Kuczynski, *op. cit.*, Vol. II, pp. 123-124.

88/ Marriage among the Kikuyu was generally not allowed until after a lengthy initiation period into formal adulthood during the teen years, and premarital sex was discouraged or totally disapproved during those years. Sexual relations were also prohibited during the customary two years of lactation. These customs and their downward influence on fertility are discussed more fully in Appendix I. *Id.* at pp. 188-189, 216.

89/ *Kenya Legislative Council Debates*, 1925, (2), p. 533.

Other evidence corroborates this statement.[90/]

On balance, it seems likely that African birth rates in the 1920's may have climbed close to 50 per thousand -- a high rate, but one commonly found in developing countries -- and death rates may have come down to around 30 per thousand, leaving a rate of natural increase approaching 2 percent annually.

90/ See, e.g., Med. Rep. for the Col. and Prot. of Kenya, 1929, pp. 13-14.

> The African population of Kenya was estimated in 1926 to be 2,515,330, and the figures for the subsequent years are as follows:
>
> | | |
> |---|---|
> | 1927 | 2,793,963 |
> | 1928 | 2,838,022 |
> | 1929 | 2,930,604 |
>
> These figures are estimates based on the Hut Count which is made for the collection of tax. The yearly increase which the figures show may to some extent be due to closer enumeration and may not in their entirety represent increases of the population. Apart from these figures, however, all indications are that, taken as a whole, the native population of Kenya is increasing in numbers . . . .. We do not know what the general birth, death, and infantile mortality rates may be, but we do know that in certain areas both the fertility rate of the women and the infant mortality rates are very high, the former being in the neighborhood of seven live births per woman, and the latter in the neighborhood of four hundred infant deaths per thousand children born. Under these circumstances the need is not for an increased birth rate but for a higher survival rate.

See also Leakey, op. cit., pp. 19-21, 72. See also Statement of H. B. Leakey in Report of Kenya Land Comm., Ev. and Mem., Vol. I, p. 676. See also Humphrey, N., E. H. Lambert, and P. Wyn Harris, The Kikuyu Lands, Colony and Protectorate of Kenya, Nairobi, 1945, p. 41.

Economic Developments, 1920-1930

In the post-war years Kenya's colonial settlers worked to defend Kenya's interests against metropolitan Britain's in the formation of Imperial policy and their own interests against those of native Africans in the formation of local policy. They succeeded better at the latter than at the former, with the result that an increasingly heavy colonial yoke came to rest largely, though not exclusively, on the backs of the Africans. Combined with incipient population pressure in critical areas, this led to increasing African discontent.[91/]

The settlers' chief aim was to expand incomes through increases in production. For this they required decent export prices, greater transportation facilities, other expansions of infrastructure, and more African labor. A balance-of-payments crisis for a time threatened their plans. Kenya's exports had tripled between 1912 and 1919, but with the post-war collapse of the gold standard in Britain, the Kenyan currency appreciated sharply relative to the pound and export earnings fell off, despite production increases.[92/]

91/ The settlers pushed for more control over the Colony, coming close to threatening a Declaration of Independence. The question came to a head over a dispute between European settlers and Whitehall as to whether Indians residing in Kenya should be enfranchised. The result was the momentous Devonshire White Paper setting forth the paramountcy of the interests not of Europeans, but of Africans. Despite this, Kenya's European settlers continued to have the whip hand. See Huxley, *op. cit.*, Vol. II, pp. 110-160; MacPhee, *op. cit.*, pp. 70-74.

92/ Huxley, *op. cit.*, Vol. II, pp. 72-81.

Feeling profits squeezed and sterling debts looming larger, the Europeans moved to reduce African wages -- a blow to African living standards having nothing to do with population.[93/]

The settlers pushed the colonial regime to reduce defense expenditures and instead to expand the railway and other infrastructure, to provide more dips and medicines for cattle, and to expand medical and educational facilities for both Europeans and Africans.[94/] They also pushed for a reduction in African taxes.

The colonial government responded to the trade situation and the settlers' demands for more production-oriented expenditures by passing a set of measures amounting to partial devaluation, reducing settlers' taxes, and subsidizing maize to foster its production for domestic use and export, a measure that would sharply affect future agriculture.[95/] It also expanded the railway into the rich grain belt of Njoro and the Uasin Gishu beyond.[96/] The result was trade-led growth. At this point the expansion in African

---

93/ Huxley, *op. cit.*, Vol. II, p. 80.

94/ "Could [tax revenues] not be better spent . . . in providing these tribes with agricultural instructors to show them how to grow better crops, with serum for their cattle . . ., with technical schools, . . . with medicines?" Huxley, *op. cit.*, Vol. II, pp. 102-103.

95/ *Id.* at pp. 105-107. See also MacPhee, *op. cit.*, p. 75.

96/ Huxley, *op. cit.*, Vol. II, pp. 95-98. This second major line of the railway was critical to later growth of marketed output.

population seems chiefly to have enabled the Kenyan economy to grow, albeit in a dualistic pattern that probably did not return to Africans the full value of their economic contribution.97/

During the headiest "gilded years," 1924-1928, agriculture expanded in both the African and European sectors, and exports rose:

European Exports 98/		African Exports 99/ (Total £)	
1924	2,239,614	1922	176,000
1925	2,724,629	1923	271,680
1926	3,266,433	1924	480,360
1927	2,745,940	1925	564,865
1928	3,286,403	1926	470,750
1929	2,382,976	1927	497,780
1930	2,343,874	1928	482,437
		1929	500,740

More and more Europeans were coming to Kenya and staking out farms:

Alienated Land (Acres) 100/		Landowners
1921	3,168,588	1005 (est.)
1925	5,745,607	1695
1929	6,720,080	2035

97/ Lord Moyne concluded in 1932 that Africans contributed £ 791,100 in taxes but received only £ 33,986. MacPhee, *op. cit.*, pp. 86-87. Subsequent research confirms this view.

98/ *Colonial Office Lists*, 1921-1930, Waterlow & Sons, Ltd., London, *passim*. See also *Annual Rep. on the Col. and Prot. of Kenya*, 1921-1930, *passim*. See also MacPhee, *op. cit.*, pp. 75-80.

99/ *Annual Rep. on the Col. and Prot. of Kenya*, 1929.

100/ *Annual Rep. on the Col. and Prot. of Kenya*, 1921-1929, *passim*.

and by 1929 they had alienated over 85 percent of the land they would ever control in Kenya. (The Europeans held perhaps one-fifth of the prime agricultural land; the Africans retained the rest.)

In the mid-1920's, interestingly, Europeans found the labor they needed with less and less difficulty despite their increasing requirements; African employment climbed to over 100,000 Africans a month, perhaps about one-sixth of the adult male population. Were Africans "pulled" toward European farms by the promise of higher earnings and opportunities to learn new ways there or "pushed" off their remaining land because the combination of European settlement and African population growth caused increasingly serious population pressure on that land?

In this period, apparently, they were primarily pulled to the European farms. Real wages improved over the period; cash wages more than doubled over 1924-29 while prices rose only 14 percent.[101/] Assuming an African's option was traditional agriculture, he probably did at least as well in some areas to work for Europeans -- particularly since he also learned about European cash-cropping (though colonial restrictions on cash-cropping by Africans limited

---

101/ Annual Rep. on the Col. and Prot. of Kenya, 1924-1930, passim. See also Kenya Legislative Council Debates, 1925 (1), p. 382. See also Native Affairs Dept. Report, 1929, Kenya Colony and Protectorate, London H.M.S.O., 1931, Appendix "A", p. 134; see also Native Affairs Dept. Rep., 1926, pp. 69-74, stating wages consisted of 2 pounds of maize daily sometimes supplemented by meats and vegetables, plus shs. 10 per month in the Rift to shs. 60 in tea estates in Kericho.

his ability to put that knowledge to use).[102/] On the other hand, diminutions of African lands undoubtedly caused increasing hardships for the Africans affected. But it seems clear that even with the Europeans' seizure of land and the accelerating growth of African population in the 1920's, there was no demographic pressure sufficient really to damage African living standards. On the contrary, African population growth seems to have facilitated expansion in both the European and African sectors.

1930-1940: THE DEPRESSION

During the Depression years of the 1930's the combination of hard times on European farms following declines in export prices and increasing demographic pressure in major African areas, particularly Kikuyuland and near Lake Victoria, led to the first clear evidence of growing economic difficulties for Africans. The African population had reached a level considerably higher than most of the colonials would have believed, and it was growing ever faster. The Africans themselves perhaps realized more clearly than the colonials what the implications of this population expansion were. For the 1930's saw the first major expression of African demands that the alienated land be returned to them, on grounds that they needed it to sustain their own living standards. The result was the famous

---

102/ See, *e.g.*, *Kenya Legislative Council Debates*, 1926 (1), p. 37.

Kenya Land Commission ("Carter Commission"), from which much of our historical information on Colonial Kenya derives.

Demographic Patterns, 1930-1940

The 1930's bring fairly clear confirmation of the hypothesis that the African population was both substantial and rapidly expanding. The population most likely reached the 4 million mark by 1940, though official estimates were roughly 20 percent lower.[103/]

Demographic data collected during the period are still fragmentary. The Colonial Reports' population estimates still derive from Hut Tax rolls, and are still subject to a wide margin of error, though it is likely that their accuracy increased as the government's reach spread. Those estimates imply an average growth rate over 1930-35 of only .4 percent, doubtless the result of Africans' successful efforts to avoid taxation during the Depression by tearing down their huts. The rate over 1935-40 of 2.7 percent implied by the Colonial Reports for those years is probably closer to the mark.

Another source of national population estimates was developed and refined in the 1920's and 1930's: the lists of adult male Africans who had been issued identification cards or "kipandis." Each male African over 16 was

---

103/ See, e.g., Annual Rep. on the Col. and Prot. of Kenya, 1930, p. 9; 1931, p. 13; 1932, p. 13; 1933, p. 12; 1934, p. 12; 1935, p. 9; 1936, p. 10; 1937, p. 10; 1938, p. 10, after which the Reports were suspended until 1946. See also Med. Rep. on the Col. and Prot. of Kenya, 1940, p. 3; 1946, p. 22.

required to have a kipandi, and by 1930 almost one million had been issued -- suggesting widespread though not universal coverage.[104/]

The kipandi lists were used by the government in combination with current guesses about population structure to make estimates of the total population; two critical assumptions were that women constituted 51 percent of the population and children 37 percent.[105/] Later census results made clear that those assumptions alone -- regardless of the accuracy of the kipandi count -- must have resulted in substantial underestimation of total population.

The kipandis were also used to estimate birth and death rates, but these were not published.

The same forces that operated during the 1920's to reduce death rates continued to operate in the 1930's.[106/] The Pax Britannica, the expanding transportation network, continued peace, the diffusion of basic principles of hygiene and health to more people, and the development of a rudimentary medical system most probably reduced death rates to the 25-30 per thousand range on the average.[107/] It is also

---

104/ Kuczynski, op. cit., pp. 139-41. See also Native Affairs Dept. Rep., 1928, p. 121.

105/ Kuczynski, op. cit., Vol. II, pp. 151-1952. See Appendix 1 for further discussion.

106/ Though the Depression may have worked to increase morbidity and mortality.

107/ See Appendix 1 for further discussion of the demographic effects of these influences.

likely that birth rates continued around the 50 per thousand level.[108/]

As Kuczynski himself notes, the major collection of historical evidence in the 1930's -- the Report of the Kenya Land Commission -- runs counter to his view that the population was virtually stable. (The very fact that the Commission came into being also militates against the stable-population hypothesis.) The information on population growth presented to the Commission (cited above in the discussion of population trends during the 1920's) was hardly extensive or precise. But it led the Commission to conclude that

---

108/ See, *e.g.*, Dr. Leakey's statement before the Kenya Land Commission in 1932:

> "The reason for the great overcrowding today, to my mind, is that the last fourteen or fifteen years have seen a tremendous change in native custom as it affects birth and population. Formerly, no Kikuyu woman was allowed to conceive a second child until the first child had stopped suckling, which was usually not until the end of the second year, so there were generally intervals of about three years between the children. That has been broken down entirely, . . . and children are now being born -- according to figures from the Kabete Mission -- about one every one-and-a-half years.
>
> "Secondly from investigations and inquiries I made just at the beginning of 1919 over not a very big area . . . I estimated . . . that the number of deaths before puberty compared with children born was about 60 per cent . . . . From the figures I have got now, anyway as regards those who are affected by missionary influences, the death rate is very much lower indeed."

Rep. of Kenya Land Comm. Ev. and Mem., Vol. I, p. 676.

population was growing at least at 1-1.5 percent annually.[109/] The 1948 Census ten years later would imply that the growth rate must in fact have been higher.[110/]

The age distribution of the population must also have been changing in such a way as to raise birth rates and so accelerate population growth. In 1922 the proportion of children to total population in Kavirondo District was put at 37-41 percent; this was the basis of the estimate of the 37 percent used by the colonial regime through the 1930's. But two studies of smaller populations suggest that children constituted a still higher proportion of total population. Over 1928-38, the agricultural censuses of "squatters" show that children constituted well over 40 percent of the total squatter population.[111/] And a survey of the Digo District concluded that children constituted 52 percent of total population.[112/] Kuczynski fails to pay these studies much attention. But since the 1940's, sample population censuses made in many developing countries indicate that age structures such as these studies imply are typical of developing countries in the demographic transition.

109/ Rep. of Kenya Land Comm., p. 349. See also Kuczynski, op. cit., Vol. II, p. 226.

110/ Afr. Pop. of Kenya Col. and Prot. (1948), p. 1.

111/ Kuczynski, op. cit., Vol. II, p. 154.

112/ Id. at pp. 154-155. See also Med. Rep. on the Col. and Prot. of Kenya, 1933, p. 25.

Economic Developments, 1930-1940

Increasing population density aggravated the economic problems that the Depression caused Africans. The harbinger of the Depression in East Africa was a devastating plague of locusts that descended in 1929 from Northern Africa -- the first locust plague in thirty years. The 1930 harvest was decimated. Once more famine threatened. But this time the government stepped in with massive food-grain imports.[113/]

On the heels of the locust plague came world-price collapse; despite farmers' efforts to compensate with increases in production, their incomes fell.[114/] And in 1931 a second plague of locusts arrived to make matters worse.[115/]

The economy reeled from the blow. For once there were no complaints of a "labor shortage." Rather, the Africans now complained of severe and rising unemployment. Even those who kept their jobs had trouble, for over 1930-1936 their real wages dropped by about 15 percent.[116/]

Africans protested to the Europeans that they needed back the alienated land. Accelerating population

---

113/ Huxley, *op. cit.*, Vol. II, p. 256. See also *Kenya Legislative Council Debates* 1929 (2), p. 366. See also *Native Affairs Dept. Rep.*, 1933, pp. 1-30. See also MacPhee, *op. cit.*, p. 81.

114/ Huxley, *op. cit.*, Vol. II, pp. 305-306, 311. See also *Native Affairs Dept. Rep.*, 1933, *passim*. See also MacPhee, *op. cit.*, pp. 81-83.

115/ Huxley, *op. cit.*, Vol. II, p. 257.

116/ *Annual Rep. on Col. and Prot. of Kenya*, 1930-1936, *passim*.

growth had begun to stress traditional systems; where Europeans had seized some of the land, as in Kiambu, the pressure was increased by a quantum. In densely populated areas the old pattern of shifting cultivation was now breaking down. Fallow periods were shortened; cropping and grazing were intensified.117/ Leakey reported cultivation ratios of 1/8 to 1/13; by the 1930's the ratios were more than twice as high, and fallow periods curtailed proportionately.118/ As a result of the post-war maize subsidy, far more maize was being grown in African as well as European areas. Increased consumption of maize improved African diets and incomes of the moment, but, unfortunately, maize depleted the land relatively quickly, exacerbating the adverse effects of shorter fallow periods. Attempts to encourage manuring to compensate for shorter fallow periods and the additional maize cultivation failed as the cattle were seldom confined to pens near the cropped areas. (Generally, they roamed about in wider grazing areas sometimes held more or less communally.) Resulting erosion was

---

117/ "It is quite true that there is a method of shifting cultivation being practiced in the native reserves which will continue to be practiced over large areas for a considerable time to come. In certain other areas, due to density of population, this method of shifting cultivation has already had to be given up." Alexander Holm, Director of Agriculture, Rep. of Kenya Land Comm., Ev. and Mem., Vol. III, p. 3149.

118/ *Id.* at p. 27.

becoming a problem.[119/] More and more Africans consequently fled to seek employment on European farms, and more and more made concerted protests to the colonial regime on the land question.[120/]

As the protests mounted, the British government established the Kenya Land Commission, under the aegis of Sir Morris Carter, to investigate African land grievances and to achieve a compromise settlement that would right the more egregious wrongs while preserving the European enclave largely intact.[121/] The Carter Commission took testimony from scores of witnesses -- colonial officers, missionaries, settlers, Africans -- and concluded that some tribes, particularly the Kikuyu and the Nandi, had indeed lost land

---

119/ See, e.g., Kenya Legislative Council Debates 1930 (1), p. 165, for statement of Canon H. B. Leakey, and pp. 185-90. See also the statement describing pastoral Rift areas, where despite what appears to be sparse population, growing human population had led to growing livestock populations, with resulting overstocking "far in excess of the capacity of the land to carry. The result is complete ruination of the land, which for all practical purposes is no longer capable of supporting life." Id. at (2), p. 479; see also the statement that due to erosion from overcropping and overstocking, "small deserts are being created in many of the Native Reserves." Ibid.

120/ One European legislator noted, for example:

> "Why do the natives go out to squat? We hear of tribal discipline and the like, but the main reason is pressure on his own land."

Kenya Legislative Council Debates 1938 (1), p. 63.

121/ Rep. of Kenya Land Comm., passim. This report, with its volumes of evidence and memoranda, represents a major source of data on colonial Kenya.

which they therefore should be allowed to reclaim. The Commission recommended what it believed to be a generous settlement. The chief enacting legislation -- the Native Lands Trust Ordinance -- passed in 1938 and fixed the European lands at 16,700 square miles (including 3,900 square miles of forest) out of a total of 220,000 square miles. But the proportion of fertile land held by Europeans was about one-fifth. Not surprisingly, the most aggrieved Africans, including many Kikuyu, remained unappeased.

The Depression had hurt the Africans, and their ability to adjust was limited by (1) European settlement on a significant portion of their better land; and (2) population increase. That the 1920's had brought improvements in living standards comes clear; many Africans did not consider a return to old subsistence agriculture, with no salable surplus, an attractive alternative. Worse, the European seizure of land had cut off even that option for many Africans, especially the Kikuyu. From this point on, for the next several decades, land would be scarce enough so that population increases would result in growing economic problems for Africans.

1940-1948: THE DECLINE OF TRADITIONAL AFRICAN AGRICULTURE

The war years saw European farms generally prosper while African holdings deteriorated as a result in large part of increasing population pressure on the land. To the colonials' surprise, the first Kenyan census in 1948 showed that the African population had surpassed the 5 million mark -- about 20 percent above the going estimates and perhaps double its level of only fifty years back. The Census indicated that population growth rates had to be much higher than they were thought to be -- or that population in the earlier years of the century had been enormously higher than all responsible estimates suggest. The population had grown so fast that traditional agriculture could not adjust. The result was economic stagnation in African areas and land erosion so severe as to startle the colonial regime into a last-ditch effort to stave off economic disaster and preserve the social order.

Demographic Patterns: The Census of 1948

The 1948 Census provided the first hard information on Kenya's African population, and it came as a rude awakening. On the basis of earlier estimates, the African population had been expected to reach no more than 4.4 million in 1948. When the returns were in, the population totaled 5,251,120.[122/]

The 1948 Census revealed two obvious sources of underestimation: women turned out to constitute 53.3 percent

---

122/ The Census was carried out through a careful Hut Count directed by C. J. Martin, who has described the methods and its problems in detail. Martin, C. J., "The East African Population Census, 1948: Planning and Enumeration," *Population Studies*, Vol. III, No. 3, 1949, *passim*.

of the population, as against the earlier estimate of 51 percent, and children to constitute about 48 percent, as against the far lower earlier estimate of 37 percent.[123/] If the population in the 1930's had been structured like the population in 1948, the estimates based on adult male Hut Tax and kipandi counts would have been low by about a third. The revised estimates of our reconstructed series, which are about 20-25 percent larger than the official figures, are therefore quite plausible.[124/]

The Census established Kenya as a country in the midst of the demographic transition. Although no careful estimates of adult mortality were made, an invaluable estimate of child mortality was obtained.[125/] Infant "wastage" or mortality was first put at 184 per thousand babies aged one year and under.[126/] That rate is high, but still far lower than the earlier estimate that 500 children had died in their

---

123/ Children may even have been underestimated as Africans were superstitious about admitting the number of their children so that enumerators often had to record only the ones they could find.

124/ If children had constituted only 40 percent of the population, it would still have been underestimated by over 15 percent.

125/ Generally, no distinction is made between the infant mortality rate (for births in some year) and the 0-1 age-specific death rate in that same year.

126/ As most mothers thought not in terms of calendar years but in terms of weaning, which was traditionally at roughly two years, this rate was ultimately treated as deaths in the first two years of life, rather than in the conventional first year. This procedure perhaps resulted in too low an estimate, however, since weaning was reported to occur within a year by the 1940's.

first two years, and it confirms the decline in death rates, particularly among children, that marks the demographic transition.127/

Since no direct estimates of birth rates were made, the Census supervisor, C. J. Martin, derived indirect estimates from data on the population's structure.

Rough estimates of an age pyramid in Kenya show relatively high proportions of Kenya's population in the younger age groups. This pattern is similar to that found in other developing countries.

Age Distribution of Population128/

	Less than 1	1-5	6-15	16-45	46+
Kenya (1948)	4.5	19.0	24.6	43.2	8.7
Tanganyika (1948)	3.6	15.2	23.4	47.8	10.0
Uganda (1948)	2.8	14.3	23.8	47.5	11.6
Peru (L948)	3.5	15.0	25.7	41.8	14.0
Turkey (1945)	2.5	13.9	26.1	43.5	14.0
Brazil (1940)	3.3	15.3	26.3	43.5	11.6

Thus children represented approximately as great a proportion of the population (48 percent) as was reported in the earlier studies rejected by Kuczynski, and well above the 37 percent estimate used for so long by the government.129/ Martin finds

---

127/ The earlier estimate may, of course, have been exaggerated, but at least one African country still has an infant mortality rate exceeding 300, so there probably was a substantial decline.

128/ Martin, C. J., "Some Estimates of the General Age Distribution, Fertility, and Rate of Natural Increase of the African Population of East Africa," Population Studies, Vol. VII, No. 2, 1953, p. 186.

129/ Actually, girls were counted as 13 and under, so the percent was probably slightly higher.

the percentage of children even higher in Kenya than in other developing countries:

Children as a Percent of Total Population 130/

	Children (0-13 Female) (0-15 Male)	Adults
Kenya (1948)	48.0	51.9
Tanganyika (1948)	42.2	57.8
Uganda (1948)	40.0	59.1
Peru (1940)	44.2	55.8
Turkey (1945)	42.5	57.5
Brazil (1940)	44.9	55.1

To conform to Martin's estimate of child mortality, birth rates would have to be around 50 per thousand. Martin found that birth rate implausibly high; the government considered it virtually impossible. 131/ But our series, supported by later census data, indicate Martin was right even though he could not believe it. (See Appendix 1.)

Why the predilection of the government and Kuczynski to dismiss the evidence of population growth?

130/ Martin, *op. cit.*, p. 119. If no children died in the first year, the birth rate would have had to be 45 per thousand population to put children 0-1 at 4.5 percent of the population as estimated by the Census. An "infant wastage rate" of 184 per thousand births spread over a two-year infancy suggests that the birth rate must have been at least 50 per thousand population, to leave infants one year and under about 4.5 percent of the population. Martin suggests that children under one year may have been overestimated -- despite an earlier claim of the opposite -- and puts them at only 4 percent of the population, which with an infant wastage rate of 184 suggests a birth rate of 44 or 45. *Ibid.*

131/ Data gathered on existing family size also pointed to high birth rates. Unfortunately, that data attributes an implausible number of births, especially first births, to older women. See Martin, "Some Estimates of the General Age Distribution, Fertility, and Rate of Natural Increase of the African Population of East Africa," *op. cit.*, p. 194.

First, it was not very scientific. Second, and more important, after over-advertising the supply of African labor to potential British settlers and having to cope with the settlers' complaints about labor shortages for years afterward, the government was indisposed to perceive a large and rapidly growing African population. Indeed, few demographers would have jumped to a similar conclusion. We now have the advantage of later censuses (1962 and 1969) and evidence on demographic transitions elsewhere, which show that the early descriptions of population growth were almost certainly accurate.

The result was clear: with the British land-grab and the unsuspected rapid growth of African population, population density had increased markedly in some African areas. Unfortunately, it is impossible to produce a good time series on density over the 1900-1948 period under consideration because of the inadequacies of early population data and changing geographic boundaries, but the following tables give a suggestion of what was happening, at least between the Kenya Land Commission in the 1930's and the 1948 Census and -- in order to highlight the trend -- the later 1962 Census in selected districts (including most of those on which we will focus in evaluating the land reforms later). The first table gives gross population density per square mile in selected districts. The district boundaries changed several times over the period, and it was not possible to re-define population for the same area. The area as it existed is noted, and density is computed for the area as it existed. With this unavoidable apples-and-oranges problem, the table gives only a rough idea of density trends:

GROSS POPULATION DENSITY

Location (Province & District)	1930 (KENYA LAND COMMISSION) Land Area (Sq.Miles)	African Population	Density Per Sq. Mile	1948 CENSUS Land Area (Sq.Miles)	African Population	Density Per Sq. Mile	1962 CENSUS Land Area (Sq.Miles)	African Population	Density Per Sq. Mile
CENTRAL									
Embu	1,090	92,650	85	1,657	202,125	122	1,603	292,276	182
Fort Hall	583	188,309	323	739	303,646	411	702	343,880	490
Kiambu	400	92,800	232	615	258,085	420	730	402,866	552
Meru	2,471	165,557	67	3,740	312,917	84	3,763	468,223	124
Nanyuki	N/A	N/A	N/A	2,432	32,784	13	2,811	55,132	196
Nyeri	N/A	N/A	N/A	673	183,057	272	595	252,451	424
Thika	N/A	N/A	N/A	894	66,475	74	839	94,775	113
RIFT VALLEY									
Baringo	N/A	N/A	N/A	3,511	72,034	21	3,941	129,906	33
Elgeyo-Marakwet	1,144	36,608	32	1,144	64,455	56	1,009	160,896	160
Laikipia	N/A	N/A	N/A	2,994	33,926	11	2,736	68,643	25
Naivasha	N/A	N/A	N/A	N/A	N/A	N/A	1,369	69,747	51
Nakuru	N/A	N/A	N/A	4,468	199,179	45	2,432	225,915	93
Nandi	736	47,104	64	630	80,562	128	714	118,859	166
Trans Nzoia	N/A	N/A	N/A	1,155	61,424	53	1,209	94,797	78
Uasin-Gishu	N/A	N/A	N/A	1,676	79,492	47	1,637	95,524	58

Sources: Rep. of Kenya Land Comm.; 1948 Census; 1962 Census; Morgan and Shaffer.

More interesting is a second table giving density on arable or cultivable land -- i.e. -- land of "high" and "medium" potential. "High potential" land generally receives rainfall of at least 35 inches annually and has no serious disabilities. "Medium potential" land generally receives only 25-35 inches of rainfall annually or has some climactic or drainage problem. Detailed data were available only for the districts as defined in 1962. To estimate roughly the arable or cultivable land in the districts as constituted in earlier years, it was assumed that those districts had the same proportion of arable or cultivable land as corresponding districts had in 1962, despite intervening boundary changes. This, of course, reduces the accuracy of the comparison, but the trend is still valid.

More relevant, however, is an estimate of land (particularly cultivable land) per family or per person in selected districts. Fragmentary information could be derived from data published in the Kenya Land Commission Report, and is presented below.[132/] As early as the 1930's, the "land per person" ratio in most areas is low enough to permit no more than a few pounds' worth of output beyond subsistence, if that. "Cultivable land per person" demonstrates that much Kenyan land is not usable for much besides grazing, and a sizable fraction is virtually useless. A detailed discussion below assesses the production capacity of average land per family in one Kikuyu area.

132/ Rep. of Kenya Land Comm., Ev. and Mem., Vol. I, pp. 260-274, and Vol. II, pp. 1935-1980, passim.

POPULATION DENSITY ON CULTIVABLE LAND

Location (Province & District)	1930's (KENYA LAND COMMISSION) Total Land Area (Sq.Miles)	Agr. 133/ Land Area (Sq.Miles)	Afr. Pop.	Density Per Sq. Mile	1948 CENSUS Total Land Area (Sq.Miles)	Agr. 134/ Land Area (Sq.Miles)	Afr. Pop.	Density Per Sq. Mile	1962 CENSUS Total Land Area (Sq.Miles)	Agr. 135/ Land Area (Sq.Miles)	Afr. Pop.	Density Per Sq. Mile
CENTRAL												
Embu	1,090	424	92,650	218	1,657	645	202,215	313	1,603	623	292,276	469
Fort Hall	583	322	188,309	323	739	409	303,646	742	702	388	343,880	886
Kiambu	400	172	92,800	540	615	264	258,085	977	730	314	402,886	1,283
Meru	2,471	543	166,577	307	3,740	822	312,917	381	3,763	829	468,223	565
Nanyuki	N/A	N/A	N/A	N/A	2,432	567	32,784	578	2,811	655	55,132	842
Nyeri	N/A	N/A	N/A	N/A	673	448	183,057	409	595	396	252,451	638
Thika	N/A	N/A	N/A	N/A	894	270	66,475	246	839	253	94,775	375
RIFT VALLEY												
Baringo	N/A	N/A	N/A	N/A	3,511	551	72,034	131	3,941	618	129,906	210
Elgeyo-Marakwet	1,144	181	36,608	202	1,144	290	64,455	220	1,009	256	160,896	628 136/
Laikipia	N/A	N/A	N/A	N/A	2,994	350	33,926	96	2,736	321	68,643	214
Naivasha	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1,369	N/A	69,749	N/A
Nakuru	N/A	N/A	N/A	N/A	4,468	1,510	199,179	132	2,432	719	224,915	313
Nandi	736	596	47,104	79	630	510	80,562	158	714	578	118,859	206
Trans Nzoia	N/A	N/A	N/A	N/A	1,155	490	61,424	125	1,209	513	94,797	185
Uasin-Gishu	N/A	N/A	N/A	N/A	1,676	826	79,492	96	1,637	807	95,524	118
West Pokot	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1,960	255	58,869	231

Sources: Rep. of Kenya Land Comm.; 1962 Census; 1948 Census; 1968 Statistical Abstract; Morgan and Shaffer.

133/ Figured using same proportion as for 1962 districts.

134/ Figured using same proportion as for 1962 districts.

135/ High and Medium Potential Land (Classes "A" and "B").

136/ Boundary change.

ACRES OF LAND PER FAMILY AND PER PERSON IN THE 1930'S

(KENYA LAND COMMISSION)

District	Persons Per Family	Land Per Family	Cultivable Land Per Family	Land Per Person	Cultivable Land Per Person
Nyeri	5.85	8.09	4.05	1.38	0.69
Nandi	5.0	56.40	51.90	11.28	10.38
Elgeyo	2.90	45.9	2.5	15.83	0.86
Marakwet	3.07	96.9	5.1	31.56	1.66
Elgeyo-Marakwet	2.99	67.4	3.8	22.54	1.27
Luo	4.26	31.34	N/A	7.49	N/A
Kisii	4.56	25.52	N/A	4.73	N/A
Central Nyanza	15.35	16.2	N/A	3.12	N/A
North Nyanza	4.4	20	N/A	4.55	N/A

Source: Rep. of the Kenya Land Comm.

For approximate comparison's sake, it is interesting to look at similar computations from data compiled later (by the Lawrence Commission from the 1960/61 African Agricultural Sample Census); though intervening data are unavailable because holdings became so fragmented in the 1940's and 1950's (as discussed below), the rough trend reflected in the 1960's data undoubtedly existed then.

ACRES OF LAND PER FAMILY AND PER PERSON IN THE 1960'S

District	Persons Per Family (or Holding)	Land Per Family	Cultivable Land Per Family	Land Per Person	Cultivable Land Per Person
CENTRAL	8.17	4.81	2.3	0.59	0.28
Kiambu	10.45	5.15	2.2	0.49	0.21
Nyeri	6.23	4.27	2.1	0.69	0.34
Fort Hall	6.57	3.61	1.5	0.55	0.23
Embu	12.92	7.10	3.3	0.55	0.26
RIFT					
Nandi	5.08	16.22	2.1	3.19	0.41
Elgeyo-Marakwet 137/	5.83	10.20	0.8	1.75	0.14
NYANZA	7.23	5.36	3.5	0.74	0.48
Elgon	9.14	18.18	5.7	1.99	0.62
North	6.93	5.94	3.1	0.86	0.45
Central	6.66	2.59	1.11	0.39	0.15
South	8.18	6.06	4.0	0.74	0.49
Kericho	6.26	10.25	2.6	1.64	0.42

Source: Kenyan African Agricultural Sample Census, 1960/61.

137/ Taken from Economic Survey, 1970, pp. 75-76.

What effect had the density increases had on African agriculture in the first half of the century? Among tribes (notably the Masai) whose traditional land area was large or from whom the British had not taken much land, life still went on much as before. But among many other tribes, both cultivator and pastoral, the process of intensification of land use that began in the 1930's to undermine traditional systems now accelerated. As fallow periods were curtailed more drastically, the systems that had trouble adjusting to the milder changes of the 1930's now collapsed.138/

An obscure study of the Nyeri region of Kikuyuland made in 1943-44 by agricultural officers N. Humphrey, W. E. Lambert, and P. Wyn Harris strongly suggests that population density there had reached levels sufficient to disrupt traditional agricultural patterns and threaten

---

138/ See East Africa Royal Comm. Rep., pp. 312-325, pp. 343-344. A long discussion of the need for improved agricultural methods notes at the outset: "The actual disappearance of soil and the sight of land once fertile becoming barren is naturally the most vivid sign of deterioration." P. 313. See also the legislative debates; for example, in 1942, Dr. D. L. Blunt noted: "Our main concern will not be to encourage production in the Reserves, but to try to bring them back to a conservative form of agriculture which is going to take proper care of the land." Kenya Legislative Council Debates, 1942 (1), pp. 414-415. In 1953 a member of Kenya's Legislative Council remarked that Kikuyu squatters on European land could hardly return to Kikuyu areas: "Heaven knows how they are going to make a living when they return to the land units (left 30-40 years ago) and find there is not a square inch of land for them to cultivate." Kenya Legislative Council Debates, 1952-1953, p. 81. See also notes 117-121, supra, on the adverse effects on the land resulting from rising population density in earlier decades, particularly around the time of the Carter Commission.

Kikuyu living standards, such as they were.[139/] Humphrey gathers statistical data -- imperfect but reasonable, on the whole -- which indicates that between 1936 and 1944, as the African population in South Nyeri grew by some 17 percent (from an estimated 142,000 to 166,000), the land available to each family declined by some 20 percent (from around 8 acres to around 6.7 acres) leaving enough to provide only the slightest margin above subsistence; in fact, holdings were about half the size required to yield under traditional technology a "decent subsistence," as then defined by the government.[140/] Humphrey presents estimates of population density and resulting average farm size based on 1948 census data; these estimates have been extrapolated forward to 1962 using 1962 census and land data, to show further decreases in average holdings.

139/ Humphrey, N., E. H. Lambert and P. Wyn Harris, The Kikuyu Lands, Colony and Protectorate of Kenya, Nairobi, 1945. These views were corroborated by other evidence; as early as 1934, one member of the Legislative Council noted that the githaka system "is already showing signs of breaking down . . .. It encourages uneconomic subdivision of holdings." Kenya Legislative Council Debates, 1934 (1), p. 520.

140/ Though Humphrey uses population data predating the 1948 Census, he seems not to have underestimated average family size in that area, perhaps because Nyeri had received considerable attention from the Nairobi population officials; thus, his work may be taken as a reasonable "minimum" assessment of the damage. See Humphrey, et al., op. cit., pp. 2-3.

Agricultural Land Per Family
in South Nyeri (as defined in 1944)

Year	People/ Sq. Mile	Average Family Size	Average Area/ Family	Average Usable Area/ Family
1936	463	5.85	8.09	4.05
1944	542	5.69	6.71	3.35
1955 (Humphrey projection)	674	5.50	5.22	2.61
1962 (1962 Census & holding estimate)	822	6.80	4.59	2.30

Source: Humphrey, *et al.*, *op. cit.*, p. 4; 1962 Census.

To estimate "usable land," Humphrey subtracts about half of the land as being too steep for farming. This may have been an overestimate; in what follows, to be conservative, the adjustment for steepness will be ignored.

Humphrey presents "food requirements" for a family of around 5.7 people (an estimate conforming to 1948 Census data), as published in a contemporary East African Medical Journal.[141/] But the data are reasonable estimates of gross dietary "requirements" for protein and calories, based on nutritional standards for developing countries available.

141/ These requirements square approximately with what we know of nutrition today, though they indicate possible deficiencies in vegetables and fruits, hence in vitamins, common in many developing country areas.

Annual Food Requirements of Average Family

Maize	6 bags	(1095 lb./bag)
Millet	6 bags	(365 lb./bag)
Beans	1/2 bag	(95 lb./bag)
Potatoes	2 bags	(365 lb./bag)
Milk	160 gal.	
Meat	365 lb.	
Green Veg.	276 lb.	
Sugar	137 lb.	
Tea	23 lb.	

Source: Humphrey, et al., op. cit.

In addition to their subsistence requirements, valued at about £ 2-4, Humphrey assumes a modest target income of about £ 16, to total £ 18-20.

To reach this target income, holdings would have to exceed 11 acres per family, including 6-1/2 for crops (under the current fallow-field production techniques) and 5 for grazing, assuming all land was usable.

Land Needed to Meet Food Requirements of Average Family

Acres	Crop	Yield	Surplus
1	Maize LR 142/	6-9 bags	0-3 bags over subsistence
	Millet SR 143/	3-4 bags	1/2
1/2	Beans LR	1 1/2 bags	2 1/2 surplus
	Beans LR	1 1/2 bags	
1/2	European Potatoes	13 bags	11 bags
1/2	Sweet Potatoes	---	
3/4	Wattle (1/7 harvested)	8.6 cwt. bark 3 tons wood	8.6 cwt. bark
1/4	Bananas		
1/2	Vegetables and fruit	---	---
2 1/2	Fallow		
6 1/2	Total Cropland		
5	Grazing		
11 1/2	TOTAL		

142/ Long rains, occurring in spring.

143/ Short rains, occurring in fall.

With contemporary price data, such a holding would yield production worth some £ 18-20 per year.[144]

If holdings had averaged 11 1/2 acres per family, Humphrey concludes that South Nyeri could have supported 15,360 families in 1944; it had 29,720.[145] Thus 14,000 families, or about 80,000 of 166,000 people, were by that definition "in surplus."[146]

Actual holdings were, of course, only <u>half</u> that size -- around 6.7 acres. It is interesting to go a step further and speculate on what the average family in South Nyeri could produce on the land actually available to it. Dividing that land roughly along the proportions Humphrey used -- 3.7 acres for crops, the remaining three acres for grazing -- we have the following pattern of land use and resulting yields allocable to subsistence and a marketable surplus:

<u>144/</u> <u>Estimated Cash Returns</u> (shs.)

11 bags of potatoes at 10 shs./bag	110/00
2 1/2 bags of beans at 12 shs./bag	30/
8.6 cwt. wattle bark at 4 shs./cwt.	34/40
Bananas	90/00
Cattle	50/00
Poultry (and eggs)	50/00
	shs. 364/40 ≐ £ 18

Humphrey, *et al.*, *op. cit.*, p. 10.

<u>145/</u> *Ibid.*

<u>146/</u> *Ibid.*

Output of Land Available for Average Family 147/

Acres	Crop-Livestock	Yield	Surplus	Cash Return (shs.)
3/4	Maize (LR)	4.5-6.8 bags	-1.5 to +.8 bags	0
	Millet (SR)	1/5-2		
1/4	Beans (LR)	.75 bag	1 bag	12
	Beans (SR)	.75 bag		
1/8	European Potatoes	6 bags	4 bags	40
1/8	Sweet Potatoes	6		
3/8	Wattle	4.3 cwt. bark	4.3 cwt. bark	17
	(1/7 harvested)	1.5 tons wood	(some)	20
1/8	Bananas	88 bunches	(some)	
1/2	Vegetables and Fruit	--	--	
				89
1.45	Temporarily fallow			
3.7	Cropland			
3.0	Grazing Land			Cattle-30
				Poultry-50
6.7	Total Land			shs. 169
				≐ £ 8

The average farmer might have had his £ 2-4 in subsistence, depending on what he sold, and perhaps around £ 8 in salable surplus to finance his purchases of other basic consumables like tea or sugar and his clothing, household needs, and any investment in his farm. That was not a large margin over bare subsistence.

147/ It is worth noting that the assumed maize yields are not extremely low; maize yields in the 1960's, with the addition of some new technology, were in the 7-9 bag range according to national data. Also, the table assumes a slightly disproportionate amount of land under maize, on the realistic assumption that many African families prefer to plant enough subsistence crops to feed or nearly feed their families, even at the cost of some acreage for cash crops. This "risk aversion" is common in such economies.

African living standards were not good; but had they actually worsened? There is evidence that they had.

If so, some change in consumption habits should be evidenced; since food was the principal consumable, it is sensible to look for any reports of diet changes. According to agricultural officer Humphrey, African diets had deteriorated. He describes in detail traditional African diets for both men and women, and how they changed during the middle decades of the 20th Century.[148/] Men and women both subsisted traditionally on a gruel (uchuru or uki) made of flour and water and perhaps a little honey; they also ate a mixture of maize, bananas, vegetables, and salt (ujali), and a few other dishes. There was also quite a variety of vegetables, particularly beans, to provide proteins and vitamins.[149/] The natural salt was rich in minerals. Sour milk provided additional proteins and vitamins. Meat was generally consumed only on ceremonial occasions. (The birth of a child might demand the slaughter of a sheep; the visit of a mother-in-law, an ox.)

The men's diet reportedly improved in the early 20th Century as the Kikuyu men began eating Masai cheese -- a mixture of milk, blood, and cow's urine -- as well as their own traditional sour milk. The men also had cattle

---

148/ Humphrey, *et al.*, *op. cit.*, pp. 33-35.

149/ Vegetables included cowpeas, colcasia, *terere*, *togoha*, *haltha*, and *wimbe*.

hunts -- ikari -- which sometimes ended in feasts. By 1944, however, it appears that the diet was far more vegetarian, and therefore shorter in protein; it consisted largely of maize, bananas, and beans. Consumption of both milk and meat reportedly had declined. The African soldiers entering the war appeared malnourished.

Women had apparently not reduced their protein intake as much since they consumed less meat to begin with, but as a result of rising prices, they were reducing consumption of calcium-rich wimbe, a major food, during pregnancy and lactation, and they grew fewer vegetables.[150/] As to children, the period of lactation was apparently reduced from two years to a year or less. Thus, although it is reasonable to assume some improvement in morbidity and mortality as health conditions improved, nutrition may well have worsened.[151/]

But what was the mechanism of change? How did the deterioration of African agriculture come about? The answer lies, at least in Kikuyuland, in the limited ability of the "githaka" system to handle population growth.

In Kikuyuland, the decline in agriculture derived largely from the githaka system's limited ability to

---

150/ Id. at pp. 35, 40.

151/ This is not the type of change that would normally result from growing British influence; the British did not preach or practice low consumption of meats and vegetables. This change can most reasonably be attributed to the worsening land shortage.

withstand demographic pressure. The system had once guaranteed adequate variety of land, but now led increasingly to fragmentation that prevented efficient farming.

Under the githaka system, each new wife of each man was given shambas or plots suited to various crops she would grow -- maize, millet, beans, fruits and vegetables; and her husband had his grazing land for livestock. As the wives of the sons and grandsons of original landowners demanded land in their turn, the supply of unclaimed land dissipated and gradually all shambas were subdivided. A mosaic of small, scattered family holdings emerged. By 1950, a typical farmer in Nyeri had six fragments of land, each of an acre or less; in Kiambu, he might have had fifteen. 152/

Two "technological changes" followed, which had the general effect of promoting more inefficient use of the increasingly scarce land. The decline in total land area held by one family (or one wife) inspired shortcuts in fallow-field cultivation on cropland and overstocking on grazing land; increased fragmentation exacerbated these problems. The fraction of cultivated land to total land had increased from around 1/8 to 1/3 to almost continuous cropping in some areas. This depleted the soil by exhausting humus, attracting eel-worms, and causing surface run-off.

152/ Individual cases were ludicrous. One man in Nyeri had forty fragments, the smallest .01 acres and some five miles from his homestead; another had twenty-nine fragments totaling three acres. The smallest recorded fragment was one banana plant.

Ideally, according to Ester Boserup, as fallow periods shorten, tree fallow gives way to bush and finally to grass fallow, and cultivators typically switch from hoes to the plows necessary to dig up matted grass roots.153/ They keep more cattle and use more manure as fertilizer to compensate for the shortening of the fallow period. But the Kikuyu's steep land and the increased scattering of plots discouraged the switch to plows. In this case, Boserup suggests an intensive "bush fallow" system is likely to develop where land is cropped consecutively for up to eight years and then rested for an equal time.154/ If population becomes too dense, the fallow period is likely to be dispensed with and an intensive system adopted where fertility is maintained through more sophisticated crop and ley rotation, manure, and other fertilizers.155/ The Kikuyu system -- and other indigenous African systems -- also failed to generate such a technology. The increased scattering of plots discouraged the women, who did much of the work, from carting heavy manure. Increasingly scarce land was given over more and more to footpaths, and the Kikuyu spent inordinate amounts of time just getting to and fro among their patches. Increasing labor/land ratios, without any intervening spur to productivity from improved technology, led to diminishing

---

153/ Boserup, *op. cit.*, pp. 15-18.

154/ *Id.* at pp. 25, 65, and *passim*.

155/ *Ibid.*

returns to labor. Specialization offered virtually no gains in efficiency with this simple crop mix, and colonial prohibitions on cash-cropping kept Africans from trying the exotic crops or dairying. Overuse of the land caused dramatic erosion, and agriculture slid downhill, almost literally, in a downward spiral.[156/]

So far from confirming Boserup's theory that population growth induces compensating technical change, the Kikuyu's story shows a system responding with harmful technical changes that exacerbated the effects of demographic pressure. The Kikuyu tribe deserves special attention, but less populous tribes also suffered, including the Kamba south of Nairobi, some of the tribes crowded into the fertile areas around Lake Victoria, and some of the pastoral peoples roaming the ever more barren arid lands.[157/]

While African agriculture declined, African expectations were rising. For with European settlement,

---

156/ "Whereas of yore several shambas would be cultivated of choice to suit particular needs, now a number of them, often ludicrously small, must be cultivated, however wasteful the labor involved . . .. There is a complete breakdown of the old agricultural system. Shifting cultivation, primitive as it may have seemed, was at least something different from chaos." Humphrey, *et al.*, *op. cit.*, p. 22.

157/ The Masai, of course, still held enough land to bail out the Kikuyu had they been inclined to let the Kikuyu use their land -- but the Masai were not, and are not, so inclined.

African views on life style changed.[158/] At the same time, African political strength and awareness was growing, under Kenyatta's leadership, and Africans began pushing for economic reform and political control. Faced with a "revolution of rising expectations" on the one hand and a spiralling economic decline on the other, the colonial regime at last admitted it had a problem, and moved to try to do something about it.

EPILOGUE: THE IMPORTANCE OF THE EUROPEAN LAND

The British clearly accelerated the increase in the population/labor ratio on African land by alienating some 7 million acres, including perhaps 3 million high-potential acres. Had this never happened, would the demographic pressures on the land have sufficed to put stress on African agriculture? That is an "iffy" question, but there is some reason to believe the answer is affirmative.

Looking at the population structure data from the 1948 Census, we may surmise that an average "family" might have included two parents and perhaps four children; there are problems with polygamy and so on, but let us use that

---

158/ Until the British came, so far as we know, the Kikuyu's "wealth" consisted largely of his wives, children, and livestock. A rich Kikuyu lived more or less as his poorer brothers lived, eating simple food, wearing simply clothing, living in a mud and wattle hut; he differed largely in his greater stores of wealth perhaps including more wives. With the advent of missionaries, settlers, and teachers, Africans learned to want -- a better house, a tap, education, money for "luxuries."

as an approximation. The question is, how many people (grouped into such families) could the alienated land have supported under traditional African agriculture -- had the British never come? Let us first look at the 3 million acres of good arable land, a significant fraction of it in Kikuyuland. There is no airtight evidence on traditional shamba size (or grazing land), but probably it was not less than 7-8 acres for a man, his first wife, and their children. Building up from that, some 300,000-400,000 families might have been supported on the 3 million acres, or around 2-2.4 million people.[159/] It is hard to say what population the remaining land might have supported under traditional technology, but with long fallow requirements, probably not more than half a million. With an actual increase in population over 1900-1948 of between two and three million, there is thus reason to think that the African population would have been running out of land in several areas, notably Kikuyuland. What technological changes they might have produced in response to this, in the absence of British settlement, is an open question. What they did do is obvious -- they went to work for Europeans, agitated for the return of their European land, and overused the land they still held.

159/ The additional acreage the Europeans alienated could also have supported more, but much of it came from Masailand and other areas where average holdings were very large; in any case, it is hard to do sound estimates.

Chapter 2. TRANSFORMING TRADITIONAL AGRICULTURE: THE SWYNNERTON REFORMS FOR SMALL FARMS

Although about four-fifths of Kenya's best agricultural land lay outside the rich European enclave in the vast African reserves, population growth had been rapid enough to bring devastating demographic pressure on much of that land. Exacerbated by traditional patterns of land ownership, population pressure had also discouraged the investment in modern agriculture required to restore and preserve the land and to guarantee its most profitable use.

Other problems contributed, of course. The colonials had prohibited Africans from growing some cash crops that might have eased the pinch for a time. And the Europeans' seizure of fertile land worsened the Africans' land shortage by a quantum. By the late 1940's however, the overriding problem was the growing inability of the traditional agricultural system to cope with increasing population pressure -- and only a massive transformation of traditional agriculture would halt and reverse the decline.

Such an agricultural transformation has been under way in Kenya for some time now. Though its record is mixed and still debated, it has provided perhaps a million Africans with secure title to their own small holdings, better methods for raising products for home use, and more opportunities for modern cash-cropping and livestocking, thereby multiplying incomes and other real and dubious benefits of the technological age.

1946 DEVELOPMENT PLAN

The effort to reform African traditional agriculture dates from 1946, when the colonial regime adopted its first major plan for reforming the African areas. The Plan was to cover 1946-1955. It was designed to (1) restore and preserve the fertility of high-rainfall land under cultivation by encouraging water and soil conservation, including terracing of eroding hillsides; (2) improve methods for growing subsistence crops; (3) rehabilitate exhausted pastureland in the farming areas by establishing a rotational ley system and limiting livestock to the carrying capacity of the land;1/ (4) institute controlled grazing schemes in the low-rainfall pastoral areas; and (5) introduce more Africans to cash-cropping and ranching for market, thus integrating them into the cash economy.2/

Unfortunately, despite the government's apparent willingness to support some agricultural reform, the 1946 Plan accomplished relatively little beyond some terracing, especially in Central Province, and some stocking schemes.

Over 1946-1955, the government stated its intention to allocate some £ 15.5 million to agricultural reform;

1/ Some of the pastureland represented fallow cropland that would be plowed under in its turn; other was so steep, so dry, or so cold that it could be used only for grazing.

2/ Report of the Development Committee, Colony and Protectorate of Kenya, Government Printer, Nairobi, 1946, pp. 10-12. See also African Land Development in Kenya 1946-1962, Colony and Protectorate of Kenya, Ministry of Agriculture, Nairobi, 1962, p. 1.

but of this, only about £ 8 million was in fact allocated to development projects, and another £ 2.5 million was budgeted for reform in 1950. Of the £ 10.5 million, only about half went to African areas -- £ 3 million for District Betterment Schemes and a few African settlement schemes (particularly for detribalized persons or others with peculiar problems) and somewhat less to soil conservation and water development. The settlement schemes and many of the conservation programs were on too small a scale to provide much more than useful guidance for planning larger programs.[3/]

One problem with the 1946 Plan may have been the strength of the government's commitment, though that is difficult to assess. Another problem was poor cooperation from Africans. Many tribal elders retained enough power to thwart government plans of which they disapproved, and they disapproved of this one. It represented a challenge to their authority -- not only from the colonial interlopers, but also from some of the younger generation of Africans who joined forces, however uneasily, with the government to push for modernization. Agricultural reform proceeded faster where chiefs were progressive enough to accept the need for change or where progressive members of the tribe were too strong to be denied.

3/ Afr. Land Dev. in Kenya, passim.

SPONTANEOUS LAND REFORM

In some areas of Kenya a spontaneous movement to enclose land, establish at least a prescriptive right if not a legal title, and improve agricultural practices sprang up. Largely because of demographic pressure but also because of weakened African traditions, old land tenure patterns were set to give way. Earlier patterns which vested rights in kinship or other tribal groups and gave every member of the group a right to some land were yielding to new patterns under which the individuals' land rights would come to the fore.[4/] During this transition the traditional authority of tribal elders naturally weakened.

Where land was still fairly plentiful -- particularly in the Rift Valley -- Africans often staked out claims simply by planting hedgerows. In the 1930's and 1940's the Kipsigis, a semi-pastoral Rift tribe with no tradition of individual land rights, began to enclose their land informally, the better to grow maize to sell Europeans for their laborers.[5/] By the 1950's nearly all the Kipsigis' land was enclosed, though until recently the Kipsigis did not press for formal title to the land.[6/] The Elgeyo, another Rift tribe, began enclosing their land, as young men made their way up the Rift escarpment to the high plateau

---

4/ DeWilde, *op. cit.*, p. 7.

5/ *Id.* at pp. 7-8. See also Huxley, Elspeth, *A New Earth*, William Morrow & Co., New York, 1960, pp. 81-96.

6/ *Ibid.*

and carved out individual plots for crops or grazing from land that had been used only for communal grazing.[7] And the Nandi, particularly the askaris returning from the war, ended a traditional prohibition on individual ownership by pegging out claims to bush and forest from unused areas or from what had once been common grazing land -- despite the opposition of tribal councils who had always settled the disposition of land before.[8] In such areas, though enclosure went fairly smoothly, land disputes inevitably ensued, particularly as decreasing supplies of grazing land and increasing livestock populations, the concomitants of increasing human population, led to overgrazing of what pastures were left. A systematic tenure reform was needed to clarify who owned what.

Severe land scarcity or fragmentation made tenure reform that much harder, for it then entailed tampering with long-standing land claims. In such areas land disputes clogged the courts; in the early 1950's, the Kikuyu spent £ 100,000 a year on land cases.[9] A systematic tenure reform under the aegis of recognized authority was all the more needed to end this chaos.

7/ See, e.g., deWilde, op. cit., pp. 8, 165-168. See also Huxley, op. cit., p. 51.

8/ See, e.g., deWilde, op. cit., pp. 14-15. See also Huxley, op. cit., p. 67.

9/ See, e.g., Huxley, op. cit., p. 235. See also East Afr. Royal Comm. Rep., pp. 348-352. Interestingly, following the land adjudication and registration programs, land disputes in many years virtually disappeared.

In one Kikuyu district, North Tetu, agrarian reform did move along as early as the 1940's under the vigorous leadership of the progressive Chief Muhoya.[10/] He began experimenting with consolidation, persuading farmers to trade their land fragments until each had a holding of the same total size and with roughly the same land variety, but all in one piece. Those holdings were then registered. The smallholders also had a stake in reform here; many of the Kikuyu in this area had tended European dairy cattle, saw the Europeans' resulting profits, and had saved to buy "Better Cows." They supported enclosure to preserve their dairy cattle from Tick Fever and other depradations of communal grazing with zebu cattle. The chief's leadership, however, was critical to the effort's success.

But in many other Kikuyu areas, consolidation, enclosure and the Development Plan in general were denounced as another skulduggerous European plot to steal land by tribal leaders some of whom had their own ends to serve. For in much of Kikuyu country, the contrast between the poor, often landless African and the prosperous European landlord had become too visible; palliative measures -- as the Plan was taken to be -- would not satisfy all. In dissatisfaction, the seeds of African Independence would flourish.

10/ Huxley, *op. cit.*, pp. 236-237.

MAU MAU

By 1953, Kikuyu dissatisfaction had become acute. Kikuyu radicals -- the Mau Mau -- declared open war on the Europeans and their Uncle Toms -- the Africans who manned the European farms, whose labor sustained Kenya's dualistic society, and who had accepted the Plan for modernization. The Mau Mau fought for self-government, for the power to improve their own lot. But they also had a deeper, almost religious purpose -- to rid Kenya of British interlopers and their influence, to restore African life to the "purity" of times past. The Mau Mau swore a blood oath to accomplish their purpose, invoking savage retribution if they failed. [11]

The blood bath was long and terrible. Europeans were attacked and killed, their farms ravaged. But more vicious were the attacks on Africans who offended only by not joining in. [12] And worst was the vengeance wreaked on Africans who dared oppose. Many loyalist chiefs were provided with guards and fortified houses -- though some, including Muhoya, disdained all that to take an active role in the struggle. [13]

11/ See, e.g., Leakey, op. cit., passim. See also Historical Surveys of the Origins and Growth of Mau Mau, Great Britain Colonial Office, Cmd. 1030, London H.M.S.O., 1960, passim.

12/ See, e.g., Huxley, op. cit., p. 236.

13/ Ibid. See also Kenya Legislative Council Debates, 1952-1953, pp. 185-191, 197. See also Kenya Legislative Council Debates, 1955, p. 482.

Partly to preserve the safety of innocent Kikuyu but partly to hem in potential Mau Mau, the government brought the Kikuyu together from their scattered _shambas_ into new, centralized and fortified villages. Many fought "villagization," as it broke their strong religious and economic ties to family lands.[14/] Civil libertarians then as now railed against the gross affront to Africans' traditions and rights. But in the end the government held sway.

For three years the colonial regime struggled to put down the rebellion, and eventually the ringleaders were tried and jailed. Among those jailed was Jomo Kenyatta, whose guilt is still doubted and debated. In the end Kenya lay in shock -- and no one knew what the future would bring.

Some leaders, European and African, evidenced amazing lack of understanding of Mau Mau. It was instigated "by working on the feelings of ignorant and stupid men, but it was not born of land hunger."[15/] Or "this business of Mau Mau is not a child of economic circumstances."[16/] And so on.

But some, both Africans and Europeans, determined to treat the economic roots of the rebellion. They held that real improvement required reorganization of land tenure systems and transformation of farming methods -- and the

---

14/ See, _e.g._, Leakey, _op. cit._, _passim_. See also _Kenya Legislative Council Debates_, 1955, p. 482.

15/ _Kenya Legislative Council Debates_, 1952-1953, p. 96.

16/ _Id._ at p. 110.

defeat of both tribal elders and entrenched colonial interests who stood in the way. They joined forces with larger groups, both African and European, who felt, often without much deeper understanding, that "something had to be done" for Africans.

The government had a golden opportunity to implement agrarian reform. It had survived the Mau Mau Emergency with the authority and the funds to do the job. It had imprisoned many in a position to oppose reform -- using methods offensive to democratic ideals but conducive to change.[17/] Villagization, by ending the old ways of living, had paved the way for the new. The Kikuyu lived as they never had, close together, far from family lands, under immediate British authority.[18/] In some ways their living standards had reportedly improved. Health conditions and care were supposedly better, despite crowding. Cattle bomas had been built near cultivated plots so manure could be collected and spread, and the crops grew better. So while those with larger holdings returned home after the Emergency, many with little land or none remained in the villages and tried to re-plan their lives. During the Emergency some voluntary demand for consolidation and enclosure had persisted; now it caught on for fair as many more Kikuyu began to look to agricultural modernization to provide the

---

17/ See, *e.g.*, Huxley, *op. cit.*, p. 238. See also *Kenya Legislative Council Debates*, 1955, p. 482.

18/ *Ibid*. See also Leakey, *op. cit.*, *passim*.

economic gain and political power they had failed to win by force.[19] The government could now respond to and build on this demand for reform. With at least a limited understanding of the economic roots of African discontent, a growing appreciation of the inevitability of Kenya's independence as nationalism ignited in Africa, a firm desire to avoid a repeat of the Mau Mau nightmare -- and perhaps a lingering belief in Kipling-esque values -- the colonial regime determined that real agrarian reform, to benefit Africans, was the wisest course. But even among those advocating reform, few recognized the underlying role of population growth or its implications for the likely success of plans to raise Kenyan living standards.

THE SWYNNERTON PLAN

The government's major reform effort began in 1954 with the adoption of the "Swynnerton Plan," formally titled A Plan to Intensify the Development of African Agriculture in Kenya, authored by Roger Swynnerton, then Assistant Director of Agriculture.[20] It was designed to cover the first third of a fifteen-year period of reform. Since Independence in 1963, the government of the Republic

---

19/ See, e.g., Afr. Land Dev. in Kenya, pp. 6-7. See also Huxley, op. cit., p. 239. See also Ruthenberg, Hans, African Agricultural Production Development Policy in Kenya 1952-1965, Springer-Verlag, New York, 1966, pp. 8-9.

20/ Swynnerton, Roger J. M., A Plan to Intensify the Development of African Agriculture in Kenya, Colony and Protectorate of Kenya, Government Printer, Nairobi, 1954, passim.

of Kenya has expanded the work begun in the Swynnerton Plan primarily in two Development Plans, covering 1966-1970 and 1970-1974, which contain further major programs for reform in the African lands.[21/]

The Swynnerton Plan was designed to enable as many as possible of the African families in high-potential farming areas (usually defined as good land with rainfall averaging at least 35 inches per year) to produce more crops and livestock for their own use and enough for sale to raise their net incomes from around £ 10 per year to around £ 100 per year.[22/] (Some thought it possible, though difficult, to do this on holdings equivalent to 3.5 acres of prime arable land (provided coffee could be grown); others considered as much as 7 acres more realistic.)[23/] The Plan also sought to increase the annual exportable surplus of cattle from the pastoral areas. It comprised measures not only for the farming areas, but also for the pastoral areas and the potentially irrigable desert:[24/]

21/ Development Plans, 1965/66-1969/70, 1969/70-1973/74, Republic of Kenya, Nairobi, 1965, 1969, *passim*.

22/ Brown, L. H., A National Cash Crops Policy for Kenya, Republic of Kenya, Nairobi, 1963, p. 3.

23/ Etherington, Daniel, "Projected Changes in Urban and Rural Population in Kenya and the Implications for a Development Policy," East African Economic Review, Vol. I, No. 2, 1965, p. 81; conversation with Alexander Storrar, August, 1970, Washington, D. C., I.B.R.D.

24/ *Ibid.*, *passim*; Ruthenberg, *op. cit.*, pp. 9-10.

-- a land reform to enclose and consolidate the land and provide African farmers with secure title to their own enclosed small holdings.

-- a shift in emphasis from production of subsistence crops to cash crops, including coffee, tea, pyrethrum, and dairy products, all formerly produced primarily or almost entirely on European-owned farms of considerable size.

-- improved resource management to assure high standards of husbandry and to preserve the land. (The government approached individual farmers and offered advice on farming planning, on crop culture and animal husbandry, on soil and water conservation, on the management of grazing through rotational leys, and on farm management.)

-- rationalization of land use in eroded pastoral areas by establishing grazing schemes requiring: (1) limitation of livestock to the proper carry-capacity of the land; (2) controlled grazing within a new rotational system involving grass leys; (3) supervision of livestock production; and (4) provision of more auxiliary services, including technical assistance, water, education and training, and marketing assistance.

-- new settlements on high-rainfall land and several new projects involving irrigation of fertile land. (These were relatively minor parts of the Plan.)

Our focus will be on the Plan's application to small farms. The first step was implementing land-tenure reforms -- consolidation, enclosure, and final adjudication and registration that would leave individuals with secure title to economically viable holdings. The process got under way in Central Province in 1956 and was nearly completed by 1960 -- in less than half the time planned. Two hundred fifty thousand fragmented holdings were consolidated into some 43,000 holdings with titles registered individually.

CONSOLIDATION, ENCLOSURE, AND ADJUDICATION

The process of consolidating and enclosing land reform in Central Province began on an *ad hoc* basis, but later became the model for much of Kenya. It involved several steps:[25/]

(1) First, the District Commissioner had held an open meeting, or *baraza*, in which the majority of local people was asked to approve the proposed land reform for a specified "adjudication area." That area was then divided into "adjudication sections" for about 500-1000 landowners.

(2) An adjudication officer, generally the District Commissioner, was appointed. He publicized the government's intention to settle land titles and invited land claims based on native law and custom. The Africans then officially put in claims for the land they held.

25/ DeWilde, *op. cit.*, pp. 9-12. See also *Afr. Land Dev. in Kenya*, pp. 236-240.

(3) The District Commissioner appointed a committee of 25 or more local Africans (including tribal elders) to decide all land claims in each adjudication section, with the advice of an executive officer, usually a District officer. With the help of an arbitration board, they first determined who owned what land fragments, recording disputed cases in the "Record of Existing Rights."

(4) The Record was held open for any objection for 60 days; objections to first decisions were referred back to the committee for a second decision which was then confirmed by the adjudication officer. All claims were then recorded.

(5) Along the way, an aerial survey of the adjudication area was made, and claims were recorded in the Record as they appeared from the surveys.

(6) The Committee next determined how much land to allocate to public purposes such as roads and dams, and provided for that land by cutting a uniform percent from the holdings of all landowners.

(7) The Committee gave each person a consolidated holding equal in area to the fragments recognized as his claim (adjusted for land donated for public purposes) and comprising the same types of land he had before. To assure that, the consolidated holding usually ran in a vertical stripe from ridge to valley. Smaller holdings of under three acres were situated near consolidated villages.

(8) The final boundaries of each consolidated holding were then worked out, and the holdings were recorded in a register and on maps. The boundaries were then supposed to be checked by aerial survey -- "refly" -- after each landowner had planted hedgerows, though that was not always done. Final adjustments were then made, and registered title deeds granted to the landowners.

In the process of this reform, the whole adjudication area was planned in detail. "Skeletal planning" was in good part imported from the United States by Alexander Storrar after a visit in 1952.[26/] It involved laying out not only the farms, but also the supporting infrastructure -- roads, cut-off drains, terraces, and if necessary, dams.

PLANNING THE FARMS

Under skeletal planning, the extension service sought to provide enough guidance to get at least a substantial minority of smallholders well under way, in hopes others would also learn through a "demonstration effect." With limited resources and a need to provide a "critical minimum" of services to each farmer, the service concentrated on thousands of small farmers with holdings large enough to support both subsistence and cash crops comfortably. For well over half the farmers, with holdings of under 5 acres or so, the service did little; the fate of

---

26/ Huxley, *op. cit.*, p. 52.

these farmers, and the implications for the future of the size distribution of holdings, will be discussed.

The service provided two types of farm plans.[27/] The first, "farm layouts," placed buildings, fences, and plots for crops and livestock in conformity with good conservation and farm management. The layout was organized basically by the slope and contours of the land, flat land for subsistence crops, hilly land for cash crops (many of which preferred the higher, cooler land), and steep land for grass and trees. Rotational ley systems were outlined to control grazing and enrich future cultivation land. The second, "farm plans," provided more detailed plans for crop and livestock management including a phased program to maximize the yield of the holding over seven years, to give some cash crops time for full bearing. But the farm plans proved time-consuming and only a relative few were done. By the end of 1963 there were about 40,000 layouts covering some 420,000 acres of small holdings averaging around 10 acres and about 5,400 plans covering 95,000 acres of holdings averaging around 17 acres.[28/] (The district with the most layouts was that of Chief Muhoya, who had urged reform among his people earlier.)

27/ See, e.g., Ruthenberg, op. cit., pp. 14-22. See also deWilde, op. cit., p. 17. See also East Africa Royal Comm. Rep., pp. 312-317.

28/ See, e.g., deWilde, op. cit., pp. 18-19. See also Farm Economic Survey Unit Report No. 24 (Nyeri District, 1964), Republic of Kenya, Nairobi, 1968, pp. 4-5.

As the reform spread, providing individual layouts also proved too time-consuming for the limited extension staff. Today the government concentrates on more general plans which can be publicized through mass media -- an easier task now that more farmers, or their children, are literate -- and so reach farmers with holdings of any size, even those too small for much more than subsistence production.29/

The extension workers generally sought to persuade, not compel, farmers to change. Relying on the "demonstration effect" to advertise the new ways, the service began by concentrating on better farmers with good land, and approaching them and inviting them to visit exhibitions, join "Better Farmers' Clubs," attend Farming Training Centers, and so on. The extension workers also tried generally to enforce rules and laws on good farming and conservation as passed by the government and local councils.

SUPPORTING SERVICES

To meet the demands of farm planning and supervision of new enterprises, the Swynnerton Plan demanded a considerably enlarged extension service, and Kenya's extension service remains today one of the best in Africa in terms of both its expertise and its relatively high number of well

---

29/ DeWilde, *op. cit.*, pp. 18-21, 68-70.

trained officers per thousand clients.[30/] The service was organized into a network centering in Nairobi and feeding out into the African areas. At the primary level, an extension worker specializing in crops served about 500 families; another specializing in animal husbandry served somewhat more.[31/] The extension workers at the primary level had access to crop or animal-husbandry specialists further up the line and to farm-planning specialists.[32/]

Despite inevitable limitations of numbers and inadequate training, Kenya's extension service was in fact crucial to the reform's success. Kenya's communities of smallholders had the resources necessary to improve living standards -- labor, some land, and a surprising amount of capital, judging by what they spent on land litigation.[33/] But they needed tehnical assistance to institute and then manage farming technology, usually far different from what they had known before (unless they had worked on European farms where some of the new ways had been tried). Extension workers played a vital role by encouraging farmers to try

---

30/ Employment, Incomes, and Equality: A Strategy in Increasing Productive Employment in Kenya, U.N.D.P., I.L.O., Geneva, 1972, pp. 154-155. Kenya had one trained extension worker (agricultural assistant or equivalent) to every 700 farmers in 1972.

31/ Id. at p. 407. See also deWilde, op. cit., p. 17. See also Ruthenberg, op. cit., pp. 14-15.

32/ DeWilde, op. cit., pp. 68-70. See also Ruthenberg, op. cit., pp. 14-15.

33/ See note 9, supra.

the new ways, overcome their reluctance to change, and persevere over the several years required to reap the full fruits of their labor from crops and livestock taking time to mature. (Often the particular success of farmers in a given region could be attributed in part to the particular ability of extension officers serving there.) Without the extension service, the Swynnerton Plan might have foundered; with it, the Plan succeeded.

MARKETING

Once the planned-for crops and livestock matured, they had to be marketed -- no easy task in a country with Kenya's topography. Marketing cooperatives, particularly for the new cash crops and dairying, have helped many farmers to overcome processing and transportation difficulties. With the introduction of the Swynnerton Plan, the government encouraged and pressured Africans to join the marketing cooperatives, particularly for coffee, tea, and dairy products.[34/] By the mid-1960's there were more than 600 African marketing societies on the primary level, feeding into the major cooperatives; they had a membership of several hundred thousand farmers. Despite organizational and administrative difficulties, the cooperatives seemed to serve their purpose.[35/]

34/ See, *e.g.*, deWilde, *op. cit.*, pp. 24-30.

35/ *Ibid.*

COST

As is often the case, particularly with data from developing countries, it is difficult to obtain or derive comprehensive cost data on the Swynnerton and associated reforms. In principle and generally in practice the people paid for "skeletal planning" -- about £ .5 per acre, a substantial expense whose usefulness they must have appreciated, judging from their willingness to pay. The government financed consolidation, enclosure, and registration -- averaging about £ 2 per acre with a "refly" to check boundaries, £ 1 without. These estimates are very rough, as costs varied with the topography, the former tenure patterns of the different areas, and the experience of the surveyors, but these are the mean estimates of the Lawrence Commission, which reviewed the process of registration in 1965, and they are generally corroborated from data in the Development Plans.[36/]

The Swynnerton Plan, of course, comprised more than land reform; it also called for roadways, schools, and water control in some areas. The main financing for local schools, hospitals, etc., has been provided by local District Councils run by elected African members, who assess agricultural produce to obtain revenues. Unfortunately, no

---

36/ See Report of the Mission on Land Consolidation and Registration in Kenya, 1965-1966 (usually called the Lawrence Commission), Republic of Kenya, Nairobi, 1966, pp. 16-17, 30-31. Development Plan for the Period 1965/66-1969/70, Republic of Kenya, Nairobi, 1966, p. 126.

decent data are available on these components of the reform. But as they are not directly related to agriculture, their exclusion from the study should not be a serious problem.

CREDIT

The Swynnerton Plan called for massive injections of agricultural credit so small-scale farmers could more easily finance ventures into cash-cropping and dairying. This credit represents a social cost only to the limited extent that it is subsidized, but Kenya's planners considered that it might represent the sine qua non for trying new ways to small farmers who could not be expected to have the wherewithal to finance purchases of new seeds, plants, and livestock, fencing, and so on.[37/] But in the event, the credit schemes foundered, and the Swynnerton reforms succeeded despite the credit shortage. Farmers convinced that their living standards would probably rise if they tried the new technology made a major effort to finance the new investment themselves. Sometimes they began with one cash crop and used earnings to finance others, or they sought supplementary employment and plowed earnings back into their farms. Even in Nyeri, where cash-cropping was on a larger scale, the FESU Report notes:

> "The development that has taken place has obviously been achieved with finance provided by the farm operators themselves, both from their earnings . . .

37/ DeWilde, op. cit., p. 22.

and from incomes derived in the non-agricultural sector." 38/

Until the mid-1960's the credit provided African farmers was virtually negligible. 39/ Even under the newer Development Plan's stepped-up credit, there would only be about £ .3 per acre on the average -- hardly enough to make a major difference in farming patterns.

What credit there was for small-scale farmers and African cooperatives came from three basic sources: commercial banks, Kenya government revenues, and international agencies including the World Bank, A.I.D., and other bilateral donors. It is difficult to determine exact amounts; what follows is only a brief description.

The supply of funds available for lending to African farmers has never equaled the demand. Credit must therefore be rationed severely, through a yearly allocation among regions and their component districts; this process has sometimes entailed reducing loans until they are really inadequate to achieve the borrowers' purposes.

Commercial Bank Credit

Commercial bank credit for African farmers -- substantial in amounts -- apparently began in earnest with registration of title, for then the titled land could serve as security for the loans. Because administrative costs are

---

38/ *Farm Economic Survey Unit Report* No. 21 (Nyeri District, 1962), para. 27, Republic of Kenya, Nairobi, 1964.

39/ DeWilde, *op. cit.*, p. 23.

lower and risks easier to assess for a few large loans than for many small ones, most commercial loans have gone to farmers with relatively large holdings. There is little reliable information on the volume or terms of commercial loans, but most observers agree they were not particularly helpful to small farmers. Moreover, poor repayment records have evidently discouraged further commercial loans.[40/]

Government Credit

The dearth of small-farmer credit is also revealed in government credit data. From mid-1948 to mid-1964 the total amount of loans issued was some £ 600,000 -- under the 1946 Development Plan, the Swynnerton Plan and the 1966-1970 Development Plan. In 1960-1963 there were only around 6,000 loans totaling slightly over £ 400,000 -- or under £ 70 on the average. Loans were generally made for five years or less and the interest charge varied between 5.5 percent and 6.5 percent.[41/] Such subsidized credit might have been a cost. But the repayment record on smallholder credit until the mid-1960's was not good, with perhaps half the loans in arrears. To streamline credit operations and spur repayment, the Agricultural Finance Corporation was established in 1963 with a mandate to handle most credit operations; repayment

---

40/ Id. at p. 22.

~~41~~/ ~~Ibid~~. See also ~~Plan 1966-1970~~, pp. 132-133. See also Ruthenberg, op. cit., p. 23.

has picked up since the tax officers have been assigned the additional duty of collecting loan payments.[42/]

Plans for agricultural credit under the 1970-1974 Development Plan are outlined in the following table:

Agricultural Credit Under the 1970-1974 Plan

(£ '000)	1969/70	1970/71	1971/72	1972/73	1973/74	Total
SMALL-SCALE FARMERS						
IDA Credit Proj. (AFC)	281	315	340	164	---	1,100
Masai/Kericho Proj.	40	30	30	12	---	112
Pineapple Loans (AFC)	10	---	---	---	---	10
Other New Loan Prog.	---	5	30	224	400	659
Loans issued through Coop. Bank	---	50	100	125	150	425
Total Small-Scale Farmers	331	400	500	525	550	2,306
FARMERS IN THE RANGE AREAS (AFC)						
Medium Term Dev. Loans	200	210	300	325	260	1,295
Short Term Loans	130	189	208	230	200	957
Administrative Expenses	25	38	42	45	40	190
Total Farmers Range Areas	355	437	550	600	500	2,442
LARGE-SCALE FARMERS (AFC)						
Long and Med. Term Loans	318	300	300	300	300	1,518
TOTAL	1,004	1,137	1,350	1,425	1,350	6,266

Source: Plan 1970-1974, p. 214.

42/ *Ibid.*

SUMMARY OF ADJUDICATION AND REGISTRATION TO DATE AND FUTURE PLANS

Data on adjudication and registration to date are not complete, but the latest major source, the 1970-1974 Development Plan, offers some interesting data.[43/] During the first ten years of the program, 1956-1966, about 1,800,000 acres of agricultural land (and virtually no range land) were adjudicated and registered at a cost (net of accompanying services or loans) of about £ 3,650,000. (Another 1,500,000 acres had been consolidated and demarcated before registration began in earnest.) The program has proceeded; by 1969 about 3,418,000 acres of agricultural land had been adjudicated, representing about one-fifth of Kenya's 15,297,000 acres of "Class I" land (good land with rainfall of at least 35 inches annually). It also represented about one-fourth of the Class I land in the formerly African areas.

Another 548,000 acres of range land had been adjudicated, to give a total of some 3,966,000 acres. The total cost of consolidation, enclosure, and registration (net of accompanying services) is put at £ 5,885,000. (Other land has been enclosed or consolidated informally.) Of the agricultural plots, perhaps half are under five acres.

In the mid-1960's the government decided to accelerate reform in African areas, and to slow down if necessary on resettlement of formerly European lands (discussed in the next chapter). The government appointed a mission of

---

43/ Plan 1970-1974, p. 213.

inquiry chaired by T. C. D. Lawrence to outline an expanded program and recommend ways of streamlining procedures and increasing resources needed to speed reform.[44/]

The Lawrence Commission recommended land reform for those areas likely to benefit most, suggesting an expansion in the adjudication program to cover about 7,600,000 acres over 1966-1970, of which about 2,700,000 acres were in higher rainfall areas and some 4,900,000 acres in lower rainfall pastoral areas.[45/] The cost of the program was projected at around £ 3,400,000.

In the event, the 1966-1970 Development Plan gave priority to reform in the African areas, and enclosure, consolidation, and adjudication proceeded apace.[46/] It is estimated that over 1966-1969, about 1,650,000 acres of agricultural land and about 550,000 acres of rangeland were adjudicated at a cost of about £ 2,235,000. This exceeded the pace Lawrence recommended for the agricultural areas; there were shortfalls in pastoral areas, partly due to lags in passage of required legislation.

The 1966-1970 Plan shifted emphasis from settlement on the European lands to consolidation, enclosure, and registration of the African lands. The Plan originally allocated £ 4,360,000 to land consolidation and registration

---

44/ Rep. of Comm. on Land Consol. and Reg., *passim*.

45/ *Ibid*.

46/ *Plan 1970-1974*, pp. 213-214; *Economic Survey*, 1970, p. 75.

alone, and £ 13,759,000 to all programs for the African areas, also including credit for small-scale farmers, development of semi-arid range-lands, irrigation, other land reclamation (tsetse control), settlement, and rural development schemes for the African lands. This compared to £ 8,650,000 allocated to resettlement of the European lands and £ 16,890,000 for all programs related to resettlement of the European lands. Considering other programs that also affect the two categories, the proportion of relevant expenditures allocated to the African lands rose from 28 percent in 1965/66 to 69 percent in 1969/70.[47/]

During the current 1970-1974 Plan, the program for land adjudication will be expanded to cover an additional 18,367,000 acres of land, comprising about 6,306,000 acres of agricultural land and about 12,061,000 acres of pastoral land, at a cost of around £ 6,295,000. Thus the Plan suggests that at its close the total area adjudicated should reach about 22,363,000 acres of land comprising over 9 million acres of agricultural land and over 12 million acres of pastoral land, at a total adjudication cost of £ 12,180,000. (The adjudication program will affect some 30 districts of Kenya, some of which will have complete adjudication.) Related agricultural development costs over the 1970-1974 Plan period are put at £ 17,620,000 in total.[48/]

47/ *Ibid*.

48/ *Plan 1970-1974*, pp. 213-214.

The economic results of the Swynnerton reforms -- the costs of adjudicating and establishing the new farms and the resulting benefits -- will be addressed in Chapters 4 and 5.

Chapter 3. THE AFRICANIZATION OF EUROPEAN LAND: THE MILLION ACRE SCHEME

Many Africans had consolidated their small holdings and registered titles under the Swynnerton Plan, but others, including thousands of Kikuyu, had little or nothing to consolidate or register. Many of them were crowded on the edges of the thousand-acre White Highland estates; others were squatters on those estates. For them the Swynnerton reforms could hardly suffice. As nationalism ignited, more Africans began challenging the dualism that sustained Europeans' economic and social privileges, demanding the return of European-held lands, and fighting to hasten political independence. In the end Britain gave way. To ease tensions among the African populace, the consciously lame-duck colonial regime turned to traditional land reform -- seizure of the large European farms for resettlement by Africans.1/

In 1960, in the momentous Lancaster House Conference, the colonial regime moved to arrest the dualistic development of Kenya's agriculture.2/ It published the Kenya (Land) Order in Council, which swept away restrictions on transfer of title between members of different races, thus

---

1/ The expropriated Europeans were compensated, as discussed below.

2/ See, e.g., Nottige, C.P.R., and J.R. Goldsack, The Million Acre Settlement Scheme 1962-1966, Republic of Kenya, Department of Settlement, Nairobi, 1966, p. 1.

ending 58 years of official discrimination between "Scheduled" European lands and "Unscheduled" African lands.[3/] With this dramatic reversal of entrenched policy, the government initiated a major effort to relieve the damaging pressures on African life and culture from overcrowding that European settlement had so badly exacerbated. It also assured the end of British dominion.

The colonial regime needed to relieve land hunger in the most overcrowded African regions, to ameliorate growing urban unemployment, especially in Nairobi, by making farm life more attractive, and to blur the distinction between the debilitated and often landless African and the prosperous European overlord. At the same time, it wanted to avoid driving out too many of the Europeans too quickly. For on them the entire cash economy depended. The trick was to replace the Europeans in an orderly way with Africans who could cope with modern farming.

The government's strategy centered on a reform program that would not only redistribute land, but ensure its profitable use afterwards. It began in 1961 with a pilot program to settle some 6,000 families on "peasant holdings" of about 40 acres that would yield a net income of around £ 100 and another 1,800 families on larger "yeoman farms" that would yield at least £ 250. But as Independence drew near, land hunger increased. In 1962 the colonial regime

---

3/ Ibid.

theory that many felt was essential to persuade small farmers to grow more profitable but perishable cash crops. For if those crops failed or if their prices collapsed, the farmers would still have subsistence crops to fall back on.

Most of the Europeans' farms on their three million arable acres already produced a mixture of products for local sale or export;[6/] these "mixed farms" were the core of Kenya's cash economy.[7/] In the early 1960's they were doing fairly well. An average farm of around a thousand acres netted several thousand pounds a year; together they accounted for 30% of total large farm production in 1962, provided 24% of Kenya's agricultural earnings, and employed 111,700 workers with a wage bill of £ 4.4 million.[8/] The farms produced their crops, especially wheat and maize, under fairly mechanized technology, where cultivation was typically done by tractor and harvesting with the help of machinery.

The operation of these farms must be discussed in some detail to pave the way for comparison of the profitability of large European and small African farms, and of the

---

6/ A few specialized plantations and ranches took up the rest.

7/ There were around 3,600 large farms in the early 1960's; there are perhaps 2,800 large farms remaining in the formerly Scheduled Areas today (a few hundred still owned by Europeans) plus 400 large farms and 40 cooperatives within settlement schemes, on perhaps 40 percent of the high and medium potential land.

8/ Ruthenberg, op. cit., p. 62.

results of the Million Acre Scheme and Swynnerton reforms, which will be presented in Chapters 4 and 5. Fortunately, there are some decent, though hardly ideal, data available that give a reasonably detailed picture of mixed farms in three major sections of the Rift Highlands -- the Uasin Gishu, Trans Nzoia, and Njoro -- many of which were later expropriated. These data were gathered by the Farm Economic Survey Unit of the Ministry for Development and Economic Planning over 1958-1963, and also published in a series of FESU Reports.[9/] (The samples will be discussed extensively in Chapter 4.)

The size of the farms in the samples varied -- from around 500 acres to over 1,500 acres -- but averaged 1,197 acres. All were at fairly high altitudes -- 5,500-7,500 feet -- on good land where rainfall was generally adequate. They produced a wide variety of cash crops, dairy products, and livestock, allocating most land to livestock, including dairy cattle:

9/ See Chapter 4, note 3, *infra*.

EUROPEAN MIXED FARMS[10/]

Land Use

	Average	Uasin-Gishu	Njoro	Trans Nzoia
Farm Size (acres)	1197	1482	746	1364
Acreage Under:				
(a) Cash Crops	306	490	199	228
(% Land) (% Crop-land)	(26) (100)	(32) (100)	(27) (100)	(19) (100)
	109	94	48	185
Maize	(9) (36)	(6) (19)	(6) (24)	(14) (81)
	155	340	125	---
Wheat	(13) (51)	(23) (69)	(17) (63)	-- --
	2	--	--	5
Coffee	(0) (1)	-- --	-- --	(1) (2)
	40	56	26	38
Other	(3) (12)	(4) (12)	(5) (13)	(3) (17)

(Components may not add to totals because of rounding.)

Source: FESU Reports, as amended.

10/ As compared to data from the Statistical Abstract 1970, on land use patterns on large farms (including single crop plantations), these data show about the same proportion of land devoted to pastures, and within the cropland, slightly more proportionately devoted to maize, wheat, and other crops as might be expected for mixed farms.

EUROPEAN MIXED FARMS (Contd.)

	Average	Uasin-Gishu	Njoro	Trans Nzoia
(b) Livestock	891	992	547	1136
(% of Land)	(73)	(65)	(72)	(83)
Stocking ratio	3.70	4.85	2.73	3.53
Livestock Units	240	205	200	320
(% LU)	(100)	(100)	(100)	(100)
Dairy	180	163	174	204
	(75)	(80)	(87)	(64)
Beef	43	32	10	86
	(18)	(16)	(5)	(27)
Sheep	12	9	16	12
	(5)	(4)	(8)	(4)
Other	6	1	1	18
	(2)	(0)	(0)	(5)

(Components may not add to totals because of rounding.)

Source: FESU Reports, as amended.

The value of output per acre reflects the land allocation; the farms in these three analyses achieved output worth about £ 7 per acre, against an average of £ 5 per acre on European farms generally.

EUROPEAN MIXED FARMS

Output from a Typical Acre

	Average	Uasin-Gishu	Njoro	Trans Nzoia
Output (shs. per acre)	144	134	170	130
From:				
Cash Crops (% of output)	73(52)	90(69)	70(41)	62(48)
Livestock (% of output)	71(48)	44(31)	100(59)	68(52)

(Components may not add to totals because of rounding.)

Source: FESU Reports, as amended.

PURCHASING THE "MILLION ACRES"

To preserve some economic order, the government determined to limit land seizures to a third of the land of European mixed farms, or about 1,000 farms. Insofar as possible, they planned to take those relatively underdeveloped or poorly run -- and with Kenya's scarcity of land, that made good economic sense. They planned also to take those jutting into African areas, to smooth the borders between remaining European and African areas.11/ To other Europeans, the government offered verbal guarantees and safeguards.

But politics interfered with good planning. In the early 1960's when at last Independence became a reasonable hope, the clamor for European land grew shrill, Europeans reacted nervously, and the government feared another African upheaval and economic collapse if it failed to move swiftly on "the land question." Most descriptions of the land reform that followed note that it was done under less than ideal circumstances or more hurriedly than anticipated; in fact, those descriptions hide a startling story.12/ For in the rush to accomplish reform during the uneasy calm surrounding Independence, Bruce MacKenzie, then Minister for Lands and Settlements, and Alexander Storrar, Director of

---

11/ See, *e.g.*, Ruthenberg, *op. cit.*, pp. 64, 67. Also confirmed in conversation with Alexander Storrar, former Director of Settlement, August, 1970, Washington, D.C., I.B.R.D.

12/ See, *e.g.*, Ruthenberg, *op. cit.*, pp. 71-72.

Settlement, locked themselves into MacKenzie's office, tacked up a map of Kenya, and combining their considerable knowledge of Kenya's history, economy, and politics, worked feverishly for three days pinpointing farms for expropriation and deciding who would get what.[13/] Economic plans had to be put aside for the immediate political concerns -- to placate Africans and minimize tribal frictions. They decided to allocate land in maximum accordance with traditional tribal claims, regardless of any resulting loss in economic efficiency.[14/] Any tribe, no matter how crowded, could only get European land within its own "zone of influence" -- land to which it had an established claim.[15/] And every tribe bordering European areas would get some land.

These constraints proved a considerable burden. Demographic pressures varied widely in Kenya in the 1960's, and densely populated African regions did not always border much European land. The densest regions were the Kikuyu districts of Central Province, north of Nairobi; the Kamba District of Machakos, south of Nairobi; and the Luo District of Central Nyanza, near Lake Victoria.[16/] But most of the European land lay in the Rift Valley, the territory

---

13/ Conversation with Alexander Storrar, August, 1970, Washington, D.C., I.B.R.D.

14/ *Ibid*.

15/ *Ibid*. See also deWilde, *op. cit.*, p. 190. See also Ruthenberg, *op. cit.*, p. 67.

16/ See, *e.g.*, *Kenya Population Census, 1962*.

of the less populous Kalenjin tribes. Under the political ground rules, the Kalenjin tribes profited because they claimed large stretches of Rift farmland, even though they could not work it as efficiently as others might have; they had little farming experience and were reportedly less than eager to get it.[17/] The Kalenjins generally did not need that land as badly as the Kikuyu, who were notably good farmers. Although the Kikuyu were allocated the most land, they still settled for less than they deserved on purely economic grounds.[18/] Moreover, some of it was poor and with heavy clay soil, high on the cold Kinangops plateau. This land allocation undoubtedly affected the economic results of the reform, as will be discussed in Chapters 4 and 5.

But the allocation plan was only the first step. Once the government decided what land it wanted, it had to purchase it. To avoid panic selling among Europeans and so maintain the stability of the cash economy, the government announced officially that it would observe the principle of willing-buyer, willing-seller. After careful negotiation, most farmers who were asked to sell out did agree.

The average price paid for this land and immovable assets was projected at about £ 9 per acre, based on 1959

17/ See, e.g., Ruthenberg, op. cit., p. 72. See also deWilde op. cit., pp. 212-214.

18/ Ibid. Also confirmed in conversation with Alexander Storrar, August, 1970, in Washington, D.C., I.B.R.D.

land values (and a rate of return of 12 1/2 percent on capital), but the actual average price paid was over £ 10.19/

PLANNING SETTLEMENT

Settlement under the Million Acre Scheme has been supervised by the Department of Settlement. To successfully transform thousand-acre mechanized farms into intensively worked 20-40 acre small farms, notes former Director of Settlement Alexander Storrar, "the government must relentlessly provide every sort of extension service."20/ To plan and support resettlement, Mr. Storrar organized a special extension service comprising members of the Department of Settlement and members of the Extension Service of the Department of Agriculture seconded to Settlement. It included land planners, crop specialists, stock specialists, and agricultural administrators.

The Department's first task was to survey the purchased land to determine precisely its agricultural potential, and then determine the most appropriate farming system. The land fell into widely differing ecological categories, not all of which were equally suited to small-scale farming.21/ Some of the land (generally with rainfall below 30 inches per year or poor drainage or other problems)

19/ Ruthenberg, *op. cit.*, p. 68. See also Nottige and Goldsack, *op. cit.*, pp. 12-14.

20/ Conversation with Alexander Storrar, August, 1970, Washington, D.C., I.B.R.D.

21/ Nottige and Goldsack, *op. cit.*, p. 7.

could support only one or two specific crops or cattle; it was allocated to special plantation settlements. The remaining bulk of the land (with rainfall of at least 30 inches per year) was allocated to Settlement Schemes for smallholders, which will be the focus of this study.

To take account of the different kinds of land purchased for smallholder resettlement and the different experience of participating African farmers, the Department of Settlement established three sorts of Settlement Schemes -- "High Density," "Low Density," and a few "Yeoman" Schemes.[22/] Each scheme consisted of a group of small farms of specified

---

22/ Over the past decade the Department of Settlement has implemented eight separate schemes:

1. High-Density Smallholders program
2. Low-Density Smallholder program
3. Yeoman or "Assisted Owner" scheme
4. Compassionate case farms (for European farmers with special problems who wished to sell out)
5. Ol' Kalou Salient project (State farms)
6. "Harambee" settlement program (like the Low-Density program)
7. "Shirika" settlement program cooperative takeover of European farms (5 in 1971)
8. Cooperatives (eight farms and nine ranches carved out of M.A.S. land because that land was unsuited to small farms)

In addition, the Department has recently taken over the Haraka (squatter) program and residual ALDEV schemes. The M.A.S. name was originally confined to the high-density smallholder program; the Low Density and Yeoman farms derived from its 1961 pilot project. The term M.A.S. was soon applied to both the high and low density schemes, the associated cooperatives and compassionate case farms, and the yeoman farms, and later to Ol' Kalou. In this study, we shall focus on the High and Low Density programs for smallholders which are the heart of the M.A.S. Donaldson, G.F., Farm Size and Land Policy in Kenya, unpublished manuscript, I.B.R.D., Washington, D.C., 1973. See also Nottige and Goldsack, *op. cit.*, pp. 7-8.

size designed to yield a specified target income when operated by Africans with specified resources and experience.

High Density Schemes - The core of the Million Acre Scheme was 84 "High Density Schemes" established to provide small holdings primarily for Africans who had little or no land, agricultural experience, or capital.[23/] Each scheme of roughly 10,000 acres comprised about 300 small farms with an average of about 27 acres each. The farms were designed to provide the farmer and his family with adequate subsistence, with the means to repay any government loans, and with a net income from sales of crops and milk of £ 25, £ 40, or £ 75 per year depending on farm size, land quality, and layout.[24/] The farm size, and associated output targets, were larger than in Swynnerton areas, but the farms were still clearly "small" when compared to the thousand-acre operations.

Low Density Schemes - To farm some underutilized, high-potential land more effectively, 30 "Low Density Schemes" were also established for farmers with more experience and capital.[25/] Each scheme of about 5,000 acres comprised perhaps 130 of these slightly larger farms of about 37 acres, designed to provide subsistence, loan repayments, and a net

---

23/ See, e.g., Nottige and Goldsack, op. cit., p. 33; Dept. of Settlement Five Year Rev., pp. 1-2; deWilde, op. cit., pp. 191-192.

24/ Ibid.

25/ Ibid.

income from sales of crops and milk of £ 100 per farm.[26/] (These farms had their roots in the 1961 pilot project.)

Yeoman Farms - The 1961 pilot project also led to the creation of a few larger "Yeoman Farms" (later "Assisted Owner" farms) for farmers with considerable experience and capital; each farm was to yield a net income of at least £ 250. These were located generally on land unsuited for finer subdivisions, and sometimes specialized in fewer crops or in livestock. Because the farms were so much larger (in the 100-250 acre range) and because less information is available, they will not be focused on in this study.[27/]

After the land was purchased, the first step in building settlement schemes was determining which sort of scheme suited which land. The Department of Settlement organized the land into tracts of several thousand acres of about the same value, and decided on a type of scheme.[28/] After detailed surveys, boundaries were fixed precisely, following the old boundaries of European farms or natural features like rivers and cliffs.

Next the Department of Settlement laid out complete plans for the scheme, providing for both the individual farms

---

26/ Ibid.

27/ See, e.g., Dept. of Settlement Five Year Rev., p. 1; see also Ruthenberg, op. cit., p. 66; see also deWilde, op. cit., p. 192.

28/ Nottige and Goldsack, op. cit., pp. 15-25.

and an extensive infrastructure to service the farms. A complete scheme called for:[29/]

(1) Small farms big enough to meet target incomes when run efficiently according to plans drawn up by the Department of Settlement.

(2) A system of access roads linking each small farm to a circulatory road and a village center.

(3) A watering point within one-half mile of each small farm.

(4) Dipping facilities for stock within two miles of each farm.

(5) Produce-collection points, usually set up near the dipping facilities.

(6) Schools.

(7) Village centers.

For roads, village centers, and so on, the government used the land offering the least agricultural promise.[30/] The remaining land was then carved up into the small farms. Their size was fixed to yield the specified target income. Boundaries were designed to assure good drainage, and when drainage was a problem, the whole scheme was built around a drainage plan.[31/]

The completed plans were submitted to the Ministry for approval.

29/ *Ibid*. See also Ruthenberg, *op*. *cit*., pp. 68-69.

30/ Nottige and Goldsack, *op*. *cit*., p. 23.

31/ *Id*. at pp. 16-17.

The total planning costs for each scheme were about shs. 27 per acre:[32/]

Contour Map Production	shs. 6/acre
Planning and Demarcation	shs. 6/acre
Road and Ditch Construction	shs. 6/acre
Other	shs. 9/acre
	shs. 27/acre

BUDGETING THE SETTLEMENT FARMS

The African farmer had to earn his target income through mixed farming -- producing and selling a variety of cash crops and livestock, over and above whatever he produced for his own use. Kenya's major cash crops at that time were coffee, sisal, tea, and pyrethrum; dairying and cattle ranching were the chief commercial livestock activities. Sisal was only a plantation crop, tea was hard to grow, and, despite early reports of success in Swynnerton areas, was still considered more likely to pay off on plantations; coffee land was limited and the coffee market restricted. Among the major crops, only pyrethrum seemed particularly suited to the Settlement Farms.[33/] Cattle ranching was obviously inappropriate for small farms, but dairying seemed almost ideal since most farms had small areas that could be used best for grazing.[34/] It was selected as the major cash-earning activity.

32/ *Id*. at p. 24.

33/ DeWilde, *op*. *cit*., p. 204.

34/ *Ibid*.

A few Africans had learned about cash crops or dairying working on European farms, but most knew little or nothing. The Department of Settlement had to select the cash crops and livestock to be produced and provide the instruction and sometimes the financing to help the Africans get started. They also taught more efficient ways of growing traditional subsistence crops like maize. It was an enormous job.

Generally, however, farmers participating in the Million Acre Scheme received far more technical advice and capital assistance than their brothers participating in the Swynnerton reforms. For a "typical" farm on each scheme, the Department provided a budget specifying target outputs of crops and livestock and required inputs of labor and capital.[35/] Farmers and their families were expected to provide most of the labor required, but when the budget called for more than 6,000 manhours a year, provision was made for hiring labor.[36/] When machinery was needed -- particularly on the larger Low Density farms where timely planting required tractors -- the Department worked to find machinery contractors. For those willing to live on the schemes and able to furnish at least 33 percent of the capital value of the equipment, the government authorized a loan of up to 67

35/ Nottige and Goldsack, op. cit., pp. 19-20 and Appendix 3. See also Ruthenberg, op. cit., pp. 68-71.

36/ Ibid.

percent of the value repayable at 6 1/2 percent interest over two years.37/ Until enough contractors are found, the government continues to provide a machinery pool, which contractors may take over at the terms given.38/

FINANCIAL ASPECTS

Settlers' Financing

The costs of such an ambitious reform program were necessarily high. Alexander Storrar estimates that the total costs of establishing a farm under the Million Acre Scheme were £ 246 on High Density Schemes, £ 750 on Low Density Schemes, and £ 2,320 on Yeoman Schemes.39/ These costs covered both land purchase and subsequent development. Depending on his capital resources, each settler had to provide part of the costs of his own settlement -- about 3 percent on High Density Schemes, about 13 percent on Low Density Schemes, and about 20 percent on Yeoman Schemes. Thus, farmers on a High Density Scheme generally paid in only £ 6 to cover various fees, while farmers on Low Density Schemes paid £ 100, and those on Yeoman Schemes paid £ 500 to cover fees and a downpayment ranging from £ 1,000 to £ 5,000.40/

37/ Nottige and Goldsack, op. cit., p. 23.

38/ Ibid.

39/ Ruthenberg, op. cit., p. 69; confirmed in conversation with Alexander Storrar, August, 1970, Washington, D.C., I.B.R.D. Compare to costs on programs from the 1948 reforms, Afr. Land Dev. in Kenya, p. 9.

40/ Ruthenberg, op. cit., p. 69.

The large gap between the total costs and the settler's own contribution was filled by government subsidies and loans to the settlers, which were in turn financed by foreign grants and loans. The government provided:[41/]

(1) A subsidy equal to one-third the purchase price of land and immovable assets (financed by a grant from the U.K.).

(2) A land-purchase loan for 30 years at 6.5 percent with no grace period to help cover the remaining two-thirds of the purchase price. The loans covered 90 percent of the remaining Africans' purchase price of land on Low Density Schemes and 100 percent on High Density Schemes. (Repayments, as discussed below, have been very slow.)

(3) A development loan for 10 years at 6.5 percent to help finance purchases of grade dairy cattle, fencing, tea stumps, tractors, fertilizer, seeds and roofing. The loans were not obligatory, but were made available to settlers who applied. Most settlers did apply. On Low Density Schemes development loans averaged £ 4,200-5,000 per farm, and on High Density Schemes £ 2,000 per

---

41/ Nottige and Goldsack, _op. cit._, pp. 35-37. See also Ruthenberg, _op. cit._, p. 69.

farm. (Repayments on these loans have also been slow.) (This provision of development loans contrasts sharply with the shortage of credit noted in the Swynnerton reform areas.)[42/]

"PROGRAM FINANCING"

To cover the bulk of the costs of the Million Acre Scheme -- net of the settlers' small contributions -- the Government of Kenya made expenditures of about £ 27 million over 1961-1968; about 70 percent or £ 18.5 million had been spent by the end of 1964/65.[43/] Through 1968 about 1,200,000 acres had been purchased; that was expected to reach 1,300,000 acres shortly.[44/]

42/ See Chapter 2, *supra*.

43/ *Dept. of Settlement Five Year Rep.*, p. 33; Ruthenberg, *op. cit.*, p. 81.

44/ The Settlement Report gives a round estimate of 1,320,000 acres purchased. This is in excess of the generally later and more detailed estimates provided in the Economic Surveys, which have been relied on. The estimate of 1,200,000 acres is taken from the *Economic Survey*, 1970, Republic of Kenya, Nairobi, p. 73.

EXPENDITURES

(£ '000)

Land Purchase		
High and Low Density Settlement and Nandi Settlement	12,668	
Ol' Kalou Salient	886	
Assisted Owners	291	13,845
Operational Expenditure Dept. of Settlement		7,147
Development Expenditure (loans to settlers, etc.)		5,050
Ol' Kalou Salient net running costs, development and purchase of loose assets		909
		26,951

Source: Dept. of Settlement Five Year Rep., p. 34.

The high costs resulted primarily from the government's decision to pay Europeans a reasonable price for their land. (The government had intended to pay about £ 9 per acre, but in fact paid about £ 11.) 45/ Consequently, £ 13.8 million of the £ 27 million spent by 1968 went to purchase approximately 1,200,000 acres. Another £ 7.1 million went to finance administration and supervision, about £ 6 per acre. Thus only £ 5.9 million -- about 20 percent of the total expenditures -- went for development purposes, about £ 5 per acre. 46/ This cost is still great, far greater than that incurred in programs to modernize farming on the

---

45/ See note 17, supra.

46/ Dept. of Settlement Five Year Rep., p. 45.

African lands; the implications for future choices between the two types of land reform programs will be discussed below.

Over the 1970-1974 plan period, an additional £ 2.0 million will be spent to wind up the Million Acre Scheme. Of this, about £ 150,000 will be used to purchase land and £ 1.3 million to provide development loans for settlers and their cooperatives. About £ 486,000 will be used for special sugar settlement schemes.[47/]

The Kenyan government has refinanced most of its expenditures on the Million Acre Scheme through foreign grants and loans. Of the £ 27 million spent over 1961-1968 (including most expenditures under the 1964-1970 plan), about £ 9.8 million was covered by grants from the British government, and £ 12.7 million by loans (at 6.5 percent) from other foreign sources including £ 10.2 from the British government and less from West Germany and the I.B.R.D.[48/] Only about £ 3 million was covered by Kenya Government revenues, and £ 1.4 million from other Kenyan institutions.[49/]

47/ Plan 1970-1974.

48/ Dept. of Settlement Five Year Rep., p. 33.

49/ Ibid.

FINANCES

Financing data provided by the Settlement Department show:

		(£ '000)		
		Loans	Grants	Total
(1)	BRITISH GOVERNMENT			
	High and Low Density Settlement			
	Land Purchase	7,450	3,952	11,402
	Development	1,131	--	1,131
	Administrative Costs	--	5,397	5,397
	Total High and Low Density	8,581	9,349	17,930
	Compassionate Cases Second List for Land Purchase	261	400	661
	Ol' Kalou Salient Land Purchases, other costs, etc.	1,235	40	1,275
		111	--	111
		1,607	440	2,047
	Total H.M.G.	10,188	9,789	19,977
(2)	IBRD/CDC			
	Low Density Development 1/3 CDC, 2/3 IBRD)	1,274	--	1,274
(3)	FEDERAL GERMAN REPUBLIC			
	Development in High Density Schemes (Central Province and Rift Valley)	1,218	--	1,218
(4)	LAND BANK AND AFC			
	(From premature repayment of loans outstanding when farm is purchased)			
	High and Low Density	1,146	--	1,146
	Compassionate Cases Second List	104	--	104
	Ol' Kalou Salient	105		105
	Total Land Bank and AFC	1,355	--	1,355
	GRAND TOTAL	14,035	9,789	23,824
(5)	KENYA GOVERNMENT	1,452	1,477	2,929
	TOTAL	15,487	11,266	26,753

Source: Dept. of Settlement Five Year Rep., p. 33.

RESULTS OF THE MILLION ACRE SCHEME

By 1969, about five years after its inception, the Million Acre Scheme was nearly completed. Over 1,000 large farms covering over 1,200,000 acres -- well above the original million-acre target -- had been purchased for about £ 12.7 million and parceled out to 32,651 African families.[50/] This accounted for about 7 percent of Kenya's Class I agricultural land. All of the Low Density Schemes and all but five of the High Density Schemes were established. Another 2,000 families were settled on the Ol' Kalou Salient and 1,000 families on the Nandi Salient.[51/] Seventy-six new villages and townships, 7,500 trading plots, 106 primary schools, and four secondary schools were established on the settlements.[52/] In round figures it appears that at full completion some 35,000 families -- perhaps 150,000 people -- will have resettled in 135 schemes on over 1,320,000 acres of land. The Million Acre Scheme will cost over £ 27 million, including about £ 9.8 million in grants from the British government, £ 12.7 million in loans from foreign sources, and £ 3 million in Kenya government funds, plus £ 2 million to be spent over 1969-74 to wind things up. The average farm size will be about 27 acres in the High Density Schemes, 36 acres in the Low Density Schemes; the cost of establishing each farm will be around £ 250 and £ 750 respectively.

50/ Id. at p. 3.

51/ Ibid.

52/ Ibid.

The economic results -- the costs and resulting benefits -- will be analyzed in the next two chapters.

Chapter 4. COMPARISON OF PROFITABILITY UNDER THE THREE FARMING TECHNOLOGIES

Kenya has transformed its dualistic agricultural economy consisting of the large European farms and the traditional African scattered-plot farms by resettling Africans on European land through the Million Acre Scheme and restructuring farms in African areas through the Swynnerton reforms and their post-colonial progeny. Which of these four types of farms made most profitable use of the land? Why? What were the differences in endowments or in use of productive factors? What was the role of scale economies; was any technology suited only to farms of a narrow size range? In this chapter we address those questions by examining basic profitability. In Chapter 5 we address the related question of whether the Million Acre Scheme or the Swynnerton reforms gave higher benefits relative to the costs of implementing the reforms.

Unfortunately, an irremedial lack of data forces us to eliminate from the comparison the traditional technology of the pre-reform African areas, though that problem is not too serious since all observers agree the major traditional agricultural technologies had become extremely unproductive, given the productive factors available, by the early 1950's. Little or no decent data were recorded in African areas before the Swynnerton reforms. Africans in these areas were not yet the focus of much government attention; they contributed little directly to the cash economy that sustained the colonial regime, and their Independence movement was only just gathering steam. The traditional systems -- with their mosaics of scattered holdings and changing patterns of ownership -- would have made data recording unusually difficult. And there were as yet relatively few Africans trained sufficiently to enable them to do much data recording. (School children did some of the job under the Swynnerton reforms, and education, too, expanded as the reform movement took hold.) But it is clear that the focus on generally low-yielding subsistence crops and native cattle, increasing land fragmentation, overgrazing and overcropping, and colonial prohibitions against cash-cropping by Africans had all combined to make African agriculture a losing proposition.[1/] Thus while our profit comparison must exclude the traditional African systems, one can be confident that these systems would have ranked lowest by far. Our comparison will focus on three farming technologies for which the issue of relative profitability is still open and much debated: European large farms, Settlement farms established on formerly European land under the Million Acre Scheme, and small African farms established in the formerly traditional African areas under the

---

1/ See Chapter 1, *supra*.

Swynnerton reforms. For short, these three groups of farms will be called European, Settlement, and African farms.2/

THE THREE TYPES OF FARMS

A fairly detailed picture of farms in each of the three groups can be drawn from data presented in sample surveys conducted over 1958-1964 by the Kenyan government's Farm Economic Survey Unit. These sample surveys will be the basis for our comparison of profitability on the three farm types.3/ (Supporting data have been drawn from a variety of other sources, including published and unpublished I.B.R.D. papers, studies of particular crops and types of livestock, and other reports on farming in Kenya.)

2/ The comparison will also exclude large African farms, owned either individually or cooperatively, as data are incomplete.

3/ Farm Economic Survey Unit Reports (Economic Case Studies of Farms), Nos. 14 (Trans Nzoia 1962-1963), Oct., 1963; 15 (Elgeyo and West Pokot, 1962), Dec., 1963; 16 (Uasin Gishu 1959-1962), Dec., 1963; 17 (Accounting Techniques), Dec., 1963; 18 (Nandi 1962-1963), June, 1964; 20 (Njoro 1958-1961), July, 1964; 21 (Nyeri 1962), Aug., 1966;23 (Nandi and West Pokot, 1963-1964), Dec., 1965; 24 (Nyeri 1963), Aug., 1966; 25 (Nyeri 1964), 1968; 27 (Settlement Schemes 1964/65-1967/68), 1971; and preliminary tables for No. 27 provided to author in Kenya. Also used were notes provided by C.P.R. Nottige, then with the I.B.R.D. in Nairobi; Economic Survey of Central Province - 1963/64, Republic of Kenya, Ministry of Economic Planning and Development, Nairobi, 1968; Annual Review of Agriculture, Republic of Kenya, Ministry of Agriculture, Nairobi, annually; miscellaneous Agricultural Censuses, Ministry of Agriculture, Republic of Kenya, Nairobi; Economic Survey of Kenya, Ministry of Economic Planning and Development, Republic of Kenya, Nairobi, annually; Statistical Abstract of Kenya, Ministry of Economic Planning and Development, Republic of Kenya, Nairobi, annually.

Large European Farms

The FESU samples focus on three major areas of the European Highlands west of the Rift escarpment: the Uasin Gishu, Njoro, and Trans Nzoia Districts.

The data on the Uasin Gishu were collected over 1959-62, from a sample of eleven farms at about 6,500-7,500 feet in the rich plateau country that blends eastward into the Elgeyo District of African farms that we will be considering.[4/]

The data on Trans Nzoia are broken down into two sample surveys made in 1958-61 and 1962-63.[5/] The first sample includes 19 farms at 5,600-6,500 feet. The second sample is reduced to 12 farms, but the reduced sample "continued nonetheless to reflect the important economic features of this kind of farming."[6/] Unfortunately, the Trans Nzoia data are less complete than some of the others, and could not be used as extensively; generally the later sample was relied on.

The data on Njoro were collected in 1958-61, from a sample of ten farms at about 6,500-7,500 feet on the Njoro plateau, not far from the Nandi District of African farms we will be considering.[7/]

4/ F.E.S.U. Rep. No. 16.

5/ F.E.S.U. Reps. Nos. 13,14.

6/ F.E.S.U. Rep. No. 14 at p. 4.

7/ F.E.S.U. Rep. No. 20.

The three samples of European farms were made during years of generally average weather. In some years rainfall was slightly high or low, but in no year was the weather disastrous. Temperatures were also fairly typical.

The samples were all prepared by the same office -- the Farm Economic Survey Unit -- under the same generally sensible rules of accounting. On the whole the surveys provide sound and fairly complete records of the farms studied. The samples fall short in several ways, however. They are very small and not necessarily random. They were made at a time when many European farmers anticipated independence, and so were tempted to let their farms run down or at least postpone investment; nevertheless the FESU teams report surprisingly little gross neglect, perhaps because mixed farming did not lend itself to neglect as much as did the cattle ranches. Thus the Uasin Gishu Report states:

> "The extent to which they were able to make any major change in their methods of farm operations was, however, very limited, and it is doubtful whether farming in the area during these years showed any appreciable difference over the pattern that would have occurred in normal times." 8/

The samples also confine information on the structure of costs to the major crops and livestock types, though some information on the less important products can sometimes be derived. Last, the data are not always organized the

---

8/ F.E.S.U. Rep. No. 16, p. 3.

same way, though that can also often be fixed by working with the underlying data. (The data from the FESU Reports are cited "as amended.")

With these shortcomings in mind, the sample surveys can be used to describe European mixed farms at the time the Million Acre Scheme began.

Emerging from the samples is a picture of thousand-acre holdings spreading across the vast and fertile highlands, largely devoted to grazing for beef and dairy cattle and sometimes sheep. When the land was planted, it was usually with maize or wheat or some similar food crop, less often with coffee, and occasionally with other crops. (There were also plantations devoted exclusively to coffee, tea, or some other crop.) Farming technology was relatively mechanized; tractors, heavy plows and reapers were commonly used. Manning the machinery, otherwise tending the crops, and herding the livestock was an African labor force. Under this system, total output (including unsold output but all valued at farmers' prices) averaged about shs. 144 per acre, somewhat higher than the shs. 100 per acre usually cited as "average" for European farms. Costs (including depreciation allowances for machinery and buildings based on replacement cost and expected work-life) averaged shs. 107 per acre, reflecting cash-and-kind wages, housing and other services for African laborers, capital costs of a relatively mechanized technology, and management costs entailed in operating a large farm. Resulting net profits were only moderate, at shs. 37 per acre.[9/] With substantial investment in machinery and buildings as well as land and livestock, the return on capital was a modest 9 percent (ranging from only 5 percent in Njoro to 11 percent in Trans Nzoia and the Uasin Gishu).[10/]

Settlement Farms

A similar but larger sample survey of about 1,000 farms on some 40 High and Low Density Schemes taken over 1964-67 provides useful data for comparing their performance to that of European and African farms.[11/] The sample time frame partly coincides with that of the FESU samples of the African farms, and directly follows that of the samples of European farms. Later data would naturally be desirable, but unfortunately few are available. The sample is generally compatible in accounting terms with the FESU samples of European and Swynnerton farms. It gives a little information on cost structure for individual crops and livestock types, though some can be derived. But it is far

---

9/ F.E.S.U. Reps. Nos. 14, 16, 17 and 20, as amended. (Costs generally excluded any interest charges on loans or loan repayments, but, as discussed above, borrowing was very limited except for M.A.S. farmers, who tended not to repay.)

10/ Ibid. (Land was valued at market prices for unimproved property in 1958-1959, that is, before the market began to reflect the uncertainities surrounding the M.A.S. and Independence, as discussed in F.E.S.U. Rep. No. 17, p. 12.)

11/ Settlement Tables, as amended.

larger than the other samples, and therefore perhaps gives a more trustworthy picture of the total population of farms from which it is drawn. It covers farms in both lower and higher reaches of the Highlands, including some in the European areas covered by the FESU Reports and many bordering on the African areas we will consider. In so large a sample, altitude, rainfall, and soil naturally varied, but most farms had conditions generally suited to a variety of cash crops including coffee, tea, or pyrethrum, and to subsistence crops including maize and wheat, though, of course, not all farms could grow exactly the same crops. Good natural grasses (organized into rotational leys) were well suited to dairying and other livestocking activities.

The High Density farms sampled had a mean size of about 24 acres and the Low Density farms about 37 acres, less than one-twentieth the size of the European holdings from which they were constructed. Like the European farms, the Settlement farms used most of their land for grazing (though they used more rotational leys); most of the remaining land was planted with maize, wheat, and other vegetables.

The Africans resettling the Highlands farmed the land with less machinery and more labor, particularly family labor. Machinery was still used, however, particularly for planting. Under this technology, total output averaged shs. 125 per acre (about a third being sold). (Output including the fraction consumed at home was valued at farmers' prices for the fraction sold.) Costs and resulting net profits both averaged about shs. 60 per acre without imputing a value to family labor, but with family labor valued at appropriate prevailing wage rates, profits plummeted to average only shs. 9 per acre, with High Density farms showing a loss.12/

Restructured African Farms

FESU sample surveys also provide fairly detailed data on farms established through the Swynnerton reforms in three of Kenya's major African farming areas: The Kikuyu District of Nyeri in Central Province and the Elgeyo and Nandi Districts to the west in Rift Valley Province. Each of these districts bordered on European areas that were subdivided into Settlement farms and included in the Settlement farm sample, and Elgeyo and Nandi were near the European farms covered in the FESU samples.

The sample surveys generally are restricted to holdings slightly larger than average, but still clearly "small." Generally they were among the minority of holdings receiving considerable attention from the extension service during the Swynnerton reforms. Thus they represent not holdings typical of their district, but a cross section of holdings where the Swynnerton reforms were tried, with varying degrees of success. This suits our purposes

---

12/ Ibid. (Wages included all cash-and-kind payments.)

exactly. Again, accounting techniques were similar to those used in European and Settlement farms.

Nyeri

FESU sample surveys made in 1962, 1963, and 1964 provide considerable data on a sample of roughly 50 farms in Nyeri, a district of fine soil and hospitable climate in the Kikuyu Highlands north of Nairobi. Nyeri's land is very well suited to a wide range of cash and subsistence crops; its natural pastures, featuring Kikuyu and Star grasses, are excellent. (Its location close to Nairobi also facilitates marketing.) Following the economic disintegration of the traditional Kikuyu agricultural economy and the upheavals of Mau Mau, Nyeri was ripe for reform, and the Swynnerton Plan caught on quickly. Some 43,000 holdings covering 197,000 acres were consolidated, enclosed, and registered by 1960, in less than half the time planned.[13/]

The FESU sample covers farms averaging about 13 acres, the smallest of any farm groups we are considering, but more than double the size of the average Nyeri holding.[14/] These farms represent not a cross section of Nyeri farms, but a cross section of those farms that had tried the Swynnerton reforms.

13/ Economic Survey, 1970, Republic of Kenya, Nairobi, pp. 75-76. See also deWilde, op. cit., pp. 9, 12.

14/ F.E.S.U. Reps. Nos. 21, 24 and 25, as amended.

The sample is small, but there is no reason to think that it gives a biased picture of the results of the Swynnerton reforms in Nyeri.

In addition to the small sample sizes, problems with the Nyeri data include some inconsistencies in accounting from year to year and less complete information for 1962 and 1963. But on the whole the samples provide quite a detailed picture, particularly on the labor and capital requirements of several individual crops and types of livestock.

The Nyeri farms were small, but they were also the most intensively and adventurously farmed. Like the Settlement and European farmers, the Nyeri farmers devoted most of their land to grazing, but they experimented more with cash cropping. To produce their wide variety of products, Nyeri farmers relied on their own families' labor and considerable additional hired labor. Results under this system were most encouraging. Total output averaged shs. 447 per acre, costs averaged shs. 153, and resulting net profits totaled shs. 294 per acre, by far the highest of any farms we are considering.[15/] Imputing a value to family labor brought profits down only to shs. 236 per acre.[16/]

15/ *Ibid*.

16/ *Ibid*.

Elgeyo

Elgeyo is a district which covers part of the western Rift escarpment and the upland plateau (or "Mosop") beyond, peopled by a Kalenjin tribe. The data on the Elgeyo farms are taken from a small sample survey made by the FESU team in 1962.[17/] The sample was designed to cover a cross section of farms where the Swynnerton reforms were under way with varying degrees of success. Thus, the farms were not typical of all Elgeyo, but of the farms participating in the reforms. The data are less complete than for Nyeri, particularly on individual crops and types of livestock. The farm size of about 21 acres compares to an average size of 10 acres on the 6,000 holdings covering 62,000 acres registered by 1970.[18/] Though the sample is very small -- only five farms -- the FESU team states that it was reasonably representative, in their view, of the reform farms in Elgeyo. Reportedly, there was less disparity in farming skills and results among reform farms in Elgeyo than in many other areas because almost all the reform farmers were men who had recently staked out new holdings on what had been uncultivated land, the former tribal grazing area 8,000 feet up on the Mosop.[19/] (The area adjoins and resembles the Uasin Gishu plateau.) The soil there is fertile

17/ F.E.S.U. Rep. No. 15.

18/ Economic Survey, 1970, pp. 75-76.

19/ F.E.S.U. Rep. No. 15, p. 3.

and the rainfall adequate to support a variety of cash crops, especially pyrethrum, and subsistence crops including maize, potatoes, and wheat. Natural grasses, particularly Kikuyu grass, provide excellent pastures for both cattle and sheep. The farms sampled averaged about 21 acres, almost twice the size of the Nyeri farms, though some land is not quite as good or as accessible as the Nyeri land. The land was high and cool, in hilly and broken country, but still suited to quite a variety of crops and livestock. The Elgeyo farmers allocated a higher proportion (over a third) of their land to crops than any other farm group we are considering. But most of this land was planted with maize, with a smaller part in pyrethrum or other crops. The remaining land was used as grazing, primarily for dairy cattle and sheep. The Elgeyo farms also achieved high total output per acre, at shs. 330, at a fairly high cost of shs. 117, yielding substantial net profits, shs. 213 per acre, two-thirds as high as those on the Nyeri farms.[20/] Imputing a value to family labor reduced profits only to shs. 146 per acre.[21/]

Nandi

Nandi district near Lake Victoria has fertile land at mile-high altitudes. It is peopled by another

---

20/ F.E.S.U. Rep. No. 15, as amended.

21/ Ibid.

Kalenjin tribe who have long concentrated their energies on keeping cattle. Data on the small African farms in Nandi were taken from two surveys made over 1962-64 by the FESU team.[22/] The first survey, made in 1962-63, covered some nine farms in basically similar areas of Nandi. The second survey covered 14 farms, and, because it was more complete, it was relied on in this comparison. The Nandi farms differed in style and in results from the other African farms we are considering. Those in the sample averaged about 40 acres, while the average size of the 8,500 holdings covering 108,000 acres registered in Nandi by 1970 was about 12 acres.[23/] Land was generally some lower and somewhat less suited to a wide range of cash crops than the land in Nyeri, though the higher sections of the district had excellent land suited to tea. But like the Settlement farmers, the Nandi farmers put very little land into cash crops, and concentrated on subsistence crops, using a more capital-intensive technology than small farmers in Nyeri or Elgeyo.[24/] Resulting average output was only shs. 81 per acre, costs shs. 24, and profits about shs. 57 per acre, all substantially lower than in the other African areas.[25/]

22/ F.E.S.U. Reps. Nos. 18 and 23, as amended.

23/ Economic Survey, 1970, pp. 75-76.

24/ F.E.S.U. Rep. No. 23, as amended.

25/ Ibid.

Imputing a value to family labor cut profits to only shs. 40 per acre.26/

SUCCESS MEASURED BY PROFITS PER ACRE

Table 1 shows how the farms in the samples stacked up against one another in output, cost, and profit per acre. Striking differences emerge, and the restructured African farms, or at least those in Nyeri and Elgeyo, are the clear winners. To begin with, they produced much larger outputs per acre (with total output including subsistence valued at farm prices) -- on the average twice the output of the European farms and more than twice that of the Settlement farms. Their costs, except for those of the Nandi farms, were also higher, even in the original surveys.

But the cost data of the original surveys, specifically the labor cost data, are not fully comparable. The Europeans hired, and therefore paid, virtually all their laborers.27/ But farmers on the restructured African and Settlement farms relied considerably on family labor, not formally paid. The FESU Reports generally impute no value to family labor, on the questionable theory that family laborers had no alternative opportunities.28/ To get a more

---

26/ *Ibid*.

27/ Most Europeans managed their own farms, but there is no information sufficient to permit an estimate of the value of their time. On a per-acre basis, however, it is relatively unimportant.

28/ That is not true, as a substantial number of farmers, particularly Settlement farmers, had jobs outside their farms.

TABLE 1

Average Annual Output, Cost, and Net Profits Per Acre 29/
(shs. per acre)

	EUROPEAN FARMS (1959-1962)				SETTLEMENT FARMS (1964-1967)			AFRICAN FARMS (1959-1964)			
	Av.	Uasin Gishu (1959-1962)	Njoro (1958-1961)	Trans Nzoia (1958-1963)	Av.	H-D	L-D	Av.	Nyeri	Elgeyo	Nandi
Output	144	134	170	131	125	94	156	286	447	330	81
A. Costs (not including family labor)	107	97	138	88	60	41	79	98	153	117	24
Profits	37	37	32	43	65	53	77	188	294	213	57
B. Value of Family Labor 30/	-0-	-0-	-0-	-0-	56	72	40	48	60	67	17
Costs (including family labor)	107	97	138	88	116	112	119	145	211	184	41
Profits (net of family labor)	37	37	32	43	9	-18	37	141	236	146	40

(Components may not add to totals because of rounding.)

Source: FESU Reports and Settlement Sample, as amended.

29/ Family labor on Settlement and African farms is valued at prevailing cash-and-kind wage rates. It was not possible to value European family labor on European farms (consisting primarily of management), but its value was likely to be very small on a per-acre basis.

30/ Total output, including subsistence valued at farm prices; costs including depreciation.

accurate comparison of the three farm types, the value of family labor is estimated on Settlement and African farms using data on labor time and reported wage rates. (The wages comprised both cash payments and food or other services, and generally seem a reasonable proxy for marginal productivity.) The interesting results are also presented in Table 1. Even when family labor is valued at prevailing wage rates, the restructured African farms achieve the highest profits per acre by far; Settlement farmers, however, do less well than European farmers, and the High Density farmers actually show a loss.

Unfortunately, Table 1 is not in constant prices; insufficient data on prices and yelds for different qualities of products and proportions of different qualities marketed or consumed at home prevented construction of a suitable price index. However, available data does indicate that most prices over the periods of the different samples were roughly constant.[31/] Thus output and cost data are reasonably comparable, and the considerable differences revealed in the table undoubtedly reflect real differences. (Appendix 2 discusses the price data at length.)

31/ The price of coffee declined slowly, but that simply strengthens our conclusion that the African farms achieved higher coffee profits than the European farms had (sampled in the earlier years). The prices of tea, pyrethrum extract and pyrethrum flowers, maize, wheat, and meat are also discussed in Appendix 2. These are market prices; farm prices were generally smoother, as those for major cash products were governed by marketing boards.

It is sometimes suggested of Kenyan farming that altitude makes all the difference. Though there was significant variation in altitude particularly on the Settlement farms, no sharp patterns of profitability emerge when the farms are grouped roughly into higher and lower altitudes. (Appendix 3 presents the average output, cost, and profit data for the two groups.)

It is also sometimes suggested that variations in soil account for much of the profit differences among farms. Undoubtedly it is true that good soil, combined with adequate rainfall, is necessary to achieve high profits, and the Nyeri farms are surely a case in point. Although there is no detailed information on soil types to prove the point beyond question, the intermingling of many Settlement Schemes in the Settlement samples with African farm areas, particularly in Nyeri, argues that soils were not dramatically different on neighboring African and Settlement farms.[32/] And the Uasin Gishu sample of European farms bordered on the Elgeyo District of African farms.

Why did the African farms, particularly in Nyeri and Elgeyo, achieve so much higher average profits per acre than the Settlement farms, or, for that matter, the large European

---

32/ Some Settlement schemes were high on the Kinangops plateau, with its colder climate and heavier clay soil, but some restructured African farms in Nyeri also contended with less than ideal conditions.

farms? The explanation basically involves a shift in comparative advantage toward more labor-intensive crops and livestocking which accompanied the increasing pressure on agricultural land from a growing population.

The differences in profitability reflected in Table 1 result primarily from two sets of farming decisions: those on the allocation of land among crops and types of livestock and those on the amount of labor used to raise a given crop or type of livestock. Like all developing countries whose fundamental characteristic is a population large relative to its other resources, Kenya has a comparative advantage in labor-intensive products in world markets. It appears that African farmers, and particularly the extraordinarily successful farmers of the Nyeri and Elgeyo samples, took advantage of this situation by putting more land into labor-intensive export products. And for a given product, whether for export or domestic marketing, those same farmers tended to use a more labor-intensive technology, which resulted in generally high yields per acre. The combination of more appropriate products and higher yields brought higher average profits per acre. Thus the most successful farms were those taking full account of the major economic implication of Kenya's large and growing population: the rising labor/land ratios. They moved to make lavish use of relatively abundant labor on products where that would pay off particularly well in higher yields.

DIFFERENCES IN LAND USE

The first decision facing farmers on any of the three types of farms was how to allocate their land -- given constraints imposed by fertility and slope -- among crops and livestock in order to maximize profits. As Table 2 indicates, farmers on all three types of farms allocated most of their land to grazing, particularly for dairy cattle. But African and European farmers allocated about twice as much land on the average to crops (around 27% each) than the Settlement farmers (about 14%), with the European farmers of the Uasin Gishu and the neighboring African farmers of Elgeyo allocating about a third to crops. Food crops, notably maize, accounted for much of the land planted on the Settlement and African farms undoubtedly because production of food for home consumption was often the prime concern of farmers or, more particularly, of farmers' wives who often did much of the work and who were allegedly worried that their husbands might spend cash less than sensibly.33/ Wheat, which is subject to particularly virulent rusts in East Africa, was tried only on European and some Settlement farms. (Wheat is generally a "high management" crop considered difficult to grow on a small scale, and is also more appropriate for mechanized technology.) Although tea is grown on European mixed farms, it was only tried on the restructured Nyeri farms in the FESU samples under consideration (despite the availability of land in Nandi well suited to tea).

33/ DeWilde, *op. cit.*, p. 83.

TABLE 2

Land Use 34/ 35/

Acreage % Total % Component Land	EUROPEAN FARMS Av.	Uasin Gishu	Njoro	Trans Nzoia	SETTLEMENT FARMS Av.	H-D	L-D	AFRICAN FARMS Av.	Nyeri	Elgeyo	Nandi
Farm Size	1197	1482 100 100	746	1364	30.4	24.1	36.7	25.0	12.9	21.0	41.0
Crops	306 26 100	490 32 100	199 27 100	228 19 100	4.3 14 100	3.8 16 100	4.8 13 100	6.2 27 100	3.6 28 100	7.4 35 100	7.6 19 100
Maize	109 9 36	94 6 19	48 6 24	185 14 81	2.6 10 60	2.4 12 63	2.8 8 58	3.0 12 47	1.7 13 46	2.1 10 29	5.1 12 67
Wheat	155 13 51	340 23 69	125 17 63	- - -	0.2 1 6	0.2 1 6	0.3 1 6	- - -	- - -	- - -	- - -
Coffee	2 0 1	- - -	- - -	5 0 2	- - -	- - -	- - -	0.4 2 9	0.9 6 22	- - -	0.4 1 5
Tea	- - -	- - -	- - -	- - -	0.0 - -	0.0 - -	0.0 - -	0.2 2 6	0.7 5 18	- -	- - -
Pyrethum	- - -	- - -	- - -	- - -	- - -	- - -	- - -	1.5 7 22	0.1 1 4	4.5 21 61	- - -
(Mature Coffee)	- - -	- - -	- - -	na na na	- - -	- - -	- - -	0.2 1 5	0.5 4 15	- - -	na na na
(Mature Tea)	- - -	- - -	- - -	- - -	- - -	- - -	- - -	0.2 1 5	0.5 4 14	- - -	- - -
(Mature Pyrethrum)	- - -	- - -	- - -	- - -	- - -	- - -	- - -	na na na	na na na	na na na	- - -
Other	40 4 12	56 4 12	26 5 13	38 5 17	1.5 4 34	1.2 5 32	1.7 5 35	1.0 4 16	0.2 3 10	0.8 4 10	2.1 6 28

TABLE 2 (Cont'd)

Land Use

Acreage % Total % Component Land	EUROPEAN FARMS Av.	Uasin Gishu	Njoro	Trans Nzoia	SETTLEMENT FARMS Av.	H-D	L-D	AFRICAN FARMS Av.	Nyeri	Elgeyo	Nandi
Livestock	891 73 100	992 67 100	547 72 100	1136 81 1000	26.1 86 100	20.3 84 100	31.9 87 100	18.8 73 100	9.3 72 100	13.6 65 100	33.4 81 100
Dairy	666 56 75	790 53 80	475 63 87	726 53 64	na na na	na na na	na na na	12.3 49 67	9.3 72 100	8.4 40 64	19.3 47 58
Beef	159 12 18	155 10 16	27 4 5	304 22 27	na na na	na na na	na na na	0.9 2 4	0.0 0 0	0.0 0 0	2.7 7 9
Sheep	44 4 5	44 3 4	44 6 8	42 3 4	na na na	na na na	na na na	4.0 16 20	- - -	2.0 10 15	10.0 24 30
Other	22 1 2	3 0 1	1 0 0	64 4 5	na na na	na na na	na na na	1.6 6 9	- - -	3.2 15 21	1.4 3 4
Stocking Ratio	3.70	4.85	2.73	3.53	5.16	6.24	4.09	1.74	1.66	1.31	2.24
Livestock (Units) (%)	240 100	205 100	200 100	320 100	5.06 100	3.24 100	7.80 100	10.2 100	5.6 100	10.0 100	14.9 100
Dairy	180 75	163 80	174 87	204 64	na na na	na na na	na na na	6.9 67	5.6 100	6.4 64	8.6 58
Beef	43 18	32 16	10 5	86 27	na na na	na na na	na na na	0.4 4	0.0 0	0.0 0	1.2 8
Sheep	12 5	9 4	16 8	12 4	na na na	na na na	na na na	2.0 20	- 0	1.5 15	4.5 30
Other	6 2	1 0	1 0	18 5	na na na	na na na	na na na	0.9 9	- 0	2.1 21	0.6 4

(Components may not add to totals because of rounding.)

Source: FESU Reports.

34/ "na" indicates that there probably was some acreage devoted to this product, but data were unavailable.

35/ "-" indicates negligible or zero acreage.

TABLE 3

Profits Per Acre By Product

(Family Labor Unpaid)
(Shs. Per Acre)

	Av.	Uasin Gishu	Njoro	Trans Nzoia	Av.	H-D	L-D	Av.	Nyeri	Elgeyo	Nandi
Net Profit	39	37	32	46	65	53	77	190	294	221	57
Gross Profit From Crops	120	122	85	151	25	3	47	366	526	420	152
Maize	157	171	121	176	127	104	149			70.1	50
Wheat	99	115	83								
Coffee (Av.)	161			161					515		
Tea (Av.)									93		
Pyrethrum (Av.)		142							153	432	
Coffee (Mature)									1784		
Tea (Mature)									770		
Pyrethrum (Mature)									176		
Gross Profit From Livestock	52	23	62	51	92	72	112	162	337	256	35
Dairy	51	30	59	66	63	48	89		337		
Cattle	38	15	49	53							
Sheep	25	3	47	17							

TABLE 3 (Cont'd)

Profits By Product

(Shs. Per Livestock Unit)

	Av.	Uasin Gishu	Njoro	Trans Nzoia	Av.	H-D	L-D	Av.	Nyeri	Elgeyo	Nandi
Stocking Ratio	3.73	4.85	2.73	3.53	5.1	6.24	4.09	1.0	1.66	1.31	2.2
Profit Per Livestock Unit	136	120	137	151							
Dairy	173	159	168	205					559	440	
Cattle	105	71	132	183							
Sheep	71	13	122	78							
Overhead	(25)	(21)	(31)	(22)	(11)	(8)	(14)				
Gross Profit	62	58	63	65	76	61	121				
Yield (Gal. per Cow)	268	242	245	316	246	223	268		310	316	434
Number of Cows		99.79	110.00			1.8	4.3		4.4	4.30	
Number of Grade Cattle (L.U.'s)		162.78	173.96			na	na		5.6-	6.54	
Number of L.U.'s		210.69	207.34			3.1	7.1		5.6+	10.07	

(For available data with family labor valued, see Tables 5-7 below.)

Source: FESU Reports as amended.

Despite any distaff conservatism, however, African farmers allocated a higher proportion of their cropland -- hence their total land -- to profitable export crops like coffee, tea, and pyrethrum, particularly in Nyeri and Elgeyo. (The Nyeri farmers had 11% of their land in coffee and tea, while the Elgeyo farmers had 21% of their land in pyrethrum.) Though the data on profitability of these various crops are far from complete, as Table 3 suggests, it appears that the more successful farms, particularly those in Nyeri and Elgeyo, put more land into higher-profit crops. As to livestock, the Nyeri farmers devoted almost all grazing land to dairy cattle, which had the highest livestock profits. 36/

It is worth noting, however, that marginal profits per acre were not equated among products within farms, in part because land use limitations within farms (deriving from marketing constraints such as the International Coffee Agreement, conservation concerns underlying rotational leys, and suitability criteria) affected land use. Nevertheless, some farmers, particularly in Settlement areas and in Nandi, did apparently not allocate land as effectively as they might have.

DIFFERENCES IN TECHNOLOGY AND YIELDS PER ACRE

But differences in land use are only part of the explanation for the differences in profitability on the

---

36/ The Elgeyo farmers had a good deal of very high land suited only for sheep.

TABLE 4

OUTPUT AND YIELD PER ACRE

	Av.	Uasin Gishu	Njoro	Trans Nzoia	Av.	H-D	L-D	Av.	Nyeri	Elgeyo	Nandi
Total Output (Shs. per acre)	145	134	170	130	125	94	156	288	447	335	81
Total Output from Cash Crops (Shs. per acre)	286	280	253	324	125	93	158	469	726	480	200
Maize (Yield in 200 bags per acre)	319	317 (8.83)	286 (8.85)	355 (11.5)	176 (4.6)	152 (3.5)	199 (5.3)		350 (10.0)	355 (10.1)	119 (2.4)
Wheat (Yield in 200 bags per acre)	263	280 (6.0)	246 (7.0)		(3.0)	(3.0)	(3.1)				
Coffee (Av.) (Yield in cwt. per acre)				477 (1.70)					853 (3.5)		
Tea (Av.) (Yield in cwt. per acre)									493		
Pyrethrum (Av.) (Yield in cwt. per acre)		456 (179)							246 (219)		
Coffee (Mature) (Yield in cwt. per acre)				1006 (3.61)					2133 (8.8)		
Tea (Mature) (Yield in cwt. per acre)									1040 (41.30)		
Pyrethrum (Mature) (Yield in lbs. per acre)		500 (200)							273 (232)	335 (371)	54

TABLE 4 (Cont'd)

OUTPUT AND YIELD PER ACRE

	Av.	Uasin Gishu	Njoro	Trans Nzoia	Av.	H-D	L-D	Av.	Nyeri	Elgeyo	Nandi
Total Output from Livestock (Shs. per acre)	95	65	134	85	126	98	154	215	341	256	48
Dairy	99	61	137	99					414		
(Gallons per Cow)	(268)	(242)	(245)	(376)	(234)	(223)	(246)		(310)	(316)	
Cattle	47	23	61	60					—		
Sheep	50	20	80						—		
Stocking Ratio	3.70	4.85	2.73	3.53	5.16	6.24	4.09	1.7	1.66	1.31	2.2

Source: FESU Reports as amended; for maize data in Nyeri and Nandi, the Kenya African Agricultural Sample Census, 1960/61.

three types of farms. As Table 4 suggests, African farms stand out; coffee yields on African farms in Nyeri were more than double those achieved on the European farms in Trans Nzoia, and higher than other estimates from other sources.37/ Pyrethrum yields on African farms in Nyeri and Elgeyo were substantially higher than those on European farms in the Uasin Gishu. The Settlement farms, of course, had almost no land in these crops. As for the major subsistence crop, maize, available data from the African farms in Elgeyo and independent estimates from Nyeri suggest that these African farms achieved about the same yields as the European farms had averaged, though Settlement and Nandi farmers had notably low yields.38/ The major livestocking activity, dairying, shows a similar pattern. The African farms in Nyeri and Elgeyo achieved substantially higher yields of milk per cow than the Settlement or European farms, except for those in Trans Nzoia; when yields are adjusted by the stocking ratio to give "gallons per acre," the African farms do the best by far.

37/ Yields on specialized coffee estates were reportedly about 6 cwt. per acre. (An independent study of small-farm production of coffee in areas outside Central Province suggests yields not far different from those achieved on European farms, however; unfortunately, it was impossible to determine the compatibility of these data with the FESU Reports, or to determine how much of the acreage was at full bearing.)

38/ High-yield seeds were not yet in wide use, though a few of the African Settlement farms experimented with them, with surprisingly little success; yields seemed to depend more on the amount and quality of fertilizer used and the care provided than on the seed variety.

The African farmers' higher yields per acre apparently result in good part from a conscious choice on farming technology which also reflects the basic abundance of labor in the major farming areas of Kenya. For the African farmers, particularly in Nyeri and Elgeyo where yields were generally high, opted for a more labor-intensive technology for any given product than either the Settlement farmers or the European farmers who were also producing that product. Thus it is on the African farms in Nyeri and Elgeyo that one sees long hours spent especially for hand cultivation, weeding, mulching, and so on. The African farmers achieved enough higher yields to more than compensate for their higher labor costs. Interestingly, the African farmers of Nandi used distinctly less labor and achieved only mediocre yields.

To prove the point on labor intensity beyond any question, one should compare data on the productive technologies for respective crops and livestock types on the three types of farms. Unfortunately, such data are scarce, as they are both difficult and expensive to compile, particularly in a country like Kenya where travel can be difficult and literacy rates are not high.[39/] Some data are available on two major cash crops, coffee and pyrethrum, and on dairying, as shown in Tables 5, 6 and 7, respectively.[40/] These crop data are not perfectly comparable among samples, however, because the maturity of the crops varied. (The livestock data were also presented in different terms, though they could be reorganized to assure comparability.) While it is possible to avoid comparing "apples and oranges," it is necessary sometimes to compare green and ripe apples. That less important distinction is unlikely to invalidate the results, however.

On an acre of coffee, for example, European farmers (in Trans Nzoia) devoted about 60 days per year and achieved a yield of only 1.70 cwt. with about half the acre bearing; African farmers (in Nyeri) devoted over 150 days and achieved over 3 cwt. with around a fourth of the acre bearing. Although European labor-days are unavailable for mature coffee (all bearing), it is noteworthy that labor days increased by half for mature coffee on the African farms in Nyeri which achieved

---

39/ The high expense precluded my attempting to do my own sample.

40/ Data on specialized estates were rejected on grounds of non-comparability with mixed farms and incompatibility with the FESU Reports' accounting techniques.

Table 5

COFFEE

COMPARATIVE TECHNOLOGY
(shs. per acre)

	EUROPEAN FARMS			AFRICAN FARMS		
	Trans Nzoia 1963			Non-Central Province	Nyeri	
	Average	Mature	Coffee Estates	Mature	Average	Mature
Acreage	5	5		0.4	0.68	0.95
Output	477	1006	1848	519	853	2133
% Bearing	47	100	100	100	25	100
Yield (cwt. per acre)	1.7	3.6	6.6	2.7	3.5	8.8
Price (shs./cwt.)	280	280	280	195	245	245
Tractor Hours	6.1				-0-	-0-
Labor -- Days	62			206-155	204-153	297-225
-- Hours	372-496			1239	1222	1780
Direct Costs						
Capital	82		625	71	176	111
Seeds	-0-			-0-	69	1
Fertilizer	32			27	46	9
Sprays 41/	18			40	30	71
Bags	-0-					
Machinery	32					
(Tractors)	(32)				-0-	-0-
Other	-0-				31	30
Labor	123		375	176	162	238
% Paid	100		100	62	66	57
Labor Costs If All Labor Paid	123		375	284	240	417
Wage Rate -- By Hour (cents)					25¢	25¢
-- By Day (shs.)	2/45		2/50		2-1/50	2-1/50
Total Direct Costs						
1. Family Labor	205		1000	247	338	349
2. All Labor Paid	205		1000	355	416	528
Profit						
1. Family Labor	272		848	343	515	1784
2. All Labor Paid	272		848	235	437	1605

(Components may not add to totals because of rounding.)

Source: FESU Reports as amended.

41/ As Coffee Berry Disease spreads, it is necessary sometimes to spray with Captafol or similar fungicide at a cost of shs. 500 per acre; then only the African farms (or unusually efficient other producers) would make a profit.

Table 6

PYRETHRUM

Comparative Technology
(shs. per acre)

	EUROPEAN FARMS	AFRICAN FARMS		
	Uasin-Gishu	Nyeri		Elgeyo
		Average 43/	Mature 44/	
Acreage	15	.7		4.50
Output	456	246	273	335
Yield (at 1.5% pyrethrins) (lbs. flowers)	179	219	232	371
Price (shs./cents per lb.)	2/61	1/12	1/12	1/57
% Bearing	90	Mostly Mature	Mature	Mature
Tractor Hours (at shs. 5.26/hr.)	4	0	0	0
Labor 42/ -- Days	98			
-- Hours	588-784	633	885	
Direct Costs				
Capital	60	13	10	
Seeds	26			
Fertilizer	0			
Sprays	1			
Transport	1			
Machinery	32			
(Tractors)	(20)			
Other	0			
Labor	255	80	80	118
% Paid		56	50	
Labor Costs if All Labor Paid		143		
Wage Rate by Hour (cents)		23¢		
Total Direct Costs				
1. Family Labor		93	97	
2. All Labor Paid	314	156	194	
Profit				
1. Family Labor		153	176	216
2. All Labor Paid	142	90	79	

(Components may not add to totals because of rounding.)

Source: FESU Reports as amended.

42/ Assuming 6-8 hours per day.

43/ Using 1962-64 data.

44/ Using 1964 data only.

Table 7

DAIRY

Comparative Technology
(shs. per acre)

	EUROPEAN FARMS		SETTLEMENT FARMS		AFRICAN FARMS	
	Uasin Gishu	Njoro	H-D	L-D	Nyeri	Elgeyo
Stocking Ratio (Acres Per Cow)	4.85	2.73	6.24	4.09	1.66	1.31
Output per Cow	503	570			688	
Output per Cow per Acre	104	209			414	
Milk per Cow	358	394	65	127	570	569
Milk per Cow per Acre	74	77	404	520	343	434
Yield (Gallons per Cow)	242	245	257	232	310	316
Gallons per Acre	50	90	36	66	187	241
Price (shs./cents per gallon)	1/48	1/61	1/57	2/24	1/84	1/80
Number of Dairy Cows	100	110	1.8	4.3	4.4	4.3
Number of Dairy Cattle	163	174			5.6	6.5
Total No. of Livestock Units	211	207	3.1	7.1	5.7	10.1
Direct Costs per Cow						
Capital	241	291	123	133	77	
Foods	148	182	65	82	56	
Vet./Med.	17	26	29	30	9	
Dip	23	15	26	17	10	
Misc.	17	23	3	3	2	
Machinery and Water	15	28	-	-		
Transport	21	15	-	-		
Labor	103	100			51	
% Paid	100	100			34	
Labor Costs if all Labor Paid	103	111			150	
Labor Hours: Per Cow	184	152			641	
Per Acre	38	55			386	

Costs:	Per Cow	Per Acre	Per Cow	Per Acre	Per Cow	Per Acre
Family Labor	344	71	402	147	128	77
Paid Labor	344	71	402	147	227	137
Profit:						
1. From Milk: (Family Labor						
(Paid Labor	14	3	-8	-3	442	337
					443	206
2. From Total (Family Labor					559	336
Output: (Paid Labor	159	32	168	62	460	277

(Components may not add to totals because of rounding.)

Source: FESU Reports as amended.

high yields exceeding 8 cwt. per acre, against yields of less than 4 cwt. per acre on the European farms. 45/ 46/

Interestingly, labor and yield data on pyrethrum are both more alike on European and African farms.

For dairy cattle, African farmers (in Nyeri) devoted over 600 hours per cow (yielding 187 gallons per acre) while European farmers devoted a third as much time and got lower yields, substantially lower in per-acre terms.

In terms of overall use of labor on the three types of farms, Table 8 confirms the more labor-intensive technology of the African farms, at least those in Nyeri and Elgeyo. The land/labor ratios are significantly lower for the Nyeri and Elgeyo farms, and the man-days per acre naturally are higher. (The African farmers did not short-cut expenditures on fertilizer and medicines, however.) Tractor days, on the other hand, are higher by far on the European farms, and second-highest on the Settlement farms.

Not only did the African farmers use more family labor in place of the labor-saving machinery often used elsewhere, but they also hired more labor when the family could not do the job alone. Thus, as Table 8 suggests,

---

45/ Coffee estates sometimes achieved 6 cwt. per acre on mature coffee.

46/ It is worth noting that yields on all farms have been declining in recent years with the spread of coffee berry disease. To control it requires spraying with Captafol, or a similar fungicide, at a cost of about shs. 500 per acre. Thus only the high-yielding coffee areas may earn much of a profit on coffee if the spread of CBD continues.

Table 8

LABOR INPUTS AND COSTS PER ACRE
(shs. per acre)

	EUROPEAN FARMS			SETTLEMENT FARMS			AFRICAN FARMS			
	Av.	Uasin Gishu	Njoro	Av.	H-D	L-D	Av.	Nyeri	Elgeyo	Nandi
Labor Costs per Farm	29,052	16,302	41,904	533	185	881	747	885	1,162	194
Farm Size (Acres)	1,614	1,482	1,746	28.3	23.1	33.5	25.0	12.9	21.0	41.0
Labor Costs per Acre	18	11	24	17	8	26	42	66	55	5
% Labor Hired 47/	100	100	100	25	10	40	47	53	45	42
% Family Labor				75	90	60	53	47	55	58
Imputed Value of Family Labor				56	72	40	46	58	67	17
Total Labor Costs Per Acre	18	11	24	73	80	66	88	124	122	22
Wage Rate (shs./day) 48/	2/63	2/28	2/98	2	2	2	2	2	2	2
Total Workers				3.4	2.9	3.8	7.0	8.7	6.6	5.6
Adults in Family				2.4	2.6	2.3	3.9	4.1	3.6	4.0
Hired Laborers				0.9	0.3	1.5	3.1	4.6	3.0	1.6
Land/Labor	about-40	about-50	about-30	7.4	8.0	6.9	4.0	1.5	3.2	7.3
Man-days Per Acre Per Year	6.6	4.8	8.0	36	40	33	43	62	61	6
Hired Man-days Per Acre Per Year	6.6	4.8	8.0	9	4	13	20	32	26	2

(Components may not add to totals because of rounding.)

Source: FESU Reports as amended.

47/ There was some European family labor, in good part managerial, but it is relatively unimportant on a per-acre basis.

48/ Estimated for European and Settlement farms.

Nyeri and Elgeyo farmers hired over three times as many man-days of labor per acre as the European farmers, and even the Settlement farmers (particularly the Low Density farmers who had higher yields) hired somewhat more than the European farmers. Interestingly, it is the African farms of Nandi -- where yields and profits were more like those of the Settlement farms -- that technology is less labor-intensive and more like that of the Settlement farms, judging from the available data and farm descriptions.

African land/labor ratios and yields raise interesting questions on average and marginal productivity of labor; generally, it appears that because of the high labor requirements of some newly-introduced crops (particularly coffee and tea) and dairy cattle, the marginal productivity of the last man-hour is not exceedingly low, at least compared to parts of the Indian sub-continent or similar situations. However, serious diminishing returns to labor may not be far off.

The European farmers mechanized when possible partly for reasons of convenience and partly perhaps because hired laborers would simply not lavish the same care on the plants or livestock of a European overlord as on their own.

But why did Settlement farmers not use a more labor-intensive technology? Partly the fault may lie with the government which provided a "path of least resistance" to the Settlement farmers that led away from the very labor-intensive technology the African farmers chose. For the government gave the Settlement farmers more in the way of capital and greater access to credit; this led to what was in effect an "underpricing" of capital on the Million Acre farms which may well have biased the Settlement farmers' choice of technology away from the most labor-intensive end of the available technological spectrum. Other measures also fostered use of equipment as a substitute for labor. At first the pasturelands of many European farmers had to be broken up for crop cultivation; this could often be done most efficiently by plowing with tractors. But in subsequent seasons, the use of tractors may not have been the most efficient method of plowing. Nevertheless, the government encouraged mechanization by helping Settlement farmers arrange contract-plowing (often with remaining large-scale farmers). The explanation of Nandi farmers' behavior is less clear. The FESU Report notes that the Nandi farmers had less practice with intensive farming, as they had concentrated more on traditional cattle-herding, which perhaps left them prone to the attractions of labor-saving machinery, and less knowledgeable on plant culture and dairying in general.

Second, though this is not as strongly indicated by the data, it appears that more of the African farmers had held land that was in some sense their own long before the reforms -- often in the same general areas which were organized and titled individually under the reforms. They probably therefore identified with their newly titled land to a greater extent, and they may have been more willing to adopt the new methods and undertake the back-breaking work required to make their own farms pay. They were, in short, perhaps more committed.

Third, and this point is more amorphous, many of the farmers participating in the Swynnerton reforms in the early years (and certainly many of those willing to cooperate with the Farm Economic Unit Survey) were better equipped to adapt to change, particularly in Nyeri. They tended to be slightly better educated -- though not well educated -- and perhaps more enthusiastic about modernization. In contrast, many of those participating in the High Density Million Acre Schemes, were very badly educated. (The Low Density farms were designed for and allocated to farmers of experience, training, and capital, and their better education undoubtedly accounts for those farmers' greater success.)

PROFIT, OUTPUT, AND COST ON A "TYPICAL" ACRE

This analysis of outputs, costs, and profits on the three types of farms can be summarized by using the concept of a "typical acre" -- an acre allocated to crops and livestock in the same proportions as the total supply of farmland is allocated, thus representing the farm in microcosm.[49] As Table 9 shows, about half of total output per acre on European and African farms derives from crops (more from cash crops like coffee and tea on the African farms). Settlement farms derive less output from crops generally (and much less from cash crops than African farms do).

About 43% of the costs per acre on European farms can be attributed to crops (mostly maize and wheat) while only 13% is attributed to crops on Settlement farms and about 29% on African farms (where cash crops play a relatively larger role). (Settlement cost data impute no value to family labor. Unfortunately, inadequacies of individual product data prevent allocating costs by product with family labor costed out.) Table 8 above strongly confirms the more intensive use of labor on the high-profit African farms.

SCALE FACTORS

As with any land reform involving transformation of large farms into small ones (of various sizes), scale economies must also be assessed. In general, returns to scale are constant if doubling specified inputs yields double output under a given production function (assuming

49/ Estimated from land use data and per-acre output, cost and profit data.

Table 9

OUTPUTS, COSTS, AND PROFITS ON A TYPICAL ACRE
(shs. per acre)

	EUROPEAN FARMS				SETTLEMENT FARMS			AFRICAN FARMS			
	Av.	Uasin Gishu	Njoro	Trans Nzoia	Av.	H-D	L-D	Av.	Nyeri	Elgeyo	Nandi
OUTPUT	144	134	170	131	125	94	156	286	447	330	81
Crops (%)	73(51)	93(72)	68(40)	54(41)	41(32)	41(44)	41(26)	137(48)	200(45)	168(51)	41(51)
Livestock (%)	71(49)	41(28)	102(60)	77(59)	84(68)	53(56)	115(74)	149(52)	246(55)	162(49)	40(49)
COSTS (not inc. family labor)	107	97	138	88	60	41	79	98	153	117	24
Crops (%)	46(43)	65(67)	37(27)	35(40)	8(13)	6(15)	10(13)	24(25)	43(28)	41(35)	4(17)
Livestock (%)	62(57)	32(33)	100(73)	53(60)	52(87)	35(85)	69(87)	74(75)	110(72)	76(65)	20(83)
PROFIT	37	37	32	43	65	53	77	188	294	213	57
Crops (%)	23(62)	28(7[illegible])	31(97)	19(44)	33(51)	35(66)	31(40)	113(60)	157(53)	127(60)	36(63)
Livestock (%)	1[illegible]	9(24)	1(3)	24(56)	32(49)	18(34)	46(60)	75(40)	136(47)	86(40)	20(37)
COSTS 50/ (incl. family labor)	107	97	138	88	116	112	119	144	211 51/	184 52/	41 52/
Crops (%)	46(43)	65(67)	37(27)	35(40)				42(29)	62(29)	59(32)	6(15)
Livestock (%)	62(57)	32(33)	100(73)	53(60)				103(71)	149(71)	125(68)	35(85)
PROFIT (net of family labor)	37	37	32	43	9	-18	37	141	236	146	40
Crops (%)	23(62)	28(76)	31(97)	19(44)				93(66)	138(58)	109(75)	34(85)
Livestock (%)	13(38)	9(24)	1(3)	24(56)				49(34)	97(42)	37(25)	15(15)

(Components may not add to totals because of rounding.)

Source: FESU Reports as amended.

50/ The value of European family labor -- in good part managerial -- could not be estimated, but was small on a per-acre basis.
51/ Nyeri had 67% hired labor for crops, 32% for livestock.
52/ Assumed equal to Nyeri proportions.

technical efficiency and no technical changes), increasing if output more than doubles, and decreasing if output fails to double.

Assuming the use of generally the same technology on large and small farms, are large farms more efficient, as is often claimed, because of increasing returns to scale resulting from more efficient mechanization, transport to and from markets, or whatever? Or do smaller farms do better? Why? Do the small and large farms actually use the same technological processes, so that returns to scale may be assessed for a given process over a wide range of farm sizes? Or is some technology suited only to a narrow size range, shifting as farm size increases (because returns to scale go sharply negative for the first process)? Can returns to scale be measured within that size range?

Let us assume that large and small farms do in fact use the same technology. Then the scale "elasticity" can be defined as the percentage change in the cost of producing one unit of output divided by the percentage change in farm size. Some elasticities have been calculated, and show generally decreasing returns to scale as farm size increases from the size range of African and Settlement farms to the size range of the European farms, though the scale factor is small as the difference in farm size is enormous.[53/] Neverthless, these do not represent true

---

53/ The scale elasticity for European and African farms was .02.

scale elasticities as, it appears, technology really does change for farms of radically different sizes. Thus we are discussing not true scale economies but rather the choice of technology which depends on the scale of the farm.

Within a narrow size range for which one technology is generally suited, some notion of scale economies proper can be gained. The scale picture varies with the sharp differences in topography and climate in Kenya that determine what crops and livestock can be raised where. In the high-potential areas where temperatures are cool, soils fertile, and rainfall adequate to support the high-priced cash crops (coffee, tea, pyrethrum) and where natural pastures are suited to dairy cattle, small farms of 10-12 acres are the most efficient. Nyeri, which offers the best farming conditions of the areas we have studied, being suited to all the products mentioned, as well as subsistence crops, generally registers the highest yields per acre; Elgeyo, well suited for pyrethrum and dairying (and sheep raising) comes in second.[54/] The data suggest that yields per acre fall as farm size increases in Nyeri and Elgeyo.[55/] In Elgeyo, maize yields and milk output per cow appeared lower on larger farms of around 25-30 acres with correspondingly more acreage devoted to each

---

54/ F.E.S.U. Reps. Nos. 15, 21, 24, and 25, as amended.

55/ F.E.S.U. Rep. No. 15, as amended. See also Kenyan African Agricultural Sample Census, 1960/61.

product) than on the smaller farms of around 10 acres; pyrethrum yields were higher on the larger farms, but the pyrethrum data are more suspect because no information was provided on crop maturity that determines yields to a considerable extent.[56/] The Elgeyo sample is painfully small, but it bears noting that the FESU team believed technologies were basically similar on the farms studied. For Nyeri there is less information in the samples on particular farms, but evidence elsewhere suggests a similar pattern.[57/]

And as farm size increases, efficiency apparently declines. The data from Nandi, where the 14 holdings studied averaged about 40 acres, are more confusing.[58/] The value of dairy output drops as herd size (and generally farm size) increases. The maize data is more complicated, but suggest increasing returns to scale which will be discussed below.

Data from Settlement farms are also complicated.[59/] There is a pattern of increasing costs as farm size increases within the high and low density groups, though on the average the experienced Low Density farmers were more successful than High Density farmers who had been landless,

---

56/ F.E.S.U. Rep. No. 15, as amended.

57/ See, e.g., Kenyan African Agricultural Sample Census, 1960/61.

58/ F.E.S.U. Reps. Nos. 18 and 23, as amended.

59/ Settlement Tables as amended.

inexperienced and poorly educated. Maize yields were slightly higher on Low Density farms but poor for both groups; dairy yields were more respectable.

Focusing first on the general pattern of decreasing returns to scale for farms in the 10-40 acre range, where technology is generally similar in that some combination of coffee, tea, pyrethrum, maize, and dairy cattle can be raised, it appears that the pattern can be explained in fairly simple terms. The most productive technology given resource availabilities (higher labor/land ratios) for these products is a very labor-intensive one, requiring considerable individual attention to plants and animals; this technology can be implemented best on small farms that the farm family can operate by relying in good part on its own labor, and using little machinery. The hand cultivation long practiced by the Kikuyu, for example, is particularly adaptable to coffee or tea culture. (It is fortunate that the climate in Kikuyu areas favors these products, since much of the land is too hilly for growing, say, wheat, efficiently.)

But what prevents replicating on larger holdings the labor-intensive technology practiced on small farms of around 10-12 acres? Or what would tend at least to lead to decreasing returns to scale if larger scale replication were tried? In many areas, labor is sufficiently abundant to permit such replication, but hired laborers probably do not provide the same high quality care to either plants or animals as the farmer or his family who have a longer range personal stake in the success of the holding they own. In some areas seasonal labor constraints may make larger scale replication difficult. Some farmers may simply find machines easier to manage than hired laborers, particularly if the labor force is not highly reliable.

A small holding of, say, 12 acres has the further advantage of being generally easier to manage than one of, say, 30 acres, all other things being equal. (Perhaps the good performance of the larger holdings in Nandi occurred because all other things were not equal; the Nandi farmers with larger holdings were thought to be the better educated. This was apparently less true of the farmers in Nyeri and Elgeyo, who were more homogeneous. On the other hand, the Low Density Settlement farmers were supposed to be relatively well educated, and turned in a lackluster performance at best.)

As farm size increases to 25 acres or so, it may be time for more ox-plowing or more mechanized harvesting, more herbicides, and the other trappings of a more capital intensive farming technology, though that may carry disadvantages. But such technology may be less suited to some crops requiring close, personal attention. In some areas, like Nyeri, the land is often too hilly to permit efficient use of large scale mechanical equipment, though areas like the Elgeyo plateau are well suited to such equipment. And in any case farms of the 20-40 acre size are not large enough to use the available large-scale equipment efficiently; thus the Low

Density Settlement farms and the Nandi farms of 35-45 acres fell between the size best suited to hard cultivation and a size sufficiently large to justify truly mechanized farming. As the advantages of the labor-intensive technology give way to disadvantages and more capital-intensive technology is adopted as a second-best solution, returns to scale decrease in farms in the 10-30 acre range.

As farm size increases to the moderate-to-large range, it may be necessary to turn toward more capital-intensive technologies (mechanization where possible, more herbicides, etc.) if seasonal labor constraints, unreliability of the labor force or other factors make labor-intensive technology unsuitable. Returns to scale to more capital-intensive systems are likely positive for farms in the 30-100 acre range, or so, assuming the land is flat enough to make such technologies feasible in the first place. Returns to scale probably level off thereafter in many areas, and in any case appear not to yield as high profits per acre as the labor-intensive technology of the smallholders we have studied.

This conclusion seems eminently sensible with respect to coffee, tea, and pyrethrum, but perhaps a little surprising for dairy cattle. But dairying in Kenya is a tricky business. The cattle are subject to a variety of tick-borne diseases and other ailments hitting imported stock particularly, and bear careful watching. Thus in Nyeri, the yield per cow decreases as the size of the herd increases and as labor per cow decreases,[60/] and Nandi data suggest a similar pattern. Then the milk must be got fresh to market, using a less-than-ideal transport network. The best way of handling these problems seems to be to let smallholders tend their dairy cows, and utilize cooperative facilities for marketing. (In Nandi dairying may have had a slower start because market towns are fewer, leaving most milk to be sold at a lower price for butter though the Nandi farmers were also less well acquainted with dairy herds than the Nyeri farmers, for example.)

The data on maize deserve some mention since maize can clearly be grown under mechanized technology on large farms. The data on maize yields do not give a consistent pattern among areas, but do suggest at the least that smallholders can do about as well in per-acre terms as farmers with somewhat larger holdings. European farms studied averaged around 9.7 bags per acre from fields of 50-100 acres, a good yield. In Nandi, yields average 5.6 bags per acre for fields of 2-3 acres, 7.2 bags from fields of 5-7 acres, 8.2 bags from fields of 13-17 acres, suggesting increasing returns to scale. But in Elgeyo yields averaged 10.3 bags per acre for fields of about 2.5 acres, though yields generally declined with farm, as opposed to field, size. The Elgeyo technology was more labor-intensive than the Nandi technology, where agricultural officers complained of excessive

---

60/ F.E.S.U. Reps. Nos. 21, 24 and 25, as amended.

mechanization. Thus it appears that smallholders willing to provide high quality care, fertilizer, etc., can achieve high maize yields, compensating for any scale economies from mechanization. (It bears noting that only in Nandi were high-yield seeks used extensively, and without notable success, though in recent years successful results (with yields of 15-20 bags) have been achieved in various parts of Kenya with hybrid maize.)

In conclusion, though the data on scale economies do not yield a perfectly consistent pattern, it appears that given the products suited to much of Kenya's high potential land, small farms are at least as productive on the average as larger ones.

Chapter 5. THE PAYOFF OF KENYA'S LAND REFORMS

The crucial questions in evaluating the economic results of the land reform are:

(1) Is each reform "paying off" by inducing decreases in production costs that more than compensate for the costs of implementing the reform?

(2) Is one reform paying off better, as a result of either lower production costs or lower implementation costs?

(3) What accounts for any differences in payoff associated with the different reforms?

(4) Do the reforms seem likely to be replicable elsewhere in Kenya or in other developing countries?

It is worth emphasizing that the returns on the two reforms are not all in; as discussed below, some benefits of the reforms have already been realized, but the benefits may last well into the future. Thus, this estimate of payoff, relying as it must on projections, is necessarily a first approximation.

The benefit/cost ratios (B/C) will be defined as the ratio of the present value of the stream of expected gains in consumer surplus (S_{ct}) resulting from the reform to the present value of the "implementation costs" of the reform (C_t), which are the costs of changing tenure and setting up the new agricultural system, where both the benefits and the costs are discounted at the market interest rate (r):[1/]

$$B/C = \frac{\sum_{t=0}^{T} S_{ct}/(1+r)^t}{\sum_{t=0}^{T} C_t/(1+r)^t}$$

The benefit/cost ratio must exceed one for the reform to pay off; the reform with the higher benefit/cost ratio will be preferable in economic terms.

Benefits of Land Reform

The definition of costs is straightforward, but the definition of benefits requires some explanation. It is tempting to define the "benefit" of the reform in terms of the change in farmers' profits resulting from the reform. But a moment's reflection reveals problems with such a definition. For in a reasonably competitive agricultural economy

---

1/ Generally, benefits accrue over years t=1,..., T while costs occur at t=0.

like Kenya's, profit increases accruing on some commodities as a result of land reform are likely to be transient; with free entry, profits will dissipate and a new market equilibrium will result at a lower price and marginal cost.[2/] Yet the reform has not been undone; it seems appropriate to consider that its benefits still endure. The problem is to conceptualize the benefits so as to capture this enduring aspect. Defining benefits in terms of the decrease in average cost per unit of output will do the job.[3/] This definition facilitates focusing on the reason why profits change with land reform: the supply curve shifts down, because underlying cost curves shift down.[4/] Though profit increases may dissipate with free entry, the cost curves and therefore the supply curve remain lower than they were before. The cost reduction will be assumed to "recur" annually, so that annual benefits can be computed. Defining benefits this way raises interesting questions about the size and the distribution of the

---

2/ Entry may be restricted slightly in that the pace of reform has been governed by the regime's ability to process tenure changes and provide extension services and by the International Coffee Agreement which has restricted coffee acreage until recently.

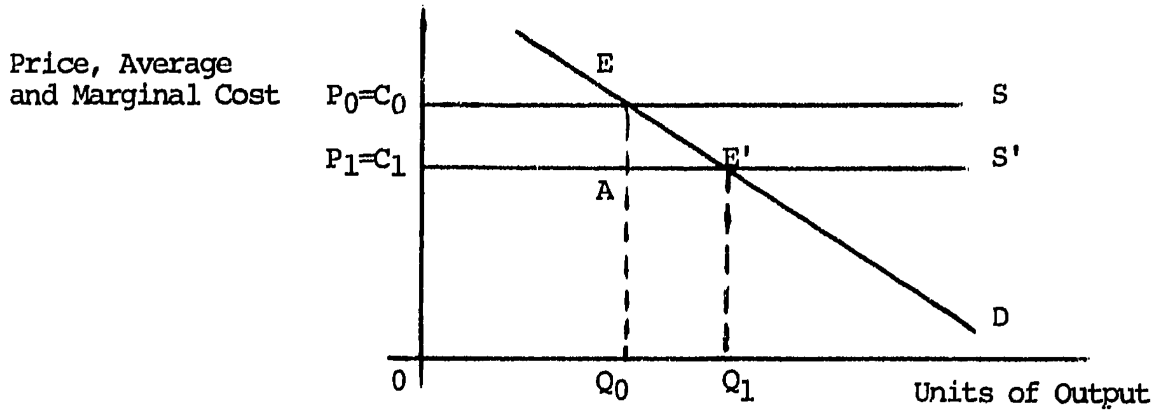
3/ Mathematically, of course, the cost decrease equals the profit increase.

4/ It is possible that the reform would only make things worse, resulting in upward shifts in cost curves or negative "benefits."

gains from reform.[5/] We shall discuss several cases, and then focus on the one relevant for Kenya.

I. FULL REFORM

A. Infinitely Elastic Supply Curve



Let D represent the demand for "agricultural output" in general, and S the supply. In this case we assume supplies of factors are infinitely elastic, so that long run average total costs are constant and the resulting supply curve is infinitely elastic. (Average total costs, and thus the supply curve, are assumed to include "normal profits" such as imputed returns to management or land.) Initial equilibrium is at point E where the demand curve (D) intersects the supply curve (S).

As a result of land reform, we assume costs of all producers decline by $C = C_0 - C_1$ to the post-reform supply curve (S'). In the short run, producers (now at point A) achieve unusually high profits equal to the cost decline. New

---

5/ See, *e.g.*, Harberger, A. C., *Taxation and Welfare*, Little, New York, 1974, *passim*.

producers enter the field and, since factor supplies are elastic, have the same average and marginal costs. A new equilibrium results at E', where the new price P_1 equals the new marginal and average cost C_1.

The total benefits of the reform consist of a gain in consumer surplus (S_c) represented by the area P_1P_0EE'.6/

$$S_c = (P_0-P_1)\ Q_0 + 1/2\ (P_0-P_1)(Q_1-Q_0)$$

Since $(P_0-P_1) = (C_0-C_1)$, we have:

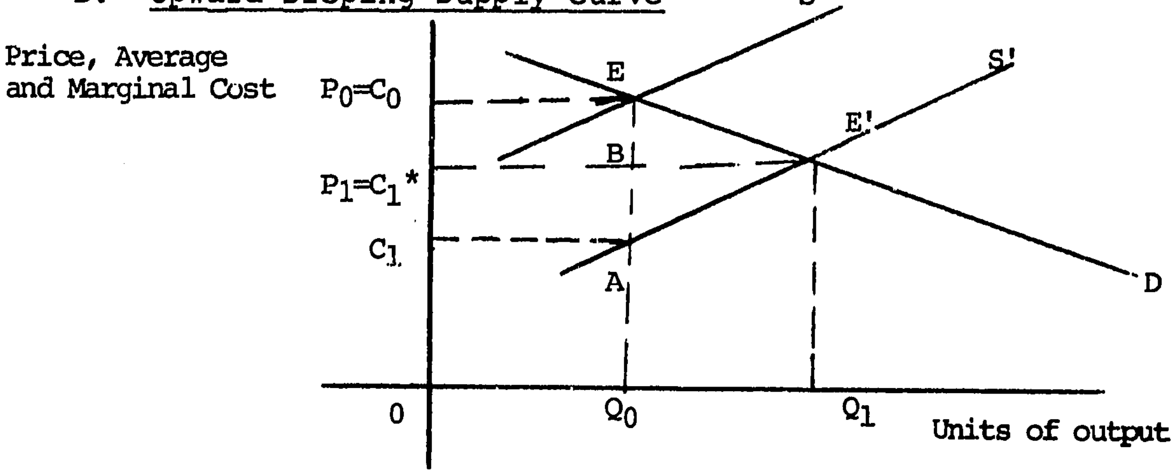
$$S_c = (C_0-C_1)\ Q_0 + 1/2\ (C_0-C_1)(Q_1-Q_0)$$

The gain in consumer surplus is greater when:

(1) The cost decline (C_0-C_1) is greater; and

(2) Initial output (Q_0) or final output (Q_1) is greater.

B. Upward Sloping Supply Curve



6/ The gain in consumer surplus equals the area of the rectangle P_1P_0EA deriving from the old producers plus the area of the triangle AEE' deriving from the new producers.

In this case, some factors are assumed to have less than infinitely elastic supply.[7/] Initial equilibrium is at point E where the demand curve (D) intersects the original supply curve (S). As a result of land reform, costs of all producers drop by $C = C_0 - C_1$ to a post-reform supply curve (S'). In the short run, producers (now at point A) achieve abnormally high profits equal to the cost decline. New producers enter the field. But the increasing number of producers must compete for the scarce factors, so factor prices are bid up. Marginal and average costs rise, and the resulting supply curve slopes upward. A new equilibrium results at E', where the price P_1 equals the new marginal and average cost C_1*, which exceeds the initial post-reform cost C_1.

The total benefits of the reform, represented by the area $C_1P_0EE'A$, are now divided between consumers and producers.

Consumers have a gain in consumer surplus represented by the area P_1P_0EE':[8/]

$$S_c = (P_0 - P_1)\ Q_0 + 1/2\ (P_0 - P_1)\ (Q_1 - Q_0)$$

Let "a" denote the ratio of the consumer surplus to the total benefits.[9/] Since $(P_0 - P_1) = a(C_0 - C_1)$, we have:

$$S_c = a\ (C_0 - C_1)\ Q_0 + 1/2\ a(C_0 - C_1)\ (Q_1 - Q_0)$$

7/ The supply of good land may be limited or labor may not be of uniform quality.

8/ The gain in consumer surplus equals the areas of the rectangle, P_1P_0EB, plus the area of the triangle EE'B.

9/ "a" may be expressed as a function of demand and supply elasticities.

The gain in consumer surplus is greater when:

(1) The cost decline (C_0-C_1) is greater;

(2) Initial output (Q_0) or final output (Q_1) is greater; and

(3) The share of consumer surplus to total benefits (a) is greater.

Producers (or owners of scarce factors) now receive a "producer surplus" consisting of the returns to the scarce factors and represented by the area $C_1P_1E'A$:[10/]

$$S_p = (P_1-C_1)\ Q_0 + 1/2\ (P_1-C_1)(Q_1-Q_0)$$

Since $(P_1-C_1) = (1-a)(C_0-C_1)$, we have:

$$S_p = (1-a)(C_0-C_1)\ Q_0 + 1/2\ (1-a)(C_0-C_1)(Q_1-Q_0)$$

The producer surplus is greater when:

(1) The cost decline (C_0-C_1) is greater;

(2) Initial output (Q_0) or final output (Q_1) is greater; and

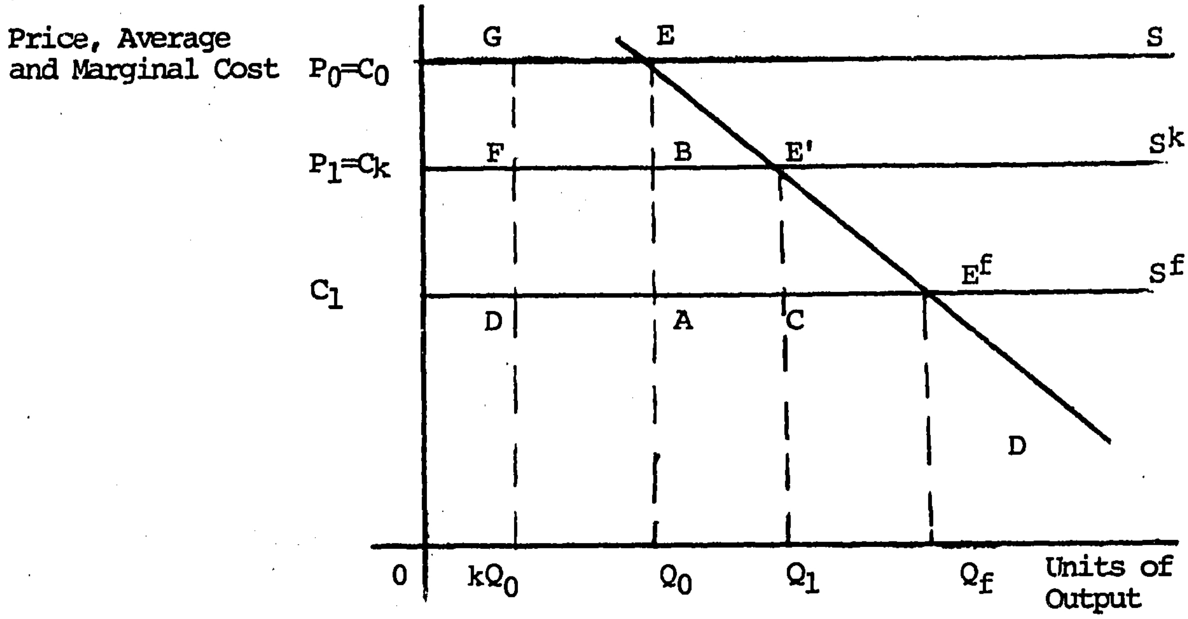
(3) The share of consumer surplus to total benefits (a) is lower.

10/ Producer surplus equals the area of the rectangle C_1P_1BA plus the area of the triangle ABE'.

II. PARTIAL REFORM

A. Infinitely Elastic Supply Curve

(As discussed below, this case represents Kenya's reforms.)



The analysis of partial reform reveals that producers who fail to reform actually suffer a loss. At the outset, all producers are assumed to have a supply curve represented by S and initial equilibrium is at E. But in this case, some fraction k of all producers reform, resulting in a cost decline of (C_0-C_1). Their post-reform supply curve is represented by S^f, which would be the post-reform industry supply curve if all producers had reformed (k=1). But the (1-k) unreformed producers continue to produce according to the original supply curve (S). Thus the post-reform industry supply curve equals a linear combination of S and S^f (with weights (1-k) and k), and is represented by S^k.

All corresponding angles, line segments, and areas described by supply curves S^k or S^f with the demand curve D and the axes are similar; for example,

$$EE'B \sim EE^fA$$

In the short run (at point B), the "average" producer (a composite of k reformed and (1-k) unreformed producers) will find unusually high profits equal to the "average" cost decline; new producers will enter, and a new equilibrium will result at E'.[11/]

The total benefits of the reforms consist of a gain in consumer surplus (S_c) represented by the area P_1P_0EE':

$$S_c = (P_0-P_1)\ Q_0 + 1/2\ (P_0-P_1)(Q_1-Q_0)$$

Since $(P_0-P_1) = k(C_0-C_1)$, we have:

$$S_c = k(C_0-C_1)\ Q_0 + 1/2\ k(C_0-C_1)(Q_1-Q_0).$$

The consumer surplus gain is also represented by the sum of the areas C_1P_0GD and $EE'B$:

$$S_c = k\ Q_0\ (C_0-C_1)+1/2\ k(C_0-C_1)(Q_1-Q_0).$$ [12/]

11/ The linear combination post-reform supply curve is artificial in that it assumes either new entrants achieve only k percent of the cost reduction, or the new entrants are "reformed" (having full cost reduction) and "unreformed" in the ratio k/(1-k). But new entrants would probably tend to be reformed. This would result in a complex dynamic process of downward shifts in S^k, reaching S^f in the limit. The simpler case pictured suffices to make the basic point that producers who fail to reform suffer a loss.

12/ This is the expression we will use in computing the benefits of Kenya's land reforms.

The consumer surplus gain is greater when:

(1) The cost decline (C_0-C_1) is greater;

(2) The initial output (Q_0) or the final output (Q_1) is greater; and

(3) The fraction of reformed producers (k) is greater.

In this case, the gain (G) of the k producers who reformed is represented by the area C_1P_1FD:

$$G = [(C_0-C_1) - (P_0-P_1)]\ kQ_0$$

Since $(P_0-P_1) = k(C_0-C_1)$, we have:

$$G = k(C_0-C_1)(1-k)\ Q_0$$

The loss (L) of the (1-k) producers who failed to reform is represented by the area FGEB:

$$L = (P_0-P_1)(1-k)\ Q_0$$

Since $(P_0-P_1) = k(C_0-C_1)$, we have:

$$L = k(C_0-C_1)(1-k)\ Q_0$$

Thus the loss of the unreformed producers equals the gain of the reformed producers in this case.

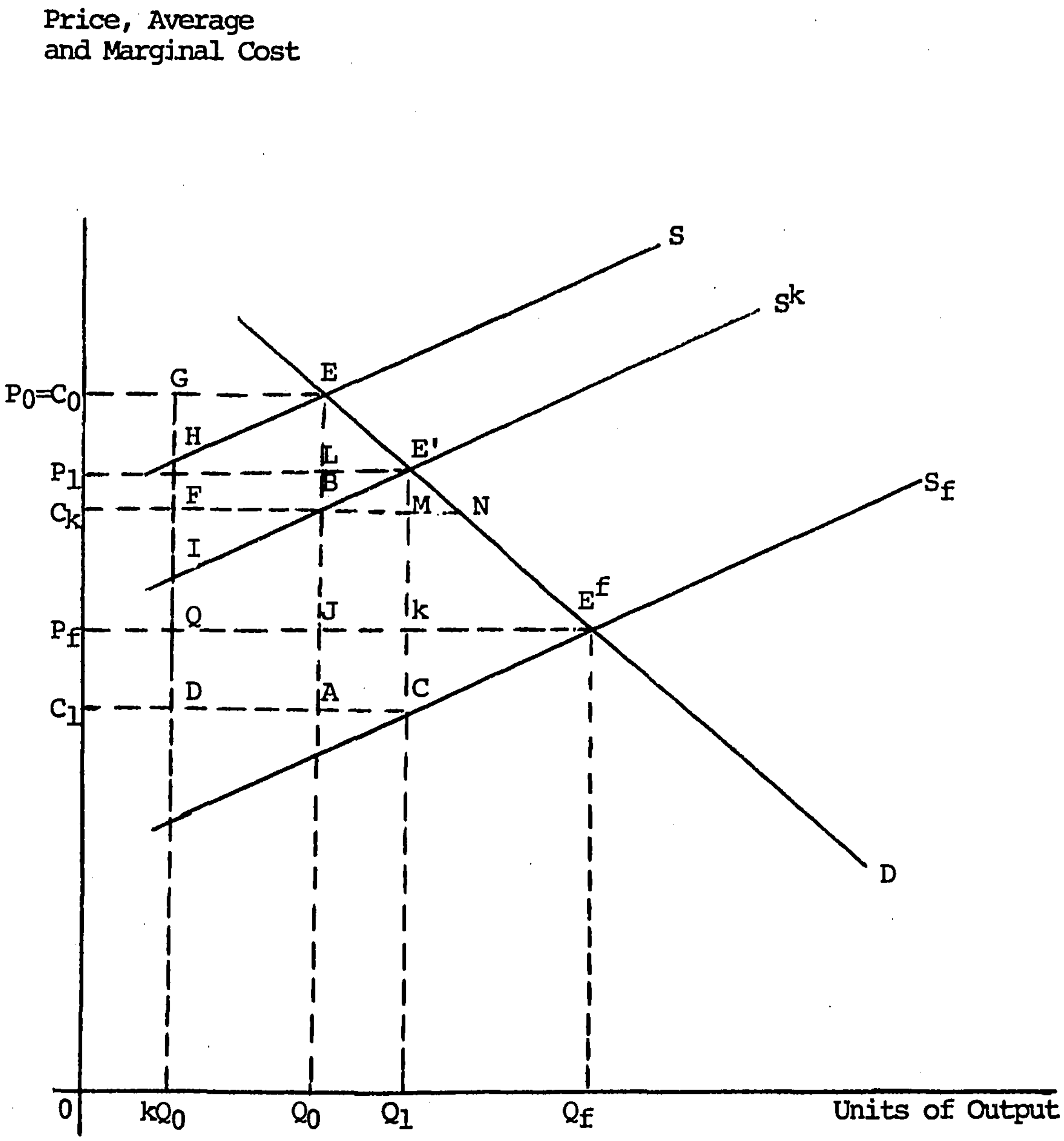
The gain (or loss) is greater when:

(1) The cost decrease (C_0-C_1) is greater, and

(2) The initial output (Q_0) is greater.

(3) The fraction of reformed producers (k) is greater.

B. Upward Sloping Supply Curve



In this case, some fraction k of all producers is assumed to reform, resulting in a cost decrease of $C = C_0-C_1$. The post-reform supply curve is represented by S^k, and the same pattern of geometric similarities applies as in case IIA.

In the short run (at point B), unusually high profits equal to the cost decline encourage new entrants. But with some factors in less than infinitely elastic supply, factor prices are bid up, and a new equilibrium results at E'.13/

The total benefits of the reform are divided between consumers and producers.

There is a gain in consumer surplus (S_c) represented by the area P_1P_0EE':

$$S_c = (P_0-P_1)\ Q_0 + 1/2\ (P_0-P_1)(Q_1-Q_0)$$

The gain in consumer surplus is also represented by the sum of the areas QP_fP_0G + $EE'L$:

$$S_c = kQ_0(P_0-P_f) + 1/2\ (P_0-P_f)\ k(Q_1-Q_0)$$
$$= kQ_0a(C_0-C_1) + 1/2\ a(C_0-C_1)k(Q_1-Q_0)$$

The gain in consumer surplus is greater when:

(1) The cost decrease (C_0-C_1) is greater;

(2) Initial output (Q_0) or final output (Q_1) is greater; and

(3) The share of reformed producers (k) is greater.

Producers (or owners of scarce factors) receive a producer surplus consisting of the returns to scarce factors and represented by the area $C_kP_1E'B$ or the areas C_1P_fQD and $LE'B$:

$$S_p = (P_1-C_k)\ Q_0 + 1/2\ (P_1-C_k)\ (Q_1-Q_0)$$
$$= [k(C_0-C_1) - ak\ (C_0-C_1)]Q_0 + 1/2\ [k(C_0-C_1) - ak(C_0-C_1)]\ (Q_1-Q_0)$$
$$= k(C_0-C_1)\ Q_0\ (1-a) + 1/2\ k(C_0-C_1)(Q_1-Q_0)(1-a)$$

13/ Land or labor is assumed to be in inelastic supply.

Producer surplus is greater when:

(1) The cost decrease (C_0-C_1) is greater;

(2) Initial output (Q_0) or final output (Q_1) is greater; and

(3) The share of reformed producers (k) is greater.

The gain of the k reformed producers is represented by the area C_1P_1HD:

$$G = [(C_0-C_1)-ak(C_0-C_1)]kQ_0$$
$$+ 1/2[k(C_0-C_1)-ak(C_0-C_1)](Q_1-Q_0)$$
$$= k(C_0-C_1)Q_0(1-ak)+1/2k(C_0-C_1)(Q_1-Q_0)(1-a)$$

The gain is greater when:

(1) The cost difference (C_0-C_1) is greater;

(2) Initial output (Q_0) or the final output (Q_1) is greater;

(3) The fraction of reformed producers (k) is greater; and

(4) The share of consumer surplus to total gain (a) is smaller.

The difference between the gain of the k reformed producers and the producer surplus is interpreted as the loss (L) of the (1-k) unreformed producers, represented by the area HGEL:

$$L = G-S_p$$
$$= k(C_0-C_1)Q_0(1-ak)+1/2k(C_0-C_1)(Q_1-Q_0)(1-a)$$
$$-k(C_0-C_1)Q_0(1-a)-1/2k(C_0-C_1)(Q_1-Q_0)(1-a)$$
$$= k(C_0-C_1)(Q_0[(1-ak)-(1-a)]$$
$$= k(C_0-C_1)Q_0a(1-k)$$
$$= ak(C_0-C_1)(1-k)Q_0$$
$$L = (P_0-P_1)(1-k)Q_0$$

The loss is greater when:

(1) The price difference (P_0-P_1) is greater;

(2) The cost difference (C_0-C_1) is greater;

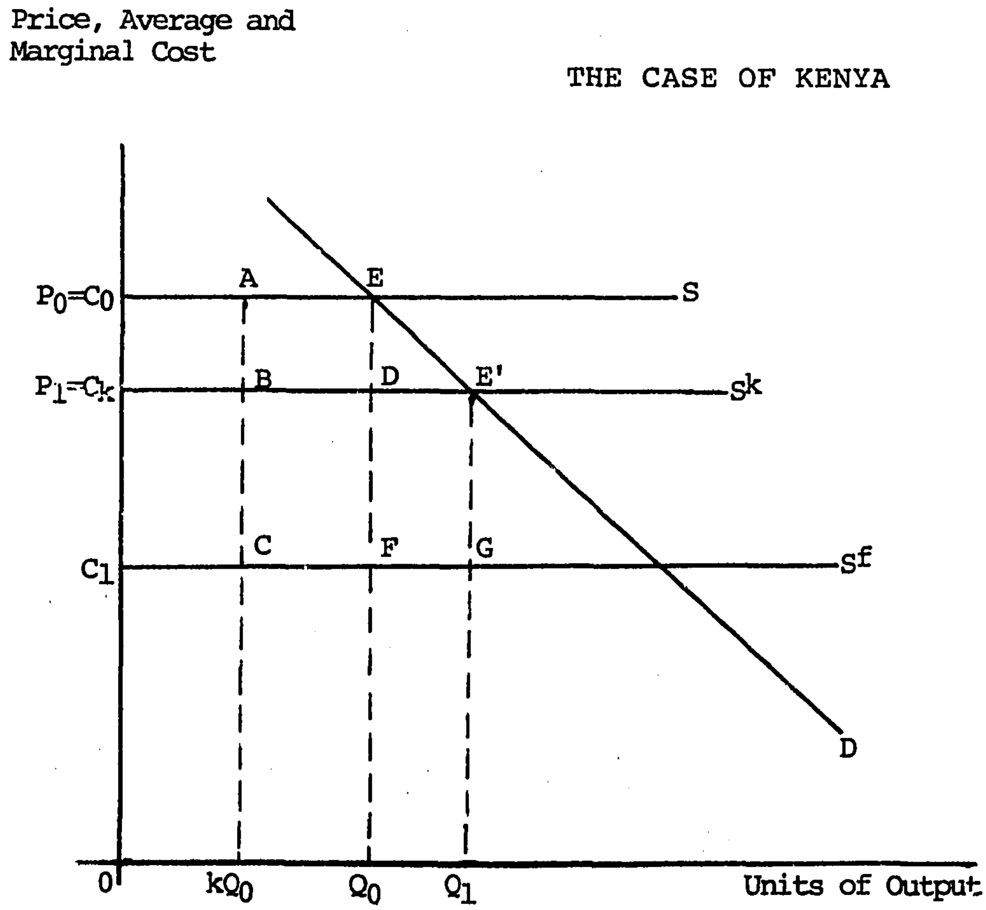
(3) Initial output (Q_0) is greater;

(4) The fraction of reformed producers (k) is greater; and

(5) The share of consumer surplus to total gain (k) is greater.

Kenya's reforms can each be pictured as a case of partial reform with elastic supply curves:

THE CASE OF KENYA



For want of a firm estimate, market demand for "agricultural output" is assumed to have unitary elasticity.[14/] Long run supply is approximated with an infinitely elastic supply curve, so that average and marginal cost are constant.[15/] Benefits (represented by the sum of the two areas C_1P_0AC and EE'D) may be defined as the change in consumer surplus caused by the shift in the supply curves.

The pre-reform and post-reform supply curves are defined so that marginal cost includes both our estimated marginal cost (equal to average cost under the constant cost assumption) and some "profit component" of a long run nature, such as rents to land or imputed wages for entrepreneurs, not captured in our marginal cost data. This profit component is assumed to remain constant after reform. Thus the vertical distance between the pre-reform and post-reform supply curves will equal the vertical distance between pre-reform and post-reform "estimated" supply curves based only on our

---

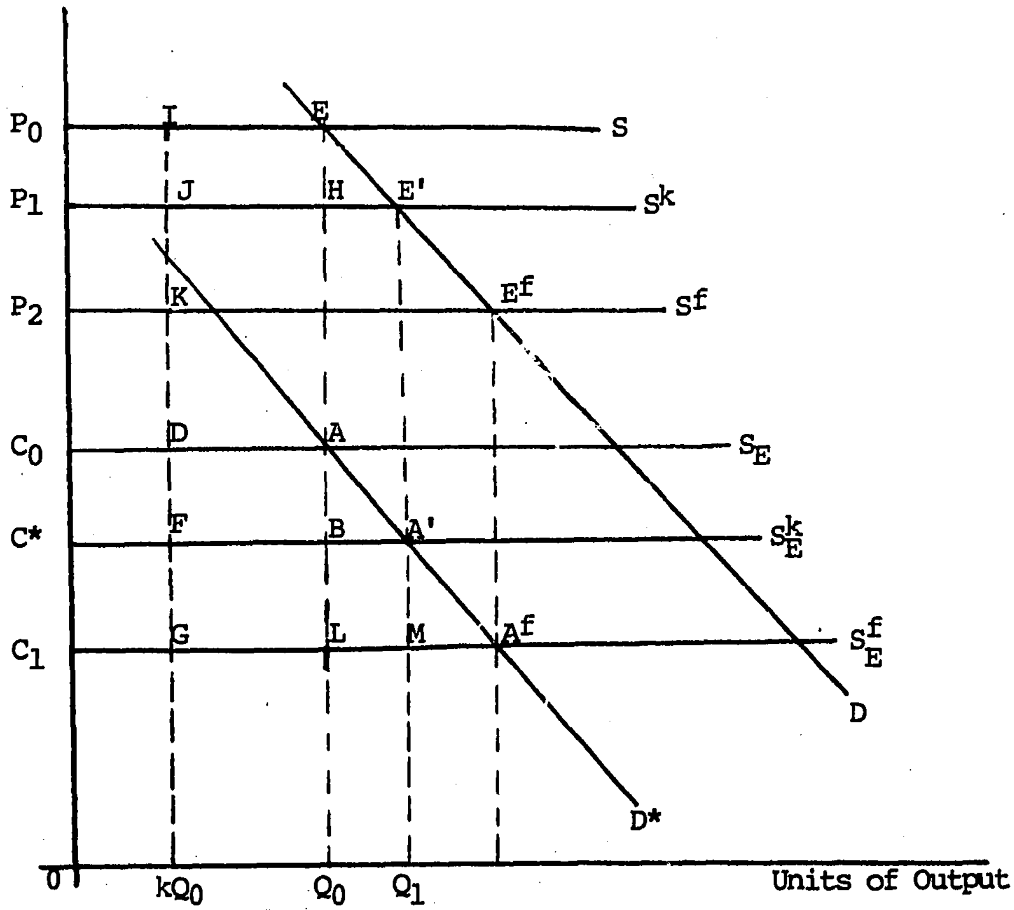
14/ Demand for some commodities produced largely for export may be more elastic; demand for subsistence crops like maize is unlikely to be inelastic since those crops are also protected.

15/ This is a reasonable assumption for the scale of reform in Kenya. There is still considerable unreformed (though used) land and many capable farmers. It is also worth noting that the scale effects described in Chapter 4 apply more between farm types than within, or "before" and "after" reform. More sophisticated supply curves might have served better, but necessary data were unavailable.

estimated marginal costs; consumer surplus can therefore be computed from the estimated curves.[16/]

16/

Price, Average and
Marginal Cost



Let long run profit be represented by the distance $(P_0-C_0) = (P_1-C^*)$. The gain in consumer surplus resulting from the reform is represented by the areas P_2P_0IK plus $EE'H$. Since line D* (Mirror Demand) is parallel to (and exactly (P_0-C_0) distance below) line D, the area C_1C_0DG equals area P_2P_0IK and the area BAA' equals area HEE'. Our estimates of costs (C_0 and C_1) can therefore be used to measure the gain in consumer surplus.

In Kenya's case, of course, there is more than one commodity whose cost curves change with reform. We shall estimate a multi-product yield index by comparing the value of total output on reformed land before and after the reform (with prices taken as constant), normalizing on the pre-reform output to give a baseline of one unit of output.[17/]

The consumer surplus concept applies to the land reform as a whole; the benefit of the reform depends on the total gain in consumer surplus from the total area reformed. Associated costs are the total costs of implementing the reform. Resulting ratios of benefits and costs are valid for Kenya as a whole.

But those same ratios also hold on a per-acre basis, assuming the costs of reform are linear with respect to the area reformed.[18/] (Within a reasonable range, they probably are; should the land reform be extended to millions

---

17/ This is essentially a Laspeyre's index. If relative prices change over time, there is a standard index number problem. Our price data is poor, but it appears that in Kenya's case, relative prices did not change much.

18/ Dividing benefits and costs by a constant equal to the acreage reformed does not change the ratio. The notion of "consumer surplus per acre" seems odd, but it is the simple mathematical expression of total consumer surplus accruing from the reform on X acres divided by X acres.

more acres, however, average costs per unit output might eventually rise as increasing marketing difficulties lead to demands for more infrastructure and as the use of progressively less suitable land affects yields.)[19/] With this proviso, the benefit/cost ratios may be taken to apply both for Kenya as a whole and on a per-acre basis.

The Payoff of the Million Acre Scheme

On the basis of benefit/cost ratios computed for the Million Acre Scheme, it appears that this reform was not successful in purely economic terms. The benefit/cost ratios were based on the following considerations.

The costs of implementing reform -- changing tenure and setting up a new agricultural system -- are called "implementation costs" to distinguish them from all costs of actual agricultural production (wages, purchase of coffee or tea plants, dips for cattle, and so on). The implementation costs should be reckoned in terms of opportunity costs -- the alternative investment opportunities foregone when the government undertook land reform. According to official data on the Million Acre Scheme, the implementation costs total almost £ 27 million -- or about £ 23 per acre for the 1.2

19/ Other factors such as poorer quality labor or less able farmers might also raise average costs per unit output.

million acres actually reformed. Of this, about £ 10.5-11 per acre went as compensation to the expropriated British farmers, about £ 6 per acre for administration, and about £ 5 per acre for general development purposes (roofing materials, etc.).[20/]

The development and administrative costs are clearly properly included as implementation costs. But the compensation of the expropriated British landlords is more difficult. The most satisfying way of interpreting that in Kenya's case seems to be the following. Barring purely humanitarian concerns, the Kenya government would use its scarce funds to compensate expropriated farmers only if compensation bought some economic benefit; otherwise it would invest funds elsewhere. The economic rationale in this case seems obvious: some compensation of the expropriated farmers was necessary to persuade the farmers remaining not to sell in panic, and thereby disrupt the critical export sector. Compensation was the price of maintaining the *status quo*.[21/]

20/ The cost data derive from two sources. Aggregate financial data were taken from the *Settlement Report*, for 1967/68, for 1970, p. 73. Generally corroborating, though unexplained, estimates are found in Ruthenberg, *op. cit.*, p. 82.

21/ It could be argued that Europeans anxious to remain in their East African homes would have held on to their land even if those whose land was seized for the Million Acre Scheme had received a lower price for their land. It would be interesting to determine whether £ 11 per acre was the lowest price the government might have paid, especially when the original target was only £ 9, but there are no data; we shall assume, therefore, that the government correctly estimated the best price.

If the expropriated British farmers had stayed and invested their compensation payments in the agricultural reforms, then the stream of benefits from the reform might have needed adjusting to reflect their investment; but the expropriated farmers generally left Kenya -- compensation in hand -- to return to Britain.[22/] Thus the compensation payments may reasonably be taken as an economic cost of the reform to Kenya, with no further adjustment of the data.[23/]

The cost situation is complicated further, however. The British government helped finance Kenya's land reform -- donating around £ 10 million in grants, largely for compensation, and providing another £ 10 million in loans, some for administration, some for development loans. In rough terms -- assuming different grants were fungible -- the British grants paid the bill for compensation.[24/] Under the reasonable assumption that for political, economic, and

---

22/ It is questionable, of course, whether absolutely all of the expropriated farmers left Kenya, and whether they took absolutely all of their payments, but the evidence suggests that the best general assumption is that they did leave with their payments.

23/ As discussed in Chapter 2, *supra*, the government planned to require farmers participating in the M.A.S. to cover part of the compensation costs, but that has not generally come to pass. However, our two calculations of M.A.S. benefits given below correspond to the assumptions that the government covered all or none of the compensation costs itself.

24/ Actually, the British grants covered only about 85 percent of compensation.

other reasons the British would not have given this aid to Kenya for any other purpose, and with the understanding that the expropriated farmers generally left Kenya with their compensation payments, the British grants-in-aid may be said to reduce the costs of the reform *pro tanto*.[25/]

The remaining costs -- about £ 16 million, or about £ 12 per acre -- were financed largely through loans from the UK, the IBRD/CDC, the Federal German Government, and other Kenya government agencies at an average rate of 6 percent for various terms. But because of the poor repayment record of the new settlers, the government fell into arrears on these loans, the repayment schedule was set aside, and a major debt rescheduling was undertaken. The British have already forgiven much of their loans, and a further easing of terms seems likely.

By rights the costs of the benefit/cost ratio should be defined to include loan repayments, discounted to present value at the assumed interest rate just as benefits are. In principle, therefore, one should wait until all debt rescheduling is finally worked out before estimating the benefit/cost ratios. But that may take considerable time; we shall therefore abstract from the repayment problem, and assume Kenya never borrowed at all, an assumption which is potentially important but which, as we shall see, probably

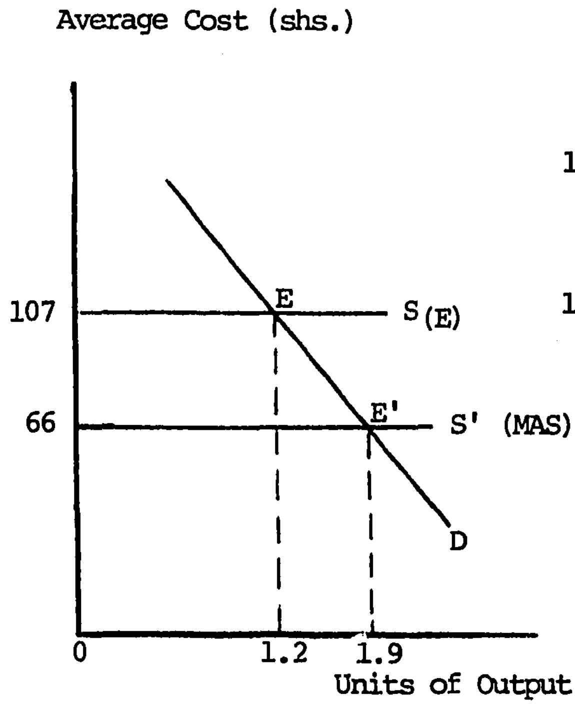
---

25/ This British assistance was generally considered to be the result of the extraordinary circumstance of coming Independence, so the assumption is reasonable.

does not vitiate the comparative results of the Million Acre and Swynnerton reforms as presented below.

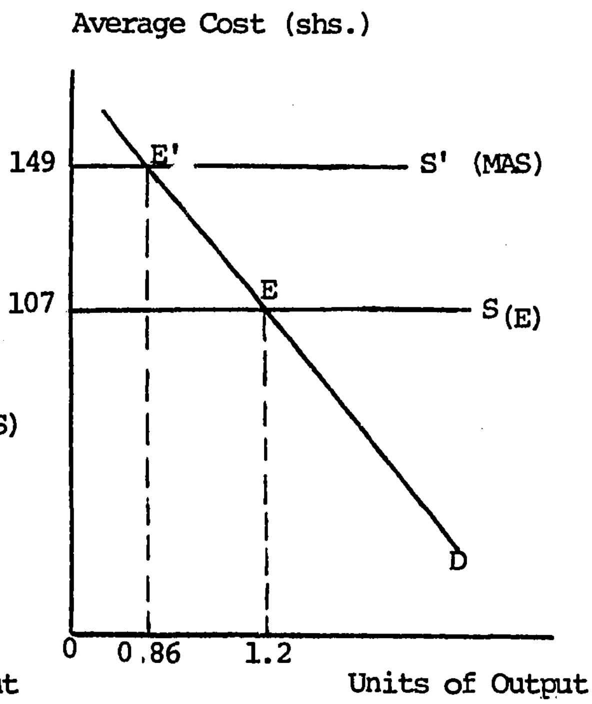
The benefits of the Million Acre Scheme are measured as the reform actually occurred, without payment to family labor, and in the more accurate economic sense, imputing a value to family labor at prevailing wage rates. The benefits in the two cases are pictured in terms of pre-reform European and post-reform Million Acre supply curves using data from Chapter 4[26] (and the unitary-elasticity assumption):

A. Unpaid Family Labor



(One unit = output from 1 million acres)

B. All Labor Paid



(One unit = output from 1 million acres)

26/ For simplicity's sake, the reforms are pictured here as if they were full reforms and supply curves as if they included long run profits. Actually, there was considerable unreformed acreage and the average costs estimated did not include normal long run profit. But none of this affects the calculation of the gain in consumer surplus, as discussed in note 16, *supra*.

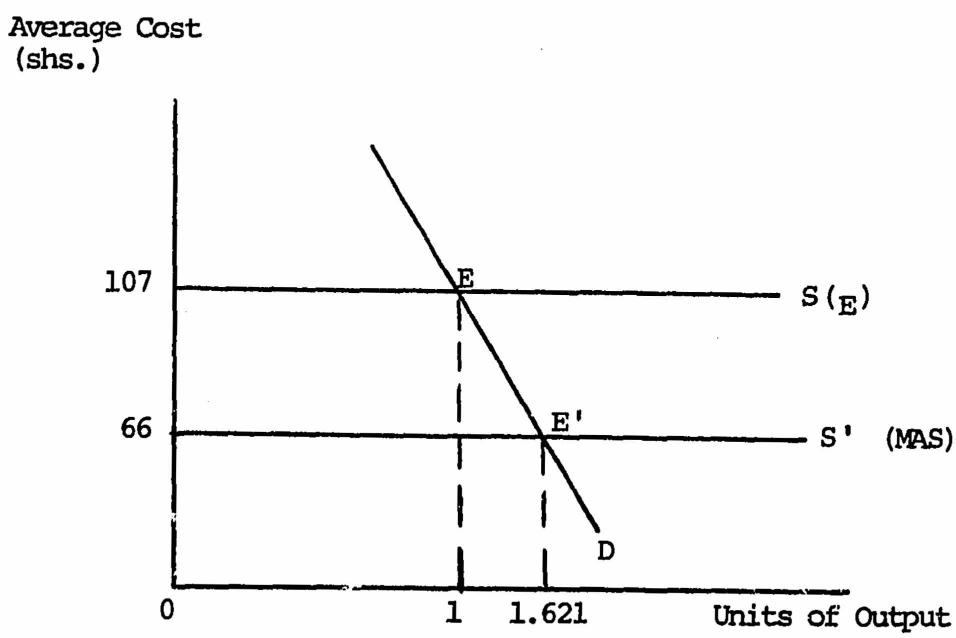
As the reform actually occurred, pictured in Case A, benefits are computed from the gain in consumer surplus:

$$S_C = (107-66)(1.2)+.5(107-66)(1.9-1.2)$$
$$\doteq 50 + 15$$
$$= \text{shs. } 65 \text{ million or about £ } 3.2 \text{ million}$$ 27/

as compared to pre-reform output of shs. 173 million on the 1.2 million acres reformed. (The "per-acre gain in consumer surplus" equals shs. 54 per acre, compared to pre-reform output of shs. 144.) 28/

27/ Shs. 50 represents the area of the rectangle while shs. 15 represents the area of the triangle.

28/ The per-acre case A is pictured as:



$$S_C = (107-66)(1)+.5(107-66)(.621)$$
$$\doteq 41 + 13$$
$$\doteq 54 \text{ shs. per acre}$$

In case B, which is more meaningful in economic terms, family labor is valued at prevailing wage rates. Interestingly, this results in an increase in cost per unit output; the reform actually leaves Kenya worse off. The loss in welfare or negative "benefits" is computed as the loss in consumer surplus:

$$S_C = -(149-107)(0.86)-.5(149-107)(1.2-0.86)$$

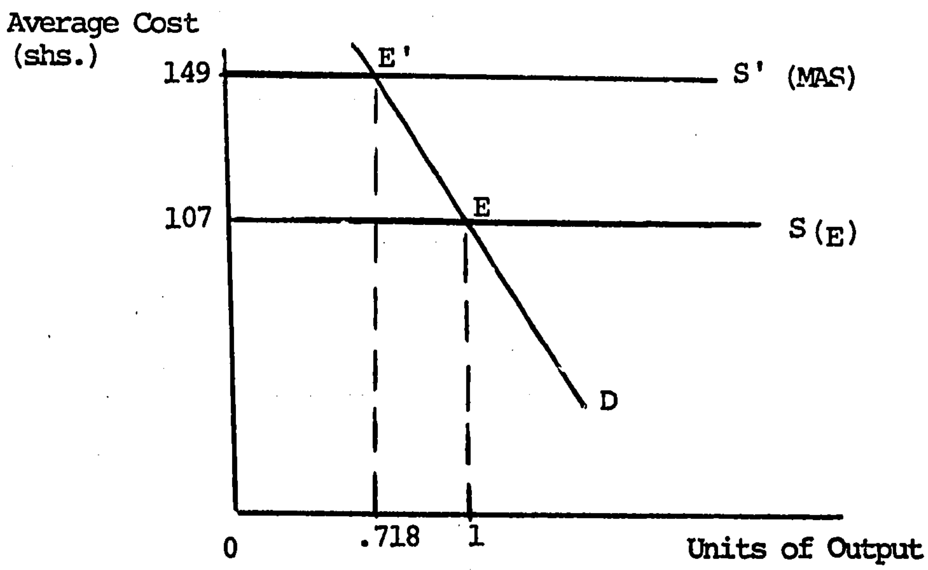
$$\doteq -37 - 8$$ 29/

$\doteq$ shs. -45 million or about £ -2.2 million

as compared to pre-reform output of shs. 174 million. (The per-acre loss in consumer surplus is shs. -37 as compared to pre-reform output of shs. 144.) 30/

29/ Shs. 37 represents the area of the rectangle while shs. 8 represents the area of the triangle.

30/ The per-acre case B is pictured as:



$$S_C = (107-149)(.718)+.5(107-149)(1-.718)$$
$$\doteq -30 - 6$$
$\doteq$ shs. -36 per acre

The benefit/cost ratios will be computed as if benefits are perpetual. If demographic pressure no longer threatened Kenya's agricultural economy, if resources were limitless, and if political and social conditions were to remain stable after Kenyatta, benefits might indeed last a long time. But with recurring demographic pressure, shortages of fertilizer and other inputs, and a political future open to question, it also makes sense to compute the ratios as if benefits last only ten years, of which most have already elapsed. (Appendix 4 presents ratios computed for benefits lasting 20 years.)

One more datum is necessary to permit calculation of the benefit/cost ratios: the "market interest rate." That rate is difficult to specify in Kenya's case, since there is no very homogeneous capital market. The interest rate on foreign loans incurred to finance land reform was about 6 percent, but foreign donors do not always offer 6 percent loans. Government credit programs for farmers generally required 5-6 percent interest, but commercial bank and other private money lenders demand far higher rates. (Mortgage money went for 8-9 percent in Nairobi.) The government -- like many other governments and private institutions -- often uses a discount rate of 10 percent or even more, in its economic planning. The most reasonable approach seems to be to take two interest rates, 6 percent and 10 percent, and calculate benefit/cost ratios using each. (Appendix 4 also gives estimates for an interest rate of 15 percent.)

Table 1 summarizes the benefit/cost ratios estimated. It makes sense from the Kenya policymaker's standpoint first to assess the reform's payoff as it actually occurred -- with the help of substantial British grants-in-aid and considerable uncompensated family labor. Column (1) presents this case. Under actual circumstances, the reform is successful if the interest rate is 6 percent, but fails to break even if the interest rate is 10 percent unless benefits last past ten years. But even with perpetual benefits, the ratios suggest only moderate success, with benefits no more than triple the level of costs.

Without UK aid, Kenya would have had to bear the whole cost of the Million Acre Scheme. As Column (2) shows, that would have raised costs enough so that the reform would not break even unless benefits last well past ten years; even with perpetual benefits, the reform just breaks even if the interest rate is 10 percent.

From an economic standpoint, it also makes sense to assess the reform's payoff as if all labor, including family labor, had been compensated at prevailing wage rates (a reasonable proxy, under Kenyan market conditions, for competitive return). Valuing family labor brings out the failure of the Million Acre Scheme in purely economic terms. For costs per unit of output actually rise, and "benefits"

Table 1

Payoff of the Million Acre Scheme

Interest Rate	Benefits Term	(1) Benefits Computed With Unpaid Family Labor; Costs Computed With UK Aid	(2) Benefits Computed With Unpaid Family Labor; Costs Computed Without UK Aid	(3) Benefits Computed As If All Labor Paid; Costs Computed With UK Aid	(4) Benefits Computed As If All Labor Paid; Costs Computed Without UK Aid
r = 6%	10 years	1.390	0.884	-0.952	-0.607
	perpetual	3.146	2.003	-2.150	-1.370
r = 10%	10 years	0.967	0.616	-0.663	-0.422
	perpetual	1.574	1.002	-1.078	-0.686

are negative.[31/] (Chiefly, this results from the poor performance of the High Density Schemes, which covered about three-fourths of the reformed land.) As Column (3) shows, even with UK aid, the reform is a losing proposition. As Column (4) shows, without UK aid, the situation would be even worse; and Column (4) represents the true economic situation from Kenya's viewpoint, valuing benefits after "paying" family labor and costs without recourse to foreign aid grants.[32/]

It is reasonable to suppose that farming during the early years of the Million Acre Scheme was unusually inefficient because farmers had not yet caught on to new ways and because livestock and some crops, :cluding coffee and pyrethrum, were still immature. Generally improving yields provide supporting evidence. As an upper bound on the Million Acre payoff, therefore, benefit/cost ratios were computed using only the data from 1967. The results are presented in Table 2. Though ratios generally improve, with all labor paid the reform is still a losing proposition. Thus even looking at the later data, the Million Acre Scheme cannot be called an unqualified economic success.

31/ Average output and cost were computed by weighting High Density and Low Density farms in the ratio 3:1 to reflect the proportion of land allocated to each. The averages presented in Chapter 4 were based on equal weights.

32/ Essentially, Column (4) represents an "economic efficiency" picture.

Table 2

Payoff of the Million Acre Scheme
1966/67 Data

Interest Rate	Benefits Term	(1) Benefits Computed With Unpaid Family Labor; Costs Computed With UK Aid	(2) Benefits Computed With Unpaid Family Labor; Costs Computed Without UK Aid	(3) Benefits Computed As If All Labor Paid; Costs Computed With UK Aid	(4) Benefits Computed As If All Labor Paid; Costs Computed Without UK Aid
r = 6%	10 years	1.831	1.165	-0.295	-0.188
	perpetual	4.144	2.638	-0.666	-0.424
r = 10%	10 years	1.273	0.811	-0.205	-0.130
	perpetual	2.072	1.320	-0.334	-0.212

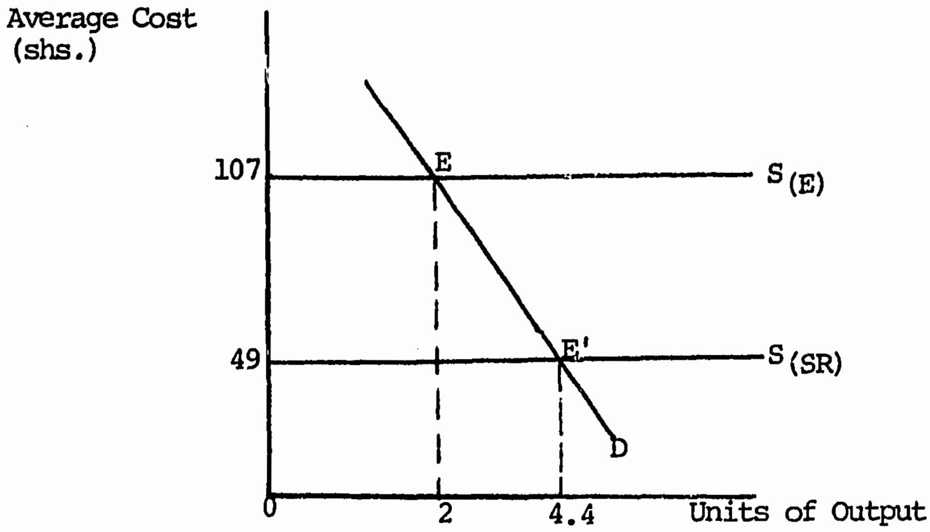
The Payoff of the Swynnerton Reforms

If the payoff from the Million Acre Scheme is low, the payoff from enclosure and modernization on African lands -- the Swynnerton reforms -- is dramatic. As this difference in payoff emerged during the course of this study, every care was taken to see that the estimates of payoff from the Swynnerton reforms were, if anything, conservative to assure that the comparison with the Million Acre Scheme would stand up.

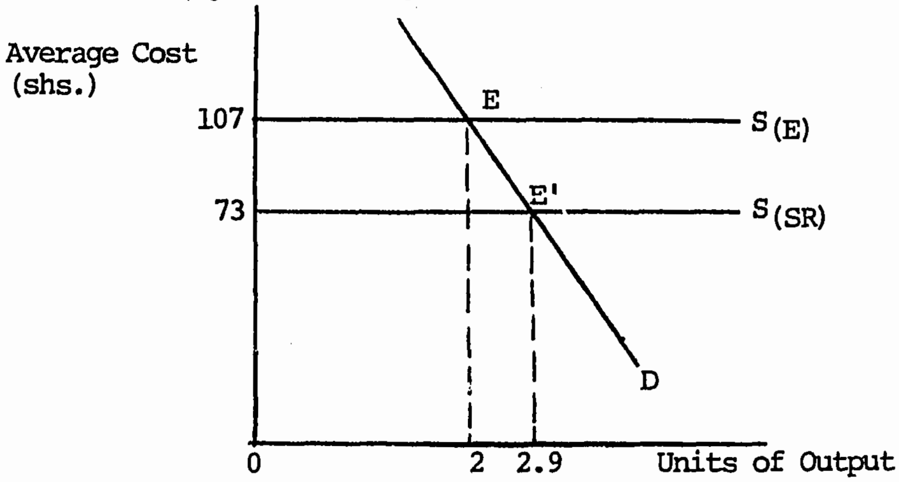
The benefits of the Swynnerton reform are measured as the reform actually occurred, without payment to family labor, and in the more accurate economic sense, imputing a value to family labor at prevailing wage rates.

The benefits in the two cases may be estimated for Kenya as a whole on the assumption that the Swynnerton reforms applied to two million acres. This assumption requires some explanation. Official data estimate that about 3.4 million acres were adjudicated by 1969, about the same time that our data end for the Million Acre Scheme. While the FESU samples apply to a cross-section of farms participating in the Swynnerton reforms, those farms represent only a fraction of the 3.4 million acres adjudicated. (They are the farms receiving more attention from the extension service, etc.) An assumption that only two million acres were fully reformed seems reasonable; it enables us to estimate the total benefits of the reform. (This assumption does not affect the benefit/cost ratios, which are based on per-acre data.) The benefits are pictured (simplified as for the Million Acre Scheme):

A. Unpaid Family Labor



B. All Labor Paid



(One unit = output from 1 million acres)

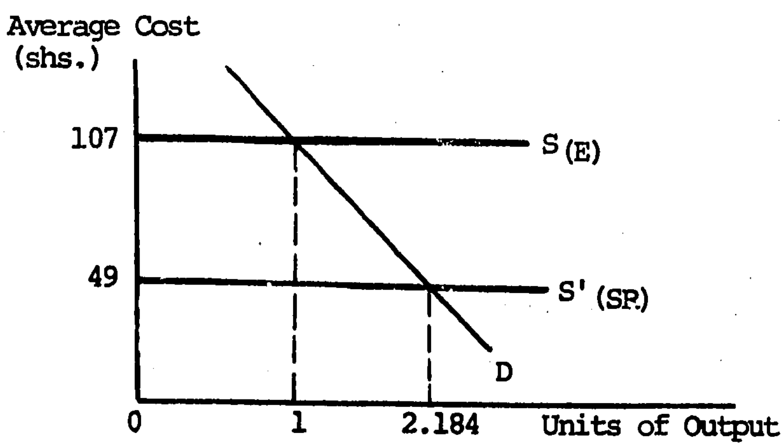
The pre-reform supply curve is taken to be the European supply curve rather than a supply curve based on data from traditional African areas. A lack of data prevented estimating a traditional supply curve. But for cash crops and dairy cattle, which were hardly raised at all in traditional areas, the European supply curve is the only choice. Other products like maize were produced by both Europeans on large farms and Africans in their traditional areas; but the traditional methods were almost surely less efficient on the whole. Thus using the European supply curve as the pre-reform curve will only underestimate the benefits of the Swynnerton reform, a conservative procedure appropriate given the relatively better results of the Swynnerton reform as compared to the Million Acre Scheme.

As the reform actually occurred, pictured in case A, benefits are computed by estimating the gain in consumer surplus:

$$S_C = (107-49)\ (2.0) + .5(107-49)(4.4-2.0)$$
$$\doteq 116 + 64$$
$\doteq$ shs. 180 million or about £ 9 million on 2 million acres. (The per-acre gain in consumer surplus is shs. 92, as compared to pre-reform output per acre of shs. 144.) 33/

In case B, which is more meaningful in economic terms, family labor is valued at prevailing wage rates.

33/ The per-acre case A is pictured as:



$$S_C = (107-49)(1) + .5(107-49)(1.184)$$
$$\doteq 58 + 34$$
$\doteq$ shs. 92 per acre

Interestingly, the gain from the reform is still substantial. The gain in consumer surplus may be estimated as:

$$S_C = (107-73)(2.0)+.5(107-73)(2.9-2.0)$$
$$= 68 + 15$$

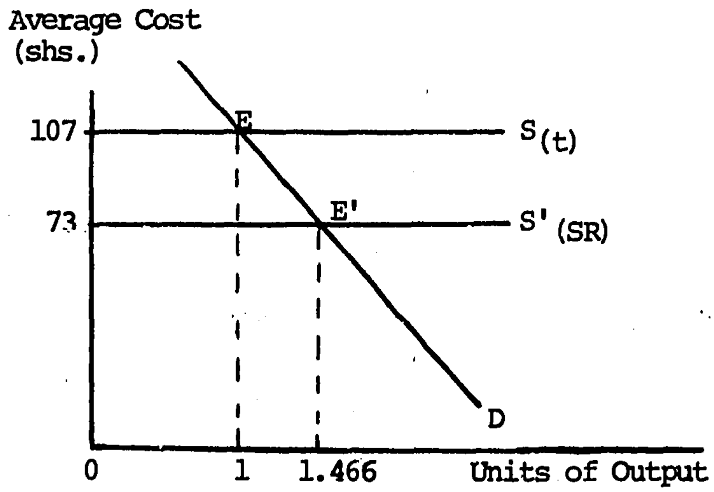
= shs. 83 million or about shs. 4.1 million on 2 million acres. (The per-acre gain in consumer surplus is shs. 42, as compared to pre-reform output of shs. 144.) 34/

As in the case of the Million Acre Scheme, all gains in consumer surplus induced by the Swynnerton reforms are assumed to last ten years, of which perhaps seven or eight have elapsed; to see the sensitivity of the ratio to the length of the term of benefits, the maximum possible pay-off will also be estimated assuming benefits are perpetual.

The implementation costs in African lands are usually estimated at shs. 20-40 or £ 1-2 per acre. Through 1968, the 1969-1974 Plan suggests, the Kenya government had spent about £ 5,885,000 to consolidate, enclose and adjudicate

---

34/ The per-acre case B is pictured as:



$$S_C = (107-73)(1)+.5(107-73)(.466)$$
$$\doteq 34 + 8$$
$$\doteq \text{shs. } 42 \text{ per acre}$$

some 3,996,000 acres -- 3,448,000 agricultural land -- at an average cost of shs. 28 or £ 1.4 per acre. The Lawrence Commission's Report on reform in African lands corroborates this estimate.35/ And the 1970-1974 Development Plan implies costs of no more than shs. 40 or £ 2 per acre.36/

But there were other costs as well -- primarily for extension services and farm development projects. The extension services can be estimated at roughly shs. 10 or £ .5 per acre. Reform implementation costs should be adjusted to reflect these costs as well.37/

35/ The Lawrence Commission estimates the costs of tenure changes at about £ 1 per acre without "refly" to check the survey, or about £ 2 with "refly," which is supposed to be the proper method but still not always done. The ALDEV Settlement Schemes on unused African land also cost £ 1-2 per acre to set up. Thus our estimate is not incompatible with some fairly broad Kenyan agricultural experience.

36/ As we saw earlier, enclosure and registration were financed in part by foreign loans and grants -- loans from the UK financed tenure changes, grants from the UK and USA financed many development projects, loans from the IBRD financed tea development, and loans from other sources financed other projects. By rights, the payoff from the reforms should reflect the benefits and costs associated with these grants and loans. But the external financing of the Swynnerton reforms is a mare's nest. The Swynnerton Plan and the Development Plan overlapped, and government statistics on expenditures simply do not indicate in sufficient detail what all has been spent on the small farms from the various foreign loans and grants. Thus we cannot consider the financing of the reform. The bias of this omission is fairly clear: the grants probably worked to increase the "actual" payoff.

37/ Both the Swynnerton and Million Acre farmers receive attention from the extension services each year, but no information was available on the cost of these recurring visits. But it can be assumed, reasonably, that these costs are roughly equivalent between the Million Acre and Swynnerton farms, though M.A.S. farms may have modestly more.

The costs for farm development projects were probably low, and can generally also be expressed as direct costs rather than as implementation costs. The government provided little assistance for this purpose in the African areas and the farmers themselves generally did little saving.[38/]

Thus, for lack of a precise estimate, the implementation costs will be taken as about shs. 50 or £ 2.5 per acre, to incorporate the higher estimates of the cost of changing tenure. The sensitivity of results to this assumption will also be discussed. Benefit/cost ratios have been computed for the same terms of benefits and rates of interest as they were for the Million Acre Scheme.

The benefit/cost ratios presented in Table 3 show the immense economic success of the reforms on African lands -- a record that contrasts sharply with that of the Million Acre Scheme. Table 3, Column (1) presents benefit/cost estimates based on actual conditions -- that is, assuming family labor was not compensated. The ratios are all very high, far higher than those achieved on the Million Acre Scheme even taking into account British aid.

In terms of economic efficiency -- that is, even if all family labor were compensated at prevailing wage rates -- the reform would have paid off very well indeed. Benefits are over five times the implementation costs.

38/ Expenditures on coffee plants, cattle, etc., are included in production data; these data also reflect costs of fencing, etc., which outlast one herd. This may bias the payoff estimate downward, but that is at least the conservative direction.

Table 3

Payoff of the Swynnerton Reforms
(Implementation Cost at £ 2.5 per acre)

Interest Rate	Term of Benefits	(1) Benefits Computed With Unpaid Family Labor	(2) Benefits Computed As If All Labor Paid 39/
r = 6%	10 years	13.543	5.888
	(perpetual)	30.667	13.333
r = 10%	10 years	11.306	4.916
	(perpetual)	18.400	8.000

39/ Imputing a value to family labor at prevailing wage rates.

One might argue, however, that any comparison of the Million Acre Scheme and the Swynnerton reforms are stacked in favor of the latter because of the low estimated Swynnerton implementation costs; if these estimates, which were very tentative, were far too low, the inequality in payoff could conceivably reverse if more accurate higher estimates could be obtained. It seems unlikely that the Swynnerton implementation cost estimates are tremendously off -- since two reasonably independent estimates were close -- but, for the sake of argument, let us estimate the payoff of the Swynnerton reform under another assumption about its cost that everyone will accept as an upper limit.[40] Let us assume the implementation cost of the Swynnerton reform actually equaled the implementation cost of the Million Acre Scheme (net of compensation), about £ 13 per acre, or about £ 26 million on the two million reformed acres.[41] It is well known that the Swynnerton implementation cost was far less, but the calculation is worth making. For if the Swynnerton benefits are so great that the Swynnerton reform still compares favorably with the Million Acre Scheme on its own cost terms, then the Swynnerton reform's superiority should be demonstrated beyond a reasonable doubt.

40/ See discussion above of the Swynnerton and ALDEV estimates of tenure costs.

41/ Estimate includes administrative and development costs of the Million Acre Scheme but excludes UK grants that roughly compensated for the land purchase costs for 1.2 million acres.

Table 4

Payoff of the Swynnerton Reforms
(Implementation Cost Assumed Equal to That
of Million Acre Scheme Including UK Aid) 42/

		(1)	(2)
Interest Rate	Term of Benefits	Benefits Computed With Unpaid Family Labor	Benefits Computed As If All Labor Paid 43/
r = 6%	10 years	2.367	1.029
	(perpetual)	5.361	2.330
r = 10%	10 years	1.976	0.859
	(perpetual)	3.216	1.406

42/ Assuming the Million Acre Scheme costs of £ 17,162,000 for 1.2 million acres, which amounts to excluding the costs of compensating the European landowners.

43/ Imputing a value to family labor at prevailing wage rates.

As Table 4 shows, even if implementation costs equaled those of the Million Acre Scheme, the benefit/cost ratios well exceed one as long as family labor is unpaid; they also exceed the ratios for the Million Acre Scheme.

And as the *coup de grâce*, even if all labor were compensated at prevailing wage rates, the Swynnerton reforms would have paid off far better than the Million Acre Scheme; benefit/cost ratios are naturally smaller, but generally greater than one and greater than the corresponding ratios for the Million Acre Scheme. (If the interest rate were 10 percent, benefits would have to last about thirteen years for the reform to break even.)

Comparison and Analysis of the Two Reforms

Within our range of assumptions about the endurance of benefits, reform implementation costs, and interest rates, the Swynnerton reforms appear far more successful in either economic or actual terms than the Million Acre Scheme.[44/] The precise difference in payoff of the two reforms is hard to fix precisely because the data are imperfect, but it is clear that there is a significant difference in the payoff of the two reforms.

This difference in payoff depends on differences in both benefits and costs; the Swynnerton reforms gave greater benefits for less cost. On balance, however, the tremendous

---

44/ That is, comparing either the historical cases or the economic efficiency cases (no aid, paid labor).

inequality in benefits is by far more important. And that arises primarily from the much greater cost savings per unit output achieved on the Swynnerton farms after reform. The estimates of payoff are not sensitive even to fairly substantial changes in estimates of reform implementation costs or other variables because the benefit difference is so overwhelming. Thus, under the obviously exaggerated assumption that the Swynnerton reforms cost as much as the Million Acre Scheme (net of compensation) -- and everyone agrees they came nowhere close -- the Swynnerton reforms still pay off far better.

Thus the basic explanation for the different results of the two reforms boils down to the explanation for the differences in resulting profits outlined in Chapter 4.

It is difficult to make precise recommendations to planners designing future reform programs. But the conclusion that thus far the sharp differences in payoff from the two reforms results not so much from the costs of implementing the reforms as from differences in resulting costs and yields offers ample food for thought to planners. Considering the limitations of the land, choosing the most efficient technology for each product (the one best reflecting factor endowments), and fostering a sense of identification with the land by securing title where traditional ties are already strong will go a long way toward making future reforms work.

This conclusion says a good deal for the replicability of the reform. The question of the limitations of the land may prove crucial in any future reform in Kenya. There is land, particularly in the Rift, whose sharply varying altitude and fertility suggest the need for facing this question squarely. If the land is used in the various ways for which it is suited, it is reasonable to expect a fairly high payoff, providing the ever-present marketing difficulties (traversing the Rift escarpement and plains to Nairobi and perhaps moving to Mombasa) can be dealt with satisfactorily. (But unless the less good land -- the land not suited to most cash crops -- is used carefully, results could be poor; it will be critical that Kenya's planners not make the easy assumption that land even in the same "class" is of the same quality. It is not.)

The implications of the question of technological choice should be obvious to any economic planner. It will be important to convince future participants in any reform like these (that is, any reform involving similar factor endowments) that their own hard work, possibly entailing high production costs, is likely to yield higher profits which will more than justify the effort in economic terms at least.

The question of identification with the land is more subtle but nonetheless important. In future reforms in Kenya, planners might do well to continue to give careful consideration to tribal claims to the land. Unfortunately, however, that may suggest giving title to land suitable for labor-intensive products to tribes with a strong traditional claim to the land but little demonstrated willingness to adopt appropriately labor-intensive technologies (*e.g.*, the Masai). This dilemma may be graver when political considerations militate against denial of any major traditional tribal land claim. This research would seem to suggest that in those circumstances, planners may wish to allocate a little of the land in question to some tribe with no traditional claim to it but with the willingness to use new methods, and hope the "demonstration effect" may persuade those with the traditional claim to the remaining areas to try the new and more efficient ways as well. It is interesting that the government of Kenya is carrying out one pilot project along these lines; the Masai have been persuaded to lease a little of their land to other tribes, notably the Kikuyu, who wish to grow grain. The results of this project are not all in, but there is some evidence that it -- and other factors, undoubtedly -- are helping persuade more Masai to become interested in modern agriculture, though of course there are still very many who could not care less.

If the "demonstration effect" should fail, however, a choice must be made between preserving the traditional claims to the land or using the land more efficiently to produce the crops and livestock bringing the highest profits. That choice must involve difficult political and social as well as economic considerations. But if the prime objective of Kenya's planners turns out to be maximum agricultural profits -- as the most feasible means of increasing living standards for the most people, for example -- then this research seems to suggest it will be important simply to adhere to basic economic principles: to determine what products the land is best suited for and to promote the adoption of the technology which is most appropriate for those products, even if that means disturbing some traditional land tenure patterns. In other words, under current market conditions and with a scarcity of fertile and well-watered agricultural land, it may be that those willing to work the land most efficiently will have to have the land.

Chapter 6. CONCLUSIONS AND PROGNOSIS

Kenya's economic history illustrates the tidal-force influence of population size and change on economic structure and change. Unrecognized population increase and resulting demographic pressures overwhelmed traditional Kenyan agricultural systems and brought on first political turmoil and later massive economic change in the guise of land reforms. Those succeeded best where they best took account of the relationship between population (and hence labor force) and other productive factors by producing labor-intensive crops using particularly labor-intensive techniques. But whether the reforms have banished the Malthusian spectre from Kenya more than temporarily is open to serious question.

One need not go to the monist extreme of laying every economic development at the door of population change. Tribal movements and culture, colonial intervention, racial politics, international transfer of technology, and general developments in world markets have played similarly major roles in Kenya's economic history and development. But the fundamental impact of population has until recently been too little appreciated, in Kenya as elsewhere. Economic and political leaders have still to assimilate fully the lesson that below the surface roiling of the waters the undramatic and sometimes largely unrecognized tidal influence of population fundamentally shapes the flow of economic history.

Malthus and his followers thought that geometric population growth would outstrip economic growth, because on a limited supply of land diminishing returns to labor would set in. Living standards would be forced back toward subsistence until increased death rates curtailed population growth again.

Malthus failed, however, to account adequately for technical change. In particular he failed to foresee the extent to which improvement of agricultural techniques would forestall and reverse diminishing returns to labor. It is tempting to conclude or hope that technical change can be counted on to stave off diminishing returns to labor indefinitely, and many have done so.

Ester Boserup, in her recent book The Conditions of Agricultural Growth, carries the technical change point a step further, at least for traditional agricultural economies.[1/] Population growth, she says, is itself a driving force of technical change in such economies. Demographic pressure forces greater specialization of labor and more intensive exploitation of the land, primarily through shorter fallow periods, which in turn lead to discovery of new tools and techniques and of fertilizers. The economic gains thus generated forestall Malthusian degeneration of living standards and may instead allow improvements.

1/ Boserup, Ester, The Conditions of Agricultural Growth, Aldine Publishing Co., Chicago, 1965.

Ms. Boserup has generated some remarkable insights, and her insistence on population change as a major determinant of economic change is an important contribution. As applied to pre-reform developments in Kenya's tribal areas, however, her hopeful scenario appears unhappily inaccurate.

As Chapter 1 of this dissertation has tried to show, Kenya apparently entered the demographic transition with twentieth-century suddenness around the turn of the century, and its population growth has been substantial and accelerating ever since. In many tribal areas, including those of the dominant Kikuyu and a number of other tribes of both cultivators and pastoralists, the land rapidly became overcrowded, but the crowding failed generally to overcome the resistance of the traditional culture to change. Such technical change as occurred was in good part counterproductive.

Fallow periods were indeed shortened, but excessively so. Overcropping and overgrazing led to severe erosion, which curtailed current yields and threatened to do worse.

Land tenure systems often exacerbated the problem. In Kikuyu areas, for example, the <u>githaka</u> system that formerly guaranteed every family several "<u>shambas</u>," or plots, suited to various uses, turned malevolent as population rose, resulting instead in fragmentation of land such that each family ended up with diminutive and widely scattered plots. Though spontaneous demand for tenure reform did arise, it failed generally to overcome the resistance of tribal elders, who interpreted it as a threat.

Nor did farming tools and techniques much respond. On the hilly slopes plowing was impractical; the Kikuyu clung to their traditional hoes. Manuring, the only significant form of fertilization, was difficult when the manure had to be lugged considerable distances to the scattered shambas. Thus, manuring did not even compensate for curtailment of fallow periods.

Perhaps what frustrated at the tribal level the adjustment that Boserup postulates was the swiftness of Kenya's entry into the demographic transition as modern hygiene and medicine were introduced. Population growth accelerated so rapidly, at so revolutionary a pace, that evolutionary technical change could not keep up.

But revolutionary change -- prompted, indeed, by actual and bloody revolution -- was in the end introduced, in the form of the land reforms. Since these thus came in good part in response to demographic pressure and its political and economic sequelae, they might be cited as bearing out in a rough way the thesis that population growth fathers its own palliative in the form of technical change. But certainly they could not be characterized as the endogenous response of the traditional agricultural system to demographic pressure, per Ms. Boserup. The colonial central government conceived of and sponsored the Swynnerton reforms. And the government had to "sell" those reforms to many a tribal skeptic. The earlier success of the Swynnerton reforms gave added impetus to the African demands for return of European land that gave rise to the Million Acre Scheme, also sponsored by the central government.

Both reforms, moreover, were predicated on the application to small African farms of an agricultural technology substantially alien to Kenya, so that each had about it something of the _deus ex machina_. "Skeletal planning" traced back to America. Dairy cattle, sheep, and several of the cash crops were introduced by colonial settlers -- Lord Delamere and hundreds of smaller-scale experimenters. Exotic crops, new livestock, and alien technology could not be transplanted wholesale to Africa, of course, but much of the essential cross-breeding and trial-and-error adaptation of techniques was also accomplished by the colonials.[2/]

The Swynnerton reforms and the Million Acre Scheme fared far differently. The new African farms established through the Swynnerton reforms achieved record profits per acre -- far higher than average profits on unreformed traditional holdings, European farms, or Settlement farms established through the Million Acre Scheme The Swynnerton reforms' success resulted in large part from participating farmers' greater exploitation of the fundamental fact of economic life in Kenya's agricultural areas: her high and

---

2/ Though crediting the colonials with much of anything is now unfashionable, this work of theirs was a considerable boon to later reformers, who were thus freed to concentrate on further adaptation of techniques to small holdings.

rising labor/land ratios. For these farmers devoted more land to the labor-intensive products in which Kenya's comparative advantage lay and, for a given product, employed a more labor-intensive technology, which generally resulted in higher yields.

The Swynnerton reforms also cost far less to implement than the Million Acre Scheme, which provided far more in the way of supporting services to its participants. In fact, those services seem to have been counterproductive, for they led Million Acre participants away from the more labor-intensive technology suitable to Kenya's situation that the Swynnerton reforms had encouraged.

The combination of lower implementation costs and higher post-reform profits led to far higher benefits per unit cost for the Swynnerton reforms, as estimated from benefit/cost ratios in Chapter 5. When family labor is valued at prevailing wage rates, the Million Acre Scheme does not break even. The Swynnerton reforms, however, still succeed very well.[3/]

The success of the Swynnerton reforms demonstrates that a developing nation can establish efficient small farms through land reform with only limited resources. If Kenya's experience is any guide, labor-intensive crops and labor-

3/ The cost data for the Swynnerton reforms are shaky. But even if they had cost as much per acre to implement as the Million Acre Scheme (net of compensation to European landowners), which they certainly did not, they would still have been modestly successful on the average.

intensive technology are a key. Again, however, one cannot be monist. It is equally essential that detailed scrutiny be given to the characteristics of the available land and of other productive factors. The participants in the reform must be given both technical and marketing assistance and a real personal stake. And it also helps to have a tough and industrious people with the perseverance to work at and stick with new techniques until the benefits become apparent.

But the Malthusian spectre has been warded off by land reform only for a time. Kenya's latest census, in 1969, revealed a population of more than ten million, again substantially exceeding official estimates. That population is growing at a rate approaching 3.5% a year (the resultant of a birth rate around 52 or 53 per thousand and a death rate around 18 or 19 per thousand). At that rate the population is adding well over 300,000 Kenyans each year; it probably already exceeds thirteen million and threatens to reach 25 million by the year 2,000 -- an increase of ten-fold in a century. Against the background of 300,000-400,000 new Kenyans each year to be provided for, the accomplishments of land reform take on a new perspective.

The Million Acre Scheme (a dubious success at best) provided land for some 34,000 families averaging 6 or 7 members each, or roughly a quarter million people. It provided employment for perhaps 50,000 more hired laborers (though not all on a full-time basis). It thus absorbed at the outside no more than two years' natural increase of the population at a cost of £ 17 million, plus £ 10 million of U.K. grants-in-aid.

The population absorption of the Swynnerton reforms is harder to establish, because the extent of those reforms is less well documented, and because they are still being implemented on substantial additional acreage. But they have provided land and increased incomes for at most eight to twelve times the numbers absorbed by the Million Acre Scheme.

Together the two reforms have hardly absorbed a single generation's population growth at Kenya's current rate; and what do we do for an encore? Already demographic pressure again threatens living standards. Fragmentation, even of the small Swynnerton holdings, has cropped up once more. The government has set out to combat fragmentation by legally forbidding subdivision of holdings. But even if it succeeds in enforcing the ban on subdivision, where are the new landless thus created to go?

A possible answer, of course, is to the vast, underused land of the Masai, much of which is fertile and is high enough for at least some regular rainfall. Some Masai land has already been leased to cultivator tribes. But some of the "underused" Masai country coincides with Kenya's national treasure -- its famous and fabulous game parks. To plow under those parks and crowd their splendid herds and flocks into ever more constricted areas would not only be a major national and international tragedy, but would endanger a major Kenyan foreign exchange asset.

More hopeful alternatives may exist. Other land might be used more intensively were it not infested with tsetse flies, which carry deadly human and bovine encephalitis. And much land could be used more intensively if it could be irrigated at reasonable cost. The high-yield varieties of maize, wheat, and rice developed as the "Green Revolution" are another obvious hope.

It may well be, in any event, that technical change from some foreseen or unforeseen quarter may come to the rescue again. But perhaps even technical change ultimately encounters diminishing returns of a sort. Technical change in agriculture today is often based on mechanization, irrigation, fertilizer, and energy. Mechanization, as already noted, is difficult on Kenya's hills and in most of its forms is inapposite to Kenya's situation, in which labor-intensive solutions are called for.[4/] Irrigation and water management are feasible in Kenya, but irrigation, in particular, can be costly and can create salt-deposit problems. The cost crisis in fertilizer, with world prices doubling in a single year, is old news now, and Kenya is among the countries least in a position to cope with the consequent drain in foreign

---

4/ As experience with the high-yield varieties in India and elsewhere shows, however, mechanization can be designed to encourage more intensive use of labor, such as by enabling farmers to double-crop. More ox-plowing may be particularly helpful in Kenya.

reserves. And the fertilizer cost-crunch is only an aspect, of course, of the larger energy shortage.

The upshot is that reliance on technical change as the panacea for the pressures of rapidly expanding population seems increasingly chancy. In the end, nonetheless, the debate between neo-Malthusian doomsayers and apostles of indefinite salvation through technical change is unresolvable in the present. It depends on the future course of technology, and neither side can prove the other wrong.

For Kenya's planners and leaders, however, as for those of other nations similarly situated, the course ought to be obvious. If the future of technology is speculative, the effect of continued population expansion, particularly at present rates, is sure: it will allow each Kenyan a smaller share of whatever Kenya can produce. Far better to use the fruits of technical change to improve the lot of the existing population than merely to sustain a larger one. The aim of development, after all, is to raise the marginal product of labor, not just to keep it from collapsing.

APPENDIX 1

GROWTH OF KENYA'S AFRICAN POPULATION
1895 - 1970

Appendix 1 discusses the growth of Kenya's African population over the past 75 years or so. In part 1, 1895-1920, it reviews the fragmentary demographic and supporting historical material also presented in good part in Chapter 1. In part 2, 1920-1948, it reviews the more extensive demographic and historical material, particularly from the Report of the Kenya Land Commission, presented in less detail in Chapter 1. In parts 3, 4 and 5 it discusses briefly the Censuses of 1948, 1962 and 1969, respectively, and population changes in the intercensal periods, which were summarized or alluded to in Chapter 1. Thus, this appendix serves to pull together in one place a good deal of the material available on Kenya's population growth -- however inadequate it may be, especially in the early years. It does not, however, represent a detailed demographic analysis of later censuses since that has been well done by the government of Kenya. The appendix also presents the author's alternative population series given in Chapter 1.

There are two major views on the course of Kenya's population over the first half of the twentieth century. The first may be described as the "official view" -- although naturally there is disagreement among the officials themselves -- that Kenya's African population declined after the famines and plagues of the 1890s, that the decline persisted through the 1920s, and that population growth thereafter was very slow. C. J. Martin, who supervised the first census in 1948, wrote of the earlier years that "it can be estimated that between 1920 and 1948 the increase in East Africa of the African population was from not more than 1/2 percent rising to 1 1/2 percent per annum."[1/] (This statement was unofficial, but typical of official thinking.) And J. E. Goldthorpe, writing in the East Africa Royal Commission Report, states "the figures may be taken to suggest that the native population declined from the earliest days of British rule through the First World War, that a turning point was reached in the early 1920's -- perhaps about 1921 -- and that there has been a tendency to increase . . . . A rate of one and one-half percent annually was considered a reasonable inference."[2/]

The second view is that of the chief demographic chronicler, R. R. Kuczynski. Although he sometimes makes seemingly contradictory statements, Kuczynski's concluding view is that population stagnated, or practically stagnated, over 1880-1945, and that population was probably seriously overestimated in the official data: "There is no reason

---

1/ Martin, C. J., "Estimates of Population Growth in East Africa," Barbour, K. M. and R. M. Prothero, eds., Essays on African Population, Frederick A. Praeger, New York, 1966, p. 53.

2/ East Africa Royal Commission 1953-1955 Report, Great Britain, Cmd. 9475, London H.M.S.O., 1955, Appendix VII (by J. E. Goldthorpe), pp. 464-465.

to assume that the total population in 1940 was any larger than in 1895."[3/]

Both the official view and Kuczynski's view are the result of considerable, conscientious examination of available evidence. But that evidence is so fragmentary and so obviously imprecise that it is open to several interpretations.

Buttressed by the more comprehensive and precise data from Kenya's population censuses that began in 1948 -- shortly after Kuczynski's death -- the early evidence on population is open to yet a third interpretation. It appears that over much of this period the population actually exceeded the official estimates, and that it was growing at an accelerating rate, particularly in the second half of the period, first as the population recovered from the disasters of the 1890s and later as the population responded to the spread of British medicine and more generally to a brush with modern living. Kenya had apparently entered the "demographic transition" as had many other twentieth century developing countries.

Starting with high birth and death rates that net to little if any population growth, death rates decline rapidly as a result of the rapid spread among developing country populations of medical technology that took many

---

3/ Kuczynski, R. R., A Demographic Survey of the British Colonial Empire, Oxford University Press, London, 1949, Vol. II, p. 125.

decades to develop elsewhere. Population growth rates accelerate, often to over 3 percent within two or three generations. As economic and social development proceeds, "desired family size" may fall, though the exact influences on that are unknown. (Education, especially for women, may open new horizons for parents. Rising husband's income may have an "income effect" leading to a desire for more children if they are not an "inferior good"; rising wife's income generally has a "substitution effect" since it must often be foregone if additional children arrive; provision of old-age social security benefits may obviate the need for many children, especially sons, to provide for parents in their dotage; improved maternal and child health facilities may reduce child mortality rates enough to encourage parents to have fewer children than might have survived before.) As these processes work out, and as modern contraceptives, sterilization and abortion are made available, birth rates may fall closer to death rates. But in the meantime, while the demographic transition is incomplete, population growth rates may be high enough to bring a doubling of the population in only a generation.

SELECTED OFFICIAL ESTIMATES OF KENYAN AFRICAN POPULATION

	Colonial Reports	Colonial List	Medical Reports	Native Commissioner
1905		4 million		
1906		4 million		
1907		4 million		
1908		4 million		
1909		4 million		
1910		4 million		
1911		4 million	3 million	
1912		4 million	3 million	
1913		4 million	3 million	
1914		4 million	3 million	
1915	2,829,050	2,829,050	3 million	2,817,860
1916	2,766,515	2,766,515	3 million	2,758,088
1917	2,628,638	2,628,638	3 million	2,626,183
1918	2,604,106	2,604,106	3 million	2,596,399
1919	2,604,106	2,604,106	3 million	2,684,845
1920	2,483,500	2,483,500	3 million	2,464,071
1921	2,483,500	2,483,500	3 million	2,330,112
1922	2,483,500	2,483,500		2,478,325
1923	2,585,896	2,585,896		2,601,858
1924	2,560,983	2,560,983		2,495,067
1925	2,549,300			
1926	2,682,848			
1927	2,793,963			
1928	2,838,022			
1929	2,930,604			
1930	2,951,023			
1931	2,966,993			
1932	3,007,645			
1933	3,017,117			
1934	3,024,975			
1935	3,012,421			
1936	3,186,976			
1937	3,253,689			
1938	3,280,774			
1939	3,413,371			
1940	3,453,763			
1941	3,454,541			
1942	3,592,992			
1943	3,596,575			
1944	3,825,533			
1945	3,922,000			
1946	4,055,000			
1947	---			
Census of 1948	5,251,120 (approximately 4 million previously estimated)			

	Original Projected Series (1.50%) (Based on 5,240)	Revised Projected Series (2.5%) (Based on 5,240)
1949	5,319,000	5,358,000
1950	5,398,000	5,478,000
1951	5,479,000	5,602,000
1952	5,561,000	5,728,000
1953	5,644,000	5,857,000
1954	5,729,000	5,988,000
1955	5,815,000	6,123,000
1956	5,902,000	6,261,000
1957	5,990,000	6,402,000
1958	6,080,000	6,546,000
1959	6,171,000	6,693,000
1960	6,203,000	6,844,000
1961	6,357,000	6,988,000
Census of 1962	8,365,942	(7,163,000 revised estimate)

	Projected Series (3%)
1963	8,575,000
1964	8,832,000
1965	9,097,000
1966	9,370,000
1967	9,651,000
1968	9,940,000
1969	10,673,770 (10,238,000 estimate)

	Projected Series (Total Population) (3.4%)
1970	11,220,000
1971	11,670,000
1972	12,070,000

Sources: Colony and Protectorate of Kenya: Annual Rep. on the Col. and Prot. of Kenya; Republic of Kenya: Statistical Abstracts.

Part 1: Population Growth, 1895-1920

Early estimates of Kenya's population were rough indeed. Kuczynski presents the data in detail. Following the guesses of some early explorers who arrived in the late 1800s, the Official Statistical Tables of the British colonies and the Colonial List place the 1905-1914 native population at approximately 4 million.[4/] The Medical Reports put the 1911-1921 population at 3 million.[5/] The Blue Book[6/] and the Colonial Reports, reflecting Native Commissioners' still lower estimates, which were probably much more accurate, put the population in the early 1920s at plus or minus 2.8 million.[7/] (See table attached.) By the mid-1920s all sources use estimates closer to the Native Commissioners', and they therefore show an apparent decline in population.

The Native Commissioners' counts were not based on any census, but rather on Hut Tax rolls. Hut tax (or Poll Tax in pastoral areas) was meant to cover the whole adult African population, excepting a few extremely poor. The

---

4/ Kuczynski, *op. cit.*, Vol. II, p. 144, summary. See also, *e.g.*, *Colonial Office List* for 1916, Waterlow & Sons, Ltd., London, p. 177.

5/ Kuczynski, *op. cit.*, Vol. II, p. 144, summary. See, *e.g.*, *Medical Report for the Colony and Protectorate of Kenya*, 1921, London H.M.S.O., p. 103.

6/ Kuczynski, *op. cit.*, Vol. II, p. 143, summary. See also *Statistical Tables, British Colonies*, London H.M.S.O., *passim*.

7/ Kuczynski, *op. cit.*, Vol. II, p. 145, summary. See also, *e.g.*, *Annual Reports of the East African Protectorate*, Great Britain Colonial Office, London H.M.S.O., 1916-1917, p. 25; 1917-1918, p. 27; 1919-1920, p. 27; *Annual Reports of the Colony and Protectorate of Kenya* 1920-1921, p. 29; 1921, p. 7; 1922, p. 6.

theory was that the size of the family, or at least the number of adults, could be recorded when the tax was paid by the owner of the hut. Thus the Hut Tax rolls were to include "the name of every owner of hut, the number of huts owned by each hut owner, and the number of wives of each hut owner," and for Poll Tax rolls "the name and father's name of every native liable." 8/ No one attempted to record births and deaths, and so nothing is known of birth rates, death rates, fertility rates, or the other more sophisticated population parameters. Only the adult population was counted.

The rolls were prepared under the supervision of colonial District Officers, who reported to District Commissioners, who in turn reported to Nairobi. 9/ District Commissioner S. H. Fazan, better known for his role as Secretary of the Kenya Land Commission, describes early counts in Nyanza (near Lake Victoria) as fairly accurate:

> "In 1915 I was sent out by Mr. Campbell, District Commissioner, when I was his Assistant District Commissioner, to make a very careful check in South Kavirondo, in Karachonyo which is a big location near the lake Victoria, the reason being that there was a heavy fall off in collections. In the course of some days' walking round the huts, I found no single case of anybody not being counted . . . . At that time wives were not entered by name -- the husband's name only was entered, but I checked the wives in each village and found them practically correct." 10/

8/ Kuczynski, *op. cit.*, Vol. II, p. 133.

9/ *Ibid.*

10/ *Id.* at p. 134. See also *Report of Kenya Land Commission*, Cmd. 4556, London H.M.S.O. 1934, Evidence and Memoranda, *Vol.* III, p. 962.

Nyanza was probably one of the tougher districts to cover. It was Kenya's second major population center, with probably the greatest population density of any region. Its climate was hot, wet, and unhealthy, especially for Europeans. Much of the land was inaccessible. If the counts there were reasonably accurate, as Fazan insists, they would probably be better in the other major population center, Kikuyuland, which was far more accessible to the clusters of colonial officials in Nairobi and far more appealing to most of them. Thus there is some reason to believe that the counts in the population centers were among the better ones. Pastoral areas might remain largely unsurveyed, but they surely held only a small fraction of the population. The total counts might therefore be reasonable rough estimates.

But they could hardly be better than that. The system had obvious drawbacks. No attempt was made to record the number of children; the government followed a contemporary convention by estimating children as a flat 37 percent of adult population reported in the Hut Tax counts.[11/] (This lasted well into the 1930s, when children probably constituted more like 48 percent of the population.) Second, the Hut Tax rolls could not hope to include every single adult with a hut, pastoral areas aside. Counting was actually done by tribal elders who were instructed to count only

---

11/ Kuczynski, *op. cit.*, Vol. II, pp. 136-137.

married women -- nearly all but obviously not absolutely all of the adult women. Moreover, the tribal elders often neglected old married women on principle, and they could easily be persuaded to neglect a young wife or two. The District Commissioner of Emru reports:

> "In 1913-14 the only counting was of huts and was done by tribal retainers. The district officer remarks on the lack of accuracy. Population figures were estimated by assuming an average of three persons per hut, and entering a round figure which approximated to the result obtained. No attempt at estimation of the population of the sexes or of adults and children was made." 12/

In this area, unlike Kavirondo, and unlike the major Kikuyu areas, no separate count of wives was made. The count was doubtless less accurate than the one Fazan checked, though it represented a smaller and therefore less important population cluster.

After around 1915, enumerators were often hired, and they apparently did a better job:

> "Hut counters were first employed in 1914-15. The District Commissioner was satisfied that the new system was a success but he was more particularly concerned with the assistance it afforded in the collection of tax. The only count was still of huts, and populations were estimated from the count as before." 13/

But they were not above reproach; at least one was prosecuted and convicted of fraud. 14/

12/ Rep. of Kenya Land Comm., Ev. and Mem., Vol. II, pp. 134-140. See also Kuczynski, op. cit., Vol. II, pp. 134-140.

13/ Id. at p. 134. See also Rep. of Kenya Land Comm., Ev. and Mem., Vol. I, p. 556.

14/ Ibid.

Thus the Hut Tax rolls remained only best-guess estimates of the adult population with huts; in 1918-1919, one District Commissioner remarked:

> "In normal years the statistics of the native population are largely a matter of conjecture, and the difficulty of estimating this for this year is greatly increased by the abnormal conditions which have been caused by the famine and the influenza epidemic." 15/

From 1919-1920 a more complete count was attempted, with "doubtless a varying degree of accuracy." 16/

But enumerating was only the first step. The counts were totaled without the help of desk calculators; Commissioner Fazan insisted that most inaccuracy resulted not from miscounting, but from misadding:

> "I have checked in many districts; certainly on the Coast, at Malindi; on the Tana River; most probably Lamu; and all the Kavirondos; Machakos; Kitui; Nyeri; Kiambu. I have checked over hut counters' tickets, and I am perfectly certain that the big error lies at the foot of the field sheets. The actual field sheets are pretty accurate, but at the foot one finds errors in addition, and in the serial numbers there are errors. Errors in serial numbers would not matter very much, except if they are used to base an estimate. The columns are bad, and I have seen such a thing as this -- somebody wrote down 100, and then proceeded with 1,001 instead of 101." 17/

But he goes on to point out that such glaring errors were generally caught, and concludes that the Hut Tax

15/ Ibid.

16/ *Ibid*.

17/ *Ibid*.

rolls probably gave fairly reasonable if imprecise estimates of at least the major trend of population growth:

> "It is pretty obvious that that amount of error is detected. In a series of years you spot the location which is wrong.
>
> "Hut counters generally are people who have done the job for upwards of ten years. Certainly the senior hut counters are . . .. In the course of 20 years collection I have detected frauds on various occasions, and sometimes rather clever frauds, but all told they have been of small account in any effect they might have on the figures." 18/

On balance, then, Hut Tax rolls were not entirely reliable; they were perhaps roughly reasonable after 1920 or so, probably not before.

The obvious implication of the early estimates of population taken together was that population was falling. But it now appears instead that much of the apparent "decline" from the huge early estimates was only statistical, not natural; in their haste to assure potential settlers that cheap labor was abundant, the home government had grossly exaggerated population. As the early Hut Tax counts trickled in, they were forced to revise their estimates downward.

Nevertheless, many officials believed that population was declining; the question of how much became a detail. The Medical Report of 1925 concludes:

> "The period 1914 to 1924 was one during which a number of strains were being experienced by the native population . . .. Increases of population

18/ Ibid.

> between the years 1904 and 1924 could hardly have been expected." 19/

And in 1924, Kenya's chief Medical Officer, Dr. Norman Leys, as always believed population could not be growing much:

> "This writer believes that there has been a steady and rapid fall in the African population in the past twenty-five years, amounting altogether in that time to a third of the former inhabitants." 20/

Kuczynski does not go quite that far. He carefully runs through all the data on Kenya's early population, and then adopts a know-nothing position, stating that there is no reason to think that population had either increased or decreased in East Africa since around 1880.[21/]

In face of the poor and incomplete demographic data, it is easy to sympathize with Kuczynski's skepticism. It is also possible to sympathize with the government officials, who viewed the raft of diseases prevalent or even endemic in Kenya -- pneumonia, malaria, yaws, bilharzia, dysentery, sleeping sickness, and so on -- and concluded that birth rates could not possibly have compensated. But their views, too, may be open to question.

The absence of census data compels resort to contemporary descriptions and historical accounts for indirect evidence on population size and change. So far from

---

19/ Med. Rep. for the Col. and Prot. of Kenya, p. 15, 1925.

20/ Kuczynski, *op. cit.*, Vol. II, p. 217.

21/ *Id.* at p. 123.

explaining why the population might have been declining in the early twentieth century, such sources suggest instead that it was in fact rising during the period.

Before the turn of the century a series of catastrophes did decimate the African population. In 1884 the rains failed, and a dreadful famine ensued. A plague of rinderpest followed, felling the cattle of the Kikuyu, the Masai, and other tribes and creating another famine among the pastoral peoples. Lord Lugard wrote:

> "Not for thirty years had a plague like this been known in the country, and even then it was not to be compared in virulence to the present one. Never before in the memory of man, or by the voice of tradition, have the cattle died in such vast numbers . . .. In the case of the Bantu tribes, the loss, though a terrible one, did not, as a rule, involve starvation and death to the people, since, being agricultural, they possess large crops as a resource. But to the pastoral races the loss of their cattle meant death." 22/

Yet a third famine struck in 1898-99 in the form of a devastating drought accompanied by an epidemic of smallpox and a plague of locusts, and early British colonists including Commissioner Eliot describe the results vividly:

> "In 1899-1900 the failure of the usual periodical rains brought about a widespread famine, which was most acute in Ukamba. Every effort was made, both by the Administration and the missionaries, to relieve the starving population, but the mortality was considerable." 23/

22/ Lugard, F. D., The Rise of Our East African Empire, Blackwood & Sons, London, 1893, Vol. I, pp. 525-527. See also Kuczynski, *op. cit.*, Vol. II, pp. 196-197.

23/ *Ibid*.

The smallpox epidemic and famine took a particularly heavy toll among the Kikuyu; estimates vary, but most writers guess that at least 30-40 percent, and possibly 60 percent, of the Kikuyu died.[24/]

Deaths were particularly heavy in Kiambu, where considerable early European settlement occurred. The surviving Kikuyu fled the district for the North, and in one or two years their plots had reverted to bush.

On balance it seems a conservative conclusion that over one-fourth of the population in Kikuyu areas had died.

Kuczynski discounts the reports heavily because of their obvious imprecision and unscientific character. But they were made carefully, if without the benefit of modern sampling techniques, and cannot responsibly be dismissed out of hand. Their virtually unanimous thrust is that the impact on African population was severe. It makes better sense to accept that general conclusion and the corollary that the African population around 1900 was most probably unusually low.

Kuczynski and contemporaries cite some counter-evidence in which they place considerable confidence. Venereal disease came with the Europeans, and apparently spread particularly among Africans working for Europeans. But mortality rates from venereal diseases are unlikely to match those from an epidemic of plague or smallpox affecting

---

24/ Id. at Vol. II, pp. 197-198. See also Rep. of Kenya Land Comm., Ev. and Mem., Vol. I, p. 847; Vol. III, p. 3369.

an entire unprotected population or those from acute famine.[25/] Many of the 200,000 askaris serving in World War I died. But they, too, were a relatively small part of the population. "Continuing diseases" were prevalent. But those are unlikely to produce a sudden drop in the population. Furthermore, as will be discussed below, colonial culture was beginning to work to undermine traditional African taboos that had regulated births.[26/]

On balance, then, it seems reasonable to suggest death rates were substantially lower in the early 1900's than they had been at the turn of the century, that birth rates may have been creeping upward, and that the population was therefore growing slowly. Proving this contention would require sample studies made at the time in Kenya's critical districts. Naturally there are none. There is one study, though, that is supportive. District Commissioner Fazan argued that the Kikuyu population was increasing in the early 1900s at about 1.2 percent a year.[27/] Unfortunately, there is only secondary and incomplete information on that study.

25/ Even in the early 1920s, with twice as many European farms as in the early 1900s, only one-sixth of the male African population worked on European farms, and most of them did so only briefly.

26/ Leakey, Mau Mau, op. cit., at pp. 19-21.

27/ Before the Kenya Land (Carter) Commission, he cited a memorandum in which he argued that in Kikuyuland, "population was increasing in normal years (1902-1909) at about 1.2% a year." Rep. of Kenya Land Comm., Ev. and Mem., Vol. I, p. 966.

Part 2: 1920-1948

The evidence for or against population growth from 1895 to 1920 is thus ambiguous. The evidence for population growth from 1920 until Kenya's first Census in 1948 is much stronger, though still fragmentary.

National population estimates still relied primarily on the Hut Tax counts. Most authorities agree that the Hut Tax counts continued to improve, as more enumerators were hired, and as they gained experience.[28] For example, the Committee on Statistical Services stated in 1925:

> "During the last ten years efforts have been directed towards the compilation of a record of the actual number of taxpayers and of their wives and children, and save as regards children there is no reason to discredit the substantial accuracy of the results." 29/

The data seem to bear this out; except for an obvious and predictable break in 1925 when Jubaland was ceded to Italy and a three-year decline during the depression when tax collectors had more than usual difficulty locating huts, no major break mars the trend. Population appears to have risen from an estimated 2,549,300 in 1925 to 3,012,421 in 1935 and 4,055,000 by 1946, at an implied rate of growth over the entire twenty years of about 2.2 percent per annum. In the first decade, the implied growth rate is 1.7 percent; in the second, growth apparently accelerates to 2.6 percent. (The true growth rate may actually have been lower; Hut Tax

---

28/ See, *e.g.*, Kuczynski, *op. cit.*, Vol. II, pp. 135-139.

29/ *Id.* at p. 137.

counts were still being improved, and part of the "growth" may have been statistical only.) But inaccuracies remained; based on a single earlier and questionable report, children were still estimated as a flat 37 percent of the population.[30/]

Another source of national population estimates was developed in the early 1920s -- the "kipandi" records. The British had required every African male above the age of sixteen to report to his District Commissioner to be fingerprinted and obtain a "kipandi" or registration card which would give his name, age, and employment record; at his death, relatives were to report in and have his card canceled.[31/] The system went into effect seriously in 1920, when almost 200,000 natives were registered. Reports of the Native Affairs Departments state that registrations had risen to 682,635 by 1925 and to 981,055 by 1930 -- by which time coverage was considered fairly complete -- and to 1,367,645 in 1938.[32/] These data, some suggested, could serve as the basis for a second set of population estimates.

If the kipandi records improved steadily in comprehensiveness and accuracy, that might account for the whole increase in recorded kipandis; the increase might not reflect any natural population growth. On the other hand, if they improved hardly at all, any increase in recorded kipandis

---

30/ Id. at pp. 136-137.

31/ Id. at p. 139.

32/ Ibid.

might measure only a natural increase in population. It is hard to say with any confidence what really happened, but it appears that there was little money, particularly in the depression years, to expand administration sufficiently to improve kipandi counts very much.

The kipandi records suggest that population increased at 1.8 percent over 1930-38 and 1.9 percent over 1933-38. Unfortunately, there were serious inaccuracies in the kipandi counts. The worst of these arose from the gross underrecording of deaths. Nearly all natives returned to their reserves to die, where no one would report the deaths to the authorities.[33/] The kipandi lists soon were swollen with names of dead men. To eliminate this inaccuracy, the authorities adjusted the kipandi data for an assumed death rate of 20 per thousand. This population was taken as the male population.[34/]

The total number of outstanding kipandis should theoretically have corresponded to the adult male population. No count of women and children was made, but an estimate of the total population was extrapolated from the supposed adult male population by assuming that women made up 51 percent of the adult population and children 37 percent of the

---

33/ Id. at p. 140.

34/ Report on Native Affairs, 1926, Colony & Protectorate of Kenya, London H.M.S.O., p. 121. See also Kuczynski, op. cit., Vol. II, p. 141.

total population.[35/] The authorities also developed a second means of estimating the adult male population from *kipandi* records.

To serve as a check, they took the annual crop of new *kipandis* as an approximation of the population of sixteen-year-old boys and extrapolated from that to obtain a total population of adult males by assuming an age structure compounded of a few estimates from a census of Uganda's population and more subjective estimates of Kenya's official statisticians.[36/]

The resulting population estimates were not published in any standard government sources, but the Chief Registrar suggests that they implied a population in excess of the official estimates based on Hut Tax counts and outstanding *kipandi* lists.[37/]

Both sets of *kipandi*-based population estimates, unfortunately, were subject to considerable inaccuracy -- above and beyond the underreporting of deaths. The *kipandi* records only purported to record the population of young men, and measured that population only roughly. Some Africans -- especially those living beyond European reach in areas like Meru and North Kavirondo -- managed to evade registration.

35/ See, *e.g.*, *Rep. on Native Affairs*, 1931, pp. 137-138. See also Kuczynski, *op. cit.*, Vol. II, p. 142.

36/ *Ibid.*

37/ *Ibid.*

Kuczynski concludes that the _kipandi_ records led to an overestimate of the population.[38/]

It appears in retrospect that they led instead to an underestimate. The 1948 Census -- made shortly after Kuczynski's death -- put Kenya's African population at over 5,200,000. If it had been only 3,280,774 in 1938, which was the official estimate based on the Hut Tax counts and the _kipandi_ records, the population would have had to grow by almost 5 percent per year in the interim. The only sensible conclusion is that the 1938 population had been underestimated.

Both the Hut Tax counts and the _kipandi_ records indicate some population growth, though the data are obviously inaccurate. Ideally one would check growth rates implied by the population data by estimating the growth rate through statistics of births and deaths; the growth rate would equal the birth rate minus the death rate (plus net immigration). Unfortunately, there is little or no information on birth and death rates. But there are some indications that whatever they were, birth rates were rising slightly and death rates were falling, so that the growth rate was increasing; Kenya had entered the demographic transition.

But the demographic transition was hardly in full swing, there had apparently been no precipitate drop in death rates. Deaths were as yet unreported except in cities

---

38/ _Ibid_.

where authorities heard of perhaps 15-18 deaths per thousand population, obviously only a part of total deaths. But in 1928 the Chief Registrar of Native Affairs estimated the African death rate at 5 per thousand at 16, rising to 30 per thousand at 45, and giving 20 per thousand for the whole registered population.[39/] That was the rate assumed by the government through 1936 (and the rate by which the kipandi data were adjusted). From what we learned of Kenya's death rates in the 1948 Census and from what we know of death rates in poor countries today, that was probably too low. It is clear that mortality remained high in the 1920s; in 1924 Dr. Leys wrote:

> "Two diseases (small pox and yaws) are under control. None of the other preventable diseases are, except to some extent in the towns. Of those, malaria and dysentery nearly everywhere, and anchylostomiasis on the coast, are as prevalent as ever . . .. Of the diseases recently introduced, the chief are tuberculosis and venereal diseases." [40/]

In 1925 the Medical Report noted that a district often had only one medical officer, who might have as many as 250,000 people under his care. Kuczynski reports the prevalence of disease in 1926 in great detail.[41/] These reports suggest a death rate well in excess of 20 per thousand.

39/ *Id*. at p. 141.

40/ Leys, Norman, *Kenya*, London, 1924, pp. 283-284.

41/ Kuczynski, *op*. *cit*., Vol. II, pp. 218-219.

But death rates, whatever they were, may have begun to drop. The eradication of smallpox and yaws were significant; smallpox epidemics, in particular, had taken a heavy toll in earlier years. Moreover, famines were occurring less frequently, for weather had been fairly good, and the government worked with increasing effectiveness to forestall the food shortages that did occur. When locust plagues struck in 1929 and 1930, the government financed programs to kill the insects and import needed food -- in contrast to the earlier plagues of around 1900 when nothing at all could be done. The 25 percent-30 percent of the African male population working on European farms in those years lived under conditions that were sometimes poor, but on the whole they probably lived a little longer than they might have in the reserves. And the British worked against some African customs that had kept death rates high, perhaps an unwitting means of containing population growth.

The Kikuyu believed that the soul of a dying man or child could "escape" only if he died outdoors; death inside a hut meant eternal discontent. A mother with a sniffley baby would therefore leave it outdoors to sleep.[42/] In the early 1900s half of the Kikuyu children are said to have died before they were two years old. British missionaries and medical officers vigorously fought this "superstition." We might therefore expect to see more children

---

42/ Leakey, *op. cit.*, pp. 20-24.

surviving early childhood over 1925-45, and the later medical reports indicate as much.43/

On the other side, birth rates may have begun to increase, though slowly. As British missionaries began to reach out into the African territories and as more and more Africans began working on European farms, African customs that had once served to limit births also began to give way. Among the Kikuyu, as among many African tribes, marriage occurred only after a lengthy "initiation" into adulthood culminating in a circumcision ceremony for boys about 16-17 and girls 14-15, sometimes older. There were virtually no births before circumcision, for that was a serious violation of tribal custom. But the girls' operation, particularly in its more extreme forms, left scars that made childbirth difficult and often dangerous, so that even after marriage Kikuyu fertility rates were not always high. The British, anxious for more farm labor and appalled at the suffering following female circumcision, fought to do away with it. Africans vigorously and emotionally defended the custom, and it remained entrenched; in the later years, however, it began to die out in its more brutal forms, so that childbirth took a lighter toll.

43/ Even the Medical Report for 1929 noted that "the indications are that, taken as a whole, the native population of Kenya is increasing." Med. Rep. 1929, p. 15. See also Kuczynski, *op. cit.*, Vol. II, pp. 218-220, especially for reports from the 1930's.

Other customs gave way more quickly. After marriage, couples avoided conception while a mother was nursing her young child -- which she did for a good two years. 44/ This ban had a particularly strong antinatalist effect as it came during the couples' most fertile years, and repeatedly. But the British also fought that "superstition." When young African men and women came to work on European farms, they often left taboos against premarital sex back in the reserves. That naturally led to an increase in venereal disease, but also to some illegitimate births. The net effect seems to have been at least a slight increase in births among Africans exposed to Europeans. On August 14, 1925, the Nominated Official Member representing African interests said in the Legislative Council:

> "Now we find amongst the educated natives today that there are families that have four, five, six, seven, or eight children; whereas before there were only two children." 45/

For the 1925-1933 period, the Kenya Land Commission reports several studies of Kikuyuland and Kavirondo, which held 50 percent of the African population, indicating growth of 1-2 percent a year for the adult population. (With children included, judging from the first accurate counts of children in 1948, the total population would have grown considerably faster.) S. H. Fazan, Kikuyuland's District

---

44/ See, *e.g.*, Dr. Leakey's statement before the Kenya Land Commission in 1932. *Rep. of the Kenya Land Comm.*, Ev. and Mem., Vol. I, p. 676.

45/ *Kenya Legislative Council Debates*, 1925, (2), p. 533.

Commissioner, and Secretary to the Land Commission, used Hut counts and counts of married women to show the adult Kikuyu population was growing at 1.5-1.6 percent a year in the 1930's -- faster than the more tentative 1.2-1.3 percent estimate he had made for the early 1900's.[46/] Unfortunately, little is known of the details of these reports. But the later reports were surely more accurate than the earlier ones, for Fazan had greater experience and greater personal knowledge of the enumerator's methods, which had improved. The Government Chief Statistician concurred with Fazan's estimate, offering the view that the population was growing faster than the counts of married women.[47/] The Chief Registrar of Natives reported in 1931 that the population of Kiambu, benefiting from nearby European medical services, might be expanding by 2 percent a year.[48/] Canon H. B. Leakey, father of the archaeologist and himself an expert on African culture, presented evidence suggesting a decline in infant mortality especially, and some increase in births which implied population growth of perhaps 1.5-2.0 percent.[49/] Speaking in 1950, his son summarized the impact of British culture on Kikuyu culture:

46/ Rep. of the Kenya Land Comm., Ev. and Mem., Vol. I, p. 974. See also Kuczynski, *op. cit.*, Vol. II, pp. 222-223.

47/ *Ibid.*

48/ *Id.* at p. 225.

49/ Rep. of Kenya Land Comm., Ev. and Mem., Vol. I, p. 676.

> "Because the population of the Kiambu part of Kikuyu country had been so drastically reduced by famine and small pox at the end of the last century, the population would still be small today and most of the land problems (in 1950) . . . would not exist. But the coming of the white man . . . resulted in such a major change in social customs, religious belief, and ideas about sickness and hygiene that the rate of population increase among the Kikuyu for the past twenty or thirty years has been very high indeed." 50/

Studies on populous Lake areas cited in the Land Commission confirm moderate population growth, and accelerating rates. Oddly, Kuczynski barely mentions these, ignoring some; doubtless he thought their obvious inaccuracies rendered them less than reliable. While that is true of the details of any one study, their unanimous thrust is clear and plausible.

In South Kavirondo, District Commissioner Major C. E. B. Buxton also gathered population data. He scrupulously presented the reasons for discounting the data, but then concluded that the adult population was probably growing by at least 1 percent a year. 51/ Given his conscientious skepticism, that conclusion is hard to ignore.

Major Buxton estimated population and population growth in South Kavirondo in three ways. 52/ First, he tried a count of married women over 1927-1932:

50/ Leakey, op. cit., p. 21.

51/ Rep. of Kenya Land Comm., Ev. and Mem., Vol. III, pp. 2348-2350.

52/ Ibid.

<u>Count of Married Women in South Kavirondo</u> <u>53/</u>

1927	84,680
1928	86,588
1929	93,289
1930	93,725
1931	94,149
1932	94,117

This implied an average growth rate of 2.2 percent, but "it is obvious from the figures for 1929 as compared with 1928 that it cannot all be natural increase but that much of it must be due to better counting." [54/] He hazarded a guess that the adult growth rate lay in the range 0.5-1.5 percent.

He tried a Hut count:

<u>Hut Count in South Kavirondo</u> <u>55/</u>

Year	Huts
1917-18	91,188
1924	91,388
1925	91,711
1926	100,334
1927	101,314
1929	108,620
1931	106,977

The increase obviously shows counting problems; but the change of 15,789 in the fourteen years between 1917 and 1931 works out at an average annual increase of 1.1 percent. [56/]

He also examined Hut Tax collections over 1909/10-1931. [57/] These figures show a sharp and steady increase

---

<u>53/</u> <u>Ibid</u>.

<u>54/</u> <u>Ibid</u>.

<u>55/</u> <u>Ibid</u>.

<u>56/</u> <u>Ibid</u>.

<u>57/</u> <u>Ibid</u>.

from 1909-1921, then a sharp fall in 1921, when many huts were pulled down to avoid a heavy Hut Tax.[58/] (Other sources of data also show this break.) The huts were gradually rebuilt until 1929, after which the depression took hold. Looking at 1909-1929 and adjusting for an estimate of coverage (92 percent), he estimates that the adult population must have increased by around 1.5 percent a year.[59/] And he argues that those figures may be fairly reliable.

> "In general the persons who were counted for tax saw to it that their neighbors did not escape, and certainly by 1915 the count of huts was quite as efficient as it is now. It is only the count of polls that has notably improved." 60/

He concludes that the annual average increase in the adult population was about 1.5 percent, "or perhaps a little more."[61/] As to the future: "the bulk of the district is unhealthy, and it appears unlikely that the rate will exceed 1.8 percent within the next thirty years." That particular estimate proved way low.[62/]

Central Kavirondo's District Commissioner, R. P. Armitage, attempted to estimate population growth for Central and North Kavirondo. He started out attempting to count

---

58/ *Ibid.*

59/ *Ibid.*

60/ *Ibid.*

61/ *Ibid.*

62/ *Ibid.*

married women, huts, and Hut Tax tickets.[63/] He could only estimate married women for a few years, but found a population increase of perhaps 1.2 percent in North Kavirondo.[64/] His hut count data were too unreliable to use. His Hut Tax data suggested:

Population of North and Central Kavirondo

1914	240,160
1915	244,971
1916	232,541
1918	237,584
1919	238,561
----	-------
1929	240,825
1930	243,125

These figures suggest no population growth over 1915-30, but Armitage notes that the War and influenza epidemic had taken their toll, which had been made up, and that more young men were living off the reserves in 1930 than in 1914. He concludes that the adult population was growing in 1930.[65/] "The rate of growth is obviously uncertain, but an annual increase of 0.8 percent is the best estimate that can be rendered in the circumstances, and it is regarded as being quite improbable that the true figure lies outside the limits of 0.5 percent and 1.2 percent.[66/]

North Kavirondo's District Commissioner, C. B. Thompson, also estimated population growth. The population data were assembled as follows:

63/ *Id*. at pp. 2261-2262.

64/ *Ibid*.

65/ *Ibid*.

66/ *Ibid*.

Population of North Kavirondo 67/

Year	Men	Women	Children	Total
1921	80,110	99,581	110,254	289,945
1922	82,144	96,163	117,398	295,705
1923	84,889	96,716	115,567	298,023
1924	85,547	97,578	113,676	298,801
1925	89,148	96,959	115,636	301,743
1926	93,329	101,252	118,363	312,944
1927	93,620	100,079	120,424	314,123
1928	97,250	105,742	121,962	324,954
1929	96,834	107,453	125,396	329,683
1930	103,750	109,207	128,069	341,026
1931	110,007	109,819		

From 1922 to 1932, the implied rate of increase is 1.4 percent a year. The population of married women increased from 96,163 to 108,725 according to the Hut census, or about 1.2 percent a year, and Thompson believed this count to be especially accurate.68/ Thompson concluded: "It can be said with a fair degree of confidence that the rate of increase over the past decade has been not less than one percent per annum and not more than 1.5 percent, with the probabilities of the case pointing to 1.2 or 1.3 percent."69/ When enough people survive in Kavirondo to give a population growth rate of 1 percent or more, enough more should survive in Kikuyuland -- which had a healthier climate and greater access to European medical services -- to give a population growth rate well above 1 percent, assuming birth rates were roughly the same.

67/ *Id.* at p. 2268.

68/ *Ibid.*

69/ *Ibid.*

Even in the far flung Rift Valley, where people lived in remote and rugged areas, the available counts indicate population growth; although those data are not accurate enough to warrant much confidence, they at least imply roughly the same trend as the data from Kavirondo and Kikuyuland.

As Kuczynski himself notes, the major piece of historical evidence in the 1930s -- the Report of the Carter Commission -- runs counter to his hypothesis that population was virtually stagnant. (The very fact that the Carter Commission came into being also militates against the hypothesis that population was stagnant.) The information on population growth presented to the Carter Commission -- from which we have quoted in detail -- was hardly precise. But the thrust was clear. Population was growing, at least in the population centers, at least at 1.5 percent a year.

> "All the evidence before us points to a high rate of increase, and we cannot discern any good reason for expecting any slackening of the rate within the next two decades. It appears more likely that it will increase as a result of the improved conditions of life." 70/

In 1933, Acting Director of Medical and Sanitary Services, Dr. Patterson, offered his account of Kenya's demography since the British had colonized Kenya and concluded the population was growing moderately:

> "Reviewing the situation and the probabilities in Kenya . . . the position probably is that,

---

70/ Rep. of the Kenya Land Comm., p. 349. See also Kuczynski, op cit., Vol. II, p. 226.

up to thirty or forty years ago, war, pestilence and famine served from time to time to reduce either the number of the population or the rate of increase.

"After the advent of settled government, the operation of these checks to population was in certain cases and to a certain extent lessened, partly as the result of comparative peace, partly as the result of improved transport, and partly perhaps as the result of sanitary measures with regard to certain major epidemic diseases. On the other hand, the checks were on occasion probably facilitated.

"The extent to which the checks were either abrogated or enhanced during the first twenty or thirty years of government cannot, however, be estimated with any degree of accuracy, and all that can be said with certainty is that during the first half of that period or more there would not appear to have been any notable increase or decrease of the native population taken as a whole, but that at the present time certain tribes are undoubtedly increasing in numbers, and that we know of no major tribe, with the possible exception of the Masai, which is decreasing in numbers or in which the rate of increase is becoming lower. Whether the rate of increase is now rising is probably unknown, but there is no evidence to suggest that on the whole it is falling.

"Beyond that we have no certain knowledge. The essential facts may therefore be summarized as follows: --

"'In Kenya at the present date, following on the institution of orderly government and the establishment of certain specific welfare measures, but in the absence of certain other welfare measures on such a scale as might be expected to ensure any general immediate result in the direction of lowering the death rate, population is increasing.'" 71/

As noted, much of the Kenya Land Commission evidence on population growth applies principally to the adult

---

71/ Rep. of the Kenya Land Comm., Ev. and Mem., Vol. III, p. 3220. See also Kuczynski, op. cit., Vol. II, pp. 221-222.

population for which tax counts were made. But the age distribution of the population seems to have been changing in such a way as to imply accelerating expansion of population in future years. As noted above, in the 1920's, the proportion of children in the Kavirondo population was put at 37-41 percent; Kuczynski not unreasonably concludes that these estimates may be only wild guesses. He and the Kenya government continued to accept an estimate of 37 percent.

But other more carefully collected small samples of data also show higher proportions of children. Over 1928-1938, the agricultural censuses show the population of African "squatters" as follows:

The Population of Squatters 1928-1938 72/

	31 July 1928	31 July 1930	28 Feb. 1931	28 Feb. 1932	28 Feb. 1933	28 Feb. 1934	29 Feb. 1936	28 Feb. 1938
Men	32,969	31,958	30,650	30,247	30,933	28,939	24,872	28,061
Women	33,329	32,068	33,350	32,294	33,383	31,035	26,908	29,711
Children	45,384	46,130	49,176	48,029	50,124	44,398	41,492	46,382
Total	111,682	110,156	113,176	110,570	114,440	104,372	93,272	104,154

and over 1943-1944 the Special Labour Census of 1944 gave other estimates: 73/

The Population of Squatters 1943-1944

Men		Women		Children		Total	
1943	1944	1943	1944	1943	1944	1943	1944
38,515	43,332	46,545	52,979	79,734	96,891	164,794	193,202

72/ *Id.* at p. 154.

73/ *Ibid.*

The absolute changes in the squatters' population of course reflect changes in economic conditions more than natural population increases. But the data also show changes in the structure of population which suggest accelerating population growth. The percentage of children increased from 41 in 1928 to 45 in 1938 to 50 in 1944: and the ratio of children to 100 women rose from 136 in 1926 to 156 in 1938 to 183 in 1944. Kuczynski dismisses this trend because the data were not completely reliable, and that may have been rash. He also characterizes as "more reliable" the results from the Digo District sample showing that children constitute 52 percent of the total population, giving two children to each adult female.74/

Digo Population

Sex	0-7 Months	8-12 Months	1-5 Years	6-8 Years	9-12 Years	13-16 Years	Young Adults	Middle Aged	Aged	Total
Males	575	759	1,987	1,450	1,338	935	3,943	1,497	491	12,975
Females	658	823	1,977	1,517	676	758	4,812	1,422	369	13,912
Total	1,233	1,582	3,964	2,967	2,014	1,693	8,755	2,919	860	25,987

He concludes that "unfortunately, the scope of the investigation is too small to permit any generalization."75/ A demographer today would be less likely to dismiss out of hand the implication of these studies; since the 1940s, sample population censuses have been made in many developing

74/ Id. at pp. 154-155. See also Med. Rep. 1933, p. 25.

75/ Ibid.

countries, and we now know that ratios of dependent children to total population of 40-50 percent are typical, not atypical, of countries in the demographic transition. Similarly high ratios are found in many of today's developing countries. Thus it appears again that Kuczynski may have dismissed his own evidence too quickly.

This evidence, although descriptive and imprecise, does indicate enough increasing population growth to suggest that Kenya might well have entered the demographic transition. The early estimates of population had been significantly overstated; perhaps as colonial governors sought to assure potential settlers that labor was abundant, they were better pleased with high population estimates. As more information became available, the population estimates were corrected and for a time appeared to decline, and though later data indicated a reversal of the trend, no one believed it.

We are therefore faced with a puzzling question: if Kuczynski explored the evidence so carefully, why did he conclude that the population was virtually stagnant? The answer turns on the lack of reliable estimates of key demographic parameters. In the absence of respectable data on vital statistics -- birth rates, fertility rates, death rates -- Kuczynski tended to discount poulation growth because he felt fairly confident that birth rates could not compensate, particularly for the high infant mortality rates that everyone accepted as a demographic axiom. But from the evidence now available, it appears that his judgment about that critical parameter, and others, may not have been accurate, and that he therefore mistakenly discounted the vague, imprecise estimates of population growth in the early 1920's and 1930's. We should also point out that Kuczynski's bias was to regard population growth as "favorable," for it was still the consensus that Kenya needed more African hands to develop. He bent over backwards not to overstate the "favorable" case for population growth. He summarizes his view on the demographic situation;

> "Let us assume the birth-rate is enormous, let us assume it 50 per 1,000. If 500 per 1,000 of the newly born children die before the age of 2, these deaths would constitute about 25 per 1,000 of the population; if the death rate of those over 2 is 20 per 1,000, their deaths would constitute about 19 per 1,000 and a natural increase of 0.6%. If we raise the birth rate to 60 per 1,000, the death rate would rise to about 49 per 1,000, and the national increase to 1.1%. It is obvious, therefore, that either the natural increase must have been smaller than 1.5%, or mortality in the first two years of life lower than 500 per 1,000, or (which is quite unlikely) the death rate of those over two lower than 20 per 1,000 . . .. The yearly natural increase in East Africa cannot possibly be anything like 1.5 % if mortality is as high as it is generally believed to be . . .. I am inclined to believe that there was a small natural increase amounting to something like, say 0.5 percent yearly. 76/

As it turned out, mortality was in fact lower than what Kuczynski assumed, and birth rates were in fact "enormous."

76/ Kuczynski, *op. cit.*, Vol. II, pp. 123-124.

Part 3: The 1948 Census

The 1948 Census -- only three years after Kuczynski's work -- provided the first hard information on Kenya's African population, and to many it came as a rude awakening. For on the basis of earlier estimates, the African population had been expected to reach little more than 4,200,000 in 1948; but when the returns were in, the population totaled 5,251,120, about a fourth more.[77/]

The Census was carried out through a careful Hut count directed by C. J. Martin, who has described the methods and its problems in detail.[78/] There were obvious problems of estimation, of which one is particularly important: Africans were superstitious about admitting the number of their children so that enumerators often had to record only the ones they could find.

The Census established Kenya as a country in the midst of the demographic transition.[79/] Although no careful estimates of adult mortality were made, an invaluable estimate of infant mortality (actually an age-specific death rate) was obtained. Mortality was first put at 184 per thousand babies aged 0-1 year. That definition was later revised. Many mothers thought not in terms of calendar years but in terms of weaning, which had traditionally been at roughly two.

77/ African Population of Kenya Colony and Protectorate (1948), Government Printer, Nairobi, 1950.

78/ Martin, C.J., "The East African Population Census, 1948: Planning and Enumeration," Population Studies, Vol. III, No. 3, 1949, *passim*.

79/ *Ibid*.

The infant mortality rate was therefore defined to apply to children up to two years. 80/ That rate is high but far lower than the earlier estimate that 500 children had died in their first two years, and confirms the precipitous death rate decline that marks the demographic transition. 81/ The earlier estimate may, of course, have been exaggerated, but at least one African country still has an infant mortality rate exceeding 300, so there probably was in fact a substantial decline.

Martin goes on to guess that about 40 percent of all children born had died before puberty (15 for boys, 13 for girls). 82/ No estimate of adult mortality was made, but censuses in neighboring Egypt and Uganda suggested adult death rates of roughly 20 per thousand. But to combine these estimates into a composite estimate of the death rate, some idea of population structure and birth rates was needed.

Since no direct estimates of birth rates were made, indirect estimates had to be obtained; they were also to be derived from data on the population's structure.

80/ There is some confusion throughout between an age-specific death rate for children aged 0-1 in a given year and the infant mortality rate on children born that year. Those are equivalent only if the pattern of births and deaths remains stable year to year. This is probably a reasonable assumption for Kenya, but it is a demographic nicety that deserves mention.

81/ See, *e.g.*, Kuczynski, *op. cit.*, Vol. II.

82/ Martin, "Some Estimates of the General Age Distribution, Fertility, and Rate of Natural Increase of the African Population of East Africa," *Population Studies*, Vol. VII, No. 2, 1953, p. 195.

Enumerators were to ask ages and group accordingly, placing young children obviously over a year in the 1-5 group. The resulting classification showed a population surprisingly young -- "emergent" in demographers' terms. Rough estimates of age pyramids in Kenya and other developing countries show relatively high proportions of Kenya's population in the younger age groups:83/

Age Distribution of Population

	Less than 1	1-5	6-15	16-45	46+
Kenya (1948)	4.5	19.0	24.6	43.2	8.7
Tanganyika (1948)	3.6	15.2	23.4	47.8	10.0
Uganda (1948)	2.8	14.3	23.8	47.5	11.6
Peru (1948)	3.5	15.0	25.7	41.8	14.0
Turkey (1945)	2.5	13.9	26.1	43.5	14.0
Brazil (1940)	3.3	15.3	26.3	43.5	11.6

The percentage of children in the population is high -- 48.1 percent of the population was aged 15 and under. (Actually, girls were counted as 13 and under, so the percent may have been even higher.) Thus the percent of children was about as high as it was reported to be in the earlier studies reported but rejected by Kuczynski, and well above the 37 percent estimate used for so long by the government. Martin finds the percentage of children even higher in Kenya than in other developing countries:84/

83/ *Id.* at p. 186.

84/ *Ibid.*

Children as a Percent of Total Population

	Children (0-13 Female) (0-15 Male)	Adults
Kenya (1948)	48.1	51.9
Tanganyika (1948)	42.2	57.8
Uganda (1948)	40.9	59.1
Peru (1940)	44.2	55.8
Turkey (1945)	42.5	57.5
Brazil (1940)	44.9	55.1

The data suggest very high birth rates. If no children died in their first year, the crude birth rate would have had to be 45 per thousand population, to leave children 0-1 as 4.5 percent of the population. If the infant mortality rate of 184 per thousand is defined to cover infants aged 0-1 only, then the crude birth rate would have to be close to 55 per thousand population to leave the surviving infants equal to 4.5 percent of the population. Martin suggests spreading the infant mortality rate over a two-year infancy, with perhaps 9 children dying as newborns and 4 or 5 more in their first year; he also suggests infants in the 0-1 bracket may have been over-estimated because some unweaned children over one year may have been included in this youngest category, so he reduces the 0-1 cohort to 4 percent of the population. (He never reconciles this with his earlier argument that mothers were reluctant, for superstitious reasons, to acknowledge all their children.) To leave infants aged 0-1 at 4 percent of the population, an infant mortality rate of 130 in the first year entails a birth rate of about 45. (Martin uses 44.) Martin finds anything above this level implausibly high; the government of Kenya found such estimates almost unprecedented.

What actually the birth rate was can, of course, never be known with certainty. But later data gained from the 1962 Census compels the view that birth rates around 1948 must have been high (see below). Perhaps the infant mortality rate was overestimated, as Martin suggests, with mothers misreporting some deaths of children aged 1-5. If the infant mortality rate for one year were 140 per thousand, and children aged 0-1 constituted about 4.3 percent of the total population (as a compromise between the arguments on under- and over-reporting), the birth rate would be about 51. This is only hypothetical, of course, but is roughly consistent with a trend implied by later, harder data and earlier ranges of estimates.

Data gathered on existing family size also pointed to high birth rates. Unfortunately, that data attributes an implausible number of births, especially first births, to older women:[85/]

Fertility Table

Estimated size of family of African women as Reported in the 1948 Census:

Live Births of Women of 16-45 Years

Av.	0	% of Women by Number of Live Births									
3.2	23	1	2	3	4	5	6	7	8	9	10+
3.2		14	13	11	10	8	7	5	4	2	23

85/ Id. at p. 194.

Live Births of All Women

Av.	0	1	2	3	4	5	6	7	8	9	10+
5.3	12	5	7	9	10	11	10	9	9	6	12

It is likely that under the tribal kinship arrangements whereby grandmothers considered grandchildren "their own," too many births may have been ascribed to older women, and some may have been double counted. But family size was probably quite large. We are left with a choice between a birth rate of around 50 (or more) as suggested by the data, or 44-45 as suggested by Martin. If the birth rate were only 44 per thousand population, children's deaths contribute 18 (8 infants) per thousand population, adults still contribute 10, the death rate falls to 28 and the population growth rate is 1.6 percent per year. That was the estimate put forth by Martin; it was rounded off to 1.5 percent and then accepted by the government. It is still three times Kuczynski's estimate and considerably above earlier estimates.

Assuming Martin's population growth rate of 1.5 percent a year, the government of Kenya projected population through 1961 as follows:

African Population (000) (1.5%)

1948	5,240
1949	5,319
1950	5,398
1951	5,479
1952	5,561
1953	5,644
1954	5,729
1955	5,815
1956	5,902
1957	5,990
1958	6,080
1959	6,171
1960	6,203
1961	6,357

But by 1962, it was obvious from fragmentary reports from the districts that population was expanding much faster than 1.5 percent a year, and that it had been for some time; Martin's view was simply disproved by the later data. (It is difficult to extrapolate backwards to show that the birth rate in 1948 was in fact 50, but one is tempted toward that conclusion. Death rates, too, were likely falling.) The government therefore arbitrarily raised the censal growth rate to 2.25 percent -- an increase of 50 percent over the earlier estimate. New estimates of past population were given:[86/]

86/ See, *e.g.*, *Statistical Abstract*, 1962.

Re-estimated African Population (000) (2.25%)

1948	5,240
1949	5,358
1950	5,478
1951	5,602
1952	5,728
1953	5,857
1954	5,988
1955	6,123
1956	6,261
1957	6,402
1958	6,546
1959	6,693
1960	6,844
1961	6,988

But in that same year, another Census was taken -- a census that would show population growth still faster than the government had realized. The Census implied that the average intercensal growth rate must have been over 3 percent.[87/]

Part 4: The 1962 Census

The 1962 Census put Kenya's African population at about 8,636,263 -- a fifth higher than the "high" projection based on the 1948 Census, and a third higher than the original or "low" projection. The 1962 Census was carefully prepared following U.N. guidelines for enumerating as many people as possible within 1-2 days, and the rest within a week. The complete Census was taken followed by a sample survey of 10 percent of the population. The Census (and sample) have been carefully and thoroughly analyzed to derive

---

87/ The actual implied intercensal growth rate is 3.3 percent, though that probably reflects improved counting in the 1962 Census.

maximum information on fertility and growth patterns. What follows is a brief summary of that analysis; for more detail, the reader is referred to the Census itself 88/ or to the summary by Coale and Van der Walle. 89/

Fertility

Fertility and birth rates were estimated indirectly through data on living children, estimates of mortality, and estimates of population growth. The "Reverse Survival Method" yielded the following estimates of crude birth rates:

Estimates of Crude Birth Rate by Reverse Survival 90/

Age Group	U.N. Mortality Level Assumed	Rate of Annual Population Growth 2.50	2.75	3.00
0-4	40 (e_o = 40 years)	47.8	48.1	48.4
	45 (e_o = 42 1/2 years)	46.9	47.2	47.4
	50 (e_o = 45 years)	46.0	46.2	46.5
5-9	40 (e_o = 40 years)	52.5	53.5	54.5
	45 (e_o = 42 1/2 years)	50.9	51.8	52.8
	50 (e_o = 45 years)	49.4	50.3	51.2

The average estimate based on the 0-4 age group was about 47, that for the 5-9 age group about 51. It is stated that

88/ Kenya Population Census, 1962, Ministry of Finance and Economic Planning, Nairobi, 1964.

89/ Coale, Ainsley J., and E. Van der Walle, "Notes on Areas for Which Estimates Were Made, But not Subject to a Detailed Study"; Brass, William, et al., The Demography of Tropical Africa, Princeton University Press, Princeton, 1968, p. 172.

90/ Kenya Pop. Census, 1962, p. 59.

the 0-4 age group was undoubtedly underenumerated, while the 5-9 age group might have been inflated; but later data would show the estimate of 51 roughly on target. It has been noted by Coale that Kenyan surviving-children data are consistent with sharply falling child mortality, and that Kenya mortality generally seems lower than for other African countries.[91/] It is suggested that deaths might have been underreported, but, as was noted earlier, the same pattern emerged in the 1948 Census and, as has been found recently, it appears once more in the 1969 Census.

Birth rates were also estimated on the basis of questions on births in the past twelve months, but resulting estimates were far too low to be plausible (40 or so), apparently the result of the usual problems of recall failure and "boundary effects."[92/] Despite these problems, the births-in-past-year data were used to indicate the distribution of births among mothers of various ages:

Age-Specific Fertility Rates Based on Births Recorded as Having Occurred to Africans in Twelve Months Preceding Census[93/]

Age Group of Mothers	Births per Thousand Women	Percentage of Total
15-19	83.3	7.9
20-24	206.8	19.7
25-29	223.2	21.3
30-34	202.8	19.3
35-39	162.9	15.5
40-44	108.6	10.3
45-49	62.9	6.0
TOTAL	5,252.5 per 1000 women	100.0

91/ Coale and Van der Walle, *op. cit.*, p. 172.

92/ *Kenya Pop. Census*, 1962, p. 60.

93/ *Id.* at p. 61.

It is noted that rates for older women seem high relative to those for younger women, and the mode is in the 25-29 age group rather than the more usual 20-24 age group in societies without unusually late marriage.

In view of this, "corrected" fertility rates were estimated with the following changes noted from the Census: 94/

(i) all births to women shown as aged 50 and over were ignored;

(ii) the analysis was based on single births only, and all multiple births were ignored;

(iii) the fertility rate of the 45-49 age group in particular had clearly been badly inflated by misunderstanding; a study was therefore made of the fertility patterns of 27 countries with high birth rates, which showed that on the average the fertility of the 45-49 age group should be equal to approximately 26 per cent of the rate of the 40-44 age group; an arbitrary reduction in the Kenya rate was therefore made, reducing it to this appropriate value;

(iv) a correction for misstatement of age was made, following a procedure evolved in the Office of Population Research, Princeton, and assuming that the fertility of the women whose ages had been misstated should be equal to the average fertility of all women in their true age group; this procedure had the effect of moving the mode of the distribution from the 25-29 to the 20-24 age group;

(v) the 'corrected' rates thus obtained were then graduated by the use of polynomial functions, as advocated by Brass.

> . . . The relative age-specific fertility rates of African women (excluding Northern Province) obtained by these procedures are shown in . . . [the following table] compared with the distributions obtained for various other African populations and with some fertility models constructed by the United Nations.

94/ *Id.* at p. 62.

Relative Age-Specific Fertility Rates: Kenya "Corrected" Rates and Various Populations and Models 95/

Age Group	Kenya ("Corrected") 1962	Tanganyika 1957	Uganda 1959	Ghana 1960	Congo (Leopoldville) 1955-57	14 Countries of Francophone Africa 1955-61	U.N. Models "Early Peak Type A"	"Broad Peak"
15-19	10.5	12.4	12.4	10.8	13.7	17.1	16.2	8.9
20-24	22.4	24.0	24.4	20.8	26.7	24.0	24.7	23.7
25-29	22.1	21.4	22.2	21.7	23.4	21.6	21.9	24.4
30-34	17.9	15.9	18.7	19.6	16.9	17.1	17.4	19.9
35-39	14.4	13.3	13.2	14.9	9.3	12.3	11.8	14.7
40-44	10.2	10.1	5.8	8.4	7.0	5.5	5.8	6.5
45-49	2.6	2.9	3.3	3.8	3.0	2.4	2.3	1.9
TOTAL	100	100	100	100	100	100	100	100
MEAN	29.7	29.3	28.8	29.9	28.2	28.0	28.0	29.2

SOURCES: Tanganyika. African Census Report, 1975, pp. 81-83.
Uganda. Uganda Census 1959. African Population, p. 25.
Ghana. Unpublished data supplied by courtesy of the Ghana Census Office.
14 Countries of Francophone Africa. I.N.S.E.E., Perspectives de Populations dans les Pays Africains et Malgache d'Expression Francaise, Paris 1963.
Congo (Leopoldville) and U.N. Models. Population Bulletin of the United Nations No. 7, pp. 104, 110.

The 1962 Census notes: 96/

> These comparisons suggest that the modifications made in the Kenya data were essentially conservative. The distribution still has a higher mean, and a higher proportion over the age of 30 than any of the others shown above except that for Ghana, for which the figures were entirely uncorrected and may well have suffered from the same errors and misstatements as had distorted the Kenya figures. However, it is not thought that any more radical adjustments would be justified; such adjustments would have involved the virtual abandonment of the original Kenya data and increasing reliance on models based on other populations whose fertility patterns might well differ radically from those in Kenya.

95/ Ibid.

96/ Id. at p. 64.

Age-Specific Fertility Rates Among African
Women Based on Past-Twelve-Months Births by Provinces 97/

Province	15-19	20-24	25-29	30-34	35-39	40-44	45-49	Total Fertility */
	Age Group							
Nairobi	150	228	240	231	121	79	45	5,470
Central	67	230	260	242	205	143	74	6,105
Coast	96	167	158	137	110	53	34	3,755
Nyanza	91	204	217	201	148	93	53	5,035
Rift Valley	94	243	274	247	199	149	92	6,490
Southern	64	158	174	149	138	90	67	4,200

*/ Sum of age-specific fertility rates multiplied by five. Half the districts in the surveyed provinces had their modes in the 25-29 age group, a fourth in the 20-24 age group (the more usual group), and a fourth in the 30-34 age group. 98/

The total fertility estimates from questions on total number of children ever born alive were summarized as follows in the Census:

Estimation of the Total Fertility Rate

22. The primary object of the question on the total number of children ever born alive was the determination of the total fertility rate. In theory, if the level of fertility had remained constant, and if the numbers of births had been accurately reported, an approximation to the total fertility rate could be obtained from the mean numbers of children born to women aged 50 and over. However, as is evident from [the] table . . ., the returns for the older women cannot be regarded as trustworthy: after the age of 50 the mean numbers of births per woman show an irregular but nevertheless pronounced decline with age. This decline may be attributed to three possible factors: the general level of fertility may have been lower when the older women were of reproductive age; there may have been a selective survival of women who had borne relatively few children; the older women may have been subject to an increasing tendency to omit some of their children, particularly those who had

97/ Ibid.

98/ Ibid.

died in infancy or those who had grown up and left the home. The last of these three possibilities is generally regarded as the primary factor, but in reality, whichever may have been the most important, it is clear that the returns for the older women cannot be regarded as providing an accurate indication of the current level of the total fertility rate.

In these circumstances, such estimates must therefore be based on the returns for the younger women still within the reproductive age group. Since these women will not, by definition, have completed their child-bearing, any estimates of the total fertility rate based on the numbers of children already born must be derived by use of a correction factor representing the expected additional births. The procedure which has been adopted is described in Appendix III(b). It should be observed here, however, that the results depend on (a) the age range of the women under consideration, (b) the age distribution of those women, and (c) the assumed shape of the age-specific fertility distribution. Two sets of calculations have therefore been made: those based on the recorded age distribution and age-specific fertility rates, and those based on the graduated age distribution and 'corrected' fertility rates. The results are shown in the table.

Estimated Total Fertility and Crude Birth Rates
From Mean Number of Births to Women of Reproductive Age

		IMPLIED TOTAL FERTILITY		IMPLIED BIRTH RATE	
Age Range of Women	Recorded Mean Births per Women	Recorded Age and Fertility Distributions	Graduated Age and Fertility Distributions	Recorded Age and Fertility Distributions	Graduated Age and Fertility Distributions
15-29	1.646	8.0	7.4	57.7	52.3
15-34	2.145	7.5	7.1	54.0	50.2
15-39	2.525	7.2	6.8	51.9	48.1
15-44	2.810	7.0	6.6	50.4	46.7
15-49	3.013	6.9	6.4	49.7	45.3

The Census notes:

It will be seen that the implied total fertility rates shown in the above table range from 6.4 to 8.0, those based on the recorded distributions being consistently higher than those based on the graduated figures. The choice of the most plausible values within this range is largely arbitrary, but the following considerations should be borne in mind: --

(a) The graduated figures can generally be regarded as closer approximations to the truth than the recorded, since the latter had manifestly been distorted by serious errors.

(b) Since the numbers of recorded births for women over the age of 50 had been affected by omissions, it would appear probable that the data recorded for women in the 40-44 and 45-49 age groups were also subjected to such omissions; below the age of 40, however, it is unlikely that the omissions were very serious, especially if the children omitted were largely those who had grown up and left the home.

(c) If the age range of the women under consideration is too restricted, the data on the mean numbers of children ever born are liable to be distorted by age mis-statement on the part of the women, particularly if this mis-statement is in any way correlated with the numbers of children born.

(d) If the adjustments made to the shape of the age-specific fertility rates had been more radical, so that the mean of the distribution had been further reduced, the implied total fertility rates would have been appreciably lower.

(e) In each age group an appreciable proportion of women were recorded as 'not stated' as to the number of children borne; in the computation of the mean births per woman these women were treated as childless; the justification for this procedure is given in Appendix III(c), but it should nevertheless be observed that some of these women may in fact have borne children, so that the recorded ratios may have been too low.

It is therefore suggested that the most plausible estimates of the total fertility rate are those provided by the age ranges 15-34 and 15-39, using the graduated data, i.e. values of 7.1 and 6.8 respectively. The crude birth rates implied by these fertility levels would lie between 48 and 51 per thousand. 99/

Fertility estimated from the age composition of the population and child mortality is higher than that estimated from the births-in-past-twelve-months data, suggesting faulty recall. Adjusting for faulty recall, by referring to

99/ Kenya Pop. Census 1962, pp. 67-68.

the relationship between reported parity divided by cumulative fertility for age intervals, Coale and Van der Walle produce estimates of fertility that conform better to age structure data: 100/

Revised Fertility Estimates

	Coast	Eastern	Central	Rift	Western	Nyanza	Kenya
Fertility from Age-Structured Data (L_2 and Proportion Under 15)	5.4	6.8	6.6	6.5	8.1	7.9	6.8
Total Fertility from Adjusted Age-Specific Rates Based on Previous Twelve Months	5.4	6.8	7.3	6.8	7.6	8.0	6.8

In summary, the Census presents the following estimates of birth and fertility rates:

Summary of Birth and Fertility Rates 101/

	Crude Birth Rate	Total Fertility Rate
Reverse Survival of Children Aged 0-4, 5-9	47-51	6.6-7.1
Comparison with Stable Population Models	47-49	6.7-6.9
Average Number of Children Borne by Women Aged 15-34, 15-39	48-50	6.8-7.1

The Census suggests using a crude birth rate of 48.

100/ Coale and Van der Walle, op. cit., pp. 173-174.

101/ Kenya Pop. Census 1962, p. 69.

Mortality

Indirect estimates of mortality were also made from data on children surviving, using mortality models begun in the U.N. and extended by Brass and Demeny. Generally, Coale-Demeny models were used because child mortality was thought to be high in the 1-4 age group as well as in infancy, and those models are considered more appropriate for such populations. The principal source of data was the following table:102/

Proportions of Surviving Children By Age Group of Mothers (Africans: Excluding Northern Province)

Age Group of Mothers	Proportion of Surviving Children	
15-19	0.854)	0.834
20-24	0.830)	
25-29	0.795)	0.778
30-34	0.762)	
35-39	0.731)	0.713
40-44	0.692)	
45-49	0.662)	0.653
50-54	0.642)	
55-59	0.610)	0.610
60-64	0.609)	
65-69	0.583)	
70-74	0.571)	0.567
75 and over	0.551)	
Total 15-44	0.761	
Total 15 and over	0.716	

From this, estimates of life expectation at birth were derived from Myburgh's formula (40-50 years) and

102/ *Id.* at p. 71.

propositions of children surviving from birth to various ages were derived using the Brass technique.[103/] The principal results were as follows, according to the Census:

Of all children born alive,

82-83% survived to their second birthday

75-77% survived to their fifth birthday

68-70% survived to their fifteenth birthday [104/]

On the basis of this information, model mortality tables were selected and crude death rates estimated by multiplying the age-sex distribution of the population by the mortality rates given by the models, giving the following results:

Crude Death Rates Per 1,000 Africans Derived
From Model Life Tables (Excluding Northern Province)

	Coale-Demeny Models			
Level	West	North	East	South
10 (Female e_o = 42 1/2 years)	22	22	22	22
11 (Female e_o = 45 years)	20	20	21	20
12 (Female e_o = 47 1/2 years)	18	18	19	18

Level	United Nations Models
40 (e_o = 40 years)	23
45 (e_o = 42 1/2 years)	21
50 (e_o = 45 years)	19

103/ *Id.* at p. 72.

104/ *Ibid.*

This table suggests a crude death rate of 18-23 per thousand.

Population Growth

Taking estimated crude birth rates of 48-51 and estimated crude death rates of 18-23, the population growth rate (rate of natural increase) would range between 3.3 percent and 2.5 percent per year.

Population was projected during the 1960's at about 3 percent a year. But by the time of the next Census in 1969, it was clear that population growth had once again been underestimated, that a higher average intercensal growth rate should have been used. For by 1969 the population was growing by at least 3.3 percent annually.

Part 5: The 1969 Census

Only partial information is available on the 1969 Census at this writing, though analysis is under way.[105/] The crude birth rate of Kenya's African population is now put at about 53 per thousand, the crude death rate at 17 or 18. Thus, the rate of natural increase has risen to a startling 3.5 percent per annum. Unofficial reports on age-specific birth and fertility rates suggest broad rises; the total fertility rate has apparently risen from 6.8 in

---

105/ The author used as the chief source on the 1969 Census a set of mimeographed tables provided by the government of Kenya, which is gradually publishing the Census analysis.

1962 to 7.1 in 1969. Mortality continues to decline, especially for infants; the infant mortality rate is now put at 126 for males aged 0-1, 112 for females. 106/

Age-specific birth rates per thousand women in 1969 were estimated as: 107/

Age-Specific Birth Rates

Age Group of Mothers	Births Per Thousand Women	Percentage of Total
15-19	132.0	8.68
20-24	330.5	21.74
25-29	337.3	22.20
30-34	294.2	19.35
35-39	223.2	14.68
40-44	135.1	8.90
45-49	67.7	4.45
	1,520.00	100.00

As compared to the 1962 Census shown above, these birth rates are far higher, though the data for 1962 were probably considerably underestimated. In any case, these birth rates are very high.

Age-specific death rates per thousand women in 1969 were estimated as: 108/

106/ Again, the infant mortality rate and age-specific death rate for babies aged 0-1 are assumed to be equivalent.

107/ *1969 Census Tables*.

108/ *1969 Census Tables*.

Age-Specific Death Rates Per Thousand Population

Age Group	Mortality Rate for Males	Mortality Rate for Females
0-1	126.0	112.0
1-4	90.4	75.4
5-9	41.5	34.1
10-14	15.7	12.6
15-19	26.7	20.4
20-24	34.2	27.4
25-29	35.5	29.5
30-34	36.8	30.4
35-39	41.2	32.8
40-44	49.4	39.8
45-49	62.0	49.1
50-54	80.4	66.1
55-59	106.8	88.1
60-64	152.2	125.0
65-69	207.7	177.5
70-74	304.2	286.8
75 and over	---	---

The age structure data derived from the 1969 Census was as follows:109/

Age Structure

Age Group	Average	Male	Female
0-4	19.2	19.3	19.2
5-9	16.5	16.7	16.4
10-14	12.6	13.0	12.2
15-19	10.1	10.2	10.0
20-24	8.0	7.8	8.2
25-29	7.0	6.4	7.5
30-34	5.5	5.4	5.7
35-39	4.5	4.3	4.6
40=44	3.7	3.7	3.7
45-49	3.0	3.0	3.0
50-54	2.5	2.5	2.4
55-59	2.0	2.0	2.0
60 and over	5.4	5.6	5.1

109/ 1969 Census Tables.

Epilogue

Kenya's population was put at 11.2 million in 1970 and 12.1 million in 1972,[110/] and has probably already passed the 13 million mark -- more than four times its level at the turn of the century. Its probable growth rate of about 3.5 percent annually is one of the world's highest. (Half the population is under fifteen; the dependency ratio is one.) Thus, the population threatens to double in about twenty years, to 26 million -- an increase of roughly ten-fold within only a century. That will, of course, probably not happen; either birth rates, or else mortality rates, will in the end adjust to leave the population within the range that Kenya can support with the resources at hand. With a view to the kinder option, the Kenya government has begun a new family planning effort designed to reduce the population growth rate to 3 percent by 1980.

110/ See, *e.g.*, *Statistical Abstract*, 1973.

Kenya Population Estimates
(millions)

OFFICIAL ESTIMATES	1900	1905	1910	1915	1920	1925	1930	1935	1940	1945	Census of 1948
Colonial Reports	4.00	4.00	4.00	2.83	2.48	2.55	2.95	3.01	3.40	3.92	5,251,120
				(2.7)	(0.5)	(3.0)	(.4)	(2.7)	(2.6)	(2.6)	(2.6)
					(Growth rate 1920-1945 = 1.7% annually)						
Martin (Population estimates are those implied by growth rates)					4.07	4.17	4.28	4.50	4.73	5.09	5,251,120
(Growth Rate)					(0.5)	(0.5)	(1.0)	(1.0)	(1.5)	(2.0)	(2.0)
					(Growth rate 1920-1945 = 1.1% annually)						
REVISED ESTIMATES (Representing smooth series conforming to trend of demographic data)											
Population	2.43	2.52	2.61	2.74	2.91	3.13	3.43	3.78	4.24	4.82	5,251,120
Growth Rate (percent)	(0.7)	(0.7)	(1.0)	(1.2)	(1.5)	(1.8)	(2.0)	(2.3)	(2.6)	(2.9)	(3.0)
Birth Rate (per 1000 pop.)	45	45	46	46	48	49	50	50	51	51	51
Death Rate (per 1000 pop.)	38	38	36	34	33	31	30	27	25	22	21
Infant Mortality (per 1000 births)	300	300	280	250	230	200	180	170	160	150	140
Non-Infant Mortality	28	28	27	26	25	24	23	22	20	17	16
					(Growth rate 1920-1945 = 2.1% annually)						

Source: Annual Report on the East Africa Protectorate 1915/1916-1919/1920; Annual Report on the Colony and Protectorate of Kenya 1920-1938, 1946-1948. Great Britain Colonial Office, London H.M.S.O.; Martin, C. J., "Estimates of Population Growth in East Africa," in Barbour, K. M., and R. M. Prothero, eds., Essays on African Population, Frederick A. Praeger, New York, 1962, p. 53.

APPENDIX 2

DATA ON COMMODITIES

It is interesting to trace over the period being considered the development of Kenya's chief export products and domestic food crops, including quantity sold,[1/] price, and resulting revenues.[2/] Data have been obtained and analyzed for coffee, tea, and pyrethrum over 1950-1967 and for these products plus meat, wheat, and maize (marketed domestic production for the latter two) over 1958-1967, the period spanning the F.E.S.U. Reports on the basis of which we have estimated the benefits of the two land reforms.[3/] The reader will particularly note the relatively stable or slowly declining prices over much of this period; as noted in Chapter 4, the land reform's benefits could be analyzed only in current prices because of data limitations, but with prices steady or nearly so (and slowly declining otherwise), the lack of constant prices is less serious.[4/] A summary

---

1/ The chief cash crops are for export. Estimates of total production were unavailable for products consumed in good part at home, particularly maize; for maize and wheat, "quantity sold" represented not quantity exported but "marketed domestic output."

2/ Export data were used because domestic prices were often manipulated, hence an inaccurate reflection of the free market.

3/ Some data on other major products, notably sisal which is produced in more arid areas, also is available.

4/ The post-reform gains of the Swynnerton reforms cannot be "overstated" if prices are declining. As to the Settlement farms, whose data were collected two or three years
(contd.)

analysis of the data over 1950-1967 is presented in Table 1; a summary analysis over 1958-1967 is presented in Table 2. A short description follows. The data were taken from Kenya Government Statistical Abstracts 1950-1968, particularly the 1968 Abstract Tables 51, 70, and 71.

Coffee

Coffee revenues grew rapidly (R=4,015+676t) and steadily (R^2=.78) over 1950-1967, being almost stable over 1957-1963 and fluctuating later. This growth resulted chiefly from the growth in quantity exported, which was substantial (Q=5,261+2,316t) and steady (R^2=.91) except during the Mau Mau Emergency and around Independence. This growth was largely the result of expanded smallholder production under the Swynnerton reforms. Expansion of coffee, of course, has been limited by the glut on the international market that brought about the International Coffee Agreement, which Kenya joined in 1964. (What the recent removal of quotas will mean is unclear; for quantity of coffee demanded is expected to rise at only 1-2% a year.) Coffee prices actually declined, though slightly, over the period (P=468.10-7.15t), though there were fluctuations especially in the early 1960's (R^2= -.33).

(footnote contd.)

later on the average than the data for the African farms of the Swynnerton reforms, it is unlikely that constant prices would have improved their results more than slightly.

Tea

Tea revenues also grew rapidly (R=25+405t) and very steadily (R^2=.92) over 1950-1967, and over the shorter 1958-1967 period. This growth also resulted chiefly from the growth of quantity exported, which was substantial (Q=452+1,002t) and steady (R^2=.91) except during the Mau Mau Emergency and in 1961 and 1966. This expansion in output also occurred mainly on small holdings, and the outlook for tea expansion is more optimistic than for coffee. (Since 1966, quantity has tripled.) Tea prices remained at about the same level on the average over the period (P=350.24+3.40t) with fluctuations primarily in the mid-1950's (R^2=.16).

Pyrethrum

Kenya is the world's chief producer of pyrethrum, used to make a non-toxic insecticide with quick knock-down properties and no residual effects. Revenues from pyrethrum extract rose rapidly (R=-80+159t) and steadily (R^2=.85) over 1950-1967. Quantity increased similarly (Q=-9+21t) and steadily (R^2=.84), again largely because of increased smallholder production. Prices fluctuated considerably (R^2=.32) around roughly the same level (P=6,528.20+68.33t). Much less pyrethrum was exported as flowers, but the flower price data are also given; it is notable that prices were again virtually steady (P=250.06+4.12t) except for a high in 1960 (R^2=.66). With growing restrictions on the use of DDT and other toxic insecticides, prospects for increased sales of pyrethrum are bright.

Meat

Data for raw and prepared meat (largely beef) are taken from 1958-1967 only, because of questions on earlier data. Revenues from meat expanded fairly rapidly (R=1,507+147t) and quite steadily (R^2=.70) over the period. This expansion resulted only slightly from expansion in quantity, which grew very little (Q=7,286+68t) and very unsteadily (R^2=.03). (Beef is produced chiefly on large ranches in lower rainfall areas, not by the farmers under consideration here.) Meat prices rose modestly (P=207.31+17.19t) and fairly steadily (R^2=.84) over the period. Prospects for meat exports are good.

Wheat

Appropriate data for wheat were also taken only from the shorter period, and for marketed domestic production rather than just exports. Over 1958-1967, the value of wheat production increased moderately (R=1,905+269t) and with some fluctuations (R^2=.53). Production increased (Q=77,119+6,056t) with sharp fluctuations (R^2=.17). Prices rose somewhat (P=24.42+.57t) and also fluctuated considerably (R^2=.36).

Maize

Maize data are also taken only from the 1958-1967 period on marketed domestic production, though a very large quantity of maize is grown and consumed at home, hence unreported. The value of maize production (taking export prices) actually declined slowly over the period (R=3,490-95t) with sharp fluctuations (R^2=-.14). Quantity fluctuated wildly around the same general level (Q=165,480-1,347t) and (R^2=-.01), though again quantity includes only the marketed surplus. Prices also fluctuated some (R^2=-.36) around roughly the same level (P=20.68-.34t).

Other Commodities

Notably absent from this list is milk. Most milk was consumed domestically or marketed locally either as milk or butter, though some was exported as milk (whole or evaporated) or butter. Unfortunately, with differences in butter and in butterfat content of milk (whole or evaporated), no good, consistent series of revenue, quantity, or price data was available.

TABLE 1

Data on Commodities
(1950-1967)

	EXPORT REVENUES			QUANTITY			PRICE		
	Mean Value (£ '000)	R^2	S.D. (£ '000)	Mean Value (Tons)	R^2	S.D. (Tons)	Mean Value (£ per ton)	R^2	S.D. (£ per ton)
Coffee	10,442	.78	4,081	27,263	.91	12,977	400.18	-.33	66.32
	(R=4,015+676t)			(Q=5,261+2,316t)			(P=468.10-7.15t)		
Tea	3,870	.92	2,249	9,967	.91	5,610	382.52	.16	45.58
	(R=25+405t)			(Q=452+1,002t)			(P=350.24+3.40t)		
Pyrethrum Extract	1,427	.85	918	190	.84	121	7,177	.32	649
	(R=-80+159t)			(Q=-9+21t)			(P=6,528.20+68.33t)		
Pyrethrum Flowers	443	.04	196	1,564	.00	572	289	.66	27
	(R=372+7t)			(Q=1,594-3t)			(P=250.06+4.12t)		

Source: Statistical Abstracts 1950-1968.

TABLE 2

Data on Commodities
(1958-1967)

	EXPORT REVENUES			QUANTITY			PRICE		
	Mean Value (£ '000)	R^2	S.D. (£ '000)	Mean Value (Tons)	R^2	S.D. (Tons)	Mean Value (£ per ton)	R^2	S.D. (£ per ton)
Coffee	12,741	.70	3,026	35,975	.86	9,958	359.25	-.37	37.57
	(R=8,114+841t)			(Q=19,146+3,060t)			(P=401.16-7.62t)		
Tea	5,434	.88	1,729	13,848	.85	4,447	393.52	-.12	12.78
	(R=2,487+536t)			(Q=6,326+1,367t)			(P=396.15-.48t)		
Pyrethrum Extract	2,165	.36	409	287	.36	55	7,553.80	-.12	173.15
	(R=1,726.00+79.87t)			(Q=227.27+10.84t)			(P=7,589.55-6.50t)		
Pyrethrum Flowers	506	-.14	233	1,644	-.18	719	307.24	.07	15.50
	(R=699-30t)			(Q=2,188=99t)			(P=302.10+.93t)		
Meat	2,316	.70	534	7,660	.03	1113.83	301.87	.84	56.21
	(R=1,507+147t)			(Q=7,286+68t)			(P=207.31+17.19t)		
Wheat (Marketed Domestic Production)	3,385	.53	335	110,428	.17	43,816	27.56	.36	2.88
	(R=1,905+269t)			(Q=77,119+6,056t)			(P=24.42+.57t)		
Maize (Marketed Domestic Production)	2,964	-.14	779	158,070	-.01	43,703	18.80	-.36	1.72
	(R=3,490-95t)			(Q=165,480-1,347t)			(P=20.68-.34t)		

Source: Statistical Abstract, 1968.

COFFEE DATA

(Coffee Not Roasted)

Year	Export Revenues (£ '000)	Export Quantity (Tons)	Export Price (£ per ton)
1950	3,549	10,300	344.56
1951	4,096	9,900	413.74
1952	7,123	16,900	421.48
1953	6,713	14,800	453.58
1954	5,711	10,773	530.12
1955	8,904	19,382	459.40
1956	13,653	26,674	510.89
1957	10,792	22,252	484.99
1958	10,405	24,998	416.23
1959	10,577	25,846	409.23
1960	10,261	27,791	369.22
1961	10,609	32,152	329.97
1962	10,593	29,316	361.34
1963	11,015	36,764	299.61
1964	15,396	41,638	369.76
1965	14,096	37,794	372.97
1966	18,780	53,603	350.35
1967	15,676	49,949	313.84
	* * *		
1971	19,530	56,200	347.51

TEA DATA

Year	Export Revenues (£ '000)	Export Quantity (Tons)	Export Price (£ per ton)
1950	1,334	4,200	317.07
1951	1,397	4,100	341.46
1952	1,316	4,300	302.33
1953	928	3,000	309.33
1954	2,106	4,840	435.12
1955	2,761	5,799	476.12
1956	2,616	6,956	376.08
1957	2,861	7,194	397.69
1958	3,217	8,136	395.40
1959	3,602	9,423	382.26
1960	4,411	10,710	411.86
1961	4,004	9,774	409.66
1962	5,189	13,240	391.92
1963	5,665	14,710	385.11
1964	6,056	16,305	371.42
1965	6,085	15,666	388.42
1966	8,714	22,252	391.52
1967	7,396	18,189	406.62
	* * *		
1971	12,174	34,300	354.92

PYRETHRUM EXTRACT DATA

Year	Export Revenues (£ '000)	Export Quantity (Tons)	Export Price (£ per ton)
1950	269	45	5,978
1951	243	35	6,943
1952	188	30	6,267
1953	396	75	5,289
1954	571	85	6,718
1955	954	135	7,067
1956	810	102	7,941
1957	597	77	7,753
1958	1,289	172	7,494
1959	1,863	248	7,512
1960	2,019	260	7,765
1961	2,267	295	7,685
1962	2,723	373	7,300
1963	2,543	334	7,614
1964	2,167	279	7,767
1965	1,964	270	7,274
1966	2,397	316	7,585
1967	2,422	322	7,522
	*	*	*
1971	2,766	230	12,026

PYRETHRUM FLOWERS DATA

Year	Export Revenues (£ '000)	Export Quantity (Tons)	Export Price (£ per ton)
1950	331	1,288	256.99
1951	357	1,456	245.19
1952	512	2,128	240.60
1953	204	750	271.98
1954	334	1,288	259.93
1955	285	1,064	267.86
1956	390	1,310	297.71
1957	506	1,732	292.15
1958	525	1,806	290.70
1959	333	1,048	317.75
1960	1,006	3,133	321.10
1961	808	2,533	318.99
1962	441	1,521	289.94
1963	482	1,736	277.65
1964	286	925	309.20
1965	266	853	311.84
1966	428	1,339	319.64
1967	488	1,544	316.06
	* * *		
1971	571	N/A	N/A

MEAT DATA

(Meat and Meat Preparation)

Year	Export Revenues (£ '000)	Export Quantity (Tons)	Export Price (£ per ton)
1958	1,230	5,999	205.03
1959	1,987	8,906	223.11
1960	1,845	7,119	259.17
1961	2,283	7,361	310.15
1962	2,758	8,953	308.05
1963	2,567	8,592	298.77
1964	2,167	6,240	347.28
1965	2,468	6,727	366.88
1966	2,994	8,557	349.89
1967	2,857	8,150	350.55
* * *			
1971	3,980	8,036	495.30

WHEAT DATA

Year	Value of Production (£ '000)	Marketed Domestic Production (Tons) 5/	Price (£ per ton)
1958	2,461	102,100	24.1
1959	2,428	95,200	25.5
1960	3,594	126,100	28.5
1961	2,897	107,700	26.9
1962	2,313	82,900	27.9
1963	3,287	117,800	27.9
1964	3,453	127,900	27.0
1965	3,732	141,900	26.3
1966	3,487	131,100	26.6
1967	6,198	177,600	34.9
* * *			
1971	9,380	205,700	45.6

5/ Rounded to nearest hundred.

MAIZE DATA

Year	Value of Production (£ '000)	Marketed Domestic Production (Tons) 6/	Export Price (£ per ton)
1958	3,202	167,800	19.08
1959	3,786	183,800	20.56
1960	3,247	163,800	19.92
1961	3,404	153,200	22.22
1962	2,565	150,100	17.09
1963	3,729	199,400	18.70
1964	1,677	86,900	19.30
1965	1,959	104,500	18.75
1966	2,314	132,100	17.52
1967	3,752	235,100	15.96
	* * *		
1971	4,490	256,600	17.50

6/ Rounded to nearest hundred.

APPENDIX 3

PROFITABILITY DIFFERENCES BY ALTITUDE

It is sometimes suggested of Kenyan farming that altitude affects profitability tremendously since the more profitable crops and types of livestock are suited only to particular climates, and climate varies sharply with altitude especially in tropical latitudes. In Kenya's case it is, of course, true that altitude affects crop and livestock choices, hence profitability; at low altitudes, the climate is humid along the coast where tropical crops are grown, and hot and dry on the interior arid lands where poor grazing is virtually the sole option; as altitude climbs to 3,000-4,000 feet, rainfall increases to the point where hot-and-dry cropping and ranching become feasible; as altitude reaches the mile-high range, temperatures moderate, rainfall increases to 35 inches or more, and wide-ranging temperate agriculture becomes feasible; at the highest altitudes, however, temperatures are chilly and agricultural choices are once more limited essentially to grazing.

At altitudes of a mile or somewhat more, where the agricultural reforms we have considered primarily occurred, variations in altitude affect crop choices. At 5,000-5,500 feet one is likely to find relatively more beef cattle, grains, and the like; at 5,500-6,500 feet, a mixture of livestock, particularly dairy cattle, and a variety of crops including coffee, fruits, grains and vegetables; at

6,500-7,000 feet, a mixture of livestock, less coffee, again a range of fruits, grains and vegetables, and tea; and at the higher reaches, pyrethrum and sheep, plus a few vegetables, especially potatoes.

In order to see whether such altitude-induced variations in crop and livestock patterns affect profitability among the farms we have studied, an attempt was made to divide them roughly into a higher and a lower group. This could be done with fair precision for the European and African farms since the F.E.S.U. Reports gave approximate altitude data. Unfortunately, for the Settlement farms the task was more difficult, as no such altitude data were provided; it was necessary simply to accept the sample's division of farms into "high" and "low" altitudes, corroborated on the basis of the district of each Settlement scheme or from more particular geographic information sometimes available. The farms were divided up as follows:

High Altitude Farms

The high altitude farms included the Uasin-Gishu and Njoro farms among the European farms, the Nyeri and Elgeyo farms among the African farms, and Nyeri, other Central Province, and Rift farms among the Settlement farms.

The Uasin-Gishu farms lay on the plateau between Nakuru and Kitale at 6,500-7,500 feet where rainfall averaged about 40 inches annually. The farms devoted about a third of their land to crops, especially maize and wheat, and the bulk of their land to grazing, 75 percent of that for dairy cattle, 18 percent for beef cattle, and the rest for sheep and other livestock, especially poultry.

The Njoro farms lay on the Njoro plateau between 6,500 and 7,500 feet, where rainfall also averaged about 40 inches annually. Under these similar conditions, the Njoro and Uasin-Gishu farming patterns were similar. The Njoro farms devoted about the same proportion of land to crops, especially maize and wheat, and to livestock, though they concentrated more on dairy cattle. Profits per acre on the Njoro and Uasin-Gishu farms were similar, though the Njoro farms had both higher output and higher cost per acre (their wheat yields and labor costs being both higher).

The high altitude African farms included those in Nyeri and Elgeyo. The Nyeri farms lay in the hills of Central Province at 5,500-7,000 feet, where rainfall averaged almost 50 inches annually. These farms supported a wider variety of crops, including coffee, tea, pyrethrum, pineapples, maize, and other fruits and vegetables, and concentrated their grazing land on dairy cattle, though many other types of livestock also thrived there. The Elgeyo farms lay above 8,000 feet in rather broken country between the Uasin-Gishu plateau and the western escarpment of the Rift, where rainfall averaged well over 60 inches annually. (Natural vegetation was "Kikuyu grass," or Pennisetum clandestinum, as in most of Nyeri.) These farms also produced quite a number of crops, including maize, vegetables, and pyrethrum; the climate was, however, a bit cool for coffee and more tropical crops. Grazing land was well suited to dairy cattle and, on the higher reaches, to sheep.

High Density Settlement farms at high altitudes were located primarily in Nyeri and nearby in Kiambu or Nyandarua, where conditions are not unlike those in Nyeri, though farms high on the Kinangop plateau suffered from a chillier climate and soils of heavier clay. Other High Density farms were in the Uasin-Gishu region. The Low Density farms fell largely in the Uasin Gishu, with the exceptions in Nyandarua. All of the Settlement farms grew a variety of crops, including maize, wheat, pyrethrum, and other fruits and vegetables; though a number might have grown coffee and some tea, few chose to, as discussed in Chapter 4. Grazing land was devoted largely to dairy cattle, though some sheep were also raised.

Low Altitude Farms

The low altitude farms present a somewhat different picture. They include European farms in the Trans Nzoia region, African farms in Nandi, and a variety of Settlement farms in Trans Nzoia, Nandi, other Rift Valley areas, and even a few in the lower reaches of Central Province or the Uasin-Gishu.

The European farms of the Trans Nzoia area lay on uplands at 5,600-6,500 feet (about 1,000 feet lower than the higher altitude farms), where rainfall still averaged about 40 inches annually, but where temperatures were a little higher. The farming pattern on the Trans Nzoia farms was not dramatically different from that on the other European farms; the principal difference was that more coffee was grown, and less wheat. Somewhat more land was devoted to grazing, mostly for dairy cattle but with more than twice as much for beef cattle as on the other European farms.

The African farms of Nandi also fell at about the same altitude; they concentrated on maize and experimented some with coffee, kept some native cattle but also did considerable dairying.

The Settlement farms at low altitude also grew maize and vegetables, but they grew less pyrethrum and potatoes, more beans, sunflowers, and other warmer-climate crops; they concentrated grazing land on dairy cattle, raising fewer sheep than high-altitude farms.

Comparison of High and Low Altitude Farms

As Table 1 shows, there is, on the whole, no consistent pattern in profitability differences between European, Settlement, or African farms at high or low altitude. Output and costs averaged slightly higher on the higher European farms, but profits on lower farms were a third higher. On the Settlement farms, the lower altitude farms showed more disparity between High and Low Density farms, with High Density farms doing worse and Low Density farms doing better than their higher altitude counterparts.

TABLE 1

Average Annual Output, Cost, and Net Profit Per Acre
(shs. per acre)

High Altitude Farms 1/

	EUROPEAN FARMS			SETTLEMENT FARMS			AFRICAN FARMS		
	Av.	Uasin-Gishu	Njoro	Av.	H-D	L-D	Av.	Nyeri	Elgeyo
OUTPUT	152	134	170	132	113	150	388	447	330
A. Costs (not incl. family labor	118	97	138	69	48	90	135	153	117
PROFITS	34	37	32	62	65	60	254	294	213
B. Value of Family Labor	0	0	0	56	72	40	66	66	67
COSTS (incl. family labor)	118	97	138	125	120	130	198	211	184
PROFITS (net of family labor)	34	37	32	7	-7	20	191	236	146

TABLE 1 (contd.)

Low Altitude Farms 1/

	EUROPEAN FARMS	SETTLEMENT FARMS			AFRICAN FARMS
	Trans Nzoia	Av.	H-D	L-D	Nandi
OUTPUT	131	118	75	162	81
A. Costs (not incl. family labor	88	51	34	68	24
PROFITS	43	67	41	94	57
B. Value of Family Labor	0	56	72	40	12
COSTS (incl. family labor)	88	107	106	108	41
PROFITS (net of family labor)	43	11	-31	54	40

Source: F.E.S.U. Reports as amended.

(Components may not add because of rounding.)

1/ There was no significant difference in the proportion of hired to family labor on high or low farms.

There were, of course, striking differences between the higher African farms of Nyeri and Elgeyo and the lower ones of Nandi. But those differences arose not from the dictates of altitude, but from the Nandi farmers' choices on crops and livestock mixes and technology, as described in Chapter 4. The Nandi farmers grew notably fewer cash crops, though they had ample land suited to coffee (and even to tea in the higher reaches of the district). And on the crops tney did grow, they achieved lower yields, primarily because they devoted less labor to the crops. Thus it cannot be proved that profits must necessarily be lower in these lower altitude farms we are considering, simply because even the lower altitudes are still high enough to grow plenty of cash crops, including high-priced coffee. Though altitude does affect what crops can be grown -- and even what livestock can be raised -- within the altitude range of the farms under consideration, it is certainly possible to choose some mix of crops and livestock that brings high profits.

APPENDIX 4

OTHER ESTIMATES OF THE PAYOFF OF KENYA'S LAND REFORMS

As noted in Chapter 4, the payoff of Kenya's land reforms may be estimated through benefit/cost ratios, where the benefits are defined to be the present value of a stream of increases in "consumer surplus" deriving from the reform, discounted at the market interest rate, and the costs are defined to be the costs of implementing the reform.

Because it is difficult to predict how long the benefits of the reforms will last, given uncertainties in the political situation, growing scarcities of raw materials (such as those needed for fertilizer), and unpredictable foreign demand for exports, benefits were computed in this dissertation for both a term of ten years and perpetually. In Appendix 4, benefits will also be computed for an intermediate term of 20 years.

It is also difficult to identify the appropriate market interest rate to use in discounting the reforms' benefits; rates of 6 percent and 10 percent were used in computing the benefit/cost ratios in this dissertation on grounds that they were most reasonable, for the reasons stated in Chapter 4. To assure that benefits have not been overestimated, however, the ratios will be computed in Appendix 4 using an interest rate of 15 percent as well. Four tables are presented analagous to Tables 1-4 of

Chapter 4, but using these additional estimates of benefit terms and market interest rates.

Whatever the term of benefits and whatever the interest rate, the Swynnerton reforms compare favorably to the Million Acre Scheme. As Table 1, column (1) shows, under actual conditions -- with U.K. aid but without paying family labor -- the Million Acre Scheme achieves modest success (perpetual benefits at 6 percent interest yield a ratio of 3.146, falling to 1.259 at 15 percent interest). But, as column (4) shows, under economic conditions -- without U.K. aid but with a value imputed to family labor at prevailing wage rates -- the reform fails to break even; actually, because the consumer surplus declined (following an increase in costs per unit), the ratios are negative. After twenty years have passed, the bulk of the benefits has accrued, particularly for the higher interest rates.

But, as noted in Chapter 4, post-reform start-up years may be extra difficult, resulting in unusually low yields. Therefore, data from the last year in the series, 1966/67, have been used alone to calculate the ratios. As Table 2 shows, the ratios are modestly higher; the reform breaks even under actual conditions (column (1)) even for an interest rate of 15 percent. But as column (4) shows, reform still fails to break even when family labor is valued at prevailing wage rates; in fact, ratios are still negative as costs per unit still increase after the reform. Once again, the bulk of the benefits has accrued after a term of twenty years.

Table 1

Payoff of the Million Acre Scheme

Interest Rate	Benefits Term	(1) Benefits Computed With Unpaid Family Labor; Costs Computed With UK Aid	(2) Benefits Computed With Unpaid Family Labor; Costs Computed Without UK Aid	(3) Benefits Computed As If All Labor Paid; Costs Computed With UK Aid	(4) Benefits Computed As If All Labor Paid; Costs Computed Without UK Aid
r = 6%	10 years	1.390	0.884	-0.952	-0.607
	20 years	2.165	1.379	-1.483	-0.944
	perpetual	3.146	2.003	-2.150	-1.370
r = 10%	10 years	0.967	0.616	-0.663	-0.422
	20 years	1.493	0.951	-1.023	-0.652
	perpetual	1.574	1.002	-1.078	-0.686
r = 15%	10 years	0.947	0.604	-0.649	-0.414
	20 years	1.182	0.752	-0.810	-0.515
	perpetual	1.259	0.802	-0.863	-1.170

Table 2

Payoff of the Million Acre Scheme
1966/67 Data

Interest Rate	Benefits Term	(1) Benefits Computed With Unpaid Family Labor; Costs Computed With UK Aid	(2) Benefits Computed With Unpaid Family Labor; Costs Computed Without UK Aid	(3) Benefits Computed As If All Labor Paid; Costs Computed With UK Aid	(4) Benefits Computed As If All Labor Paid; Costs Computed Without UK Aid
r = 6%	10 years	1.831	1.165	-0.295	-0.188
	20 years	2.376	1.512	-0.383	-0.244
	perpetual	4.144	2.638	-0.666	-0.424
r = 10%	10 years	1.273	0.811	-0.205	-0.130
	20 years	1.965	1.253	-0.317	-0.201
	perpetual	2.072	1.320	-0.334	-0.212
r = 15%	10 years	1.247	0.796	-0.201	-0.128
	20 years	1.557	0.990	-0.251	-0.159
	perpetual	1.658	1.056	-0.267	-0.362

As Table 3 shows, whatever the interest rate or the term of benefits, the Swynnerton reforms achieve impressive results; even when family labor is valued at prevailing wage rates, the lowest ratio (for only 10 years of benefits and an interest rate of 15 percent) is 4.016, indicating benefits four times as great as costs in present-value terms. These ratios contrast sharply with the negative ratios of the Million Acre Scheme, and demonstrate the far greater success of the Swynnerton Reforms. The bulk of the benefits has accrued after a term of twenty years.

As discussed in Chapter 4, it was difficult to estimate the costs of implementing the Swynnerton reforms. But even assuming the Swynnerton reforms cost as much as the Million Acre Scheme (net of the costs of purchasing the land) -- that is, more than five times our estimate of their cost -- the Swynnerton reforms still generally break even. (If family labor is valued at prevailing wage rates and an interest rate of 15 percent is used, the reforms do fail to break even, however.) Thus, in general the Swynnerton Reforms achieve fine results, particularly in comparison to the costlier and fancier Million Acre Scheme. The Swynnerton Reforms demonstrate that it is, in fact, possible to transform traditional and inefficient African holdings into modern and productive small farms.

Table 3

Payoff of the Swynnerton Reforms
(Implementation Cost at £ 2.5 per acre)

Interest Rate	Term of Benefits	(1) Benefits Computed With Unpaid Family Labor	(2) Benefits Computed As If All Labor Paid 1/
r = 6%	10 years	13.543	5.888
	20 years	21.128	9.030
	perpetual	30.667	13.333
r = 10%	10 years	11.306	4.916
	20 years	17.462	7.592
	perpetual	18.400	8.000
r = 15%	10 years	9.237	4.016
	20 years	11.520	5.009
	perpetual	12.260	5.331

1/ Imputing a value to family labor at prevailing wage rates.

Table 4

Payoff of the Swynnerton Reforms
(Implementation Cost Assumed Equal to That of Million Acre Scheme Including UK Aid) 2/

Interest Rate	Term of Benefits	(1) Benefits Computed With Unpaid Family Labor	(2) Benefits Computed As If All Labor Paid 3/
r = 6%	10 years	2.367	1.029
	20 years	3.693	1.512
	perpetual	5.361	2.330
r = 10%	10 years	1.976	0.859
	20 years	3.052	1.334
	perpetual	3.216	1.406
r = 15%	10 years	1.615	0.702
	20 years	2.014	0.876
	perpetual	2.143	0.919

2/ Assuming the Million Acre Scheme costs of £ 17,162,000 for 1.2 million acres, which amounts to excluding the costs of compensating the European landowners.

3/ Imputing a value to family labor at prevailing wage rates.

BIBLIOGRAPHY

Apthorpe, Raymond, Land Reform In Africa, Unpublished Memorandum, United Nations at Geneva, 6 March 1970.

Barbour, K. M. and R. M. Prothero, eds., Essays On African Population, Frederick A. Praeger, New York, 1961.

Boserup, Ester, The Conditions Of Agricultural Growth, Aldine Publishing Co., Chicago, 1965.

Brass, William and Ainsley J. Coale, Paul Demeny, Don F. Heisel, Frank Lorimer, Anatole Romaniuk, and Etienne Van de Walle, The Demography Of Tropical Africa, Princeton University Press, Princeton, 1968.

Brough, A. T., "Comment On The Report Of The Committee On The Organization Of Agriculture," East African Economic Review, Vol. 7, No. 2, 1960.

Brown, L. H., A National Cash Crop Policy For Kenya, Government Printer, Nairobi, 1963.

-- "Development And Farm Planning In The African Areas Of Kenya," East African Agricultural Journal, Vol. XIII, No. 2, 1958.

Burgwin, W. A., "Smallholder Sisal Production," Sisal Bulletin, Nairobi, July, 1964.

Caldwell, J. C. and Chukuka Okonjo, eds., The Population Of Tropical Africa, Longmans, Green & Co. Ltd., London, 1968.

Charnley, E. F., Country Paper: Kenya, World Land Reform Conference, United Nations (F.A.O.), Rome, 20 June 1966.

Clayton, E. S., "Small Scale Cash Crop Production In A Developing Economy," Economic Development and Cultural Change, Vol. 9, No. 4, 1961.

Colonial Office List, Waterlow & Sons Ltd., London, annual. (The list is compiled from official sources but is an unofficial publication.)

Coale, A. J., and E. van der Walle, "Notes For Which Estimates Were Made But Not Subject To A Detailed Study," Brass, William, et al., The Demography of Tropical Africa, Princeton University Press, Princeton, 1968.

de Wilde, J. C., Experiences With Agricultural Development In Tropical Africa, I.B.R.D., Johns Hopkins Press, Baltimore, 1967.

Donaldson, G. F., Farm Size And Land Policy In Kenya, Unpublished Manuscript, I.B.R.D., February, 1973.

Etherington, Daniel M., "Projected Changes In Urban And Rural Population In Kenya And The Implications For A Development Policy," East African Economic Review, Vol. 1, No. 2, 1965.

Goldthorpe, J. E., "Attitudes Toward The Census And Vital Registration In East Africa," Population Studies, Vol. VI, No. 2, 1952.

Great Britain Colonial Office:

-- Annual Report On The Colony And Protectorate Of Kenya, 1920-1938, 1946-1962, London H.M.S.O., annual.

-- Annual Report On The East African Protectorate, 1905-1920, London H.M.S.O., annual.

-- Blue Book, London H.M.S.O., annual.

-- Comments On Royal Commission Report, London H.M.S.O., 1932.

-- East Africa Royal Commission 1953-1955 Report, Cmd. 9475, London H.M.S.O., 1955.

-- Historical Survey Of The Origins And Growth Of Mau Mau, Cmd. 1030, London H.M.S.O., 1960.

-- Land And Population In Kenya, Cmd. 290, London H.M.S.O., 1952.

-- Memorandum On Native Land Policy, London H.M.S.O., 1930.

-- Overseas Economic Surveys: British East Africa, London H.M.S.O., 1952.

-- Report Of The Kenya Land Commission (Carter), Cmd. 4556, London H.M.S.O., 1934.

Harberger, Arnold C., Taxation And Welfare, Little, New York, 1974.

Heyer, Judith, The Economics Of Small-Scale Farming In Lowland Machakos, Nairobi University, Institute For Development Studies, Occasional Paper No. 1, 1967. (Input-Output Data From 16 Smallholdings In Masii Location, Machakos District, 1962/63, Supplement To Occasional Paper No. 1, 1967.)

-- A Linear Programming Model For Peasant Agriculture, E.A.I.S.R., Conference Paper, Nairobi, 1964.

-- Preliminary Results Of A Linear Programming Analysis Of Peasant Farms In Machakos District, Kenya, E.A.I.S.R., Conference Paper, Kampala, 1966.

Humphrey, N., A Preliminary Report On Agricultural Conditions In South Nyeri, Unpublished Manuscript, Nyeri, 1944.

-- E. H. Lambert and P. Wyn Harris, The Kikuyu Lands, Government Printer, Nairobi, 1948.

Huxley, Elspeth, A New Earth, William Morrow & Co., New York, 1960.

-- White Man's Country: Lord Delamere And The Making Of Kenya, MacMillan & Co., London, 1935.

International Bank For Reconstruction And Development, Agricultural Sector Survey: Kenya, Washington, D. C., December, 1973.

-- The Economic Development Of Kenya, Johns Hopkins Press, Baltimore, 1963.

-- Prospects For Economic Development In East Africa, Washington, D. C., 1967.

-- The Second Decade: A Basic Economic Report on Kenya, Washington, D. C., January, 1974.

International Labor Organization, Employment, Incomes, And Equality: A Strategy For Increasing Productive Employment in Kenya, United Nations, Geneva, 1972.

Kenya, Colony and Protectorate Of:

African Affairs Dept. Annual Report, Government Printer, Nairobi, annual.

African Land Development Board (ALDEV) Annual Report, Government Printer, Nairobi, annual.

Dept. of Settlement Annual Report, Government Printer, Nairobi, annual.

Development Programme 1954-57, Sessional Paper No. 51 Of 1955, Government Printer, Nairobi, 1955.

Progress On The Three-And-A-Half-Year Development Plan, Sessional Paper No. 97 Of 1955, Government Printer, Nairobi, 1955.

Development Programme 1957/60, Sessional Paper No. 77 Of 1956/57, Government Printer, Nairobi, 1957.

Development Programme 1960/63, Sessional Paper No. 4 Of 1959/60, Government Printer, Nairobi, 1960.

Economic Development Of Kenya (Report of Economic Survey Mission of the I.B.R.D.), Government Printer, Nairobi, 1962.

East African Statistical Dept., African Population Of Kenya Colony And Protectorate (1948), Government Printer, Nairobi, 1950.

-- Estimates Of Geographical Income And Net Product, Government Printer, Nairobi, 1953.

Ministry Of Agriculture, African Land Development In Kenya 1946-1962, English Press Ltd., Nairobi, 1962.

-- Agricultural Census (Former Scheduled Areas) 1960, Government Printer, Nairobi, 1960.

-- Annual Review, Government Printer, Nairobi, annual.

-- Review of Agriculture 1968, mimeograph, Nairobi, 1968.

Ministry For Constitutional Affairs and Economic Planning, Kenya African Agricultural Sample Census 1960/61, Government Printer, Nairobi, 1961.

Native Lands Trust Ordinance, Government Printer, Nairobi, 1949.

Report Of The Development Committee, Government Printer, Nairobi, 1946.

Kenya, Republic Of:

Agricultural Census Of Large Farms (Predominantly Formerly Scheduled Areas) 1964, 1968, Nairobi, 1964, 1968.

Dept. Of Settlement Annual Report, Nairobi, annual.

-- Five Year Review and Annual Report 1967/68, Nairobi, 1968.

Development Plan 1965/66-1969/70, Nairobi, 1965.

Development Plan 1969/70-1973/74, Nairobi, 1969.

Economic Survey, Nairobi, annual.

Economic Survey of Central Province, 1963/64, Nairobi, 1964.

Employment, Sessional Paper No. 10 of 1973, Nairobi, 1973.

Farm Economic Survey Unit Reports Nos. 14 (Trans Nzoia 1962-1963), Oct., 1963; 15 (Elgeyo and West Pokot, 1960), Dec., 1963; 16 (Uasin-Gishu 1959-1962), Dec., 1963; 17 (Accounting Techniques), Dec., 1963; 18 (Nandi 1962-1963), June, 1964; 20 (Njoro 1958-1961), July, 1964; 21 (Nyeri, 1962), Aug., 1966; 23 (Nandi and West Pokot, 1963-1964), Dec., 1965; 24 (Nyeri, 1963), Aug., 1966; 25 (Nyeri, 1964), 1968; 27 (Settlement Schemes, 1964/64-1967/68), 1971 (and preliminary and background tables for No. 27 provided to author by the Government of Kenya), Nairobi.

Population Census, 1962, Advance Report, Nairobi, 1964, Vol. I, July, 1964; Vol. II, March, 1965.

Population Census, 1969 (mimeographed tables provided by the Government of Kenya).

Report Of The Mission On Land Control And Registration 1965-1966 (Lawrence Commission), Nairobi, 1966.

Statistical Abstracts, Nairobi, annual.

Statistical Digest, Nairobi, quarterly.

Kuczynski, R. R., Demographic Survey of the British Empire, Oxford University Press, London, 1949.

Leakey, L. S. B., Mau Mau, Methuen & Co. Ltd., London, 1952.

Leys, Norman, Kenya, London, 1924.

Lugard, F. O., The Rise Of Our East African Empire, Blackwood & Sons, London, 1893.

Lury, D. A., "Population Data in East Africa," Caldwell, J. C. and C. Okonjo, eds., The Population of Tropical Africa, Longmans, Green & Co. Ltd., London, 1968. (See especially bibliography.)

MacArthur, J. D., Evaluation Of Land Reform In Kenya, World Land Reform Conference, Rome, 1966.

-- "Development of Research Into Production Economics," East African Economic Review, Vol. 9, No. 2, 1962.

MacPhee, A. Marshall, Kenya, Frederick A. Praeger, New York, 1968.

Martin, C. J., "The East African Population Census 1948: Planning and Enumeration," Population Studies, Vol. III, No. 3, 1949.

-- Estimates Of Population Growth In East Africa," Barbour, K. M. and R. M. Prothero, eds., Essays on African Population, Frederick A. Praeger, New York, 1962.

-- "Some Estimates Of The General Distribution, Fertility and Rate Of Natural Increase Of The African Population Of British East Africa," Population Studies, Vol. VII, No. 2, 1953.

Morgan, W. T. W. and N. Manfred Shaffer, Population Of Kenya: Density And Distribution, Oxford University Press, Nairobi, 1962.

Nottige, C. P. R., and J. R. Goldsack, The Million Acre Settlement Scheme, Dept. Of Settlement, Nairobi, 1966.

Ominde, S. H., Land and Population Movements in Kenya, Northwestern University Press, Evanston, 1968.

-- "Problems Of Land And Population In The Lake Districts Of Western Kenya," Proceedings Of The Inaugural Symposium Of The East African Academy, Nairobi, 1964.

-- "Rural Population Patterns and Problems Of The Kikuyu, Embu, and Meru Districts Of Kenya," Second Proceedings Of The East African Academy, Nairobi, 1968.

Pressat, Roland, Demographic Analysis: Methods, Results, Applications, Aldine-Atherton, Chicago, 1972.

Ruthenberg, Hans, African Agricultural Production Development Policy in Kenya 1952-1965, Springer-Verlag, New York, 1966. (See especially bibliography.)

Spiegelman, Mortimer, Introduction To Demography, The Society of Actuaries, Chicago, 1955.

Stolnitz, George J., Life Tables From Limited Data: A Demographic Approach, Princeton University Press, Princeton, 1956.

Swynnerton, R. J. M., A Plan To Intensify The Development Of African Agriculture In Kenya, Nairobi, 1954.

-- Planning African Farming In Kenya, Conference of Wye College, Cmd. 531, London H.M.S.O., 1958.

Todaro, M. P. and J. R. Harris, "Wages, Industrial Employment And Labour Productivity In A Development Economy: The Kenyan Experience," East African Economic Review, Vol. 1, No. 1, 1969.

Wilson, R. G., "Land Consolidation In The Fort Hall District Of Kenya," Journal Of African Administration, Vol. VIII, No. 32, July, 1956.